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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 104

Part II of II

Disposal Area - Onsite - N Plume, Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	4.28E-05	2 03E-01	7.63E-09	1.55E-09		1.17E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.19E-04	5.60E-02	2.12E-08	1.19E-09		3.26E-08	
ug/m3	1,1-DICHLOROETHENE	C	4.20E-03	1.75E-01	7.48E-07	1.31E-07		1.15E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.56E-04	9 10E-02	2 78E-08	2.53E-09	1.40E-03	4.27E-08	3.05E-05
ug/m3	BROMODICHLOROMETHANE	B2	1 23E-04		2.19E-08			3.37E-08	
ug/m3	CARBON TETRACHLORIDE	B2	4.19E-03	5.25E-02	7.47E-07	3.92E-08		1.15E-06	
ug/m3	CHLOROFORM	B2	6.03E-04	8 05E-02	1.07E-07	8 64E-09	0.00E+00	1.65E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.50E-04		9 79E-08		1.00E-02	1.51E-07	1.51E-05
ug/m3	METHYLENE CHLORIDE	B2	3.67E-04	1.65E-03	6 54E-08	1.08E-10	8.57E-01	1.01E-07	1.17E-07
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2.21E-03	2 00E-03	3.93E-07	7.87E-10	1.71E-01	6 05E-07	3.54E-06
ug/m3	trans-1,2-DICHLOROETHENE		1.27E-03		2.26E-07		2.00E-02	3.48E-07	1.74E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.38E-03	6.00E-03	2.46E-07	1.47E-09		3 78E-07	
					Total ELCR:	**1.86E-07**		**Total HI:**	**0.0001**

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Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Adult Carcinogenic Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 30E+01	1 00E-01	1 60E-04	1.93E-01		1 89E-06		
MG/L	ARSENIC	A	1 50E+00	3.66E+00	1 51E+01	3.00E-03	4 10E-01	1 60E-04	4 46E-05	7E-05	4.36E-10	2E-09	
MG/L	BARIUM	D				1 00E-01	7 00E-02	1 60E-04	1 49E-03		1 45E-08		
MG/L	BERYLLIUM	B1			8 40E+00	7.00E-04	1 00E-02	1 60E-04	1 04E-05		1.02E-10		
MG/L	CADMIUM	B1			6 30E+00	2.00E-03	1.00E-02	1.00E-03	2.97E-05		1 82E-09		
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2 00E-02	5 00E-03	1.00E-03	2.97E-04		1 82E-08		
MG/L	COBALT					2.00E-02	8 00E-01	4 00E-04	2 97E-04		7 27E-09		
MG/L	COPPER	D				2 00E-02	3 00E-01	1 60E-04	2 97E-04		2 91E-09		
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	1 49E-04		3 65E-11		
MG/L	MANGANESE	D				2 00E+00	4 00E-02	1 60E-04	2 97E-02		2.91E-07		
MG/L	MERCURY	D				1 00E-04	1.00E-04	1 00E-03	1 49E-06		9 09E-11		
MG/L	NICKEL	D				1 00E-02	2 70E-01	1 00E-04	1 49E-04		9 09E-10		
MG/L	SILICON					1.50E+01	2.00E-01	1 60E-04	2 23E-01		2 18E-06		
MG/L	VANADIUM					4 00E-02	1.00E-02	1 60E-04	5 95E-04		5 82E-09		
MG/L	DIELDRIN	B2	1 60E+01	3 20E+01	1.61E+01	6 00E-05	5 00E-01	1 60E-02	8 92E-07	1E-05	8 73E-10	3E-08	
MG/L	HEPTACHLOR EPOXIDE	B2	9 10E+00	1 26E+01	9 10E+00	1 00E-05	7.20E-01	1 10E-02	1 49E-07	1E-06	1 00E-10	1E-09	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2.86E-01	2 03E-01	1 22E-02	7 00E-01	9 00E-03	1 81E-04	4E-05	9 97E-08	3E-08	4E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7 04E-02	5 60E-02	3.58E-03	8 10E-01	8.40E-03	5.32E-05	3E-06	2 73E-08	2E-09	3E-06
MG/L	1,1-DICHLOROETHENE	C	6 00E-01	6 00E-01	1 75E-01	1 97E-02	1 00E+00	1 60E-02	2.93E-04	2E-04	2 86E-07	2E-07	5E-05
MG/L	1,2-DICHLOROETHANE	B2	9 10E-02	9 10E-02	9 10E-02	3.82E-03	1.00E+00	5 30E-03	5 68E-05	5E-06	1 84E-08	2E-09	5E-06
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6 33E-02		3 74E-03	9 80E-01	5.80E-03	5 57E-05	3E-06	1 97E-08	1E-09	
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	5 25E-02	3 14E-03	6.50E-01	2 20E-02	4 67E-05	6E-06	6 28E-08	1E-08	2E-06
MG/L	CHLOROFORM	B2	6.10E-03	3 05E-02	8 05E-02	6 36E-03	2.00E-01	8.90E-03	9.45E-05	6E-07	5 14E-08	2E-09	8E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				6.17E-03	1.00E+00	1.00E-02	9 18E-05		5 61E-08		
MG/L	METHYLENE CHLORIDE	B2	7 50E-03	7.89E-03	1.65E-03	9.84E-03	9 50E-01	4 50E-03	1 46E-04	1E-06	4 03E-08	3E-10	2E-07
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5 20E-02	2 00E-03	2.94E-02	1.00E+00	4 80E-02	4 37E-04	2E-05	1.28E-06	7E-08	9E-07
MG/L	trans-1,2-DICHLOROETHENE					1 07E-02	1.00E+00	1.00E-02	1.59E-04		9 73E-08		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7 33E-02	6 00E-03	8.28E-02	1.50E-01	1.60E-02	1 23E-03	1E-05	1 20E-06	9E-08	7E-06
	Total Risk									**4E-04**		**4E-07**	**1E-04**
										Total Risk =		**5E-04**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1.00E-01		1.30E+01	1 00E-01	1.60E-04	3 56E-01	0 36	3 99E-06	3 99E-05	
MG/L	ARSENIC	A	3.00E-04	1.23E-04		3.00E-03	4 10E-01	1 60E-04	8 22E-05	0 27	9.21E-10	7 48E-06	
MG/L	BARIUM	D	7.00E-02	4 90E-03	1 43E-04	1 00E-01	7 00E-02	1 60E-04	2.74E-03	0 039	3 07E-08	6 26E-06	
MG/L	BERYLLIUM	B1	2.00E-03	2 00E-05	5 70E-06	7 00E-04	1.00E-02	1 60E-04	1 92E-05	0 0096	2 15E-10	1 07E-05	
MG/L	CADMIUM	B1	5 00E-04	5.00E-06		2 00E-03	1 00E-02	1.00E-03	5 48E-05	0 11	3 84E-09	7 67E-04	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 00E-02	5 00E-03	1.00E-03	5 48E-04	0 18	3 84E-08	0 0026	
MG/L	COBALT		6 00E-02	4.80E-02		2.00E-02	8 00E-01	4 00E-04	5 48E-04	0 0091	1.53E-08	3 20E-07	
MG/L	COPPER	D	3 70E-02	1.11E-02		2.00E-02	3 00E-01	1 60E-04	5 48E-04	0 015	6 14E-09	5 53E-07	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	2 75E-04		7 70E-11		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2.00E+00	4 00E-02	1.60E-04	5 48E-02	0 39	6 14E-07	1 10E-04	
MG/L	MERCURY	D			8 57E-05	1.00E-04	1 00E-04	1.00E-03	2 74E-06		1.92E-10		
MG/L	NICKEL	D	2 00E-02	5.40E-03		1 00E-02	2 70E-01	1.00E-04	2 74E-04	0 014	1.92E-09	3 55E-07	
MG/L	SILICON					1 50E+01	2.00E-01	1.60E-04	4 11E-01		4 60E-06		
MG/L	VANADIUM		7 00E-03	7 00E-05		4 00E-02	1 00E-02	1.60E-04	1 10E-03	0 16	1.23E-08	1.75E-04	
MG/L	DIELDRIN	B2	5.00E-05	2.50E-05		6 00E-05	5.00E-01	1 60E-02	1.64E-06	0 033	1.84E-09	7 36E-05	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9 36E-06		1 00E-05	7.20E-01	1 10E-02	2 74E-07	0.021	2.11E-10	2 25E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4 20E-02		1 22E-02	7.00E-01	9 00E-03	3 34E-04	0.0056	2 10E-07	5 01E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		3.58E-03	8 10E-01	8 40E-03	9 80E-05	0 025	5 76E-08	1 78E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		1 97E-02	1 00E+00	1 60E-02	5 39E-04	0.060	6 04E-07	6 71E-05	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	3.82E-03	1 00E+00	5 30E-03	1 05E-04	0 0035	3 89E-08	1 30E-06	0 075
MG/L	BROMODICHLOROMETHANE	B2	2.00E-02	1.96E-02		3.74E-03	9 80E-01	5 80E-03	1 03E-04	0 0051	4 16E-08	2 12E-06	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4 55E-04		3 14E-03	6 50E-01	2 20E-02	8 61E-05	0 12	1 33E-07	2 91E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		6 36E-03	2 00E-01	8 90E-03	1 74E-04	0.017	1 09E-07	5 43E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1 00E-02	1 00E-02	6 17E-03	1 00E+00	1 00E-02	1.69E-04	0 017	1.18E-07	1 18E-05	0 017
MG/L	METHYLENE CHLORIDE	B2	6 00E-02	5.70E-02	8 57E-01	9 84E-03	9 50E-01	4.50E-03	2 70E-04	0 0045	8.49E-08	1 49E-06	3 15E-04
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1.00E-02	1 71E-01	2 94E-02	1 00E+00	4.80E-02	8 05E-04	0 080	2.70E-06	2 70E-04	0.0047
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	1 07E-02	1.00E+00	1 00E-02	2 93E-04	0 015	2 05E-07	1 03E-05	0 015
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		8 28E-02	1 50E-01	1 60E-02	2.27E-03	0 38	2 54E-06	0 0028	
	Hazard Index									**2.3**		**0.0073**	**0.11**
										Total Hazard Index =		**2.5**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - N Plume, Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds

$$\textbf{CDI} = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Disposal Area - Onsite - N Plume, Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	4.28E-05	--	--	--		4.1E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.19E-04	--	--	--		1.1E-07	
ug/m3	1,1-DICHLOROETHENE	C	4.20E-03	--	--	--		4 0E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.56E-04	--	--	--	1.40E-03	1.5E-07	1.07E-04
ug/m3	BROMODICHLOROMETHANE	B2	1.23E-04	--	--	--		1.2E-07	
ug/m3	CARBON TETRACHLORIDE	B2	4.19E-03	--	--	--		4.0E-06	
ug/m3	CHLOROFORM	B2	6.03E-04	--	--	--	0.00E+00	5.8E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5 50E-04	--	--	--	1.00E-02	5.3E-07	5 27E-05
ug/m3	METHYLENE CHLORIDE	B2	3 67E-04	--	--	--	8 57E-01	3 5E-07	4.11E-07
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2.21E-03	--	--	--	1.71E-01	2 1E-06	1.24E-05
ug/m3	trans-1,2-DICHLOROETHENE		1 27E-03	--	--	--	2.00E-02	1.2E-06	6.09E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.38E-03	--	--	--		1.3E-06	
					Total ELCR:	--		**Total HI:**	**0.0002**

Printed on 10/25/2001 8 32 AM

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds.			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above[f]**		

References:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.
f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (N Plume) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 30E+01	1.00E-01	1 60E-04	7.12E-02		5 23E-07		
MG/L	ARSENIC	A	1.50E+00	3 66E+00	1.51E+01	3 00E-03	4 10E-01	1.60E-04	1 64E-05	2E-05	1 21E-10	4E-10	2E-04
MG/L	BARIUM	D				1 00E-01	7 00E-02	1 60E-04	5 48E-04		4.02E-09		
MG/L	BERYLLIUM	B1			8.40E+00	7 00E-04	1 00E-02	1.60E-04	3 84E-06		2 82E-11		3E-05
MG/L	CADMIUM	B1			6 30E+00	2 00E-03	1.00E-02	1.00E-03	1.10E-05		5 03E-10		7E-05
MG/L	CHROMIUM, TOTAL	A-D			4 20E+01	2.00E-02	5 00E-03	1.00E-03	1 10E-04		5.03E-09		5E-03
MG/L	COBALT					2 00E-02	8.00E-01	4 00E-04	1.10E-04		2 01E-09		
MG/L	COPPER	D				2 00E-02	3.00E-01	1 60E-04	1.10E-04		8 05E-10		
	Total Risk									**1E-04**		**1E-07**	**5E-03**
											Total Risk =	**5E-03**	

Disposal Area (Potable Use) (N Plume) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation* HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 30E+01	1 00E-01	1 60E-04	8 31E-01	0 83	6 10E-06	6 10E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 00E-03	4 10E-01	1 60E-04	1 92E-04	0 64	1 41E-09	1 15E-05	
MG/L	BARIUM	D	7 00E-02	4.90E-03	1 43E-04	1 00E-01	7 00E-02	1 60E-04	6 39E-03	0 091	4 69E-08	9 58E-06	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05	5 70E-06	7 00E-04	1 00E-02	1.60E-04	4 47E-05	0 022	3 29E-10	1 64E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		2 00E-03	1 00E-02	1 00E-03	1 28E-04	0 26	5 87E-09	0.0012	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2.86E-05	2 00E-02	5 00E-03	1 00E-03	1.28E-03	0 43	5 87E-08	0 0039	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	1 28E-03	0.021	2 35E-08	4 89E-07	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3 00E-01	1 60E-04	1 28E-03	0 035	9 39E-09	8 46E-07	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	6 42E-04		1 18E-10		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2 00E+00	4 00E-02	1 60E-04	1 28E-01	0 91	9 39E-07	1 68E-04	
MG/L	MERCURY	D			8 57E-05	1 00E-04	1 00E-04	1 00E-03	6 39E-06		2 93E-10		
MG/L	NICKEL	D	2 00E-02	5 40E-03		1 00E-02	2 70E-01	1 00E-04	6 39E-04	0 032	2 93E-09	5 43E-07	
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	9 59E-01		7 04E-06		
MG/L	VANADIUM		7 00E-03	7.00E-05		4 00E-02	1 00E-02	1 60E-04	2 56E-03	0 37	1 88E-08	2 68E-04	
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05		6 00E-05	5 00E-01	1 60E-02	3 84E-06	0 077	2.82E-09	1 13E-04	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9 36E-06		1 00E-05	7 20E-01	1 10E-02	6.39E-07	0 049	3 23E-10	3 45E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		1 22E-02	7 00E-01	9 00E-03	7 79E-04	0 013	3 22E-07	7 66E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		3 58E-03	8 10E-01	8 40E-03	2 29E-04	0 057	8 82E-08	2.72E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		1 97E-02	1.00E+00	1 60E-02	1 26E-03	0.14	9 24E-07	1 03E-04	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	3 82E-03	1 00E+00	5 30E-03	2 44E-04	0 0081	5 94E-08	1.98E-06	0 17
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1 96E-02		3 74E-03	9 80E-01	5 80E-03	2 39E-04	0 012	6 37E-08	3.25E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		3 14E-03	6 50E-01	2 20E-02	2 01E-04	0 29	2.03E-07	4 46E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		6.36E-03	2 00E-01	8 90E-03	4 06E-04	0 041	1 66E-07	8.30E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	6 17E-03	1 00E+00	1 00E-02	3 95E-04	0.039	1 81E-07	1 81E-05	0 039
MG/L	METHYLENE CHLORIDE	B2	6 00E-02	5 70E-02	8 57E-01	9 84E-03	9 50E-01	4 50E-03	6 29E-04	0.010	1 30E-07	2 28E-06	7 34E-04
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 94E-02	1 00E+00	4 80E-02	1.88E-03	0.19	4 14E-06	4 14E-04	0 011
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	1 07E-02	1 00E+00	1.00E-02	6 85E-04	0 034	3 14E-07	1 57E-05	0 034
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		8 28E-02	1 50E-01	1 60E-02	5 29E-03	0 88	3 89E-06	0 0043	
	Hazard Index									**5.5**		**0.011**	**0.3**
										Total Hazard Index =		**6**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic and carcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	20	a,c	20	a,c
EF =	Exposure Frequency (days/year)	250	a	250	a
ED =	Exposure Duration (years)	25	a	25	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1.00E-03	
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	25550	a

Sources:
a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response
c = Based on an eight hour workday

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario - Inhalation

Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.9E-05	2.0E-01	2.7E-09	5 5E-10		7.6E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.1E-04	5.6E-02	7 8E-09	4.4E-10		2.2E-08	
ug/m3	1,1-DICHLOROETHENE	C	4.0E-03	1.8E-01	2.8E-07	4.9E-08		7 8E-07	
ug/m3	1,2-DICHLOROETHANE	B2	1.5E-04	9.1E-02	1.0E-08	9.3E-10	1.4E-03	2.9E-08	2.04E-05
ug/m3	1,2-DICHLOROPROPANE	B2	3 6E-04		2 5E-08		1.1E-03	7.0E-08	6 14E-05
ug/m3	BENZENE	A	7.7E-04	2.7E-02	5.4E-08	1.5E-09	1 7E-03	1 5E-07	8.90E-05
ug/m3	CARBON TETRACHLORIDE	B2	4.0E-03	5 3E-02	2.8E-07	1.5E-08		7.9E-07	
ug/m3	CHLOROFORM	B2	5 7E-04	8.1E-02	4.0E-08	3.2E-09	0 0E+00	1.1E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.3E-04		3 7E-08		1.0E-02	1.0E-07	1 03E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2.1E-03	2.0E-03	1.5E-07	3.0E-10	1.7E-01	4.2E-07	2.44E-06
ug/m3	trans-1,2-DICHLOROETHENE		1.2E-03		8.6E-08		2.0E-02	2.4E-07	1.20E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.3E-03	6.0E-03	9.2E-08	5.5E-10		2.6E-07	
ug/m3	VINYL CHLORIDE	A	4 9E-03	1.5E-02	3.4E-07	5.2E-09	1.1E-01	9.5E-07	8.64E-06
					Total ELCR:	**7.7E-08**		**Total HI:**	**0.0002**

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Inhalation:

CDI = **Ingestion CDI from above** [g]

References:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Default factors adapted from EPA Exposure Factors Handbook, August 1997.
c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
g = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Industrial Worker Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 30E+01	1 00E-01	1 60E-04	4 54E-02		1 36E-07		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1.51E+01	3 00E-03	4 10E-01	1 60E-04	1 05E-05	1 6E-05	3 15E-11	1 2E-10	
MG/L	BARIUM	D				1 00E-01	7 00E-02	1 60E-04	3 49E-04		1.05E-09		
MG/L	BERYLLIUM	B1			8 40E+00	7 00E-04	1 00E-02	1.60E-04	2 45E-06		7 34E-12		
MG/L	CADMIUM	B1			6.30E+00	2 00E-03	1.00E-02	1.00E-03	6 99E-06		1 31E-10		
MG/L	CHROMIUM, TOTAL	A-D			4 20E+01	2 00E-02	5 00E-03	1.00E-03	6 99E-05		1.31E-09		
MG/L	COBALT					2 00E-02	8 00E-01	4 00E-04	6 99E-05		5 24E-10		
MG/L	COPPER	D				2 00E-02	3 00E-01	1 60E-04	6 99E-05		2 10E-10		
MG/L	LEAD	B2				1.00E-02	1.50E-01	4 00E-06	3 51E-05		2.63E-12		
MG/L	MANGANESE	D				2 00E+00	4 00E-02	1.60E-04	6 99E-03		2.10E-08		
MG/L	MERCURY	D				1 00E-04	1 00E-04	1.00E-03	3.49E-07		6 55E-12		
MG/L	NICKEL	D				1.00E-02	2 70E-01	1.00E-04	3.49E-05		6 55E-11		
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	5.24E-02		1 57E-07		
MG/L	VANADIUM					4.00E-02	1 00E-02	1 60E-04	1.40E-04		4 19E-10		
MG/L	DIELDRIN	B2	1.60E+01	3.20E+01	1 61E+01	6 00E-05	5.00E-01	1.60E-02	2 10E-07	3 4E-06	6.29E-11	2 0E-09	
MG/L	HEPTACHLOR EPOXIDE	B2	9 10E+00	1 26E+01	9.10E+00	1 00E-05	7 20E-01	1 10E-02	3.49E-08	3 2E-07	7 21E-12	9 1E-11	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2 03E-01	2 23E+00	7 00E-01	9 00E-03	7.79E-03	1 6E-03	1 31E-06	3.8E-07	1 6E-03
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5 60E-02	2.62E-02	8 10E-01	8 40E-03	9.15E-05	5.2E-06	1.44E-08	1.0E-09	5 1E-06
MG/L	1,1-DICHLOROETHENE	C	6 00E-01	6 00E-01	1 75E-01	2.19E-02	1 00E+00	1 60E-02	7.64E-05	4.6E-05	2.29E-08	1 4E-08	1 3E-05
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9 10E-02	9 10E-02	2.20E-02	1.00E+00	5 30E-03	7 68E-05	7.0E-06	7 63E-09	6 9E-10	7 0E-06
MG/L	1,2-DICHLOROPROPANE	B2	6.80E-02	9.19E-02		2 78E-02	7.40E-01	1.00E-02	9.71E-05	6 6E-06	1 82E-08	1 7E-09	
MG/L	BENZENE	A	5.50E-02	5.67E-02	2 70E-02	2 19E-02	9.70E-01	2.10E-02	7 65E-05	4 2E-06	3 01E-08	1 7E-09	2.1E-06
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	2 21E-02	6.50E-01	2.20E-02	7 73E-05	1 0E-05	3 19E-08	6.4E-09	4.1E-06
MG/L	CHLOROFORM	B2	6.10E-03	3 05E-02	8 05E-02	2.42E-02	2 00E-01	8 90E-03	8 44E-05	5 1E-07	1.41E-08	4 3E-10	6.8E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				9 56E-02	1.00E+00	1.00E-02	3 34E-04		6 27E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5 20E-02	2 00E-03	1.82E-02	1.00E+00	4.80E-02	6 37E-05	3 3E-06	5.74E-08	3.0E-09	1.3E-07
MG/L	trans-1,2-DICHLOROETHENE					2.36E-02	1.00E+00	1 00E-02	8 24E-05		1 54E-08		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6 00E-03	1 83E+00	1.50E-01	1.60E-02	6.41E-03	7.1E-05	1 92E-06	1 4E-07	3 8E-05
MG/L	VINYL CHLORIDE	A	7.20E-01	7.20E-01	1 54E-02	2 23E-02	1.00E+00	7.30E-03	7.80E-05	5 6E-05	1 07E-08	7 7E-09	1 2E-06
	Total Risk									**1.8E-03**		**5.6E-07**	**1.7E-03**
												Total Risk =	**3E-03**

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = Inhalation Intake (CD

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 30E+01	1 00E-01	1 60E-04	1 27E-01	0 13	3 82E-07	3 82E-06	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 00E-03	4 10E-01	1 60E-04	2 94E-05	0 098	8.81E-11	7 16E-07	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1.00E-01	7 00E-02	1 60E-04	9.78E-04	0 014	2.94E-09	5 99E-07	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05	5 70E-06	7 00E-04	1 00E-02	1 60E-04	6.85E-06	0 0034	2 06E-11	1 03E-06	
MG/L	CADMIUM	B1	5.00E-04	5 00E-06		2 00E-03	1 00E-02	1.00E-03	1 96E-05	0 039	3 67E-10	7 34E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 00E-02	5 00E-03	1.00E-03	1 96E-04	0 065	3 67E-09	2 45E-04	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	1 96E-04	0.0033	1 47E-09	3 06E-08	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3 00E-01	1 60E-04	1 96E-04	0 0053	5.87E-10	5 29E-08	
MG/L	LEAD	B2				1.00E-02	1 50E-01	4 00E-06	9 82E-05		7 37E-12		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2.00E+00	4 00E-02	1.60E-04	1 96E-02	0.14	5 87E-08	1 05E-05	
MG/L	MERCURY	D			8 57E-05	1.00E-04	1.00E-04	1 00E-03	9 78E-07		1 83E-11		
MG/L	NICKEL	D	2 00E-02	5 40E-03		1 00E-02	2 70E-01	1 00E-04	9 78E-05	0 0049	1.83E-10	3.40E-08	
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	1 47E-01		4 40E-07		
MG/L	VANADIUM		7 00E-03	7.00E-05		4 00E-02	1 00E-02	1 60E-04	3 91E-04	0 056	1 17E-09	1 68E-05	
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05		6 00E-05	5 00E-01	1 60E-02	5 87E-07	0 012	1 76E-10	7 05E-06	
MG/L	HEPTACHLOR EPOXIDE	B2	1.30E-05	9 36E-06		1.00E-05	7 20E-01	1 10E-02	9 78E-08	0 0075	2.02E-11	2 16E-06	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4.20E-02		2 23E+00	7 00E-01	9 00E-03	2 18E-02	0 36	3 68E-06	8 76E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 62E-02	8 10E-01	8 40E-03	2 56E-04	0 064	4 04E-08	1 25E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 19E-02	1 00E+00	1 60E-02	2 14E-04	0 024	6 42E-08	7 14E-06	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	2 20E-02	1.00E+00	5 30E-03	2 15E-04	0 0072	2 14E-08	7 12E-07	0 15
MG/L	1,2-DICHLOROPROPANE	B2			1 14E-03	2 78E-02	7 40E-01	1.00E-02	2 72E-04		5.10E-08		0 24
MG/L	BENZENE	A	3.00E-03	2 91E-03	1.70E-03	2 19E-02	9 70E-01	2 10E-02	2 14E-04	0 071	8 44E-08	2 90E-05	0 13
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4.55E-04		2.21E-02	6 50E-01	2 20E-02	2 16E-04	0 31	8 93E-08	1 96E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		2.42E-02	2 00E-01	8 90E-03	2 36E-04	0 024	3 94E-08	1 97E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1.00E-02	1 00E-02	9.56E-02	1 00E+00	1 00E-02	9 36E-04	0.094	1 75E-07	1.75E-05	0.094
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1.82E-02	1.00E+00	4.80E-02	1 78E-04	0 018	1 61E-07	1 61E-05	0 0010
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2 00E-02	2.36E-02	1 00E+00	1.00E-02	2 31E-04	0.012	4.33E-08	2.16E-06	0 012
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		1 83E+00	1 50E-01	1 60E-02	1 80E-02	3 0	5 39E-06	0 0060	
MG/L	VINYL CHLORIDE	A	3 00E-03	3 00E-03	1 10E-01	2 23E-02	1 00E+00	7 30E-03	2.19E-04	0 073	2 99E-08	9 97E-06	0 0020
	Hazard Index									**4.6**		**0.0067**	**0.63**
										Total Hazard Index =		**5.3**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index; * = Inhalation Intake (CDI) = mg

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
		EPC	b	EPC	b
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)				
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.91E-05	2.03E-01	6.96E-09	1.41E-09		1.07E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.12E-04	5 60E-02	1 99E-08	1.12E-09		3.06E-08	
ug/m3	1,1-DICHLOROETHENE	C	4.01E-03	1.75E-01	7.14E-07	1.25E-07		1.10E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.46E-04	9.10E-02	2.60E-08	2 36E-09	1.40E-03	3.99E-08	2.85E-05
ug/m3	1,2-DICHLOROPROPANE	B2	3.57E-04		6.37E-08		1.14E-03	9.79E-08	8.59E-05
ug/m3	BENZENE	A	7.73E-04	2.70E-02	1.38E-07	3.72E-09	1 70E-03	2.12E-07	1.25E-04
ug/m3	CARBON TETRACHLORIDE	B2	4.03E-03	5.25E-02	7.18E-07	3.77E-08		1.10E-06	
ug/m3	CHLOROFORM	B2	5.70E-04	8.05E-02	1.01E-07	8 17E-09	0.00E+00	1 56E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.27E-04		9 38E-08		1.00E-02	1.44E-07	1.44E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2 13E-03	2.00E-03	3.79E-07	7.59E-10	1.71E-01	5.84E-07	3.41E-06
ug/m3	trans-1,2-DICHLOROETHENE		1.22E-03		2.18E-07		2.00E-02	3.35E-07	1.68E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.32E-03	6.00E-03	2.36E-07	1.41E-09		3.63E-07	
ug/m3	VINYL CHLORIDE	A	4.86E-03	1 54E-02	8.65E-07	1 33E-08	1.10E-01	1.33E-06	1.21E-05

Total ELCR: 1.95E-07 **Total HI: 0.0003**

Data

0 00016 MG/L	ALUMINUM
0 00016 MG/L	ARSENIC
0 00016 MG/L	BARIUM
0 00016 MG/L	BERYLLIUM
0 001 MG/L	CADMIUM
0 001 MG/L	CHROMIUM, TOTAL
0 0004 MG/L	COBALT
0 00016 MG/L	COPPER
0 000004 MG/L	LEAD
0 00016 MG/L	MANGANESE
0 001 MG/L	MERCURY
0 0001 MG/L	NICKEL

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Adult Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only):

$$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds:

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only):

$$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 30E+01	1 00E-01	1.60E-04	1.93E-01		1 89E-06		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1 51E+01	3 00E-03	4 10E-01	1 60E-04	4 46E-05	7E-05	4 36E-10	2E-09	
MG/L	BARIUM	D				1 00E-01	7.00E-02	1 60E-04	1.49E-03		1 45E-08		
MG/L	BERYLLIUM	B1			8 40E+00	7 00E-04	1.00E-02	1 60E-04	1 04E-05		1 02E-10		
MG/L	CADMIUM	B1			6.30E+00	2 00E-03	1 00E-02	1 00E-03	2 97E-05		1 82E-09		
MG/L	CHROMIUM, TOTAL	A-D			4 20E+01	2 00E-02	5 00E-03	1 00E-03	2 97E-04		1.82E-08		
MG/L	COBALT					2 00E-02	8 00E-01	4 00E-04	2 97E-04		7 27E-09		
MG/L	COPPER	D				2 00E-02	3 00E-01	1 60E-04	2 97E-04		2.91E-09		
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	1 49E-04		3 65E-11		
MG/L	MANGANESE	D				2.00E+00	4 00E-02	1 60E-04	2 97E-02		2.91E-07		
MG/L	MERCURY	D				1 00E-04	1.00E-04	1.00E-03	1.49E-06		9 09E-11		
MG/L	NICKEL	D				1 00E-02	2 70E-01	1 00E-04	1.49E-04		9 09E-10		
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	2.23E-01		2 18E-06		
MG/L	VANADIUM					4.00E-02	1 00E-02	1 60E-04	5 95E-04		5 82E-09		
MG/L	DIELDRIN	B2	1 60E+01	3 20E+01	1 61E+01	6 00E-05	5 00E-01	1.60E-02	8.92E-07	1E-05	8 73E-10	3E-08	
MG/L	HEPTACHLOR EPOXIDE	B2	9.10E+00	1.26E+01	9.10E+00	1.00E-05	7 20E-01	1 10E-02	1 49E-07	1E-06	1.00E-10	1E-09	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2.86E-01	2.03E-01	2.23E+00	7.00E-01	9 00E-03	3 31E-02	7E-03	1 82E-05	5E-06	7E-03
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7.04E-02	5 60E-02	2 62E-02	8 10E-01	8 40E-03	3 90E-04	2E-05	2.00E-07	1E-08	2E-05
MG/L	1,1-DICHLOROETHENE	C	6 00E-01	6 00E-01	1.75E-01	2.19E-02	1.00E+00	1 60E-02	3 25E-04	2E-04	3 18E-07	2E-07	6E-05
MG/L	1,2-DICHLOROETHANE	B2	9 10E-02	9 10E-02	9.10E-02	2.20E-02	1 00E+00	5 30E-03	3 27E-04	3E-05	1 06E-07	1E-08	3E-05
MG/L	1,2-DICHLOROPROPANE	B2	6 80E-02	9 19E-02		2 78E-02	7.40E-01	1.00E-02	4.13E-04	3E-05	2 53E-07	2E-08	
MG/L	BENZENE	A	5 50E-02	5 67E-02	2 70E-02	2 19E-02	9 70E-01	2 10E-02	3 26E-04	2E-05	4.18E-07	2E-08	9E-06
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5 25E-02	2 21E-02	6 50E-01	2 20E-02	3 29E-04	4E-05	4 42E-07	9E-08	2E-05
MG/L	CHLOROFORM	B2	6.10E-03	3 05E-02	8 05E-02	2.42E-02	2 00E-01	8 90E-03	3.59E-04	2E-06	1.95E-07	6E-09	3E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				9 56E-02	1 00E+00	1 00E-02	1 42E-03		8 69E-07		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5 20E-02	2.00E-03	1.82E-02	1 00E+00	4 80E-02	2 71E-04	1E-05	7 96E-07	4E-08	5E-07
MG/L	trans-1,2-DICHLOROETHENE					2 36E-02	1 00E+00	1.00E-02	3 51E-04		2 14E-07		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	1 83E+00	1 50E-01	1 60E-02	2 73E-02	3E-04	2 67E-05	2E-06	2E-04
MG/L	VINYL CHLORIDE	A	7.20E-01	7 20E-01	1 54E-02	2.23E-02	1 00E+00	7 30E-03	3 32E-04	2E-04	1.48E-07	1E-07	5E-06
	Total Risk									**8E-03**		**8E-06**	**7E-03**
											Total Risk =	**1E-02**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 30E+01	1.00E-01	1 60E-04	3 56E-01	0 36	3 99E-06	3 99E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 00E-03	4.10E-01	1 60E-04	8 22E-05	0.27	9 21E-10	7 48E-06	
MG/L	BARIUM	D	7 00E-02	4.90E-03	1 43E-04	1 00E-01	7.00E-02	1 60E-04	2 74E-03	0 039	3.07E-08	6 26E-06	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05	5 70E-06	7 00E-04	1.00E-02	1 60E-04	1 92E-05	0 0096	2 15E-10	1 07E-05	
MG/L	CADMIUM	B1	5.00E-04	5 00E-06		2 00E-03	1 00E-02	1.00E-03	5 48E-05	0 11	3 84E-09	7 67E-04	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 00E-02	5 00E-03	1.00E-03	5.48E-04	0 18	3 84E-08	0 0026	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	5 48E-04	0 0091	1 53E-08	3 20E-07	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3 00E-01	1 60E-04	5 48E-04	0 015	6 14E-09	5 53E-07	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	2 75E-04		7 70E-11		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1.43E-05	2 00E+00	4 00E-02	1.60E-04	5 48E-02	0 39	6 14E-07	1 10E-04	
MG/L	MERCURY	D			8 57E-05	1 00E-04	1 00E-04	1 00E-03	2 74E-06		1 92E-10		
MG/L	NICKEL	D	2 00E-02	5 40E-03		1 00E-02	2.70E-01	1 00E-04	2.74E-04	0 014	1 92E-09	3 55E-07	
MG/L	SILICON					1 50E+01	2.00E-01	1 60E-04	4 11E-01		4 60E-06		
MG/L	VANADIUM		7.00E-03	7 00E-05		4 00E-02	1.00E-02	1 60E-04	1.10E-03	0 16	1.23E-08	1 75E-04	
MG/L	DIELDRIN	B2	5 00E-05	2.50E-05		6 00E-05	5 00E-01	1.60E-02	1 64E-06	0 033	1 84E-09	7 36E-05	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9.36E-06		1 00E-05	7 20E-01	1 10E-02	2.74E-07	0.021	2 11E-10	2.25E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		2 23E+00	7 00E-01	9 00E-03	6.10E-02	1 0	3 85E-05	9.16E-04	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 62E-02	8.10E-01	8 40E-03	7 18E-04	0 18	4 22E-07	1.30E-04	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9.00E-03		2 19E-02	1 00E+00	1 60E-02	5 99E-04	0.067	6 71E-07	7 46E-05	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3.00E-02	1.40E-03	2 20E-02	1.00E+00	5 30E-03	6 02E-04	0 020	2.23E-07	7.44E-06	0 43
MG/L	1,2-DICHLOROPROPANE	B2			1.14E-03	2.78E-02	7 40E-01	1 00E-02	7.61E-04		5 33E-07		0.67
MG/L	BENZENE	A	3 00E-03	2 91E-03	1.70E-03	2 19E-02	9.70E-01	2 10E-02	6 00E-04	0 20	8 82E-07	3 03E-04	0 35
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4.55E-04		2.21E-02	6 50E-01	2.20E-02	6 06E-04	0.87	9 33E-07	0 0021	
MG/L	CHLOROFORM	B2	1 00E-02	2.00E-03		2 42E-02	2 00E-01	8 90E-03	6 62E-04	0 066	4 12E-07	2.06E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1 00E-02	9 56E-02	1 00E+00	1.00E-02	2 62E-03	0 26	1 83E-06	1 83E-04	0 26
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1 00E-02	1 71E-01	1 82E-02	1.00E+00	4 80E-02	5 00E-04	0 050	1.68E-06	1 68E-04	0 0029
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	2 36E-02	1.00E+00	1 00E-02	6.46E-04	0 032	4.52E-07	2 26E-05	0 032
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9.00E-04		1 83E+00	1 50E-01	1 60E-02	5 03E-02	8 4	5.63E-05	0 063	
MG/L	VINYL CHLORIDE	A	3 00E-03	3 00E-03	1 10E-01	2.23E-02	1 00E+00	7.30E-03	6 12E-04	0 20	3 13E-07	1 04E-04	0 0056
	Hazard Index									**13**		**0.070**	**1.8**
										Total Hazard Index =		**15**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Disposal Area - Onsite - NW Plume, Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3 91E-05	--	--	--		3.75E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.12E-04	--	--	--		1.07E-07	
ug/m3	1,1-DICHLOROETHENE	C	4.01E-03	--	--	--		3.85E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.46E-04	--	--	--	1.40E-03	1.40E-07	9.99E-05
ug/m3	1,2-DICHLOROPROPANE	B2	3.57E-04	--	--	--	1.14E-03	3.43E-07	3.01E-04
ug/m3	BENZENE	A	7.73E-04	--	--	--	1.70E-03	7 42E-07	4.36E-04
ug/m3	CARBON TETRACHLORIDE	B2	4.03E-03	--	--	--		3.87E-06	
ug/m3	CHLOROFORM	B2	5.70E-04	--	--	--	0.00E+00	5.46E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.27E-04	--	--	--	1.00E-02	5.05E-07	5.05E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2.13E-03	--	--	--	1.71E-01	2.04E-06	1.19E-05
ug/m3	trans-1,2-DICHLOROETHENE		1.22E-03	--	--	--	2.00E-02	1.17E-06	5 87E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.32E-03	--	--	--		1.27E-06	
ug/m3	VINYL CHLORIDE	A	4.86E-03	--	--	--	1.10E-01	4.66E-06	4.24E-05
					Total ELCR:	--		**Total HI:**	**0.0010**

Data

0 00016 MG/L	ALUMINUM
0 00016 MG/L	ARSENIC
0 00016 MG/L	BARIUM
0 00016 MG/L	BERYLLIUM
0 001 MG/L	CADMIUM
0 001 MG/L	CHROMIUM, TOTAL
0 0004 MG/L	COBALT
0 00016 MG/L	COPPER
0 000004 MG/L	LEAD
0 00016 MG/L	MANGANESE
0 001 MG/L	MERCURY
0 0001 MG/L	NICKEL

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Child Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (NW Plume) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 30E+01	1 00E-01	1 60E-04	7 12E-02		5.23E-07		
MG/L	ARSENIC	A	1.50E+00	3 66E+00	1 51E+01	3.00E-03	4 10E-01	1 60E-04	1.64E-05	2E-05	1 21E-10	4E-10	2E-04
MG/L	BARIUM	D				1.00E-01	7 00E-02	1.60E-04	5.48E-04		4.02E-09		
MG/L	BERYLLIUM	B1			8 40E+00	7 00E-04	1.00E-02	1 60E-04	3.84E-06		2 82E-11		3E-05
MG/L	CADMIUM	B1			6.30E+00	2 00E-03	1 00E-02	1 00E-03	1 10E-05		5 03E-10		7E-05
MG/L	CHROMIUM, TOTAL	A-D			4.20E+01	2 00E-02	5 00E-03	1.00E-03	1 10E-04		5 03E-09		5E-03
MG/L	COBALT					2 00E-02	8 00E-01	4.00E-04	1.10E-04		2.01E-09		
MG/L	COPPER	D				2 00E-02	3 00E-01	1.60E-04	1 10E-04		8.05E-10		
	Total Risk									**3E-03**		**2E-06**	**8E-03**
										Total Risk =		**1E-02**	

Disposal Area (Potable Use) (NW Plume) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1.30E+01	1 00E-01	1 60E-04	8 31E-01	0 83	6 10E-06	6.10E-05	
MG/L	ARSENIC	A	3.00E-04	1 23E-04		3.00E-03	4 10E-01	1 60E-04	1.92E-04	0 64	1.41E-09	1 15E-05	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1.00E-01	7 00E-02	1 60E-04	6.39E-03	0.091	4 69E-08	9 58E-06	
MG/L	BERYLLIUM	B1	2 00E-03	2.00E-05	5 70E-06	7 00E-04	1.00E-02	1.60E-04	4 47E-05	0 022	3 29E-10	1 64E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		2 00E-03	1 00E-02	1 00E-03	1.28E-04	0 26	5 87E-09	0 0012	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 00E-02	5 00E-03	1 00E-03	1.28E-03	0.43	5 87E-08	0 0039	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	1 28E-03	0.021	2 35E-08	4.89E-07	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3.00E-01	1.60E-04	1.28E-03	0 035	9 39E-09	8 46E-07	
MG/L	LEAD	B2				1.00E-02	1 50E-01	4.00E-06	6 42E-04		1 18E-10		
MG/L	MANGANESE	D	1.40E-01	5.60E-03	1 43E-05	2 00E+00	4 00E-02	1 60E-04	1 28E-01	0 91	9 39E-07	1 68E-04	
MG/L	MERCURY	D			8 57E-05	1 00E-04	1 00E-04	1 00E-03	6 39E-06		2.93E-10		
MG/L	NICKEL	D	2.00E-02	5 40E-03		1 00E-02	2 70E-01	1 00E-04	6 39E-04	0 032	2 93E-09	5 43E-07	
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	9 59E-01		7 04E-06		
MG/L	VANADIUM		7 00E-03	7.00E-05		4 00E-02	1 00E-02	1.60E-04	2 56E-03	0 37	1 88E-08	2 68E-04	
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05		6 00E-05	5 00E-01	1 60E-02	3 84E-06	0.077	2 82E-09	1 13E-04	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9 36E-06		1.00E-05	7 20E-01	1 10E-02	6.39E-07	0 049	3 23E-10	3 45E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		2 23E+00	7 00E-01	9 00E-03	1 42E-01	2 4	5 88E-05	0 0014	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3 24E-03		2 62E-02	8 10E-01	8 40E-03	1 67E-03	0 42	6 46E-07	1.99E-04	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 19E-02	1 00E+00	1 60E-02	1 40E-03	0 16	1 03E-06	1 14E-04	
MG/L	1,2-DICHLOROETHANE	B2	3.00E-02	3 00E-02	1 40E-03	2 20E-02	1 00E+00	5 30E-03	1 40E-03	0 047	3 42E-07	1 14E-05	1 0
MG/L	1,2-DICHLOROPROPANE	B2			1 14E-03	2 78E-02	7 40E-01	1 00E-02	1 78E-03		8 15E-07		1 6
MG/L	BENZENE	A	3 00E-03	2 91E-03	1.70E-03	2 19E-02	9 70E-01	2.10E-02	1.40E-03	0 47	1 35E-06	4 64E-04	0.82
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 21E-02	6 50E-01	2 20E-02	1 41E-03	2 0	1.43E-06	0.0031	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		2 42E-02	2 00E-01	8 90E-03	1.54E-03	0.15	6 31E-07	3 15E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	9 56E-02	1 00E+00	1 00E-02	6 11E-03	0 61	2.81E-06	2 81E-04	0 61
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1.82E-02	1 00E+00	4 80E-02	1 17E-03	0 12	2 57E-06	2 57E-04	0 0068
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2 00E-02	2 00E-02	2 36E-02	1 00E+00	1 00E-02	1 51E-03	0 075	6 92E-07	3 46E-05	0 075
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		1 83E+00	1 50E-01	1 60E-02	1.17E-01	20	8 61E-05	0 096	
MG/L	VINYL CHLORIDE	A	3 00E-03	3 00E-03	1 10E-01	2.23E-02	1 00E+00	7 30E-03	1.43E-03	0 48	4 78E-07	1 59E-04	0 013
	Hazard Index									**30**		**0.11**	**4.1**
										Total Hazard Index =		**34**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Scenario Titles

AOC: Disposal Area - Onsite - SW Plume
Exposure media: Indoor Air
Receptor: Hypothetical Future Industrial Worker
Report title: Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation: CDI = (Cair * IR * ET * EF * ED * CF) / (BW * AT)

	Carc	Noncarc
Cair (ug/m3)		
IR (m3/day)	20	
EF (days/year)	250	
ED (years)	25	
CF (mg/ug)	1.00E-03	
BW (kg)	70	
AT (days)	25550	9125

Units	Chemical	WOE	SFi	RfDi	Mean
ug/m3	1,1,2,2-TETRAC	C	0.203		3 391E-05
ug/m3	1,1,2-TRICHLOF	C	0.056		9 421E-05
ug/m3	BROMODICHLO	B2			9.07E-05
ug/m3	CARBON TETR/	B2	0.0525		0 003307
ug/m3	CHLOROFORM	B2	0.0805		0.0004883
ug/m3	cis-1,2-DICHLOF	D		0 01	0 0004318
ug/m3	TETRACHLORO	C-B2	0.002	0.171	0.00173
ug/m3	trans-1,2-DICHL			0.02	0.0009935
ug/m3	TRICHLOROETH	B2	0 006		0 0010894
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic and carcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	20	a,c	20	a,c
EF =	Exposure Frequency (days/year)	250	a	250	a
ED =	Exposure Duration (years)	25	a	25	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	25550	a

Sources:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response
c = Based on an eight hour workday

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Industrial Worker Scenario - Inhalation

Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3 4E-05	2.0E-01	2 4E-09	4.8E-10		6.6E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	9 4E-05	5 6E-02	6 6E-09	3.7E-10		1 8E-08	
ug/m3	BROMODICHLOROMETHANE	B2	9.1E-05		6.3E-09			1.8E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.3E-03	5.3E-02	2.3E-07	1 2E-08		6.5E-07	
ug/m3	CHLOROFORM	B2	4.9E-04	8.1E-02	3.4E-08	2.7E-09	0.0E+00	9.6E-08	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4 3E-04		3.0E-08		1 0E-02	8 5E-08	8 45E-06
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1 7E-03	2 0E-03	1.2E-07	2.4E-10	1.7E-01	3.4E-07	1.98E-06
ug/m3	trans-1,2-DICHLOROETHENE		9.9E-04		6.9E-08		2.0E-02	1.9E-07	9.72E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.1E-03	6.0E-03	7.6E-08	4 6E-10		2.1E-07	
					Total ELCR:	**1.6E-08**		**Total HI:**	**0.00002**

Data

0 00016 MG/L	ALUMINUM
0 00016 MG/L	ARSENIC
0 00016 MG/L	BARIUM
0 00016 MG/L	BERYLLIUM
0 001 MG/L	CADMIUM
0 001 MG/L	CHROMIUM, TOTAL
0.0004 MG/L	COBALT
0.00016 MG/L	COPPER
0.000004 MG/L	LEAD
0 00016 MG/L	MANGANESE
0 001 MG/L	MERCURY
0 0001 MG/L	NICKEL

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Industrial Worker Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:
Intake for non-carcinogenic and carcinogenic compounds.

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Dermal:
Intake for non-carcinogenic and carcinogenic compounds

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Inhalation.
CDI = Ingestion CDI from above [g]

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Default factors adapted from EPA Exposure Factors Handbook, August 1997
c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker
d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
g = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Industrial Worker Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgI	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1.30E+01	1 00E-01	1 60E-04	4 54E-02		1 36E-07		
MG/L	ARSENIC	A	1 50E+00	3.66E+00	1 51E+01	3.00E-03	4 10E-01	1 60E-04	1.05E-05	1 6E-05	3.15E-11	1.2E-10	
MG/L	BARIUM	D				1 00E-01	7 00E-02	1 60E-04	3.49E-04		1.05E-09		
MG/L	BERYLLIUM	B1			8 40E+00	7 00E-04	1.00E-02	1 60E-04	2 45E-06		7.34E-12		
MG/L	CADMIUM	B1			6 30E+00	2.00E-03	1 00E-02	1.00E-03	6.99E-06		1 31E-10		
MG/L	CHROMIUM, TOTAL	A-D			4 20E+01	2 00E-02	5 00E-03	1 00E-03	6.99E-05		1.31E-09		
MG/L	COBALT					2 00E-02	8.00E-01	4.00E-04	6.99E-05		5 24E-10		
MG/L	COPPER	D				2 00E-02	3 00E-01	1 60E-04	6 99E-05		2.10E-10		
MG/L	LEAD	B2				1.00E-02	1 50E-01	4 00E-06	3 51E-05		2 63E-12		
MG/L	MANGANESE	D				2 00E+00	4.00E-02	1 60E-04	6.99E-03		2.10E-08		
MG/L	MERCURY	D				1.00E-04	1 00E-04	1.00E-03	3 49E-07		6 55E-12		
MG/L	NICKEL	D				1.00E-02	2 70E-01	1 00E-04	3.49E-05		6 55E-11		
MG/L	SILICON					1.50E+01	2.00E-01	1 60E-04	5.24E-02		1 57E-07		
MG/L	VANADIUM					4.00E-02	1 00E-02	1 60E-04	1.40E-04		4 19E-10		
MG/L	DIELDRIN	B2	1 60E+01	3.20E+01	1.61E+01	6.00E-05	5 00E-01	1 60E-02	2 10E-07	3.4E-06	6 29E-11	2 0E-09	
MG/L	HEPTACHLOR EPOXIDE	B2	9 10E+00	1 26E+01	9 10E+00	1.00E-05	7.20E-01	1 10E-02	3.49E-08	3 2E-07	7 21E-12	9.1E-11	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	1 21E-01	7.00E-01	9 00E-03	4 22E-04	8.4E-05	7 12E-08	2 0E-08	8 6E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5 60E-02	5.05E-03	8 10E-01	8 40E-03	1.77E-05	1.0E-06	2 78E-09	2 0E-10	9 9E-07
MG/L	BROMODICHLOROMETHANE	B2	6 20E-02	6.33E-02		4 15E-03	9 80E-01	5 80E-03	1.45E-05	9 0E-07	1 58E-09	1 0E-10	
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2.00E-01	5 25E-02	3.14E-02	6.50E-01	2.20E-02	1 10E-04	1.4E-05	4 53E-08	9 1E-09	5 8E-06
MG/L	CHLOROFORM	B2	6 10E-03	3 05E-02	8 05E-02	3.19E-01	2.00E-01	8.90E-03	1 11E-03	6 8E-06	1.86E-07	5.7E-09	9.0E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				7.64E-03	1 00E+00	1.00E-02	2.67E-05		5 01E-09		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5.20E-02	2 00E-03	5 66E-03	1 00E+00	4.80E-02	1.98E-05	1 0E-06	1.78E-08	9.3E-10	4.0E-08
MG/L	trans-1,2-DICHLOROETHENE					4.34E-03	1.00E+00	1 00E-02	1.52E-05		2 84E-09		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7 33E-02	6.00E-03	1 45E-01	1.50E-01	1 60E-02	5 05E-04	5.6E-06	1 52E-07	1.1E-08	3.0E-06
	Total Risk									**1.3E-04**		**5.0E-08**	**1.9E-04**
											Total Risk =	**3E-04**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation* HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 30E+01	1 00E-01	1 60E-04	1 27E-01	0 13	3 82E-07	3 82E-06	
MG/L	ARSENIC	A	3 00E-04	1.23E-04		3 00E-03	4 10E-01	1 60E-04	2.94E-05	0 098	8 81E-11	7 16E-07	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 00E-01	7 00E-02	1 60E-04	9 78E-04	0 014	2 94E-09	5 99E-07	
MG/L	BERYLLIUM	B1	2.00E-03	2.00E-05	5 70E-06	7 00E-04	1 00E-02	1 60E-04	6 85E-06	0.0034	2 06E-11	1 03E-06	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		2 00E-03	1 00E-02	1 00E-03	1 96E-05	0 039	3 67E-10	7 34E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 00E-02	5 00E-03	1 00E-03	1 96E-04	0 065	3 67E-09	2 45E-04	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	1 96E-04	0 0033	1 47E-09	3 06E-08	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3 00E-01	1 60E-04	1 96E-04	0 0053	5 87E-10	5 29E-08	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	9 82E-05		7 37E-12		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2 00E+00	4 00E-02	1 60E-04	1 96E-02	0 14	5 87E-08	1 05E-05	
MG/L	MERCURY	D			8 57E-05	1 00E-04	1 00E-04	1 00E-03	9 78E-07		1 83E-11		
MG/L	NICKEL	D	2 00E-02	5 40E-03		1 00E-02	2 70E-01	1 00E-04	9 78E-05	0 0049	1 83E-10	3 40E-08	
MG/L	SILICON					1.50E+01	2 00E-01	1 60E-04	1 47E-01		4 40E-07		
MG/L	VANADIUM		7 00E-03	7.00E-05		4 00E-02	1 00E-02	1 60E-04	3.91E-04	0.056	1.17E-09	1 68E-05	
MG/L	DIELDRIN	B2	5 00E-05	2.50E-05		6 00E-05	5 00E-01	1 60E-02	5 87E-07	0 012	1 76E-10	7 05E-06	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9.36E-06		1 00E-05	7 20E-01	1.10E-02	9 78E-08	0 0075	2 02E-11	2 16E-06	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		1 21E-01	7 00E-01	9 00E-03	1 18E-03	0 020	1 99E-07	4 75E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3.24E-03		5 05E-03	8 10E-01	8 40E-03	4 95E-05	0.012	7 79E-09	2 40E-06	
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1.96E-02		4 15E-03	9 80E-01	5 80E-03	4.06E-05	0 0020	4 42E-09	2 25E-07	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		3 14E-02	6.50E-01	2 20E-02	3 07E-04	0 44	1 27E-07	2 79E-04	
MG/L	CHLOROFORM	B2	1.00E-02	2 00E-03		3 19E-01	2 00E-01	8 90E-03	3 12E-03	0 31	5 21E-07	2 60E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1.00E-02	1.00E-02	1 00E-02	7 64E-03	1 00E+00	1 00E-02	7.48E-05	0 0075	1 40E-08	1 40E-06	0.0075
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1.71E-01	5 66E-03	1 00E+00	4 80E-02	5 54E-05	0.0055	4.98E-08	4 98E-06	3 24E-04
MG/L	trans-1,2-DICHLOROETHENE		2.00E-02	2.00E-02	2 00E-02	4 34E-03	1 00E+00	1 00E-02	4 25E-05	0 0021	7 96E-09	3 98E-07	0 0021
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		1 45E-01	1 50E-01	1 60E-02	1 41E-03	0 24	4 24E-07	4 71E-04	
	Hazard Index									**1.6**		**0.0014**	**0.0099**
										Total Hazard Index =		**1.6**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = inç

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1.00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.39E-05	2.03E-01	6 04E-09	1 23E-09		9.29E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	9 42E-05	5.60E-02	1 68E-08	9.40E-10		2.58E-08	
ug/m3	BROMODICHLOROMETHANE	B2	9.07E-05		1.62E-08			2 48E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3 31E-03	5.25E-02	5.89E-07	3.09E-08		9.06E-07	
ug/m3	CHLOROFORM	B2	4.88E-04	8.05E-02	8.70E-08	7 00E-09	0 00E+00	1.34E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4 32E-04		7.69E-08		1.00E-02	1 18E-07	1.18E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1 73E-03	2.00E-03	3.08E-07	6 16E-10	1.71E-01	4.74E-07	2.77E-06
ug/m3	trans-1,2-DICHLOROETHENE		9.93E-04		1.77E-07		2 00E-02	2.72E-07	1.36E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.09E-03	6.00E-03	1 94E-07	1.16E-09		2.98E-07	
					Total ELCR:	**4.19E-08**		**Total HI:**	**0.00003**

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** f

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 30E+01	1 00E-01	1 60E-04	1 93E-01		1 89E-06		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1.51E+01	3 00E-03	4 10E-01	1 60E-04	4.46E-05	7E-05	4.36E-10	2E-09	
MG/L	BARIUM	D				1 00E-01	7.00E-02	1 60E-04	1 49E-03		1 45E-08		
MG/L	BERYLLIUM	B1			8 40E+00	7.00E-04	1.00E-02	1 60E-04	1 04E-05		1 02E-10		
MG/L	CADMIUM	B1			6 30E+00	2.00E-03	1.00E-02	1 00E-03	2 97E-05		1 82E-09		
MG/L	CHROMIUM, TOTAL	A-D			4 20E+01	2 00E-02	5 00E-03	1.00E-03	2 97E-04		1.82E-08		
MG/L	COBALT					2 00E-02	8 00E-01	4 00E-04	2.97E-04		7.27E-09		
MG/L	COPPER	D				2 00E-02	3.00E-01	1 60E-04	2 97E-04		2.91E-09		
MG/L	LEAD	B2				1 00E-02	1 50E-01	4.00E-06	1 49E-04		3 65E-11		
MG/L	MANGANESE	D				2 00E+00	4 00E-02	1 60E-04	2 97E-02		2 91E-07		
MG/L	MERCURY	D				1 00E-04	1.00E-04	1.00E-03	1 49E-06		9.09E-11		
MG/L	NICKEL	D				1.00E-02	2 70E-01	1 00E-04	1.49E-04		9 09E-10		
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	2.23E-01		2 18E-06		
MG/L	VANADIUM					4.00E-02	1 00E-02	1.60E-04	5.95E-04		5 82E-09		
MG/L	DIELDRIN	B2	1 60E+01	3 20E+01	1 61E+01	6.00E-05	5.00E-01	1 60E-02	8.92E-07	1E-05	8.73E-10	3E-08	
MG/L	HEPTACHLOR EPOXIDE	B2	9.10E+00	1 26E+01	9 10E+00	1.00E-05	7 20E-01	1 10E-02	1.49E-07	1E-06	1.00E-10	1E-09	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2.03E-01	1.21E-01	7 00E-01	9 00E-03	1.79E-03	4E-04	9 87E-07	3E-07	4E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5.60E-02	5 05E-03	8 10E-01	8.40E-03	7 52E-05	4E-06	3 86E-08	3E-09	4E-06
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6 33E-02		4 15E-03	9 80E-01	5.80E-03	6 17E-05	4E-06	2 19E-08	1E-09	
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	5 25E-02	3.14E-02	6 50E-01	2 20E-02	4 67E-04	6E-05	6.28E-07	1E-07	2E-05
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8 05E-02	3 19E-01	2.00E-01	8 90E-03	4.74E-03	3E-05	2.58E-06	8E-08	4E-04
MG/L	cis-1,2-DICHLOROETHYLENE	D				7 64E-03	1.00E+00	1 00E-02	1 14E-04		6 95E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5.20E-02	2.00E-03	5 66E-03	1.00E+00	4.80E-02	8 42E-05	4E-06	2 47E-07	1E-08	2E-07
MG/L	trans-1,2-DICHLOROETHENE					4 34E-03	1.00E+00	1.00E-02	6 46E-05		3 95E-08		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	1 45E-01	1 50E-01	1 60E-02	2.15E-03	2E-05	2 10E-06	2E-07	1E-05
	Total Risk									**6E-04**		**7E-07**	**8E-04**
											Total Risk =	**1E-03**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure, * = Inhalation Intake (CD

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1.30E+01	1.00E-01	1.60E-04	3.56E-01	0 36	3 99E-06	3 99E-05	
MG/L	ARSENIC	A	3 00E-04	1.23E-04		3 00E-03	4.10E-01	1 60E-04	8.22E-05	0 27	9 21E-10	7 48E-06	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 00E-01	7 00E-02	1 60E-04	2.74E-03	0 039	3 07E-08	6 26E-06	
MG/L	BERYLLIUM	B1	2 00E-03	2.00E-05	5 70E-06	7 00E-04	1 00E-02	1.60E-04	1.92E-05	0 0096	2 15E-10	1 07E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		2 00E-03	1 00E-02	1 00E-03	5 48E-05	0 11	3 84E-09	7 67E-04	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2.86E-05	2 00E-02	5 00E-03	1 00E-03	5 48E-04	0 18	3 84E-08	0 0026	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4.00E-04	5 48E-04	0 0091	1 53E-08	3 20E-07	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3 00E-01	1 60E-04	5 48E-04	0 015	6 14E-09	5 53E-07	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	2 75E-04		7 70E-11		
MG/L	MANGANESE	D	1.40E-01	5 60E-03	1 43E-05	2 00E+00	4 00E-02	1 60E-04	5 48E-02	0 39	6.14E-07	1 10E-04	
MG/L	MERCURY	D			8.57E-05	1 00E-04	1 00E-04	1 00E-03	2.74E-06		1 92E-10		
MG/L	NICKEL	D	2 00E-02	5.40E-03		1 00E-02	2 70E-01	1 00E-04	2 74E-04	0 014	1.92E-09	3 55E-07	
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	4 11E-01		4 60E-06		
MG/L	VANADIUM		7 00E-03	7 00E-05		4 00E-02	1 00E-02	1 60E-04	1 10E-03	0 16	1 23E-08	1 75E-04	
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05		6 00E-05	5 00E-01	1 60E-02	1 64E-06	0 033	1 84E-09	7 36E-05	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9 36E-06		1 00E-05	7.20E-01	1 10E-02	2.74E-07	0 021	2 11E-10	2 25E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		1 21E-01	7 00E-01	9 00E-03	3 31E-03	0 055	2.08E-06	4 96E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4.00E-03	3.24E-03		5 05E-03	8.10E-01	8 40E-03	1.38E-04	0 035	8 14E-08	2 51E-05	
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1.96E-02		4.15E-03	9 80E-01	5 80E-03	1.14E-04	0 0057	4 62E-08	2 36E-06	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4 55E-04		3.14E-02	6 50E-01	2 20E-02	8 60E-04	1 2	1 32E-06	0 0029	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		3 19E-01	2 00E-01	8 90E-03	8 74E-03	0.87	5 44E-06	0 0027	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	7 64E-03	1 00E+00	1 00E-02	2.09E-04	0 021	1 47E-07	1 47E-05	0 021
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1.00E-02	1 71E-01	5 66E-03	1 00E+00	4 80E-02	1.55E-04	0 016	5 21E-07	5 21E-05	9 07E-04
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2.00E-02	2 00E-02	4 34E-03	1 00E+00	1 00E-02	1.19E-04	0 0059	8 32E-08	4 16E-06	0.0059
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		1 45E-01	1.50E-01	1 60E-02	3.96E-03	0 66	4 43E-06	0 0049	
	Hazard Index									**4.5**		**0.014**	**0.028**
										Total Hazard Index =		**4.6**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds.

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Disposal Area - Onsite - SW Plume, Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Distribution Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.39E-05	--	--	--		3.3E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.42E-05	--	--	--		9.0E-08	
ug/m3	BROMODICHLOROMETHANE	B2	9 07E-05	--	--	--		8.7E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.31E-03	--	--	--		3.2E-06	
ug/m3	CHLOROFORM	B2	4.88E-04	--	--	--	0 00E+00	4.7E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.32E-04	--	--	--	1 00E-02	4.1E-07	4.14E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1.73E-03	--	--	--	1.71E-01	1.7E-06	9.70E-06
ug/m3	trans-1,2-DICHLOROETHENE		9.93E-04	--	--	--	2.00E-02	9.5E-07	4 76E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.09E-03	--	--	--		1.0E-06	
					Total ELCR:	--		**Total HI:**	**0.0001**

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Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Disposal Area (Potable Use) (SW Plume) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1.30E+01	1.00E-01	1 60E-04	7 12E-02		5.23E-07		
MG/L	ARSENIC	A	1.50E+00	3 66E+00	1 51E+01	3 00E-03	4.10E-01	1.60E-04	1 64E-05	2E-05	1 21E-10	4E-10	2E-04
MG/L	BARIUM	D				1 00E-01	7 00E-02	1.60E-04	5 48E-04		4 02E-09		
MG/L	BERYLLIUM	B1			8 40E+00	7.00E-04	1.00E-02	1 60E-04	3.84E-06		2.82E-11		3E-05
MG/L	CADMIUM	B1			6.30E+00	2 00E-03	1.00E-02	1 00E-03	1.10E-05		5 03E-10		7E-05
MG/L	CHROMIUM, TOTAL	A-D			4 20E+01	2 00E-02	5 00E-03	1 00E-03	1.10E-04		5 03E-09		5E-03
MG/L	COBALT					2 00E-02	8.00E-01	4 00E-04	1.10E-04		2.01E-09		
MG/L	COPPER	D				2 00E-02	3 00E-01	1.60E-04	1.10E-04		8 05E-10		
	Total Risk									**2E-04**		**2E-07**	**5E-03**
											Total Risk =	**5E-03**	

Disposal Area (Potable Use) (SW Plume) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		1 30E+01	1 00E-01	1 60E-04	8 31E-01	0 83	6.10E-06	6 10E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 00E-03	4 10E-01	1 60E-04	1 92E-04	0 64	1 41E-09	1 15E-05	
MG/L	BARIUM	D	7 00E-02	4.90E-03	1 43E-04	1 00E-01	7 00E-02	1 60E-04	6 39E-03	0 091	4 69E-08	9 58E-06	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05	5 70E-06	7 00E-04	1 00E-02	1 60E-04	4 47E-05	0 022	3.29E-10	1 64E-05	
MG/L	CADMIUM	B1	5.00E-04	5 00E-06		2 00E-03	1 00E-02	1 00E-03	1 28E-04	0 26	5 87E-09	0 0012	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 00E-02	5 00E-03	1 00E-03	1 28E-03	0 43	5 87E-08	0 0039	
MG/L	COBALT		6 00E-02	4 80E-02		2 00E-02	8 00E-01	4 00E-04	1 28E-03	0.021	2 35E-08	4 89E-07	
MG/L	COPPER	D	3 70E-02	1 11E-02		2 00E-02	3.00E-01	1.60E-04	1.28E-03	0 035	9 39E-09	8 46E-07	
MG/L	LEAD	B2				1 00E-02	1 50E-01	4 00E-06	6.42E-04		1 18E-10		
MG/L	MANGANESE	D	1 40E-01	5.60E-03	1 43E-05	2 00E+00	4 00E-02	1 60E-04	1.28E-01	0 91	9 39E-07	1 68E-04	
MG/L	MERCURY	D			8 57E-05	1 00E-04	1 00E-04	1.00E-03	6 39E-06		2 93E-10		
MG/L	NICKEL	D	2 00E-02	5 40E-03		1 00E-02	2 70E-01	1 00E-04	6 39E-04	0 032	2 93E-09	5 43E-07	
MG/L	SILICON					1 50E+01	2 00E-01	1 60E-04	9 59E-01		7 04E-06		
MG/L	VANADIUM		7 00E-03	7.00E-05		4 00E-02	1 00E-02	1 60E-04	2 56E-03	0 37	1 88E-08	2 68E-04	
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05		6 00E-05	5 00E-01	1 60E-02	3 84E-06	0 077	2 82E-09	1 13E-04	
MG/L	HEPTACHLOR EPOXIDE	B2	1 30E-05	9.36E-06		1 00E-05	7 20E-01	1 10E-02	6 39E-07	0 049	3 23E-10	3 45E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		1 21E-01	7 00E-01	9 00E-03	7 72E-03	0 13	3 19E-06	7 59E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		5 05E-03	8 10E-01	8 40E-03	3 23E-04	0.081	1 25E-07	3 84E-05	
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1 96E-02		4 15E-03	9 80E-01	5 80E-03	2 65E-04	0 013	7.07E-08	3 60E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		3 14E-02	6 50E-01	2 20E-02	2 01E-03	2 9	2 03E-06	0 0045	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		3 19E-01	2 00E-01	8 90E-03	2.04E-02	2 0	8.33E-06	0 0042	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	7 64E-03	1 00E+00	1 00E-02	4 89E-04	0 049	2.24E-07	2 24E-05	0 049
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	5 66E-03	1 00E+00	4 80E-02	3 62E-04	0 036	7 97E-07	7 97E-05	0 0021
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	4 34E-03	1 00E+00	1 00E-02	2 77E-04	0 014	1 27E-07	6 37E-06	0 014
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		1 45E-01	1 50E-01	1 60E-02	9 24E-03	1.5	6 78E-06	0 0075	
	Hazard Index									**11**		**0.022**	**0.065**
										Total Hazard Index =		**11**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds.		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1.27E+01	1.00E-01	1.60E-04	1.89E-01		1.85E-06		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	2.23E-03	4.10E-01	1.60E-04	3.32E-05	5E-05	3.25E-10	1E-09	
MG/L	BARIUM	D				1.60E-01	7.00E-02	1.60E-04	2.38E-03		2.32E-08		
MG/L	CHROMIUM, TOTAL	A-D				2.08E-02	5.00E-03	1.00E-03	3.09E-04		1.89E-08		
MG/L	LEAD	B2				3.95E-03	1.50E-01	4.00E-06	5.87E-05		1.44E-11		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	1.40E-02	7.37E-02	1.40E-02	6.00E-03	1.90E-01	1.60E-04	8.92E-05	1E-06	8.73E-10	6E-11	
	Total Risk									**5E-05**		**1E-09**	
												Total Risk =	**5E-05**

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 27E+01	1 00E-01	1 60E-04	3 48E-01	0 3	3.89E-06	3 89E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		2 23E-03	4 10E-01	1 60E-04	6 11E-05	0.20	6 85E-10	5 57E-06	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 60E-01	7 00E-02	1.60E-04	4 38E-03	0.063	4 90E-08	1 00E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 08E-02	5 00E-03	1 00E-03	5 69E-04	0 2	3 98E-08	0 003	
MG/L	LEAD	B2				3 95E-03	1 50E-01	4 00E-06	1 08E-04		3 03E-11		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2 00E-02	3 80E-03		6 00E-03	1 90E-01	1 60E-04	1 64E-04	0 008	1 84E-09	4 84E-07	
	Hazard Index									**0.8**		**0.003**	
										Total Hazard Index =		**0.8**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW30) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distnbution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 27E+01	1 00E-01	1 60E-04	6 95E-02		5 11E-07		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	2.23E-03	4 10E-01	1 60E-04	1 22E-05	2E-05	8 98E-11	3E-10	2E-04
MG/L	BARIUM	D				1.60E-01	7 00E-02	1 60E-04	8.76E-04		6.43E-09		
MG/L	CHROMIUM, TOTAL	A-D				2 08E-02	5 00E-03	1 00E-03	1 14E-04		5.22E-09		
MG/L	LEAD	B2				3.95E-03	1 50E-01	4 00E-06	2 16E-05		3 97E-12		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	1 40E-02	7 37E-02	1 40E-02	6.00E-03	1 90E-01	1 60E-04	3 29E-05	5E-07	2 41E-10	2E-11	5E-07
	Total Risk									**2E-05**		**3E-10**	**2E-04**
										Total Risk =		**2E-04**	

Offsite Groundwater (MW30) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 27E+01	1 00E-01	1 60E-04	8.11E-01	0 8	5 96E-06	5 96E-05	
MG/L	ARSENIC	A	3.00E-04	1 23E-04		2 23E-03	4 10E-01	1 60E-04	1.43E-04	0 5	1 05E-09	8 52E-06	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1.43E-04	1 60E-01	7 00E-02	1 60E-04	1 02E-02	0 15	7 50E-08	1 53E-05	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1 50E-05	2 86E-05	2 08E-02	5 00E-03	1 00E-03	1 33E-03	0 4	6 09E-08	0 004	
MG/L	LEAD	B2				3.95E-03	1 50E-01	4 00E-06	2 52E-04		4 64E-11		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2 00E-02	3 80E-03		6 00E-03	1 90E-01	1 60E-04	3 84E-04	0.019	2 82E-09	7 41E-07	
	Hazard Index									**1.9**		**0.004**	
										Total Hazard Index =		**1.9**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.4E-05	2.0E-01	6.0E-09	1.2E-09		9 3E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.4E-05	5 6E-02	1 7E-08	9 4E-10		2.6E-08	
ug/m3	1,1-DICHLOROETHENE	C	3 3E-03	1.8E-01	6.0E-07	1.0E-07		9.2E-07	
ug/m3	1,2-DICHLOROETHANE	B2	1.2E-04	9 1E-02	2 2E-08	2.0E-09	1 4E-03	3.4E-08	2.45E-05
ug/m3	CARBON TETRACHLORIDE	B2	3.3E-03	5.3E-02	5.9E-07	3.1E-08		9.1E-07	
ug/m3	CHLOROFORM	B2	4 8E-04	8.1E-02	8 6E-08	6 9E-09	0.0E+00	1.3E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.3E-04		7.7E-08		1.0E-02	1.2E-07	1.19E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1.7E-03	2.0E-03	3.1E-07	6.2E-10	1.7E-01	4.8E-07	2 80E-06
ug/m3	trans-1,2-DICHLOROETHENE		1.0E-03		1.8E-07		2.0E-02	2.7E-07	1.37E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.1E-03	6.0E-03	1.9E-07	1.2E-09		3.0E-07	
					Total ELCR:	**1.48E-07**		**Total HI:**	**0.0001**

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Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only)

$$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only)

$$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i.e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 36E+01	1 00E-01	1.60E-04	2 02E-01		1 97E-06		
MG/L	ARSENIC	A	1.50E+00	3 66E+00	1 51E+01	3.26E-03	4 10E-01	1 60E-04	4.85E-05	7E-05	4 74E-10	2E-09	
MG/L	BARIUM	D				1 79E-01	7 00E-02	1 60E-04	2 66E-03		2.60E-08		
MG/L	CHROMIUM, TOTAL	A-D				2.89E-02	5 00E-03	1.00E-03	4.30E-04		2 63E-08		
MG/L	IRON					4 30E+00	1 50E-01	1 60E-04	6 39E-02		6 25E-07		
MG/L	LEAD	B2				1 09E-02	1 50E-01	4.00E-06	1 63E-04		3 98E-11		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4.77E-02	7.00E-01	9 00E-03	7.09E-04	1E-04	3.90E-07	1E-07	1E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7.04E-02	5 60E-02	3 78E-03	8.10E-01	8 40E-03	5 63E-05	3E-06	2 89E-08	2E-09	3E-06
MG/L	1,1-DICHLOROETHENE	C	6 00E-01	6 00E-01	1 75E-01	2 22E-02	1.00E+00	1.60E-02	3 30E-04	2E-04	3.23E-07	2E-07	6E-05
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9 10E-02	9.10E-02	5 68E-03	1 00E+00	5 30E-03	8 45E-05	8E-06	2.74E-08	2E-09	8E-06
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	5 25E-02	2.88E-03	6 50E-01	2.20E-02	4 28E-05	6E-06	5 76E-08	1E-08	2E-06
MG/L	CHLOROFORM	B2	6 10E-03	3.05E-02	8 05E-02	1 18E-02	2.00E-01	8 90E-03	1.76E-04	1E-06	9.59E-08	3E-09	1E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				1 40E-02	1 00E+00	1 00E-02	2 08E-04		1 27E-07		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5 20E-02	2 00E-03	3.31E-02	1 00E+00	4.80E-02	4 92E-04	3E-05	1 44E-06	8E-08	1E-06
MG/L	trans-1,2-DICHLOROETHENE					2 35E-02	1.00E+00	1 00E-02	3 50E-04		2.14E-07		
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	2.62E-01	1.50E-01	1 60E-02	3.89E-03	4E-05	3 81E-06	3E-07	2E-05
	Total Risk									**5E-04**		**7E-07**	**3E-04**
											Total Risk =	**8E-04**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 36E+01	1 00E-01	1 60E-04	3 72E-01	0 4	4 16E-06	4 16E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 26E-03	4 10E-01	1 60E-04	8 93E-05	0 3	1 00E-09	8 13E-06	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 79E-01	7 00E-02	1 60E-04	4 89E-03	0 07	5 48E-08	1 12E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 89E-02	5 00E-03	1 00E-03	7 92E-04	0 3	5 55E-08	0 004	
MG/L	IRON		3 00E-01	4 50E-02		4 30E+00	1.50E-01	1 60E-04	1.18E-01	0 4	1 32E-06	2 93E-05	
MG/L	LEAD	B2				1 09E-02	1 50E-01	4 00E-06	3 00E-04		8 39E-11		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 77E-02	7 00E-01	9 00E-03	1 31E-03	0 02	8 23E-07	1 96E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		3 78E-03	8 10E-01	8 40E-03	1 04E-04	0.026	6 10E-08	1 88E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 22E-02	1 00E+00	1.60E-02	6 08E-04	0.068	6 81E-07	7 56E-05	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	5 68E-03	1 00E+00	5 30E-03	1 56E-04	0 0052	5 78E-08	1 93E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 88E-03	6 50E-01	2 20E-02	7 89E-05	0 11	1 21E-07	2 67E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		1 18E-02	2 00E-01	8 90E-03	3 25E-04	0.03	2 02E-07	1 01E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 40E-02	1 00E+00	1 00E-02	3 84E-04	0 04	2 69E-07	2 69E-05	0 04
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	3 31E-02	1 00E+00	4 80E-02	9 06E-04	0 09	3 05E-06	0 0003	0 005
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	2 35E-02	1 00E+00	1 00E-02	6 44E-04	0 03	4 51E-07	2 26E-05	0 03
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9 00E-04		2 62E-01	1 50E-01	1 60E-02	7 17E-03	1 2	8 03E-06	0 009	
	Hazard Index									3		0 014	0
										Total Hazard Index =		3	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = Inhalation intake (CDI) = ir

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds.

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW31), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.39E-05	--	--	--		3.25E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.43E-05	--	--	--		9.04E-08	
ug/m3	1,1-DICHLOROETHENE	C	3 34E-03	--	--	--		3.21E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1 25E-04	--	--	--	1 40E-03	1 20E-07	8.56E-05
ug/m3	CARBON TETRACHLORIDE	B2	3.32E-03	--	--	--		3 19E-06	
ug/m3	CHLOROFORM	B2	4 83E-04	--	--	--	0.00E+00	4 63E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.35E-04	--	--	--	1.00E-02	4 17E-07	4 17E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1 75E-03	--	--	--	1.71E-01	1.67E-06	9.79E-06
ug/m3	trans-1,2-DICHLOROETHENE		1.00E-03	--	--	--	2 00E-02	9 62E-07	4.81E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.09E-03	--	--	--		1 05E-06	
					Total ELCR:	--		**Total HI:**	**0.0002**

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Inhalation.
CDI = Ingestion CDI from above [f]

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW31) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgI	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 36E+01	1.00E-01	1 60E-04	7 43E-02		5.46E-07		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1.51E+01	3 26E-03	4 10E-01	1 60E-04	1.79E-05	3E-05	1 31E-10	5E-10	3E-04
MG/L	BARIUM	D				1.79E-01	7 00E-02	1 60E-04	9.79E-04		7 19E-09		
MG/L	CHROMIUM, TOTAL	A-D				2.89E-02	5 00E-03	1 00E-03	1 58E-04		7 27E-09		
MG/L	IRON					4.30E+00	1.50E-01	1.60E-04	2 36E-02		1 73E-07		
MG/L	LEAD	B2				1 09E-02	1 50E-01	4 00E-06	5 99E-05		1.10E-11		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2 86E-01	2 03E-01	4 77E-02	7 00E-01	9 00E-03	2 61E-04	5E-05	1 08E-07	3E-08	5E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5 60E-02	3 78E-03	8 10E-01	8 40E-03	2 07E-05	1E-06	7 99E-09	6E-10	1E-06
	Total Risk									**2E-04**		**2E-07**	**4E-04**
										Total RIsk =		**5E-04**	

Offsite Groundwater (MW31) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 36E+01	1 00E-01	1.60E-04	8 67E-01	0 9	6 37E-06	6 37E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		3 26E-03	4 10E-01	1 60E-04	2 08E-04	0 7	1 53E-09	1 24E-05	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1.43E-04	1.79E-01	7 00E-02	1.60E-04	1 14E-02	0 16	8 38E-08	1 71E-05	
MG/L	CHROMIUM, TOTAL	A-D	3.00E-03	1 50E-05	2 86E-05	2 89E-02	5 00E-03	1 00E-03	1 85E-03	0 6	8 48E-08	0 006	
MG/L	IRON		3 00E-01	4 50E-02		4 30E+00	1 50E-01	1 60E-04	2 75E-01	0 9	2 02E-06	4 49E-05	
MG/L	LEAD	B2				1 09E-02	1.50E-01	4 00E-06	6 99E-04		1 28E-10		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 77E-02	7.00E-01	9 00E-03	3 05E-03	0 05	1 26E-06	3 00E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		3 78E-03	8 10E-01	8 40E-03	2 42E-04	0 060	9 33E-08	2 88E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 22E-02	1 00E+00	1 60E-02	1 42E-03	0 16	1.04E-06	1 16E-04	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	5 68E-03	1 00E+00	5 30E-03	3 63E-04	0 012	8 84E-08	2 95E-06	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4 55E-04		2 88E-03	6.50E-01	2 20E-02	1 84E-04	0 26	1 86E-07	0 0004	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		1 18E-02	2.00E-01	8 90E-03	7 57E-04	0 08	3 09E-07	1 55E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 40E-02	1 00E+00	1 00E-02	8 95E-04	0 09	4 11E-07	4 11E-05	0.09
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	3 31E-02	1.00E+00	4 80E-02	2 12E-03	0.21	4 66E-06	0 0005	0 012
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	2 35E-02	1 00E+00	1 00E-02	1 50E-03	0 08	6 90E-07	3 45E-05	0 08
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9 00E-04		2.62E-01	1 50E-01	1 60E-02	1 67E-02	3	1 23E-05	0 014	
	Hazard Index									7		0.021	0
										Total Hazard Index =		7	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = Inhalation intake (CDI) = ir

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
		EPC	b	EPC	b
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)				
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.54E-05	2.03E-01	6 30E-09	1.28E-09		9.70E-09	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.80E-05	5.60E-02	1.75E-08	9 77E-10		2.68E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.43E-03	5.25E-02	6.12E-07	3.21E-08		9.41E-07	
ug/m3	CHLOROFORM	B2	5.05E-04	8 05E-02	9.00E-08	7.25E-09	0.00E+00	1.38E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.49E-04		8.00E-08		1.00E-02	1.23E-07	1.23E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1.80E-03	2.00E-03	3.20E-07	6.41E-10	1.71E-01	4.93E-07	2.88E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.13E-03	6 00E-03	2.01E-07	1.21E-09		3 10E-07	
					Total ELCR:	**4.35E-08**		**Total HI:**	**0.00002**

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Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					2.70E+01	1.00E-01	1 60E-04	4.01E-01		3.92E-06		
MG/L	ARSENIC	A	1 50E+00	3.66E+00	1 51E+01	5 55E-03	4.10E-01	1 60E-04	8 25E-05	1E-04	8.07E-10	3E-09	1E-03
MG/L	BARIUM	D				5.11E-01	7 00E-02	1.60E-04	7.59E-03		7 43E-08		
MG/L	CADMIUM	B1			6.30E+00	1.52E-03	1 00E-02	1 00E-03	2.26E-05		1.38E-09		1E-04
MG/L	CHROMIUM, TOTAL	A-D				5 04E-02	5 00E-03	1.00E-03	7 49E-04		4.58E-08		
MG/L	IRON					8 66E+00	1 50E-01	1 60E-04	1.29E-01		1 26E-06		
MG/L	LEAD	B2				2 32E-02	1 50E-01	4 00E-06	3 45E-04		8.42E-11		
MG/L	MANGANESE	D				2.03E+00	4 00E-02	1 60E-04	3 02E-02		2 96E-07		
MG/L	VANADIUM					1.58E-02	1 00E-02	1 60E-04	2 34E-04		2 29E-09		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	1 40E-02	7.37E-02	1 40E-02	4 60E-02	1 90E-01	1 60E-04	6 84E-04	1E-05	6 69E-09	5E-10	1E-05
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4 65E-02	7.00E-01	9 00E-03	6 92E-04	1E-04	3 81E-07	1E-07	1E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5.60E-02	2.53E-03	8.10E-01	8.40E-03	3 76E-05	2E-06	1 93E-08	1E-09	2E-06
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2.00E-01	5 25E-02	2.84E-02	6.50E-01	2 20E-02	4 22E-04	5E-05	5 68E-07	1E-07	2E-05
MG/L	CHLOROFORM	B2	6.10E-03	3 05E-02	8 05E-02	7.43E-02	2 00E-01	8.90E-03	1.11E-03	7E-06	6 01E-07	2E-08	9E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				1.03E-02	1 00E+00	1.00E-02	1 53E-04		9.35E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2.00E-03	2 53E-03	1.00E+00	4.80E-02	3 76E-05	2E-06	1.10E-07	6E-09	8E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6.00E-03	6 84E-02	1.50E-01	1.60E-02	1 02E-03	1E-05	9 95E-07	7E-08	6E-06
	Total Risk									**3E-04**		**3E-07**	**2E-03**
											Total Risk =	**2E-03**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		2 70E+01	1 00E-01	1.60E-04	7 39E-01	0 7	8 28E-06	8 28E-05	
MG/L	ARSENIC	A	3.00E-04	1 23E-04		5 55E-03	4 10E-01	1 60E-04	1 52E-04	0 5	1.70E-09	1 38E-05	
MG/L	BARIUM	D	7.00E-02	4 90E-03	1 43E-04	5 11E-01	7 00E-02	1 60E-04	1 40E-02	0 20	1 57E-07	3.20E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		1 52E-03	1 00E-02	1 00E-03	4 16E-05	0 08	2.92E-09	5 83E-04	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	5 04E-02	5 00E-03	1 00E-03	1 38E-03	0 5	9 66E-08	0 006	
MG/L	IRON		3 00E-01	4 50E-02		8 66E+00	1 50E-01	1 60E-04	2 37E-01	0 8	2 66E-06	5 90E-05	
MG/L	LEAD	B2				2 32E-02	1 50E-01	4 00E-06	6 35E-04		1 78E-10		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2 03E+00	4 00E-02	1 60E-04	5.57E-02	0 40	6 24E-07	1 11E-04	
MG/L	VANADIUM		7 00E-03	7.00E-05		1 58E-02	1.00E-02	1 60E-04	4 32E-04	0 06	4 83E-09	6 90E-05	
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2 00E-02	3 80E-03		4 60E-02	1 90E-01	1 60E-04	1 26E-03	0	1 41E-08	0	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 65E-02	7 00E-01	9 00E-03	1 28E-03	0 021	8 03E-07	1 91E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 53E-03	8 10E-01	8 40E-03	6 92E-05	0 017	4 07E-08	1 26E-05	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 84E-02	6 50E-01	2.20E-02	7 77E-04	1 1	1 20E-06	0 0026	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		7 43E-02	2 00E-01	8 90E-03	2 04E-03	0 2	1 27E-06	0 0006	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 03E-02	1 00E+00	1 00E-02	2 82E-04	0.028	1 97E-07	1 97E-05	0 028
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 53E-03	1 00E+00	4 80E-02	6.93E-05	0 007	2 33E-07	2 33E-05	4 05E-04
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 84E-02	1 50E-01	1 60E-02	1 87E-03	0 31	2 10E-06	0 0023	
	Hazard Index									**5**		**0.013**	**0**
										Total Hazard Index =		**5**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = Inhalation intake (CDI) = ir

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.
b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW32), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3 5E-05	--	--	--		3.4E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	9.8E-05	--	--	--		9.4E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3 4E-03	--	--	--		3.3E-06	
ug/m3	CHLOROFORM	B2	5.1E-04	--	--	--	0.0E+00	4.8E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.5E-04	--	--	--	1 0E-02	4.3E-07	4.31E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1.8E-03	--	--	--	1.7E-01	1.7E-06	1.01E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.1E-03	--	--	--		1.1E-06	
					Total ELCR:	--		**Total HI:**	**0.0001**

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Child Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW32) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgI	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					2.70E+01	1 00E-01	1 60E-04	1 48E-01		1.09E-06		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1.51E+01	5.55E-03	4.10E-01	1 60E-04	3 04E-05	5E-05	2 23E-10	8E-10	5E-04
MG/L	BARIUM	D				5 11E-01	7 00E-02	1 60E-04	2 80E-03		2 05E-08		
MG/L	CADMIUM	B1			6 30E+00	1.52E-03	1 00E-02	1.00E-03	8 33E-06		3 82E-10		5E-05
MG/L	CHROMIUM, TOTAL	A-D				5 04E-02	5 00E-03	1 00E-03	2 76E-04		1 27E-08		
MG/L	IRON					8 66E+00	1 50E-01	1.60E-04	4.74E-02		3.48E-07		
MG/L	LEAD	B2				2.32E-02	1 50E-01	4 00E-06	1 27E-04		2 33E-11		
MG/L	MANGANESE	D				2 03E+00	4 00E-02	1 60E-04	1.11E-02		8 18E-08		
	Total RIsk									**1E-04**		**9E-08**	**6E-04**
											Total RIsk =	**7E-04**	

Offsite Groundwater (MW32) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1.00E-01		2.70E+01	1 00E-01	1 60E-04	1 72E+00	1 7	1 27E-05	1.27E-04	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		5 55E-03	4 10E-01	1 60E-04	3 55E-04	1 2	2 60E-09	2 12E-05	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	5 11E-01	7 00E-02	1 60E-04	3 26E-02	0.5	2 40E-07	4 89E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		1 52E-03	1 00E-02	1 00E-03	9 72E-05	0 19	4 46E-09	0 0009	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	5 04E-02	5 00E-03	1 00E-03	3 22E-03	1.1	1 48E-07	0 010	
MG/L	IRON		3.00E-01	4 50E-02		8 66E+00	1 50E-01	1 60E-04	5 53E-01	1 8	4 06E-06	9 03E-05	
MG/L	LEAD	B2				2 32E-02	1 50E-01	4 00E-06	1.48E-03		2 72E-10		
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	2 03E+00	4 00E-02	1 60E-04	1 30E-01	0.9	9 55E-07	1 70E-04	
MG/L	VANADIUM		7 00E-03	7 00E-05		1 58E-02	1 00E-02	1 60E-04	1 01E-03	0 14	7.39E-09	1 06E-04	
MG/L	bis(2-ETHYLHEXYL) PHTHALATE	B2	2 00E-02	3 80E-03		4 60E-02	1 90E-01	1 60E-04	2 94E-03	0	2 16E-08	0	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		4 65E-02	7 00E-01	9 00E-03	2 98E-03	0 05	1.23E-06	2 93E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2.53E-03	8 10E-01	8 40E-03	1 61E-04	0.040	6 23E-08	1.92E-05	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4.55E-04		2 84E-02	6 50E-01	2 20E-02	1 81E-03	2.6	1 83E-06	0 0040	
MG/L	CHLOROFORM	B2	1 00E-02	2.00E-03		7 43E-02	2 00E-01	8 90E-03	4 75E-03	0.5	1 94E-06	0 0010	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 03E-02	1 00E+00	1 00E-02	6 58E-04	0 07	3 02E-07	3 02E-05	0 07
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1.00E-02	1 71E-01	2 53E-03	1 00E+00	4 80E-02	1 62E-04	0 016	3 56E-07	3 56E-05	0 0009
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9 00E-04		6 84E-02	1 50E-01	1 60E-02	4 37E-03	0 7	3 21E-06	0 0036	
	Hazard Index									**12**		**0.020**	**0**
										Total Hazard Index =		**12**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

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Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
		EPC	b	EPC	b
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)				
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1.00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	1.3E-05	2.0E-01	2.3E-09	4.6E-10		3.5E-09	
					Total ELCR:	**4.63E-10**		**Total HI:**	**0.0000**

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only).

$$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds.

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only)

$$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 11E+01	1.00E-01	1 60E-04	1.66E-01		1.62E-06		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	6.37E-03	4 10E-01	1 60E-04	9.47E-05	1E-04	9 26E-10	3E-09	
MG/L	BARIUM	D				1.18E-01	7 00E-02	1.60E-04	1 75E-03		1 71E-08		
MG/L	CHROMIUM, TOTAL	A-D				2 12E-02	5 00E-03	1.00E-03	3.15E-04		1 92E-08		
MG/L	IRON					2 88E+00	1.50E-01	1.60E-04	4 29E-02		4 19E-07		
MG/L	LEAD	B2				9.72E-03	1.50E-01	4 00E-06	1.45E-04		3.53E-11		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2.03E-01	2.23E-03	7 00E-01	9 00E-03	3.32E-05	7E-06	1.83E-08	5E-09	7E-06
	Total Risk									**1E-04**		**9E-09**	**7E-06**
											Total Risk =	**2E-04**	

Notes. WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = Inhalation Intake (CD

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1.00E+00	1 00E-01		1 11E+01	1 00E-01	1 60E-04	3 05E-01	0 3	3 42E-06	3 42E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		6 37E-03	4 10E-01	1.60E-04	1 74E-04	0 6	1 95E-09	1 59E-05	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 18E-01	7 00E-02	1 60E-04	3 23E-03	0 05	3 61E-08	7 37E-06	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2 86E-05	2 12E-02	5.00E-03	1 00E-03	5 80E-04	0 2	4 06E-08	0 003	
MG/L	IRON		3 00E-01	4 50E-02		2 88E+00	1 50E-01	1 60E-04	7 90E-02	0 26	8 85E-07	1 97E-05	
MG/L	LEAD	B2				9 72E-03	1 50E-01	4 00E-06	2 66E-04		7 45E-11		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		2 23E-03	7 00E-01	9 00E-03	6 12E-05	0 0010	3 86E-08	9 18E-07	
	Hazard Index									**1.4**		**0.003**	
										Total Hazard Index =		**1.4**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW33), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	1 3E-05	--	--	--		1 2E-08	
					Total ELCR:	--		Total HI:	0.000

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.
f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW33) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 11E+01	1 00E-01	1 60E-04	6.10E-02		4.48E-07		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	6 37E-03	4 10E-01	1 60E-04	3.49E-05	5E-05	2.56E-10	9E-10	5E-04
MG/L	BARIUM	D				1 18E-01	7 00E-02	1 60E-04	6.45E-04		4.74E-09		
MG/L	CHROMIUM, TOTAL	A-D				2 12E-02	5 00E-03	1 00E-03	1.16E-04		5 32E-09		
MG/L	IRON					2.88E+00	1 50E-01	1 60E-04	1 58E-02		1 16E-07		
MG/L	LEAD	B2				9 72E-03	1 50E-01	4 00E-06	5 32E-05		9 78E-12		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2 86E-01	2 03E-01	2 23E-03	7 00E-01	9 00E-03	1 22E-05	2E-06	5 06E-09	1E-09	2E-06
	Total Risk									**5E-05**		**2E-09**	**5E-04**
											Total Risk =	**6E-04**	

Offsite Groundwater (MW33) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1 11E+01	1 00E-01	1 60E-04	7.12E-01	0 7	5 23E-06	5 23E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		6.37E-03	4 10E-01	1 60E-04	4 07E-04	1 4	2 99E-09	2.43E-05	
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 43E-04	1 18E-01	7 00E-02	1 60E-04	7 53E-03	0 11	5 53E-08	1 13E-05	
MG/L	CHROMIUM, TOTAL	A-D	3 00E-03	1 50E-05	2.86E-05	2 12E-02	5 00E-03	1 00E-03	1 35E-03	0 5	6 21E-08	0 004	
MG/L	IRON		3 00E-01	4 50E-02		2 88E+00	1 50E-01	1 60E-04	1 84E-01	0 6	1 35E-06	3 01E-05	
MG/L	LEAD	B2				9.72E-03	1.50E-01	4 00E-06	6 21E-04		1 14E-10		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		2 23E-03	7 00E-01	9 00E-03	1 43E-04	0 0024	5 90E-08	1 40E-06	
	Hazard Index									**3**		**0.004**	
										Total Hazard Index =		**3**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = Inhalation intake (CDI) = ir

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Offsite Groundwater (MW37) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only)

$$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal.

Intake for non-carcinogenic compounds.

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only):

$$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW327) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgI	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	BARIUM	D				6 39E-01	7.00E-02	1 60E-04	3.50E-03		2 57E-08		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7.13E-03	1.90E-01	1.60E-04	3 90E-05		2.87E-10		
MG/L	CHROMIUM, TOTAL	D			4.10E+01	7 71E-03	5 00E-03	1.00E-03	4 22E-05		1.94E-09		2E-03
MG/L	MANGANESE	D				1 88E-01	4.00E-02	1 60E-04	1.03E-03		7 58E-09		
	Total Risk												2E-03

Total Risk = 2E-03

Offsite Groundwater (MW327) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BARIUM	D	7 00E-02	4 90E-03	1 40E-04	6 39E-01	7 00E-02	1 60E-04	4 08E-02	0 58	3 00E-07	6 12E-05	
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7 13E-03	1 90E-01	1 60E-04	4 55E-04		3 34E-09		
MG/L	CHROMIUM, TOTAL	D	3 00E-03	1 50E-05	3 00E-05	7 71E-03	5 00E-03	1.00E-03	4 93E-04	0 16	2 26E-08	0 0015	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	1 88E-01	4 00E-02	1 60E-04	1 20E-02	0 086	8 84E-08	1 58E-05	
	Hazard Index									**0.8**		**0.0016**	
										Total Hazard Index =		**0.8**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Groundwater (MW37) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds.			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW327) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	BARIUM	D				6.39E-01	7 00E-02	1 60E-04	3 50E-03		2.57E-08		
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7.13E-03	1 90E-01	1 60E-04	3 90E-05		2.87E-10		
MG/L	CHROMIUM, TOTAL	D			4 10E+01	7 71E-03	5 00E-03	1 00E-03	4.22E-05		1.94E-09		2E-03
MG/L	MANGANESE	D				1 88E-01	4 00E-02	1 60E-04	1 03E-03		7 58E-09		
	Total Risk												2E-03

Total Risk = 2E-03

Offsite Groundwater (MW327) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BARIUM	D	7.00E-02	4.90E-03	1 40E-04	6 39E-01	7.00E-02	1 60E-04	4 08E-02	0 58	3 00E-07	6 12E-05	
MG/L	bis(2-ETHYLHEXYL) PHTHALATE					7 13E-03	1.90E-01	1 60E-04	4 55E-04		3 34E-09		
MG/L	CHROMIUM, TOTAL	D	3 00E-03	1 50E-05	3 00E-05	7 71E-03	5.00E-03	1 00E-03	4 93E-04	0 16	2 26E-08	0 0015	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	1.88E-01	4 00E-02	1 60E-04	1 20E-02	0 086	8.84E-08	1.58E-05	
	Hazard Index									**0.8**		**0.0016**	
										Total Hazard Index =		**0.8**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW40), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds.

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW40), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	1 8E-03	1.8E-01	3 3E-07	5.7E-08		5.0E-07	
					Total ELCR:	**5.70E-08**		**Total HI:**	**0.0000**

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	BARIUM	D				3.54E-01	7 00E-02	1.60E-04	5 26E-03		5 14E-08		
MG/L	MANGANESE	D				1.07E+00	4.00E-02	1.60E-04	1.58E-02		1 55E-07		
MG/L	1,1-DICHLOROETHENE	C	6 00E-01	6 00E-01	1 75E-01	2 30E-03	1.00E+00	1 60E-02	3 41E-05	2E-05	3 34E-08	2E-08	6E-06
	Total Risk									**2E-05**		**2E-08**	**6E-06**
											Total Risk =	**3E-05**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BARIUM	D	7 00E-02	4 90E-03	1.43E-04	3.54E-01	7 00E-02	1 60E-04	9 68E-03	0 14	1 08E-07	2 21E-05	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	1 07E+00	4 00E-02	1 60E-04	2 92E-02	0 21	3.27E-07	5 84E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 30E-03	1 00E+00	1 60E-02	6 29E-05	0 0070	7 04E-08	7 82E-06	
	Hazard Index									**0.35**		**8.83E-05**	
										Total Hazard Index =		**0.35**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW40), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW40), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

Units	Chemical	WOE	EPC	Carcinogenic			Noncarcinogenic		
				SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	1.8E-03	--	--	--		1.8E-06	
					Total ELCR:	--		Total HI:	0.000

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW40) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	BARIUM	D				3 54E-01	7.00E-02	1 60E-04	1 94E-03		1.42E-08		
MG/L	MANGANESE	D				1 07E+00	4 00E-02	1.60E-04	5.84E-03		4 29E-08		
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1 75E-01	2 30E-03	1.00E+00	1 60E-02	1 26E-05	8E-06	9.24E-09	6E-09	2E-06
	Total Risk									**8E-06**		**6E-09**	**2E-06**
											Total Risk =	**1E-05**	

Offsite Groundwater (MW40) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BARIUM	D	7.00E-02	4 90E-03	1.43E-04	3 54E-01	7 00E-02	1 60E-04	2 26E-02	0 32	1.66E-07	3 39E-05	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	1 07E+00	4 00E-02	1 60E-04	6 81E-02	0 49	5.00E-07	8 93E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		2 30E-03	1 00E+00	1.60E-02	1 47E-04	0 016	1 08E-07	1 20E-05	
	Hazard Index									**0 83**		**1.35E-04**	
										Total Hazard Index =		**0.83**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:
CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS· Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	CADMIUM	B1			6 30E+00	2.09E-03	1.00E-02	1.00E-03	3 11E-05		1 90E-09		
MG/L	MANGANESE	D				3 83E-01	4.00E-02	1.60E-04	5.70E-03		5 57E-08		
	Total Risk												

Total Risk =

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

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Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		2 09E-03	1 00E-02	1 00E-03	5 73E-05	0 11	4 01E-09	0 0008	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	3 83E-01	4 00E-02	1 60E-04	1 05E-02	0 075	1 18E-07	2 10E-05	
	Hazard Index									**0.19**		**0.0008**	
										Total Hazard Index =		**0.19**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW42) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgI	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	CADMIUM	B1			6 30E+00	2.09E-03	1.00E-02	1 00E-03	1 15E-05		5 26E-10		7E-05
MG/L	MANGANESE	D				3 83E-01	4 00E-02	1 60E-04	2 10E-03		1.54E-08		
	Total Risk												7E-05

Total Risk = 7E-05

Offsite Groundwater (MW42) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		2 09E-03	1 00E-02	1 00E-03	1.34E-04	0 27	6 13E-09	0 0012	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	3 83E-01	4.00E-02	1 60E-04	2 45E-02	0 17	1 80E-07	3.21E-05	
	Hazard Index									**0.44**		**0.0013**	
										Total Hazard Index =		**0.44**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFI	CDI	ELCR	RfDi	CDI	HI
ug/m3	BROMODICHLOROMETHANE	B2	1.0E-04		1.8E-08			2.8E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.7E-03	5.3E-02	6.5E-07	3.4E-08		1.0E-06	
ug/m3	CHLOROFORM	B2	5.4E-04	8.1E-02	9 6E-08	7.7E-09	0.0E+00	1.5E-07	
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	1.9E-03	2.0E-03	3 4E-07	6.9E-10	1.7E-01	5.3E-07	3 09E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.2E-03	6.0E-03	2 2E-07	1.3E-09		3.3E-07	

Total ELCR: 4.40E-08 **Total HI: 0.000003**

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Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds.

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only)

$$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only).

$$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment· Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					4 33E+00	1.00E-01	1.60E-04	6 43E-02		6 29E-07		
MG/L	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	8.69E-03	4 10E-01	1 60E-04	1.29E-04	2E-04	1.26E-09	5E-09	
MG/L	CADMIUM	B1			6 30E+00	1.56E-03	1 00E-02	1 00E-03	2 32E-05		1.42E-09		
MG/L	IRON					1.10E+01	1 50E-01	1 60E-04	1 63E-01		1 59E-06		
MG/L	MANGANESE	D				3 88E-01	4 00E-02	1.60E-04	5.76E-03		5 64E-08		
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6 33E-02		2 32E-03	9 80E-01	5.80E-03	3 45E-05	2E-06	1 22E-08	8E-10	
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2.00E-01	5 25E-02	2 94E-03	6 50E-01	2.20E-02	4 37E-05	6E-06	5 88E-08	1E-08	2E-06
MG/L	CHLOROFORM	B2	6 10E-03	3 05E-02	8.05E-02	2 63E-03	2 00E-01	8 90E-03	3.92E-05	2E-07	2.13E-08	6E-10	3E-06
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	2 57E-03	1.00E+00	4.80E-02	3 82E-05	2E-06	1 12E-07	6E-09	8E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7.33E-02	6 00E-03	2.09E-03	1 50E-01	1 60E-02	3.11E-05	3E-07	3 04E-08	2E-09	2E-07
	Total Risk									**2E-04**		**3E-08**	**6E-06**
										Total Risk =		**2E-04**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure, * = Inhalation intake (CD

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		4 33E+00	1 00E-01	1 60E-04	1 18E-01	0 12	1 33E-06	1 33E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		8 69E-03	4 10E-01	1 60E-04	2 38E-04	0 8	2 67E-09	2 17E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		1 56E-03	1 00E-02	1 00E-03	4 27E-05	0 09	2 99E-09	0.0006	
MG/L	IRON		3 00E-01	4 50E-02		1 10E+01	1 50E-01	1 60E-04	3 00E-01	1 0	3 36E-06	7 48E-05	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	3 88E-01	4 00E-02	1 60E-04	1 06E-02	0 08	1 19E-07	2 12E-05	
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1 96E-02		2 32E-03	9 80E-01	5.80E-03	6 36E-05	0 0032	2 58E-08	1 32E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 94E-03	6 50E-01	2 20E-02	8 05E-05	0 12	1 24E-07	2 72E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		2 63E-03	2 00E-01	8 90E-03	7 21E-05	0 007	4.49E-08	2 25E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 57E-03	1 00E+00	4 80E-02	7 04E-05	0 007	2.37E-07	2 37E-05	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 09E-03	1 50E-01	1 60E-02	5 72E-05	0 010	6 41E-08	7 12E-05	
	Hazard Index									**2.2**		**0.0011**	
										Total Hazard Index =		**2.2**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW44), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	BROMODICHLOROMETHANE	B2	1.0E-04	--	--	--		9.9E-08	
ug/m3	CARBON TETRACHLORIDE	B2	3.7E-03	--	--	--		3.5E-06	
ug/m3	CHLOROFORM	B2	5.4E-04	--	--	--	0.0E+00	5.1E-07	
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	1.9E-03	--	--	--	1.7E-01	1.8E-06	1.08E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.2E-03	--	--	--		1.2E-06	
					Total ELCR:	--		**Total HI:**	**0.00001**

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.
f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW44) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					4 33E+00	1 00E-01	1 60E-04	2 37E-02		1 74E-07		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1.51E+01	8 69E-03	4 10E-01	1 60E-04	4 76E-05	7E-05	3 50E-10	1E-09	7E-04
MG/L	CADMIUM	B1			6 30E+00	1 56E-03	1 00E-02	1.00E-03	8 55E-06		3 92E-10		5E-05
MG/L	IRON					1 10E+01	1 50E-01	1 60E-04	6 01E-02		4.41E-07		
MG/L	MANGANESE	D				3 88E-01	4 00E-02	1 60E-04	2 12E-03		1.56E-08		
MG/L	BROMODICHLOROMETHANE	B2	6.20E-02	6 33E-02		2 32E-03	9 80E-01	5 80E-03	1 27E-05	8E-07	3 38E-09	2E-10	
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5.25E-02	2 94E-03	6 50E-01	2 20E-02	1.61E-05	2E-06	1 63E-08	3E-09	8E-07
MG/L	CHLOROFORM	B2	6.10E-03	3 05E-02	8 05E-02	2.63E-03	2 00E-01	8 90E-03	1.44E-05	9E-08	5 89E-09	2E-10	1E-06
	Total Risk									**8E-05**		**7E-09**	**8E-04**
										Total Risk =		**9E-04**	

Offsite Groundwater (MW44) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1.00E+00	1.00E-01		4 33E+00	1 00E-01	1 60E-04	2.76E-01	0 28	2 03E-06	2 03E-05	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		8 69E-03	4 10E-01	1 60E-04	5 56E-04	1 9	4.08E-09	3 32E-05	
MG/L	CADMIUM	B1	5 00E-04	5 00E-06		1 56E-03	1 00E-02	1 00E-03	9 97E-05	0 20	4.58E-09	0 0009	
MG/L	IRON		3 00E-01	4 50E-02		1 10E+01	1 50E-01	1 60E-04	7.01E-01	2 3	5 15E-06	1.14E-04	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1.43E-05	3 88E-01	4 00E-02	1 60E-04	2 48E-02	0 18	1 82E-07	3 25E-05	
MG/L	BROMODICHLOROMETHANE	B2	2 00E-02	1 96E-02		2 32E-03	9 80E-01	5 80E-03	1.48E-04	0.0074	3 95E-08	2 01E-06	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		2 94E-03	6 50E-01	2 20E-02	1.88E-04	0 27	1 90E-07	4.17E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		2 63E-03	2 00E-01	8 90E-03	1 68E-04	0 017	6 88E-08	3.44E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 57E-03	1 00E+00	4 80E-02	1 64E-04	0 016	3 62E-07	3 62E-05	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 09E-03	1 50E-01	1 60E-02	1 34E-04	0.022	9 80E-08	1 09E-04	
	Hazard Index									**5**		**0.0017**	
										Total Hazard Index =		**5**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Indoor Air Inhalation Pathway when the estimated indoor air concentration is known

Scenario Titles

AOC: Offsite Monitoring Well (MW51)
Exposure media: Indoor Air
Receptor: Hypothetical Future Residential Adult
Report title: Dunn Field, Defense Depot Memphis, Tennessee

Inhalation: CDI = (Cair * IR * ET * EF * ED * CF) / (BW * AT)

	Carc	Noncarc
Cair (ug/m3).		
IR (m3/day)	13	20
EF (days/year)	350	
ED (years)		30
CF (mg/ug)	1 00E-03	
BW (kg)		70
AT (days)	25550	10950

Units	Chemical	WOE	SFi	RfDi	Mean
ug/m3	1,1-DICHLOROE	C	0.175		0.0049243
ug/m3	TETRACHLORO	C-B2	0 002	0.171	0 0026332
ug/m3	TRICHLOROETH	B2	0.006		0.0016321
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
ug/m3					
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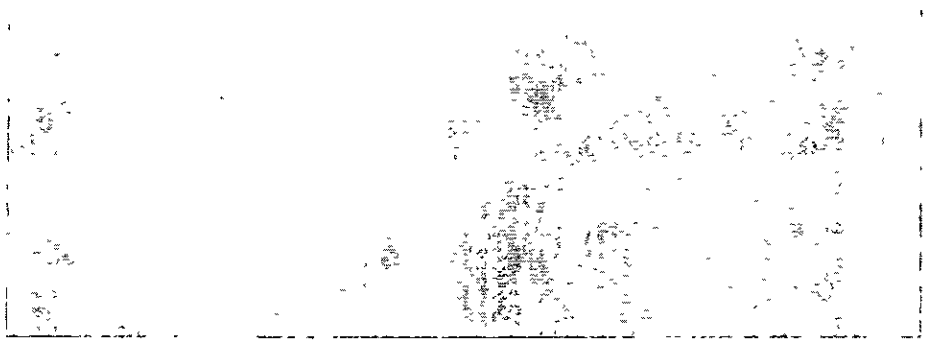

Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds.

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1.00E-03		1.00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	**Chemical**	**WOE**	**EPC**	**SFi**	**CDI**	**ELCR**	**RfDi**	**CDI**	**HI**
ug/m3	1,1-DICHLOROETHENE	C	4.9E-03	1.8E-01	8.8E-07	1.5E-07		1.3E-06	37189
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2.6E-03	2.0E-03	4.7E-07	9.4E-10	1.7E-01	7.2E-07	4.22E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.6E-03	6 0E-03	2.9E-07	1.7E-09		4.5E-07	

Total ELCR: 1.56E-07 **Total HI: 3.72E+04**

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Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds: $CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$

Age-specific intake (for carcinogenic compounds only): $CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$

C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgI	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 32E+00	1.00E-01	1 60E-04	1.97E-02		1.92E-07		
MG/L	IRON					3.21E+00	1 50E-01	1.60E-04	4 78E-02		4 67E-07		
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1.75E-01	1 67E-02	1.00E+00	1.60E-02	2 48E-04	1E-04	2.43E-07	1E-07	4E-05
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5.20E-02	2.00E-03	1.72E-03	1 00E+00	4 80E-02	2 56E-05	1E-06	7.51E-08	4E-09	5E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7.33E-02	6.00E-03	6 89E-03	1 50E-01	1.60E-02	1.02E-04	1E-06	1 00E-07	7E-09	6E-07
	Total RIsk									**2E-04**		**2E-07**	**4E-05**
											Total RIsk =	**2E-04**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD

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Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1.32E+00	1 00E-01	1 60E-04	3 62E-02	0 04	4 05E-07	4 05E-06	
MG/L	IRON		3 00E-01	4.50E-02		3 21E+00	1 50E-01	1 60E-04	8 80E-02	0 3	9 86E-07	2.19E-05	
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		1.67E-02	1 00E+00	1 60E-02	4 57E-04	0 05	5 12E-07	5 69E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 72E-03	1 00E+00	4 80E-02	4 71E-05	0 0047	1 58E-07	1 58E-05	2 76E-04
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 89E-03	1 50E-01	1 60E-02	1.89E-04	0 031	2 11E-07	2 35E-04	
	Hazard Index									**0.4**		**3.34E-04**	**2.76E-04**
										Total Hazard Index =		**0.4**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds

$$\textbf{CDI} = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW51), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	4.9E-03	--	--	--		4.7E-06	
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2.6E-03	--	--	--	1.7E-01	2.5E-06	1.48E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1 6E-03	--	--	--		1.6E-06	
					Total ELCR:	--		**Total HI:**	**1.48E-05**

Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds.			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds.			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event.

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW51) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					1 32E+00	1 00E-01	1.60E-04	7 24E-03		5 32E-08		
MG/L	IRON					3.21E+00	1 50E-01	1 60E-04	1 76E-02		1.29E-07		
MG/L	1,1-DICHLOROETHENE	C	6 00E-01	6 00E-01	1 75E-01	1.67E-02	1 00E+00	1 60E-02	9.14E-05	5E-05	6 71E-08	4E-08	2E-05
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 72E-03	1.00E+00	4.80E-02	9.43E-06	5E-07	2 08E-08	1E-09	2E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	6 89E-03	1 50E-01	1 60E-02	3 78E-05	4E-07	2 77E-08	2E-09	2E-07
	Total Risk									**6E-05**		**4E-08**	**2E-05**
										Total Risk =		**7E-05**	

Offsite Groundwater (MW51) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01		1.32E+00	1 00E-01	1 60E-04	8 45E-02	0 08	6 20E-07	6 20E-06	
MG/L	IRON		3 00E-01	4.50E-02		3.21E+00	1 50E-01	1.60E-04	2 05E-01	0 7	1.51E-06	3 35E-05	
MG/L	1,1-DICHLOROETHENE	C	9.00E-03	9 00E-03		1 67E-02	1 00E+00	1 60E-02	1 07E-03	0 12	7 83E-07	8 70E-05	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 72E-03	1 00E+00	4.80E-02	1 10E-04	0 011	2 42E-07	2.42E-05	0 0006
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 89E-03	1 50E-01	1 60E-02	4 41E-04	0.073	3 24E-07	3.59E-04	
	Hazard Index									**1.0**		**5.10E-04**	**0.0006**
										Total Hazard Index =		**1.0**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

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Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.8E-05	2.0E-01	6.7E-09	1.4E-09		1.0E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.0E-04	5.6E-02	1.8E-08	1.0E-09		2 8E-08	
ug/m3	BENZENE	A	7.1E-04	2.7E-02	1.3E-07	3.4E-09	1.7E-03	1.9E-07	1.14E-04
ug/m3	CARBON TETRACHLORIDE	B2	3.5E-03	5 3E-02	6.2E-07	3.3E-08		9.6E-07	
ug/m3	CHLOROFORM	B2	5.6E-04	8.1E-02	1.0E-07	8.1E-09	0 0E+00	1.5E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.55E-04		8.11E-08		1.00E-02	1.25E-07	1.25E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1.80E-03	2 00E-03	3.20E-07	6.40E-10	1.71E-01	4.92E-07	2.88E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1 16E-03	6 00E-03	2.06E-07	1.24E-09		3.17E-07	
					Total ELCR:	**4.84E-08**		**Total HI:**	**0.0001**

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Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment· Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFI**	**EPC**	**ABSgI**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	IRON					5.49E+00	1.50E-01	1 60E-04	8.17E-02		7 99E-07		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2.86E-01	2 03E-01	9 10E-03	7 00E-01	9 00E-03	1.35E-04	3E-05	7.45E-08	2E-08	3E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5 60E-02	2.37E-03	8 10E-01	8 40E-03	3 53E-05	2E-06	1.81E-08	1E-09	2E-06
MG/L	BENZENE	A	5.50E-02	5 67E-02	2 70E-02	2.22E-03	9 70E-01	2 10E-02	3 30E-05	2E-06	4 23E-08	2E-09	9E-07
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2 00E-01	5 25E-02	6.14E-03	6 50E-01	2.20E-02	9 13E-05	1E-05	1 23E-07	2E-08	5E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8 05E-02	6 24E-03	2 00E-01	8.90E-03	9 28E-05	6E-07	5 05E-08	2E-09	7E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				1 51E-02	1.00E+00	1.00E-02	2.25E-04		1 37E-07		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1.87E-03	1 00E+00	4 80E-02	2 78E-05	1E-06	8 15E-08	4E-09	6E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	6.14E-02	1 50E-01	1 60E-02	9 13E-04	1E-05	8 93E-07	7E-08	5E-06
	Total Risk									**5E-05**		**1E-07**	**5E-05**
										Total Risk =		**1E-04**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

										Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	IRON		3 00E-01	4 50E-02		5 49E+00	1 50E-01	1 60E-04	1 51E-01	0.5	1 69E-06	3.75E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		9 10E-03	7 00E-01	9 00E-03	2 49E-04	0 004	1 57E-07	3 74E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 37E-03	8 10E-01	8 40E-03	6 50E-05	0 0163	3 82E-08	1 18E-05	
MG/L	BENZENE	A	3 00E-03	2 91E-03	1 70E-03	2 22E-03	9 70E-01	2 10E-02	6.08E-05	0 0203	8 93E-08	3 07E-05	0 0357
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		6 14E-03	6 50E-01	2 20E-02	1 68E-04	0 24	2 59E-07	0 0006	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		6 24E-03	2 00E-01	8 90E-03	1 71E-04	0 017	1 07E-07	5 33E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	1 51E-02	1 00E+00	1 00E-02	4 14E-04	0 041	2 90E-07	2 90E-05	0 041
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1 00E-02	1 71E-01	1 87E-03	1 00E+00	4 80E-02	5 11E-05	0.0051	1 72E-07	1 72E-05	2.99E-04
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 14E-02	1.50E-01	1 60E-02	1 68E-03	0.28	1.88E-06	0 0021	
	Hazard Index									**1.1**		**0.0028**	**0.1**
										Total Hazard Index =		**1.2**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings. Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW54), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	3.79E-05	--	--	--		3.63E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.03E-04	--	--	--		9.91E-08	
ug/m3	BENZENE	A	7.10E-04	--	--	--	1.70E-03	6.81E-07	4.00E-04
ug/m3	CARBON TETRACHLORIDE	B2	3.50E-03	--	--	--		3 35E-06	
ug/m3	CHLOROFORM	B2	5.62E-04	--	--	--	0.00E+00	5.39E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.55E-04	--	--	--	1 00E-02	4.36E-07	4.36E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1.80E-03	--	--	--	1.71E-01	1.72E-06	1.01E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.16E-03	--	--	--		1.11E-06	
					Total ELCR:	--		**Total HI:**	**0.0005**

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW54) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	IRON					5.49E+00	1.50E-01	1.60E-04	3 01E-02		2 21E-07		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2 86E-01	2 03E-01	9 10E-03	7.00E-01	9.00E-03	4.99E-05	1E-05	2 06E-08	6E-09	1E-05
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5 60E-02	2 37E-03	8.10E-01	8 40E-03	1 30E-05	7E-07	5 01E-09	4E-10	7E-07
MG/L	BENZENE	A	5 50E-02	5 67E-02	2 70E-02	2.22E-03	9.70E-01	2.10E-02	1 22E-05	7E-07	1 17E-08	7E-10	3E-07
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2.00E-01	5 25E-02	6 14E-03	6 50E-01	2.20E-02	3 36E-05	4E-06	3 40E-08	7E-09	2E-06
MG/L	CHLOROFORM	B2	6.10E-03	3.05E-02	8 05E-02	6 24E-03	2.00E-01	8.90E-03	3.42E-05	2E-07	1 40E-08	4E-10	3E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				1 51E-02	1 00E+00	1 00E-02	8.29E-05		3 80E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 87E-03	1.00E+00	4 80E-02	1 02E-05	5E-07	2 25E-08	1E-09	2E-08
	Total Risk									**2E-05**		**3E-08**	**2E-05**
										Total Risk =		**4E-05**	

Offsite Groundwater (MW54) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	IRON		3 00E-01	4 50E-02		5 49E+00	1 50E-01	1 60E-04	3 51E-01	1 2	2 58E-06	5 73E-05	
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4 20E-02		9 10E-03	7 00E-01	9 00E-03	5 82E-04	0 010	2 40E-07	5 72E-06	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 37E-03	8 10E-01	8.40E-03	1 52E-04	0 038	5 85E-08	1.81E-05	
MG/L	BENZENE	A	3 00E-03	2.91E-03	1 70E-03	2 22E-03	9 70E-01	2 10E-02	1 42E-04	0 0473	1 37E-07	4 70E-05	0 083
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		6 14E-03	6 50E-01	2 20E-02	3 92E-04	0 6	3 96E-07	0 0009	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		6 24E-03	2 00E-01	8 90E-03	3.99E-04	0 04	1 63E-07	8 15E-05	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1.00E-02	1 00E-02	1 51E-02	1 00E+00	1 00E-02	9.67E-04	0 10	4 44E-07	4 44E-05	0 10
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	0 010	0.010	0 17	0 0019	1 0	0 048	1.19E-04	0 012	2 63E-07	2 63E-05	6 98E-04
MG/L	TRICHLOROETHYLENE (TCE)	B2	0 0060	9 00E-04		0 06	0 15	0 016	0.0039	0 7	2 88E-06	0.0032	
	Hazard Index									**2.6**		**0.0044**	**0**
										Total Hazard Index =		**3**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
		EPC	b	EPC	b
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)				
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	4 2E-05	2.0E-01	7.5E-09	1.5E-09		1.1E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.2E-04	5.6E-02	2.1E-08	1.2E-09		3.3E-08	
ug/m3	CARBON TETRACHLORIDE	B2	4 3E-03	5 3E-02	7.7E-07	4.0E-08		1.2E-06	
ug/m3	CHLOROFORM	B2	6 2E-04	8.1E-02	1.1E-07	8.8E-09	0.0E+00	1 7E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.6E-04		1.0E-07		1.0E-02	1.5E-07	1 54E-05
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	2.3E-03	2.0E-03	4.1E-07	8.1E-10	1 7E-01	6.2E-07	3.64E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.4E-03	6.0E-03	2.5E-07	1.5E-09		3.9E-07	
					Total ELCR:	**5.42E-08**		**Total HI:**	**0.00002**

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Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only):

$$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds:

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only).

$$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation.

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2.86E-01	2 03E-01	1.38E-01	7.00E-01	9 00E-03	2.06E-03	4E-04	1.13E-06	3E-07	4E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5 70E-02	7 04E-02	5 60E-02	2 69E-03	8 10E-01	8.40E-03	3 99E-05	2E-06	2.05E-08	1E-09	2E-06
MG/L	CARBON TETRACHLORIDE	B2	1.30E-01	2 00E-01	5.25E-02	3 68E-02	6 50E-01	2.20E-02	5 48E-04	7E-05	7.36E-07	1E-07	3E-05
MG/L	CHLOROFORM	B2	6 10E-03	3.05E-02	8 05E-02	9 18E-01	2 00E-01	8.90E-03	1 36E-02	8E-05	7 42E-06	2E-07	1E-03
MG/L	cis-1,2-DICHLOROETHYLENE	D				9 23E-03	1.00E+00	1.00E-02	1 37E-04		8.39E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5 20E-02	2.00E-03	6.41E-03	1 00E+00	4.80E-02	9.54E-05	5E-06	2 80E-07	1E-08	2E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6 00E-03	2.02E-01	1 50E-01	1 60E-02	3.00E-03	3E-05	2 93E-06	2E-07	2E-05
	Total Risk									**6E-04**		**9E-07**	**2E-03**
											Total Risk =	**2E-03**	

Notes. WOE = Weight of Evidence; CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD

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Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4.20E-02		1 38E-01	7 00E-01	9 00E-03	3 79E-03	0.063	2 38E-06	5 68E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2 69E-03	8 10E-01	8 40E-03	7 36E-05	0 018	4 33E-08	1 34E-05	
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4.55E-04		3 68E-02	6 50E-01	2 20E-02	1 01E-03	1 4	1 55E-06	0 0034	
MG/L	CHLOROFORM	B2	1 00E-02	2.00E-03		9 18E-01	2 00E-01	8 90E-03	2 51E-02	2 5	1 57E-05	0 0078	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	9 23E-03	1 00E+00	1 00E-02	2 53E-04	0 025	1 77E-07	1.77E-05	0 025
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	6 41E-03	1 00E+00	4 80E-02	1.76E-04	0 018	5 90E-07	5 90E-05	0 0010
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 02E-01	1 50E-01	1 60E-02	5 52E-03	0 9	6 19E-06	0 007	
	Hazard Index									**5.0**		**0.018**	**0**
										Total Hazard Index =		**5**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = Inhalation intake (CDI) = ir

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1.00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW71), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	4 2E-05	--	--	--		4.0E-08	
ug/m3	1,1,2-TRICHLOROETHANE	C	1.2E-04	--	--	--		1.2E-07	
ug/m3	CARBON TETRACHLORIDE	B2	4.3E-03	--	--	--		4.1E-06	
ug/m3	CHLOROFORM	B2	6 2E-04	--	--	--	0.0E+00	5.9E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	5.6E-04	--	--	--	1.0E-02	5.4E-07	5 40E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	2 27E-03	--	--	--	1.71E-01	2.18E-06	1.28E-05
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.42E-03	--	--	--		1.36E-06	
					Total ELCR:	--		**Total HI:**	**0.0001**

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.
f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW71) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2 86E-01	2.03E-01	1 38E-01	7 00E-01	9.00E-03	7 57E-04	2E-04	3.13E-07	9E-08	2E-04
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7.04E-02	5 60E-02	2 69E-03	8 10E-01	8 40E-03	1.47E-05	8E-07	5 67E-09	4E-10	8E-07
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	5 25E-02	3 68E-02	6 50E-01	2 20E-02	2.02E-04	3E-05	2 04E-07	4E-08	1E-05
MG/L	CHLOROFORM	B2	6 10E-03	3 05E-02	8 05E-02	9 18E-01	2 00E-01	8 90E-03	5 03E-03	3E-05	2 05E-06	6E-08	4E-04
MG/L	cis-1,2-DICHLOROETHYLENE	D				9 23E-03	1 00E+00	1 00E-02	5 06E-05		2 32E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5.20E-02	2 00E-03	6 41E-03	1 00E+00	4 80E-02	3 51E-05	2E-06	7 74E-08	4E-09	7E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	2 02E-01	1.50E-01	1 60E-02	1 10E-03	1E-05	8 11E-07	6E-08	7E-06
	Total Risk									**2E-04**		**3E-07**	**6E-04**
										Total Risk =		**8E-04**	

Offsite Groundwater (MW71) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4 20E-02		1.38E-01	7 00E-01	9 00E-03	8.83E-03	0 15	3.65E-06	8 69E-05	
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		2.69E-03	8 10E-01	8 40E-03	1.72E-04	0 043	6.62E-08	2 04E-05	
MG/L	CARBON TETRACHLORIDE	B2	7.00E-04	4 55E-04		3 68E-02	6 50E-01	2 20E-02	2 35E-03	3 4	2 38E-06	0 0052	
MG/L	CHLOROFORM	B2	1.00E-02	2 00E-03		9 18E-01	2 00E-01	8 90E-03	5.87E-02	5 9	2.40E-05	0 012	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1.00E-02	1 00E-02	9.23E-03	1 00E+00	1 00E-02	5.90E-04	0 059	2 71E-07	2 71E-05	0 059
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	6.41E-03	1 00E+00	4 80E-02	4 10E-04	0 041	9 03E-07	9 03E-05	0.0024
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 02E-01	1 50E-01	1 60E-02	1.29E-02	2.1	9 47E-06	0 011	
	Hazard Index									**12**		**0.028**	**0**
										Total Hazard Index =		**12**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW76/77), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds:

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds:

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW76/77), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	BENZENE	A	5 8E-04	2.7E-02	1.0E-07	2.8E-09	1.7E-03	1 6E-07	9.35E-05
ug/m3	CARBON TETRACHLORIDE	B2	3.0E-03	5.3E-02	5.3E-07	2.8E-08		8 1E-07	
ug/m3	1,2-DICHLOROETHANE	B2	1.1E-04	9 1E-02	2 0E-08	1.9E-09	1.4E-03	3.1E-08	2.24E-05
ug/m3	cis-1,2-DICHLOROETHYLENE	D	3.8E-04		6.9E-08		1.0E-02	1.1E-07	1.05E-05
ug/m3	trans-1,2-DICHLOROETHENE		8 8E-04		1.6E-07		2.0E-02	2 4E-07	1.21E-05
					Total ELCR:	**5.24E-08**		**Total HI:**	**0.0016**

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Offsite Groundwater (MW76_77) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

Ingestion:

Intake for non-carcinogenic compounds.

$$CDI = \frac{C_{gw} * IR * EF * ED}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only)

$$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

Intake for non-carcinogenic compounds:

$$CDI = \frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only):

$$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$$

		Carcinogenic	Noncarcinogenic
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1 09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW76/77) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	BENZENE	A	5 50E-02	5 67E-02	2.70E-02	2.53E-03	9 70E-01	2 10E-02	3.76E-05	2E-06	4 82E-08	3E-09	1E-06
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	5 25E-02	1 65E-03	6 50E-01	2.20E-02	2 45E-05	3E-06	3.30E-08	7E-09	1E-06
MG/L	1,2-DICHLOROETHANE	B2	9 10E-02	9 10E-02	9 10E-02	1 60E-03	1.00E+00	5.30E-03	2 38E-05	2E-06	7.71E-09	7E-10	2E-06
MG/L	cis-1,2-DICHLOROETHYLENE	D				8 80E-02	1 00E+00	1 00E-02	1 31E-03		8.00E-07		
MG/L	trans-1,2-DICHLOROETHENE					2.33E-02	1 00E+00	1 00E-02	3 46E-04		2 11E-07		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2 86E-01	2 03E-01	2 40E+00	7 00E-01	9.00E-03	3.57E-02	7E-03	1 96E-05	6E-06	7E-03
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5.20E-02	5 20E-02	2 00E-03	5 75E-03	1.00E+00	4 80E-02	8 55E-05	4E-06	2 51E-07	1E-08	2E-07
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7 04E-02	5 60E-02	4.75E-03	8.10E-01	8 40E-03	7 06E-05	4E-06	3 63E-08	3E-09	4E-06
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	1.61E+00	1.50E-01	1.60E-02	2 39E-02	3E-04	2 34E-05	2E-06	1E-04
MG/L	CHLOROFORM	B2	6 10E-03	3.05E-02	8 05E-02	2 48E-03	2.00E-01	8 90E-03	3 68E-05	2E-07	2.00E-08	6E-10	3E-06
MG/L	VINYL CHLORIDE	A	7 20E-01	7 20E-01	1.54E-02	1 55E-03	1 00E+00	7.30E-03	2.31E-05	2E-05	1.03E-08	7E-09	4E-07
	Total Risk									**7E-03**		**7E-06**	**7E-03**
											Total Risk =	**1E-02**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CD

Offsite Groundwater (MW76/77) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	3 00E-03	2 91E-03	1 70E-03	2 53E-03	9 70E-01	2 10E-02	6 92E-05	0 023	1 02E-07	3 49E-05	0 041
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		1 65E-03	6 50E-01	2 20E-02	4 52E-05	0 065	6 96E-08	1 53E-04	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1.40E-03	1 60E-03	1.00E+00	5 30E-03	4 38E-05	1 46E-03	1 63E-08	5 42E-07	0 0313
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	8 80E-02	1 00E+00	1 00E-02	2 41E-03	0.24	1 69E-06	1.69E-04	0 24
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	2 33E-02	1 00E+00	1 00E-02	6 37E-04	0 032	4 46E-07	2 23E-05	0 032
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6 00E-02	4.20E-02		2 40E+00	7 00E-01	9 00E-03	6 58E-02	1 1	4 14E-05	0 0010	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1.00E-02	1 71E-01	5 75E-03	1.00E+00	4 80E-02	1 58E-04	0 016	5 29E-07	5 29E-05	0 0009
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3.24E-03		4.75E-03	8 10E-01	8 40E-03	1.30E-04	0 033	7 65E-08	2 36E-05	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9 00E-04		1 61E+00	1 50E-01	1 60E-02	4 40E-02	7	4 93E-05	0 055	
MG/L	CHLOROFORM	B2	1 00E-02	2.00E-03		2 48E-03	2 00E-01	8 90E-03	6 78E-05	0 007	4 22E-08	2 11E-05	
MG/L	VINYL CHLORIDE	A	3 00E-03	3.00E-03	1 10E-01	1 55E-03	1 00E+00	7 30E-03	4 25E-05	0 0142	2 17E-08	7 23E-06	3 86E-04
	Hazard Index									**9**		**0.056**	**0.35**
										Total Hazard Index =		**9**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW76/77), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW76/77), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation

Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	BENZENE	A	5 8E-04	--	--	--	1.7E-03	5.6E-07	3.27E-04
ug/m3	CARBON TETRACHLORIDE	B2	3.0E-03	--	--	--		2.8E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.1E-04	--	--	--	1.4E-03	1.1E-07	7.84E-05
ug/m3	cis-1,2-DICHLOROETHYLENE	D	3.8E-04	--	--	--	1.0E-02	3 7E-07	3.69E-05
ug/m3	trans-1,2-DICHLOROETHENE		8.8E-04	--	--	--	2.0E-02	8.5E-07	4.24E-05
ug/m3	1,1,2,2-TETRACHLOROETHANE	C	0	--	--	--		2.9E-08	
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	0	--	--	--	1 7E-01	1.5E-06	8.64E-06
ug/m3	1,1,2-TRICHLOROETHANE	C	8.4E-05	--	--	--		8.1E-08	
ug/m3	TRICHLOROETHYLENE (TCE)	B2	9.7E-04	--	--	--		9.3E-07	
ug/m3	CHLOROFORM	B2	4.4E-04	--	--	--	0.0E+00	4.2E-07	
ug/m3	VINYL CHLORIDE	A	3.7E-03	--	--	--	1.1E-01	3.6E-06	3.27E-05
					Total ELCR:	--		**Total HI:**	**0.0005**

Offsite Groundwater (MW76/77) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation.			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
b = US EPA Exposure Factors Handbook, August 1997.
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS· Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW76/77) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distnbution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	BENZENE	A	5.50E-02	5 67E-02	2 70E-02	2 53E-03	9.70E-01	2.10E-02	1 38E-05	8E-07	1.33E-08	8E-10	4E-07
MG/L	CARBON TETRACHLORIDE	B2	1 30E-01	2.00E-01	5.25E-02	1 65E-03	6 50E-01	2 20E-02	9.04E-06	1E-06	9 13E-09	2E-09	5E-07
MG/L	1,2-DICHLOROETHANE	B2	9.10E-02	9.10E-02	9.10E-02	1 60E-03	1 00E+00	5.30E-03	8 77E-06	8E-07	2 13E-09	2E-10	8E-07
MG/L	cis-1,2-DICHLOROETHYLENE	D				8 80E-02	1 00E+00	1 00E-02	4 82E-04		2.21E-07		
MG/L	trans-1,2-DICHLOROETHENE					2.33E-02	1.00E+00	1 00E-02	1 27E-04		5 85E-08		
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2 86E-01	2 03E-01	2 40E+00	7.00E-01	9 00E-03	1 32E-02	3E-03	5 43E-06	2E-06	3E-03
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5.20E-02	2.00E-03	5 75E-03	1 00E+00	4 80E-02	3.15E-05	2E-06	6 94E-08	4E-09	6E-08
MG/L	1,1,2-TRICHLOROETHANE	C	5.70E-02	7 04E-02	5 60E-02	4 75E-03	8 10E-01	8 40E-03	2 60E-05	1E-06	1 00E-08	7E-10	1E-06
	Total Risk									**3E-03**		**2E-06**	**3E-03**
											Total Risk =	**5E-03**	

Offsite Groundwater (MW76/77) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	3 00E-03	2 91E-03	1 70E-03	2 53E-03	9 70E-01	2.10E-02	1.61E-04	0.054	1 56E-07	5 35E-05	0 09
MG/L	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04		1 65E-03	6 50E-01	2.20E-02	1 05E-04	0 151	1 07E-07	2.34E-04	
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1.40E-03	1 60E-03	1 00E+00	5.30E-03	1 02E-04	3 41E-03	2.49E-08	8 29E-07	0 073
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	8 80E-02	1 00E+00	1 00E-02	5 63E-03	0 56	2.58E-06	2 58E-04	0 56
MG/L	trans-1,2-DICHLOROETHENE		2 00E-02	2 00E-02	2 00E-02	2.33E-02	1 00E+00	1 00E-02	1 49E-03	0 07	6 82E-07	3 41E-05	0 07
MG/L	1,1,2,2-TETRACHLOROETHANE	C	6.00E-02	4.20E-02		2 40E+00	7 00E-01	9 00E-03	1 53E-01	2 6	6 34E-05	0 0015	
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1.00E-02	1 00E-02	1 71E-01	5 75E-03	1 00E+00	4 80E-02	3 68E-04	0 037	8 10E-07	8 10E-05	0 0021
MG/L	1,1,2-TRICHLOROETHANE	C	4 00E-03	3 24E-03		4 75E-03	8.10E-01	8 40E-03	3 04E-04	0.08	1 17E-07	3 61E-05	
MG/L	TRICHLOROETHYLENE (TCE)	B2	6.00E-03	9 00E-04		1 61E+00	1 50E-01	1.60E-02	1 03E-01	17	7 55E-05	0 08	
MG/L	CHLOROFORM	B2	1.00E-02	2 00E-03		2.48E-03	2 00E-01	8 90E-03	1 58E-04	0 016	6 46E-08	3 23E-05	
MG/L	VINYL CHLORIDE	A	3 00E-03	3 00E-03	1 10E-01	1 55E-03	1 00E+00	7 30E-03	9 91E-05	0 0330	3 32E-08	1.11E-05	9 01E-04
	Hazard Index									**21**		**0.09**	**0.8**
										Total Hazard Index =		**22**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index, * = inhalation intake (CDI) = ir

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation

Intake for noncarcinogenic compounds

$$CDI = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

Intake for carcinogenic compounds

$$\frac{C_{air} * IR_{adj} * EF * * CF}{AT}$$

		Carcinogenic		Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	EPC	b	EPC	b
IR =	Inhalation Rate (m^3/day)	NA		20	a
IRadj =	Adjusted Inhalation Rate (m^3-yr)/(kg-day)	13	a,c	NA	
EF =	Exposure Frequency (days/year)	350	a	350	a
ED =	Exposure Duration (years)	NA	a	30	a
CF =	Conversion Factor (mg/ug)	1 00E-03		1 00E-03	
BW =	Body Weight (kg)	NA	a	70	a
AT =	Averaging Time (days)	25550	a	10950	a

Sources:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

c = Age adjusted

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Adult Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDI	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	3.2E-03	1.8E-01	5.7E-07	1.0E-07		8.8E-07	
ug/m3	1,2-DICHLOROETHANE	B2	1 2E-04	9.1E-02	2.2E-08	2.0E-09	1.4E-03	3.3E-08	2.37E-05
ug/m3	BENZENE	A	6.2E-04	2.7E-02	1 1E-07	3.0E-09	1.7E-03	1.7E-07	9.95E-05
ug/m3	CHLOROFORM	B2	4.7E-04	8.1E-02	8.3E-08	6.7E-09	0.0E+00	1.3E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.1E-04		7.3E-08		1.0E-02	1.1E-07	1.13E-05
ug/m3	TETRACHLOROETHYLENE(PCE	C-B2	1.65E-03	2 00E-03	2.93E-07	5.86E-10	1.71E-01	4 5E-07	2.64E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1.04E-03	6.00E-03	1.85E-07	1.11E-09		2.8E-07	
					Total ELCR:	**1.13E-07**		**Total HI:**	**0.0001**

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Adult Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:
CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFI**	**EPC**	**ABSgI**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	BENZENE	A	5 50E-02	5.67E-02	2 70E-02	1 45E-03	9.70E-01	2 10E-02	2.16E-05	1E-06	2.77E-08	2E-09	6E-07
MG/L	1,2-DICHLOROETHANE	B2	9 10E-02	9 10E-02	9 10E-02	5 18E-04	1 00E+00	5 30E-03	7 70E-06	7E-07	2 49E-09	2E-10	7E-07
MG/L	1,1-DICHLOROETHENE	C	6.00E-01	6.00E-01	1 75E-01	4.10E-02	1 00E+00	1.60E-02	6 10E-04	4E-04	5.96E-07	4E-07	1E-04
MG/L	cis-1,2-DICHLOROETHYLENE	D				2 01E-03	1 00E+00	1 00E-02	2.99E-05		1 82E-08		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2.00E-03	2 53E-02	1.00E+00	4 80E-02	3.76E-04	2E-05	1 10E-06	6E-08	8E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6 00E-03	2 10E-02	1 50E-01	1.60E-02	3 12E-04	3E-06	3.05E-07	2E-08	2E-06
MG/L	CHLOROFORM	B2	6 10E-03	3.05E-02	8 05E-02	1 01E-03	2.00E-01	8 90E-03	1.49E-05	9E-08	8.13E-09	2E-10	1E-06
	Total Risk									**4E-04**		**4E-07**	**1E-04**
											Total RIsk =	**5E-04**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure; * = inhalation intake (CD

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	3 00E-03	2 91E-03	1 70E-03	1 45E-03	9 70E-01	2 10E-02	3 97E-05	0 013	5 84E-08	2 01E-05	0 023
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	5 18E-04	1.00E+00	5 30E-03	1 42E-05	4.73E-04	5.26E-09	1 75E-07	0 010
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		4 10E-02	1 00E+00	1 60E-02	1 12E-03	0 12	1.26E-06	1 40E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1 00E-02	2 01E-03	1.00E+00	1 00E-02	5 50E-05	0 006	3 85E-08	3.85E-06	0 006
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 53E-02	1 00E+00	4 80E-02	6 93E-04	0 069	2 33E-06	2 33E-04	0 0041
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 10E-02	1 50E-01	1 60E-02	5 75E-04	0 10	6 44E-07	7 16E-04	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		1 01E-03	2 00E-01	8 90E-03	2 75E-05	0 0028	1.72E-08	8 58E-06	
	Hazard Index									**0.31**		**0.0011**	**0.04**
										Total Hazard Index =		**0.4**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = Inhalation intake (CDI) = ir

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Depot Memphis, Tennessee

Inhalation
Intake for noncarcinogenic compounds.

$$\textbf{CDI} = \frac{C_{air} * IR * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic	
C_{air} =	Estimated Indoor Air Concentration (ug/m^3)	NA	EPC	b
IR =	Inhalation Rate (m^3/day)	NA	15	a
EF =	Exposure Frequency (days/year)	NA	350	a
ED =	Exposure Duration (years)	NA	6	a
CF =	Conversion Factor (mg/ug)	NA	1 00E-03	
BW =	Body Weight (kg)	NA	15	a
AT =	Averaging Time (days)	NA	2190	a

Sources:
a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Indoor air concentrations estimated using the Johnson - Ettinger Model (1991) for Subsurface Vapor Intrusion into Buildings Calculations were performed using the Groundwater Tier II Model in excel format provided by the USEPA Office of Emergency and Remedial Response

Offsite Monitoring Well (MW79), Indoor Air - Hypothetical Future Residential Child Scenario - Inhalation
Dunn Field, Defense Depot Memphis, Tennessee

				Carcinogenic			Noncarcinogenic		
Units	Chemical	WOE	EPC	SFi	CDI	ELCR	RfDi	CDI	HI
ug/m3	1,1-DICHLOROETHENE	C	3 2E-03	--	--	--		3.07E-06	
ug/m3	1,2-DICHLOROETHANE	B2	1.2E-04	--	--	--	1.40E-03	1.16E-07	8.31E-05
ug/m3	BENZENE	A	6.2E-04	--	--	--	1.70E-03	5.92E-07	3.48E-04
ug/m3	CHLOROFORM	B2	4.7E-04	--	--	--	0.00E+00	4.48E-07	
ug/m3	cis-1,2-DICHLOROETHYLENE	D	4.1E-04	--	--	--	1 00E-02	3.94E-07	3.94E-05
ug/m3	TETRACHLOROETHYLENE(PCE)	C-B2	1.6E-03	--	--	--	1.71E-01	1.58E-06	9 23E-06
ug/m3	TRICHLOROETHYLENE (TCE)	B2	1 0E-03	--	--	--		9.9E-07	
					Total ELCR:	--		**Total HI:**	**0.0005**

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Child Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment. Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event
f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

Offsite Groundwater (MW79) (Potable Use) - Future Residential Child Carcinogenic Scenario (OptionaL)
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	BENZENE	A	5.50E-02	5.67E-02	2 70E-02	1.45E-03	9.70E-01	2 10E-02	7 95E-06	4E-07	7 66E-09	4E-10	2E-07
MG/L	1,2-DICHLOROETHANE	B2	9 10E-02	9 10E-02	9 10E-02	5.18E-04	1.00E+00	5 30E-03	2 84E-06	3E-07	6 90E-10	6E-11	3E-07
MG/L	1,1-DICHLOROETHENE	C	6 00E-01	6 00E-01	1.75E-01	4 10E-02	1 00E+00	1 60E-02	2 25E-04	1E-04	1.65E-07	1E-07	4E-05
MG/L	cis-1,2-DICHLOROETHYLENE	D				2 01E-03	1 00E+00	1.00E-02	1.10E-05		5.05E-09		
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2.00E-03	2.53E-02	1 00E+00	4 80E-02	1 39E-04	7E-06	3 05E-07	2E-08	3E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	2 10E-02	1 50E-01	1 60E-02	1 15E-04	1E-06	8 45E-08	6E-09	7E-07
MG/L	CHLOROFORM	B2	6.10E-03	3 05E-02	8 05E-02	1 01E-03	2.00E-01	8 90E-03	5 51E-06	3E-08	2.25E-09	7E-11	4E-07
	Total Risk									**1E-04**		**1E-07**	**4E-05**
										Total Risk =		**2E-04**	

Offsite Groundwater (MW79) (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario
Dunn Field, Defense Distribution Depot Memphis, Tennessee

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	BENZENE	A	3 00E-03	2.91E-03	1 70E-03	1.45E-03	9 70E-01	2 10E-02	9 27E-05	0 031	8 93E-08	3 07E-05	0.05
MG/L	1,2-DICHLOROETHANE	B2	3 00E-02	3 00E-02	1 40E-03	5.18E-04	1 00E+00	5 30E-03	3 31E-05	0 0011	8 05E-09	2 68E-07	0 024
MG/L	1,1-DICHLOROETHENE	C	9 00E-03	9 00E-03		4 10E-02	1 00E+00	1 60E-02	2.62E-03	0 29	1 92E-06	2.14E-04	
MG/L	cis-1,2-DICHLOROETHYLENE	D	1 00E-02	1 00E-02	1.00E-02	2 01E-03	1.00E+00	1 00E-02	1.28E-04	0 013	5 89E-08	5 89E-06	0 013
MG/L	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	2 53E-02	1 00E+00	4.80E-02	1 62E-03	0 16	3 56E-06	3 56E-04	0.009
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		2 10E-02	1 50E-01	1 60E-02	1 34E-03	0 22	9 86E-07	0 0011	
MG/L	CHLOROFORM	B2	1 00E-02	2 00E-03		1 01E-03	2 00E-01	8.90E-03	6 42E-05	0 006	2 62E-08	1 31E-05	
	Hazard Index									**0.73**		**0.0017**	**0.1**
										Total Hazard Index =		**0.8**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ir

Appendix G-6

Appendix G-6

Depth-to-Water and Soil Type Classifications Input for Johnson-Ettinger Indoor Air Modeling of Groundwater

Dunn Field RI

Well	Loc	DTW (ft bgs)	Soil Stratum A Thickness (ft)	Soil Stratum A SCS type	Soil Stratum B Thickness (ft)	Soil Stratum B SCS type	Soil Stratum C Thickness (ft)	Soil Stratum C SCS type
MW-06	Onsite	62	NA	NA	NA	NA	NA	NA
MW-12 (NW Plume)	Onsite	77	38.5	C	0		39	S
MW-30	Offsite	47	16	SI	4	SC	27	S
MW-31	Offsite	68	30	C	5	SC	33	S
MW-32	Offsite	64	25	SI	2	SC	37	S
MW-33	Offsite	53	20	SIC	5	SC	28	S
MW-35	Onsite	77	38 5	C	0	NA	39	S
MW-37	Offsite	135	25	SI	2	SC	108	S
MW-40	Offsite	92	8	SC	9	SIC	75	S
MW-42	Offsite	56	25	SI	6	SC	25	S
MW-44	Offsite	56	19	SI	5	SC	32	S
MW-51	Offsite	45	18	SI	18	SC	9	S
MW-54	Offsite	82	28	SI	10	SC	44	S
MW-67	Offsite	124	15	C	51	S	44	SIC
MW-71	Offsite	67	25	SI	0	NA	44	S
MW-74	Onsite	79	31	SI	12	SC	36	S
MW-75	Onsite	80	31	SI	12	SC	37	S
MW-76	Offsite	86	33	SI	8	SL	45	S
MW-77	Offsite	82	32	SI	10	SC	40	S
MW-78 (N Plume)	Offsite	50	22	SI	2	SL	26	S
MW-79	Offsite	73	25	SI	10	SL	38	S
MW-80	Offsite	62	30	SI	1	SC	31	S
MW-15 (SW Plume)	Onsite	68	23	SI	10	SC	35	S

Soil Classification:

- C Clay
- CL Clay Loam
- L Loam
- LS Loamy Sand
- S Sand
- SC Sandy Clay
- SCL Sandy Clay Loam
- SI Silt
- SIC Silty Clay
- SICL Silty Clay Loam
- SIL Silt Loam
- SL Sandy Loam

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
56235	2 879285714	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3 16E-03	7 99E-04	4 74E-04	5 46E-04	7 93E-04	2057 64

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	8 53E+02	0 10	5 70E-01	3.16E-03	3 84E+02	1 15E+03	3 89E-06	3 32E-03	1 5E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
4 88E+01	NA	4 88E+01	7.93E+05	4 88E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1.13E-06	25	715 90	969 27	15,000	2 1E-03	0.0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2.1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1.25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2.1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8.4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661.15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4.51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3.39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4.83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3.12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7.48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2.00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754.00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3.01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383.78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2.88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657.15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1.47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9.55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9.27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1.05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6.97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1.14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3.2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512.27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3.30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	21	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2225 04	762	304 8	1158 24	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1 7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, t (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2210.04	0 230	0.150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	4 82E-04	5 55E-04	7 35E-04	2210 04

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3 84E+02	3 39E+03	3 73E-06	1 04E-03	1 7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
1 38E+03	NA	1 38E+03	1.10E+06	1 38E+03

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0.010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3.98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1.17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4.57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2.8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2.61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1.90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2.40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707.60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674.43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5.91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936.00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1.50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839.36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4.32E-06	8 00E-02	1.89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475.22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
127184	25 3	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	Totals must add up to value of L_{WT} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2225 04	762	304 8	1158 24		C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1.55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2210 04	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	4 38E-04	5 05E-04	6.68E-04	2210 04

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2 92E-03	3 84E+02	7 48E+03	3 49E-06	1 65E-03	5.8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final Indoor exposure groundwater conc , (µg/L)
2 55E+03	NA	2 55E+03	2 00E+05	2.55E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5.00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390.88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7.51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1.15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617.20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2.09E+02	5 84E-02	8 69E-06	7 87E+03	8.20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4.07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591.79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1.30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1.84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667.95	936.00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1.67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2.1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873.31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3.30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
156592	2 0075	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2225 04	762	304 8	1158 24	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

704 891

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 36E-02	1 13E-05	4 07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0 0E+00	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2210 04	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,674	2 72E-03	1 15E-01	1 77E-04	2 98E-03	7 60E-04	4 56E-04	5 24E-04	6 93E-04	2210 04

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	1 15E+02	0.10	6 67E-01	2 98E-03	3 84E+02	6 13E+03	3 59E-06	4 11E-04	NA	3 5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	8 88E+04	8 88E+04	3 50E+06	8 88E+04

INCREMENTAL RISK CALCULATIONS·

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0.0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3.7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347.24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9.39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5.75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2.05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1,38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6.26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486.15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7.50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7.79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1.55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1.42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3.17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0.0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9.23E-05	2.25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1.16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2.00E-03	25	377 50	512 27	19,000	1.0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2.22E-02	5 42E-06	4 20E-01	1.19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_w (µg/L)	Chemical
75354	41	1,1-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2225 04	762	304 8	1158 24	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
9.00E-02	1 04E-05	2 61E-02	25	6,247	304 75	576 05	5 89E+01	2 25E+03	5 0E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2210 04	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	6,353	1 87E-02	7 88E-01	1 77E-04	3 65E-03	9 22E-04	5 47E-04	6 30E-04	8 34E-04	2210 04

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	7 88E+02	0 10	6 67E-01	3 65E-03	3 84E+02	1 26E+03	4 06E-06	3 20E-03	5 0E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final Indoor exposure groundwater conc , (µg/L)
1 52E+01	NA	1 52E+01	2 25E+06	1 52E+01

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7.42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1.85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9.39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660.60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3.12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2.2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491.14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616.20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9.78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7.53E-06	1 72E+04	7 38E-04	1 80E-05	25	451.15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4.18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1.78E+03	3 00E-02	8.23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1.1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7.06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7.83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3.50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655.95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3.7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2.46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377.50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
107062	0 5175	1,2-Dichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2225 04	762	304 8	1158 24	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
1 04E-01	9 90E-06	9 78E-04	25	7,643	356 65	561 00	1 74E+01	8 52E+03	2 6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2210 04	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4.16E-04	15	8,457	6 27E-04	2 64E-02	1.77E-04	4 22E-03	1 09E-03	6 67E-04	7 62E-04	1 01E-03	2210 04

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 64E+01	0 10	6 67E-01	4 22E-03	3 84E+02	4 75E+02	4 59E-06	1 21E-04	2 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
7 71E+02	NA	7 71E+02	8 52E+06	7 71E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0.036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5.00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1.56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636.44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 65E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7.86E-06	1 12E+01	3 85E-08	9.39E-10	25	613 15	798 67	14,751	0 0E+00	3.5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6.26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2.13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1.20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1.56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759.13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1.0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345.65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1.9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7.07E-02	1 19E-05	6 30E+03	3 85E-01	9.39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2.06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979.00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9.51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2.00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340.50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3.40E-01	2.13E-02	5 20E-04	25	345.50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
71432	1 45	Benzene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2225 04	762	304 8	1158 24	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
8.80E-02	9 80E-06	5 56E-03	25	7,342	353 24	562.16	5 89E+01	1 75E+03	8.3E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2210 04	0 230	0.150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0.136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,Ts}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,061	3 64E-03	1 53E-01	1 77E-04	3 57E-03	9 05E-04	5 40E-04	6 21E-04	8 22E-04	2210 04

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 53E+02	0 10	6 67E-01	3 57E-03	3 84E+02	1 47E+03	4 03E-06	6 18E-04	8 3E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
4.75E+02	NA	4 75E+02	1 75E+06	4 75E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0.095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0.027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3.0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570.44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3.39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7.78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2,72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3.3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7.34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746.87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19 000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_w (µg/L)	Chemical
75014	1 55	Vinyl chloride (chloroethene)

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure drfferential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

704 916

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1 06E-01	1 23E-06	2 71E-02	25	5,250	259 25	432 00	1 86E+01	2 76E+03	8.4E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545.32	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	4,933	2 09E-02	8.81E-01	1 77E-04	4 29E-03	1 08E-03	6 43E-04	7 41E-04	1 03E-03	2545 32

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 81E+02	0 10	6 67E-01	4 29E-03	3 84E+02	4 28E+02	4 25E-06	3 75E-03	8 4E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
7 73E+00	NA	7 73E+00	2.76E+06	7 73E+00

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to Indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0.0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1.14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695.00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552.00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7.0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6.35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1.98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1,4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7.24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719.00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2.09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7.53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3.3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5.10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7.20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0.0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3.7E-05	2.0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
67663	2 475	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
1 04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536.40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam penmeter, X_{crack} (cm)
9 46E+08	2545 32	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4 22E-03	1.07E-03	6 40E-04	7.36E-04	1 02E-03	2545 32

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 , $C_{buiding}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	1 04E+02	0 10	6 67E-01	4 22E-03	3 84E+02	4 80E+02	4 24E-06	4 41E-04	2 3E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 40E+02	NA	2 40E+02	7 92E+06	2 40E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0.0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8.3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0.0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1.94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675.00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2.40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7.0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404.87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0.0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0.0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873.00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5.25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9.51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3.30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	1607 5	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1.10E+03	1.7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545 32	0 230	0 150	0 130	0.419	9 36E-10	0 746	6 98E-10	17.05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1.77E-04	3 20E-03	8 11E-04	4 82E-04	5.55E-04	7 71E-04	2545 32

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3 84E+02	3 39E+03	3 50E-06	9.73E-04	1 7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 47E+03	NA	1 47E+03	1 10E+06	1 47E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0.43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2.73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15 000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4.00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1.05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3.10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2.80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8.80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544,20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1.42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0.0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79005	4 75	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8.80E-06	9 12E-04	25	8,322	386 15	602 00	5.01E+01	4 42E+03	1 6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545.32	0 230	0 150	0 130	0.419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	9,507	5 53E-04	2 33E-02	1 77E-04	3 17E-03	8.25E-04	5 10E-04	5 80E-04	8 07E-04	2545 32

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 33E+01	0 10	6 67E-01	3 17E-03	3 84E+02	3 68E+03	3 61E-06	8 43E-05	1 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based Indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 80E+03	NA	1 80E+03	4 42E+06	1 80E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0.20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1.47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1.74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4.74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842.25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5.36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720.00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1.14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2,28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1,52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1.04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8,71E+01	1 49E-02	1 03E-05	3,10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4.42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13 733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14 751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	* 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13 000	0 0E+00	7 0E 01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E 03	6 37E-05	25	570 44	870 00	12 666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13 977	5 7E-06	0 0E+00
87683 Hexachloro-1 3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 *5	738 00	10 206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	* 95E+C3	1 00E-06	2 44E-08	25	582 15	813 20	14 000	3 4E-05	0 0E+00
88062 2 4 6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 0CE+02	3 *9E-04	7 78E-06	25	519 15	749 03	12 000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10 373	0 0E+00	* 4E 0*
91941 3 3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E 07	4 00E-09	25	560 26	754 03	13 000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	* 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+0*	7 40E-02	8 30E-06	2 60E+04	4 92E 05	1 20E-06	25	484 19	697 60	10 800	0 0E+00	1 8E-0*
95501 * 2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E 01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9 572	0 0E+00	* 8E-02
95954 2 4 5 Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E 06	25	526 15	759 *3	13 000	0 0E+00	3 5E-0*
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E 04	2 40E-05	25	483 95	719 00	10 566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8 50*	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8 737	0 0E+00	1 0E+00
*05679 2 4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	1* 329	0 0E+00	7 0E-02
106423 p Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E 01	7 66E-03	26	411 52	616 20	8 525	0 0E+00	7 0E+00
106467 1 4-Dichlorobenzene	6 *7E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9 271	0 0E+00	8 0E-0*
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11 689	0 0E+00	1 4E-02
*07062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7 643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E 02	5 12E-04	25	345 65	519 13	7 800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8 523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7 930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10 920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9 000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-08	5 10E-01	4 59E 04	1 12E-05	25	674 43	942 94	14 000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-08	1 02E-07	25	657 15	806 00	15 999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15 000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13 121	0 0E+00	1 1E+00
120821 1 2 4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 *5	725 00	10 471	0 0E+00	2 0E-01
120832 2 4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	*1 000	0 0E+00	1 1E-02
121142 2 4-Dinitrotoluene	9 55E+01	2 03E-0*	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	*3 467	* 9E-04	0 0E+00
*27184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	7 83E-04	25	416 14	678 20	8 000	2 4E-05	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 84E-02	25	394 40	620 20	8 288	5 8E-07	0 0E+00
156592 cis-1 2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	* 10E-05	25	667 95	936 00	14 370	0 0E+00	1 1E-01
156605 trans-1 2-Dichloroethylene	5 25E+0*	7 07E-02	1 19E-05	6 30E+03	3 85E-01	4 07E-03	25	333 65	544 00	7 192	0 0E+00	3 5E-02
193395 Indeno(1 2 3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	9 39E-03	25	320 85	516 50	6 717	0 0E+00	7 0E-02
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	* 50E-03	4 55E-03	1 60E-06	25	809 *5	1078 24	17 000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-0*	6 60E-04	1 1*E-04	25	715 90	969 27	15 000	2 1E-04	0 0E+00
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	6 00E-04	3 40E-05	1 61E-05	25	655 95	905 00	13 815	0 0E+00	1 4E-01
218019 Chrysene	3 98E+05	2 48E-02	6 2*E-06	1 60E-03	3 88E-03	8 29E-07	25	753 15	1019 70	16 000	2 1E-05	0 0E+00
309002 Aldrin	2 45E+06	* 32E 02	4 86E-08	1 80E-01	6 97E-03	9 46E-05	25	714 15	979 00	16 455	2 1E-06	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-08	2 00E+00	4 35E-04	1 70E-04	25	603 01	839 37	13 000	4 9E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	1 06E-05	25	596 55	839 36	13 000	* 8E-03	0 0E+00
542756 1 3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	7 44E-07	25	596 55	839 36	*3 000	5 3E-04	0 0E+00
606202 2 6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	* 77E-02	25	381 15	587 38	7 000	3 7E-05	2 0E-02
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	7 46E-07	25	558 00	770 00	12 938	1 9E-04	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	2 25E-06	25	509 60	746 87	11 000	2 0E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+0*	3 07E-02	6 30E-06	5 62E-02	4 67E-01	9 5*E-06	25	613 96	848 76	13 000	2 6E-03	0 0E+00
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	1 14E-02	25	629 88	1750 00	14 127	0 0E+00	3 0E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	* 38E-02	4 32E-06	8 00E-02	1 89E-01	6 00E-06	25	657 15	873 31	14 000	3 2E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	4 60E-03	25	402 50	539 37	*9 000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 00E-03	25	377 50	5*2 27	19 000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 *4E-02	5 31E-06	3 40E-01	2 13E-02	2 90E-04	25	340 50	475 22	18 000	1 0E-04	0 0E+00
						5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
127184	5 75	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure drfferential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545.32	0 230	0 150	0 130	0 419	9 36E-10	0 746	6.98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4.16E-04	15	9,492	1.12E-02	4 71E-01	1.77E-04	2 92E-03	7 38E-04	4.38E-04	5 05E-04	7 01E-04	2545 32

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2.92E-03	3 84E+02	7 48E+03	3 27E-06	1 54E-03	5 8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 72E+03	NA	2 72E+03	2 00E+05	2 72E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14.59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720.75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1.02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1.25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0.0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508.10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1.19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979.00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0.0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES:

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79345	2400	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1.7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545 32	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	5 23E-04	5 83E-04	8 13E-04	2545 32

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc, RfC (mg/m^3)
15	8 36E+00	0.10	6 67E-01	2.90E-03	3 84E+02	7 88E+03	3 63E-06	3 03E-05	5 8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 38E+03	NA	1 38E+03	2 97E+06	1 38E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0.011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2.63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5.60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839.36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1.00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1.24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1.03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5.50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5.06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1.4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3.7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
156605	23 25	trans-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7.07E-02	1 19E-05	9 39E-03	25	6,717	320 85	516 50	5 25E+01	6 30E+03	0 0E+00	7 0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545 32	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,073	6 48E-03	2 73E-01	1.77E-04	2 87E-03	7 26E-04	4 33E-04	4 98E-04	6 92E-04	2545 32

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 73E+02	0 10	6 67E-01	2 87E-03	3 84E+02	8 80E+03	3 24E-06	8 84E-04	NA	7 0E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS·

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	8 26E+04	8 26E+04	6 30E+06	8 26E+04

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0,034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334.32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458.00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3.08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5 714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-05	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512.15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2.88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447.53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1,74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5.25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
156592	88	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 36E-02	1 13E-05	4 07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0 0E+00	3 5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545.32	0 230	0 150	0 130	0 419	9.36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,674	2 72E-03	1 15E-01	1 77E-04	2 98E-03	7 60E-04	4 56E-04	5 24E-04	7.28E-04	2545 32

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	1 15E+02	0 10	6 67E-01	2 98E-03	3 84E+02	6 13E+03	3 36E-06	3 85E-04	NA	3 5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	9 48E+04	9 48E+04	3 50E+06	9 48E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1.48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1.02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5.74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7.80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1.00E+06	1 69E-02	4 76E-06	9.00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2.80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3.74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	581 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1.82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4.6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596.55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

704 964

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
107062	1 6	1,2-Dichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
1 04E-01	9 90E-06	9 78E-04	25	7,643	356 65	561 00	1 74E+01	8 52E+03	2 6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545 32	0 230	0 150	0.130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0.136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,457	6 27E-04	2 64E-02	1 77E-04	4 22E-03	1 09E-03	6.67E-04	7 62E-04	1.06E-03	2545 32

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	2 64E+01	0 10	6 67E-01	4 22E-03	3 84E+02	4 75E+02	4 33E-06	1 15E-04	2 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
8 17E+02	NA	8 17E+02	8 52E+06	8 17E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0.016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0,43	0 089	0 0056
SIL	0 45	0 020	1 41	0.291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969.27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7.80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7.97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5.50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1,66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1,41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1,55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591,79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
56235	1 65	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545 32	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17.05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3 16E-03	7 99E-04	4 74E-04	5.46E-04	7 59E-04	2545 32

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 53E+02	0 10	6 67E-01	3 16E-03	3 84E+02	3 77E+03	3 46E-06	2,95E-03	1 5E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
5 50E+01	NA	5 50E+01	7 93E+05	5 50E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0.059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2.49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1,30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304.75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8.80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1.41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4.21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	4 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7.24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6.46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2.19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1.32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019.70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
71432	2 525	Benzene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2560 32	1005 84	274 32	1280 16	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1.7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
8 80E-02	9 80E-06	5 56E-03	25	7,342	353 24	562 16	5 89E+01	1 75E+03	8 3E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2545 32	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17.05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4.16E-04	15	8,061	3.64E-03	1 53E-01	1.77E-04	3 57E-03	9 05E-04	5.40E-04	6.21E-04	8 63E-04	2545 32

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 effectve 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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	1 53E+02	0 10	6 67E-01	3 57E-03	3 84E+02	1 47E+03	3 78E-06	5.80E-04	8 3E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
5.05E+02	NA	5 05E+02	1 75E+06	5 05E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0.41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14.59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1.23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1.37	0 270	0 46	0 034	0 0046
SIC	0.02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0.43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2.79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1.20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1.07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7.05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1.69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1,44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1.19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4.37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5.75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3.58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5.91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1.96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839.36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4.32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539.37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2.22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER initial groundwater conc , C_W (µg/L)	Chemical
67663	917 5	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042 16	762	1280 16	0	B	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
1 04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2027 16	0.230	0.150	0 130	0 419	9 36E-10	0.746	6 98E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4.16E-04	15	7,492	2 47E-03	1.04E-01	1 77E-04	4 22E-03	1 07E-03	0 00E+00	6 00E-04	1 46E-03	2027 16

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	1 04E+02	0 10	6 67E-01	4.22E-03	3 84E+02	4 80E+02	5 92E-06	6 17E-04	2.3E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 72E+02	NA	1 72E+02	7 92E+06	1 72E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0,010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720.75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1.25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004.79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3.08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1.8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6,74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1.09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488.35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360.36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6,74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3,66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5,91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6.56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715.90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	201 65	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042 16	762	1280 16	0	B	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7.90E-02	9 10E-06	1 03E-02	25	7,505	360.36	544 20	1 66E+02	1.10E+03	1 7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2027 16	0 230	0 150	0 130	0 419	9.36E-10	0 746	6 98E-10	17 05	0 42	0.126	0.294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2.78E-01	1 77E-04	3 20E-03	8.11E-04	0 00E+00	4 52E-04	1 11E-03	2027 16

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3 84E+02	3 39E+03	5 10E-06	1 42E-03	1 7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 01E+03	NA	1 01E+03	1 10E+06	1 01E+03

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0.100	0 025
SCL	1.31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349.90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1.54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1.04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2,28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9.77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1.8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1.30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8.71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2.25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13 000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512.15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1.7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4.21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 60E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615.18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES:

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79005	2 685	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2042 16	762	1280 16	0	B	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	9 12E-04	25	8,322	386 15	602 00	5 01E+01	4 42E+03	1 6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil Intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2027 16	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17.05	0.42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4 16E-04	15	9,507	5 53E-04	2.33E-02	1 77E-04	3 17E-03	8 25E-04	0.00E+00	4 79E-04	1 13E-03	2027 16

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.33E+01	0 10	6 67E-01	3 17E-03	3 84E+02	3.68E+03	5 15E-06	1 20E-04	1 6E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
1 27E+03	NA	1 27E+03	4.42E+06	1 27E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0.016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596.55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3.98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3.61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488.35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1.6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5.17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3.18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806.00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5.25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2.1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7.34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
127184	6 4125	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2042 16	762	1280 16	0	B	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure drfferentual, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

7041000

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7.20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2027 16	0 230	0 150	0 130	0 419	9 36E-10	0.746	6 98E-10	17 05	0.42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	0 00E+00	4 11E-04	1 01E-03	2027 16

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2.92E-03	3 84E+02	7 48E+03	4 83E-06	2 27E-03	5 8E-07	NA

7041002

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , - (µg/L)
1 84E+03	NA	1 84E+03	2 00E+05	1 84E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3.32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536.40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1.23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1.11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8.98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2.30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9.00E-02	1 04E-05	2.25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1.61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3.74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873.00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2.0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79345	138 175	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042 16	762	1280 16	0	B	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041006

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2027 16	0 230	0 150	0 130	0 419	9 36E-10	0 746	6.98E-10	17 05	0 42	0 126	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	0 00E+00	4 94E-04	1 08E-03	2027 16

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	8 36E+00	0.10	6 67E-01	2 90E-03	3 84E+02	7 88E+03	5.02E-06	4 20E-05	5 8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 00E+03	NA	1 00E+03	2 97E+06	1 00E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0.078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0.040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0.187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1.13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1.54E-06	25	720 00	751 00	10,000	0 0E+00	1.4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458.00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1.64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3,74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7.90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567.15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1.0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1.82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659.79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582.55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	-1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770.00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041012

DATA ENTRY SHEET

VERSION 1 2
September, 1998

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
156592	9 2275	cis-1,2-Dichloroethylene

ENTER Average soil/groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28): Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042 16	762	1280 16	0	B	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7 36E-02	1 13E-05	4.07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0 0E+00	3 5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2027 16	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4 16E-04	15	7,674	2 72E-03	1.15E-01	1 77E-04	2 98E-03	7 60E-04	0.00E+00	4 28E-04	1 04E-03	2027 16

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	1.15E+02	0 10	6 67E-01	2 98E-03	3.84E+02	6 13E+03	4 91E-06	5 63E-04	NA	3 5E-02

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	6 48E+04	6 48E+04	3 50E+06	6 48E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0.0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533.15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3.34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0.0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751.00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1.80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0.0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078.24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873.31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
56235	36 825	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2042.16	762	1280 16	0	B	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2027 16	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4.16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3 16E-03	7 99E-04	0 00E+00	4 44E-04	1 09E-03	2027 16

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8.53E+02	0 10	6 67E-01	3 16E-03	3 84E+02	3.77E+03	5 06E-06	4 32E-03	1 5E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
3.76E+01	NA	3 76E+01	7 93E+05	3 76E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0.019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0.25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4.63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15 000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7.80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1,23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1.8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419.60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9.10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1.78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1.1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3.98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3.30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTPY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
67663	6 24	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041024

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
1 04E-01	1.00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2484.36	0.230	0 150	0 130	0.347	3 89E-09	0 778	3 03E-09	30 00	0 43	0.084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4 22E-03	1 07E-03	6 40E-04	1 63E-04	9 14E-04	2484 36

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 04E+02	0.10	2 89E+00	4 22E-03	3 84E+02	4 31E+11	5 40E-06	5 62E-04	2.3E-05	NA

7041026

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 88E+02	NA	1 88E+02	7 92E+06	1 88E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1,41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276,71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2,30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0,0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6.23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1.74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2.05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7,0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615.18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7.46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79016	61 41538462	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041030

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1 7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2484 36	0 230	0 150	0 130	0 347	3.89E-09	0 778	3 03E-09	30 00	0 43	0.084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	4 82E-04	1 17E-04	6 87E-04	2484 36

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 78E+02	0 10	2 89E+00	3 20E-03	3 84E+02	2 10E+15	4 17E-06	1.16E-03	1 7E-06	NA

7041032

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 24E+03	NA	1 24E+03	1 10E+06	1 24E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0.068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0.45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3.32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3.34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5.75E-01	1 24E-01	1.14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1.59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4.76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1.20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8.71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330.55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4.37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369.52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4.18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8.17E-06	9 89E+03	9 23E-05	2.25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79005	2 373076923	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

1

7041036

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8.80E-06	9 12E-04	25	8,322	386 15	602 00	5 01E+01	4 42E+03	1.6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2484 36	0 230	0 150	0 130	0 347	3 89E-09	0.778	3 03E-09	30 00	0 43	0 084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,507	5 53E-04	2,33E-02	1 77E-04	3 17E-03	8 25E-04	5,10E-04	1 70E-04	7 35E-04	2484 36

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 33E+01	0 10	2 89E+00	3 17E-03	3 84E+02	2 99E+15	4 43E-06	1 03E-04	1 6E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 47E+03	NA	1 47E+03	4 42E+06	1 47E+03

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0.41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562.16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-05	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422.35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4.21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0.0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7,10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2,72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1.12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14 447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0.0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2.6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
127184	1 866923077	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2484 36	0 230	0 150	0 130	0 347	3 89E-09	0 778	3 03E-09	30 00	0 43	0 084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	4 38E-04	1 05E-04	6 24E-04	2484 36

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	4,71E+02	0 10	2.89E+00	2 92E-03	3 84E+02	6 50E+16	3 81E-06	1 80E-03	5 8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
2 34E+03	NA	2.34E+03	2 00E+05	2 34E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0.045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0.016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1.37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885.73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1.8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512.15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1,4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79345	9 1	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1.7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

7041048

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7 10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2484 36	0 230	0 150	0 130	0 347	3 89E-09	0 778	3 03E-09	30 00	0 43	0 084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	5 23E-04	2 50E-04	7 53E-04	2484 36

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 36E+00	0 10	2 89E+00	2 90E-03	3 84E+02	8 15E+16	4 53E-06	3 79E-05	5 8E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 11E+03	NA	1 11E+03	2 97E+06	1 11E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8.00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1.05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0.0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5.0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7.82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7.69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678,20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
156592	15 1225	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1.7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041054

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)	Entha'py of vaponzation at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 36E-02	1 13E-05	4 07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0 0E+00	3 5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2484.36	0 230	0 150	0.130	0 347	3 89E-09	0 778	3 03E-09	30 00	0 43	0.084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,674	2 72E-03	1 15E-01	1 77E-04	2 98E-03	7 60E-04	4 56E-04	1 20E-04	6 52E-04	2484 36

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	1.15E+02	0 10	2 89E+00	2 98E-03	3 84E+02	2 73E+16	3.97E-06	4 55E-04	NA	3 5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	8 02E+04	8 02E+04	3 50E+06	8 02E+04

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29.70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0.0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF (µg/m^3)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3.80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1,40E-05	25	596 55	839.36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639.90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1.20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7.08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2,19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethythexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
56235	6 136923077	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2484.36	0 230	0 150	0 130	0 347	3.89E-09	0 778	3 03E-09	30 00	0 43	0 084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3 16E-03	7 99E-04	4 74E-04	1 12E-04	6 75E-04	2484 36

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	8 53E+02	0.10	2 89E+00	3 16E-03	3 84E+02	3 32E+15	4 10E-06	3 50E-03	1 5E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
4 64E+01	NA	4 64E+01	7 93E+05	4 64E+01

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0,095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0,145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1,25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9,00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7,97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390.88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1.0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1.8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9 479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4.68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4.37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9.10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1.13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2.1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7.36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1.90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2.26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
71432	2 217692308	Benzene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2499 36	853 44	304 8	1341 12	C	SC	L		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
8 80E-02	9 80E-06	5 56E-03	25	7,342	353 24	562 16	5 89E+01	1 75E+03	8 3E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2484 36	0 230	0 150	0.130	0 347	3 89E-09	0 778	3 03E-09	30.00	0 43	0 084	0 346	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4 16E-04	15	8,061	3 64E-03	1 53E-01	1 77E-04	3 57E-03	9 05E-04	5 40E-04	1 35E-04	7 71E-04	2484 36

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 53E+02	0 10	2 89E+00	3 57E-03	3 84E+02	5 65E+13	4 63E-06	7 10E-04	8 3E-06	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
4 13E+02	NA	4 13E+02	1 75E+06	4.13E+02

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0.027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0.45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0.030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1.23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5.89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2.80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3.74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1.10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803.15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1.29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486.15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0.0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632.40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5.10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4.18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0.0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9.27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	6 890769231	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1371 6	548 64	548 64	274 32	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1.7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1356 6	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0.43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4.16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	4 82E-04	5.55E-04	9 63E-04	1356 6

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3 84E+02	3 39E+03	5 87E-06	1 63E-03	1 7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
8 77E+02	NA	8 77E+02	1 10E+06	8 77E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0.067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1.20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3.98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347.24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848.49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1.30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422.35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1.07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1.15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705.00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
127184	1 720769231	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1371 6	548 64	548 64	274 32	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1356 6	0 230	0 150	0 130	0 419	9 36E-10	0 746	6.98E-10	17 05	0 43	0.136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	4 38E-04	5 05E-04	8 77E-04	1356 6

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2 92E-03	3 84E+02	7 48E+03	5 59E-06	2 63E-03	5 8E-07	NA

7041080

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 59E+03	NA	1 59E+03	2 00E+05	1 59E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1,31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0,100	0 025
SCL	1 31	0 059	1 48	0 324	0,39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3.5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2.28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6,74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603.69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01
8001352 Toxaphene	2 57E+05	1.16E-02	4 34E-06	7 40E-01	2 46E-04
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02

4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00	
9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01	
1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01	
5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00	
6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01	
1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00	
8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00	
2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00	
7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00	
4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01	
4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00	
5 20E-03	25	417 60	630 30	8 661	0 0E+00	7 0E+00	
1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01	
1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01	
3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02	
4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01	
2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03	
7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00	
2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00	
2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02	
7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00	
2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01	
3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02	
9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00	
5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01	
7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00	
6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01	
3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02	
3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00	
1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00	
1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02	
1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00	
6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02	
1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00	
6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00	
1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01	
3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02	
9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00	
7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00	
1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00	
1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01	
4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02	
9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02	
1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00	
1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00	
1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01	
8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00	
9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00	
1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00	
1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00	
7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00	
1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02	
7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00	
2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00	
9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00	
1,14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04	
6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00	
4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00	
2 00E-03	25	377 50	512 27	19,000	1 0E-04	0.0E+00	
2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00	
5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00	

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
75354	16 67692308	1,1-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1371 6	548 64	548.64	274 32	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
9 00E-02	1 04E-05	2 61E-02	25	6,247	304 75	576 05	5 89E+01	2 25E+03	5 0E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1356 6	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	6,353	1.87E-02	7.88E-01	1 77E-04	3 65E-03	9 22E-04	5.47E-04	6.30E-04	1 09E-03	1356 6

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	7 88E+02	0 10	6 67E-01	3 65E-03	3 84E+02	1.26E+03	6 25E-06	4 92E-03	5 0E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
9.88E+00	NA	9 88E+00	2 25E+06	9 88E+00

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0.036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0.25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2.50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842.25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563.05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2,71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319.00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330.55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2.97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2,0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2.45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
67663	2 633076923	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1706 88	579 12	152 4	975 36	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1 04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1691 88	0 230	0.150	0 130	0 419	9 36E-10	0 746	6.98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,492	2.47E-03	1 04E-01	1 77E-04	4.22E-03	1 07E-03	6 40E-04	7 36E-04	9 41E-04	1691 88

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	1 04E+02	0 10	6 67E-01	4 22E-03	3 84E+02	4 80E+02	5 16E-06	5 37E-04	2 3E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1.97E+02	NA	1 97E+02	7 92E+06	1 97E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0.008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1.56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29.70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969.27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15 000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1-54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1.00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1,86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2.19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363.15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7 505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	2 088461538	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1706 88	579 12	152 4	975 36	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7.90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1 7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1691.88	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3.20E-03	8 11E-04	4 82E-04	5 55E-04	7 10E-04	1691 88

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3.84E+02	3 39E+03	4 35E-06	1 21E-03	1 7E-06	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 18E+03	NA	1 18E+03	1 10E+06	1 18E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0.145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839.36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1.00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9.30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7.82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12 155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
127184	2 570769231	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1706 88	579 12	152 4	975 36	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1.7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

7041102

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1691 88	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	4 38E-04	5 05E-04	6 45E-04	1691.88

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2 92E-03	3.84E+02	7 48E+03	4 09E-06	1 93E-03	5 8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 18E+03	NA	2.18E+03	2 00E+05	2.18E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0.38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4.42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4,44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313.00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422.35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4.22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419.60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7.08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8.15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1.78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethythexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6.31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
56235	2 938461538	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1706 88	579 12	152 4	975 36	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041103

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 (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1691 88	0 230	0 150	0.130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3 16E-03	7 99E-04	4 74E-04	5 46E-04	6,98E-04	1691 88

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	8 53E+02	0.10	6 67E-01	3 16E-03	3 84E+02	3 77E+03	4 31E-06	3 67E-03	1 5E-05	NA

20411110

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
4 42E+01	NA	4 42E+01	7 93E+05	4.42E+01

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6,03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004.79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0.0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5.89E+01	9 00E-02	1 04E-05	2 25E+03	1.07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1.12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661.15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1,74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660.60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630.30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1.20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942.94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
75274	2 32	Bromodichloromethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1706 88	579 12	152 4	975 36	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
2 98E-02	1 06E-05	1 60E-03	25	7,000	363 15	585.85	5 50E+01	6 74E+03	1 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1691.88	0.230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17.05	0 43	0 136	0.294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,723	1 07E-03	4 49E-02	1 77E-04	1 21E-03	3 22E-04	2 04E-04	2 30E-04	2 96E-04	1691 88

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	4 49E+01	0 10	6 67E-01	1.21E-03	3 84E+02	2 07E+09	2.31E-06	1 04E-04	1 8E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 30E+03	NA	1 30E+03	6 74E+06	1 30E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0.187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0.270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1.23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1.82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624.24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2.14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1.54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6.9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2.76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1.30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1.00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5.50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5.89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4.37E+01	7 82E-02	8.73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4.18E-06	1 02E-07	25	657.15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75354	2 295	1,1-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2804 16	243 84	274 32	2286	C	S	SC		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
9 00E-02	1 04E-05	2 61E-02	25	6,247	304 75	576 05	5 89E+01	2 25E+03	5 0E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2789.16	0 230	0.150	0 130	0 303	4 49E-10	0.834	3 75E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	6,353	1 87E-02	7 88E-01	1 77E-04	3 65E-03	9 22E-04	5 47E-04	6 30E-04	6 15E-04	2789 16

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	7 88E+02	0 10	3.58E-01	3 65E-03	3 84E+02	4 62E+01	2 32E-06	1 83E-03	5 0E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 66E+01	NA	2 66E+01	2 25E+06	2 66E+01

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0.010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9.40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4.74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718.15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8.70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697.60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1.8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719.00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7.69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9.10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79345	2 234285714	1,1,2,2-Tetrachioroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1615 44	609 6	152 4	853 44	C	S	StC		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration.

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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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1600 44	0 230	0 150	0 130	0 361	7 49E-11	0 799	5 99E-11	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	5 23E-04	5 83E-04	7 90E-04	1600 44

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	8.36E+00	0 10	5.72E-02	2 90E-03	3 84E+02	2 16E+00	1 53E-06	1 28E-05	5 8E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
3 27E+03	NA	3 27E+03	2 97E+06	3 27E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720.75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8.3E-06	0.0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6 706	4 7E-07	3 0E+00
75150	Carbon disulfide	4.57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1,20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2.80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7.08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1.74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5.00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
67663	74 34538462	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950 72	762	60 96	1127 76	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041132

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1 04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7.92E+03	2 3E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1935 72	0 230	0 150	0 130	0.419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4.22E-03	1 07E-03	6 40E-04	7 36E-04	9 71E-04	1935 72

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	1 04E+02	0.10	6 67E-01	4 22E-03	3 84E+02	4 80E+02	4 86E-06	5 05E-04	2 3E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 09E+02	NA	2 09E+02	7 92E+06	2 09E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1.09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29.70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605.28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1.99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613.32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7.92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1.04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1.41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0.0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7.08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6.74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7.00E-02	7 80E-06	1 61E+02	3 01E-01	7.34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1.42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9.27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79016	68 41538462	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950 72	762	60 96	1127 76	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041138

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1 7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1935.72	0.230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	4 82E-04	5 55E-04	7 32E-04	1935 72

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3.84E+02	3.39E+03	4 07E-06	1 13E-03	1 7E-06	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 27E+03	NA	1 27E+03	1 10E+06	1 27E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0.43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15 000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0.0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5.56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1.23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9.00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4,57E+01	1 04E-01	1 00E-05	1 19E+03	1,24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1.10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	4 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6.16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3.89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4,83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79005	2 526153846	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950 72	762	60 96	1127 76	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

1 of 7

70411144

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	9 12E-04	25	8,322	386 15	602 00	5 01E+01	4 42E+03	1.6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	1935 72	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 130	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,507	5 53E-04	2 33E-02	1 77E-04	3 17E-03	8 25E-04	5 10E-04	5 80E-04	7 69E-04	1935 72

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 33E+01	0 10	6 67E-01	3 17E-03	3 84E+02	3 68E+03	4 20E-06	9 80E-05	1 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 55E+03	NA	1 55E+03	4 42E+06	1 55E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0.0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1.13E-06	25	715 90	989 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842.25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1.04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1.03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5.69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567.15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2.91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1.13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2.26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
127184	2 527692308	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950 72	762	60 96	1127 76	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 20E-02	8 20E-06	1.84E-02	25	8,288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1935 72	0 230	0 150	0.130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 130	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7.38E-04	4 38E-04	5 05E-04	6 66E-04	1935 72

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2 92E-03	3 84E+02	7 48E+03	3 82E-06	1 80E-03	5 8E-07	NA

7041152

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 33E+03	NA	2 33E+03	2 00E+05	2 33E+03

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SiL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1,75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1.8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523.00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746.00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1.20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7.82E-02	8 73E-06	2 80E+03	1.15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5.01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7.90E-02	9 10E-06	1 10E+03	4 22E-01	1.03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4.07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6.56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2.0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79345	46 54846154	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950 72	762	60 96	1127 76	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1935 72	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	5.23E-04	5.83E-04	7 78E-04	1935.72

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 36E+00	0 10	6 67E-01	2 90E-03	3.84E+02	7 88E+03	4 23E-06	3 54E-05	5 8E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
1 19E+03	NA	1 19E+03	2 97E+06	1 19E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0.39	0 100	0 029
SI	0.25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1.00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1.59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1.44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9.7E-05	0 0E+00
74839	Methyl bromide	1.05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1.01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5.50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369,52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3.39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582.15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8.70E-02	1 00E-05	1 78E+02	2.13E-01	5 20E-03	25	417 60	630.30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1.0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1.74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2.60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3.30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
156592	10 29	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water tabte	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	1950 72	762	60 96	1127 76	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0.43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 36E-02	1.13E-05	4 07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0 0E+00	3 5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1935 72	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	7,674	2 72E-03	1 15E-01	1 77E-04	2 98E-03	7 60E-04	4.56E-04	5 24E-04	6 91E-04	1935 72

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 15E+02	0 10	6 67E-01	2 98E-03	3 84E+02	6 13E+03	3 92E-06	4 49E-04	NA	3.5E-02

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	8 13E+04	8 13E+04	3 50E+06	8 13E+04

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1.41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708.15	1004 79	15 000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562.16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7.80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4.57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552.00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1.03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3.16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2.72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4.24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5.30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519.13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629,88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0.0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
56235	28 37692308	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1950 72	762	60 96	1127 76	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1935.72	0 230	0 150	0 130	0 419	9.36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3.16E-03	7 99E-04	4 74E-04	5 46E-04	7 20E-04	1935 72

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 53E+02	0 10	6 67E-01	3.16E-03	3 84E+02	3.77E+03	4 02E-06	3 43E-03	1 5E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
4 72E+01	NA	4 72E+01	7 93E+05	4 72E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2.14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751.00	10,000	0.0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8.00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3.02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1.05E-05	5 06E+03	2 30E-01	5 61E-03	25	330.55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1.80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7 10E-02	7.90E-06	2 97E+03	1 41E-02	3 44E-04	25	419.60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6.36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7.60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416.14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1.23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1.42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345.50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
67663	11 84857143	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041174

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1 04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17.05	0 43	0 136	0.294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4 22E-03	1 07E-03	6 40E-04	7 36E-04	1 07E-03	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 04E+02	0 10	5 70E-01	4 22E-03	3 84E+02	1 96E+02	4 64E-06	4 83E-04	2.3E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 19E+02	NA	2 19E+02	7.92E+06	2 19E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0.036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0.561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3.05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1,06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1.17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1.49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846.31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1.80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715.00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4.37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4,21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3,81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	261 8071429	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1 7E-06	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 365	7.49E-10	0.797	5 97E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1.77E-04	3 20E-03	8 11E-04	4 82E-04	5 55E-04	8 07E-04	2057 64

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 78E+02	0 10	5 70E-01	3 20E-03	3 84E+02	1 05E+03	3 93E-06	1.09E-03	1 7E-06	NA

7041182

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 31E+03	NA	1 31E+03	1 10E+06	1 31E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0.43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1.00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563.05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7.80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347.24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1.23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1.44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1.06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7.21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9.12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	938 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4,34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79005	3 784285714	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	9 12E-04	25	8,322	386 15	602 00	5 01E+01	4.42E+03	1 6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0.230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,507	5 53E-04	2 33E-02	1 77E-04	3 17E-03	8.25E-04	5.10E-04	5 80E-04	8 44E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 33E+01	0.10	5 70E-01	3 17E-03	3.84E+02	1 12E+03	4 04E-06	9 43E-05	1 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 61E+03	NA	1 61E+03	4 42E+06	1 61E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0.0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0.005	1 09	0 083	0 26	0.070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6.80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353.24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1.0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6.48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259.25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1.80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6.76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386.15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9.10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632.28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738.00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7.10E-02	8 00E-06	3 10E+02	1 13E-01	2.76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582.55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1,07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753.15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
127184	33 08642857	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1.55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0.43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7.38E-04	4 38E-04	5 05E-04	7 33E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	4 71E+02	0.10	5 70E-01	2 92E-03	3 84E+02	2 06E+03	3 71E-06	1 75E-03	5.8E-07	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 40E+03	NA	2 40E+03	2 00E+05	2 40E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0.029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1.09	0.083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15 000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3,98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563.05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9.80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-05	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1.01E-01	1 17E-05	1 30E+04	8 98E-02	2.19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363.15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7.42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1.07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1,09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1.11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1.20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4,37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3,74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803.15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	4 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3.12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632.28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2.00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8.70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7.60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1.74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3.66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0.0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979,00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1.14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79345	47 69428571	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7.10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057.64	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17.05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2.90E-03	7 95E-04	5 23E-04	5 83E-04	8 50E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 36E+00	0 10	5.70E-01	2 90E-03	3 84E+02	2 15E+03	4 06E-06	3 39E-05	5 8E-05	NA

7041200

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1.24E+03	NA	1 24E+03	2 97E+06	1 24E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1.09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1.89	0 471	0 41	0 065	0 030

7041202

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15 000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5,56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863.77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467.00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1.11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1.30E+04	8 98E-02	2 19E-03	25	313.00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4,57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2,30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1.41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7.82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572.00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0.0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486.15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0.0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2.90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
156605	23 52222222	trans-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1.7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041204

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 07E-02	1 19E-05	9 39E-03	25	6,717	320 85	516 50	5 25E+01	6 30E+03	0 0E+00	7 0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0.230	0 150	0 130	0.365	7 49E-10	0 797	5 97E-10	17.05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,073	6 48E-03	2 73E-01	1 77E-04	2 87E-03	7 26E-04	4 33E-04	4.98E-04	7 24E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 73E+02	0 10	5 70E-01	2 87E-03	3 84E+02	2 36E+03	3 67E-06	1 00E-03	NA	7 0E-02

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	7 28E+04	7 28E+04	6 30E+06	7 28E+04

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1.09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0.12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0.270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1.25E-02	4 74E-06	1 95E-01	6.19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6.31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1.14E-05	1.00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1,72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1.00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1.44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259,25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422.35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1,15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7.08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4.38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5.75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6.17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1.14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
156592	14 005	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	3.55E+01	3.50E+03	0.0E+00	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	7,674	2 72E-03	1 15E-01	1 77E-04	2 98E-03	7 60E-04	4 56E-04	5 24E-04	7 61E-04	2057 64

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 15E+02	0 10	5 70E-01	2 98E-03	3 84E+02	1 74E+03	3 79E-06	4 35E-04	NA	3 5E-02

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final Indoor exposure groundwater conc , (µg/L)
NA	8 40E+04	8 40E+04	3 50E+06	8 40E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15 000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlorde	1 74E+02	7.80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720,00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0.0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5.61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1.80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4.37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602.00	8,322	1 6E-05	0.0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1.10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3.71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7.53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659.79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1.51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2.95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1.05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1.23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
75354	22 18785714	1,1-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
9 00E-02	1 04E-05	2 61E-02	25	6,247	304.75	576 05	5 89E+01	2 25E+03	5 0E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 365	7 49E-10	0 797	5.97E-10	17.05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	6,353	1 87E-02	7.88E-01	1 77E-04	3 65E-03	9 22E-04	5.47E-04	6 30E-04	9 15E-04	2057 64

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	7 88E+02	0 10	5 70E-01	3 65E-03	3 84E+02	4 48E+02	4 24E-06	3 34E-03	5 0E-05	NA

7041218

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 46E+01	NA	1 46E+01	2 25E+06	1 46E+01

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0.095	0 016
L	1 04	0 036	1 56	0.359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0.025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1.41	0 291	0 45	0.067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15 000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1,44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-05	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1.17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4.57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5,34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4.68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2.80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9,33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0.0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5.60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464.19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412.27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1.42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9.27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1.55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0.0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0.0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 58E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4.32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
107062	5 684285714	1,2-Dichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	914 4	152 4	1005 84	C	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1 04E-01	9 90E-06	9 78E-04	25	7,643	356 65	561 00	1 74E+01	8 52E+03	2 6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam penmeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4 16E-04	15	8,457	6 27E-04	2 64E-02	1 77E-04	4 22E-03	1 09E-03	6 67E-04	7 62E-04	1 11E-03	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	2 64E+01	0 10	5 70E-01	4 22E-03	3 84E+02	1 95E+02	4 73E-06	1.25E-04	2 6E-05	NA

7041224

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
7 49E+02	NA	7 49E+02	8 52E+06	7 49E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0.41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0.124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0.187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1.37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3.98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4.0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2.71E-02	25	259.25	432 00	5,250	8.4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319.00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1,09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369.52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7.08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1,55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3.5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1.55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
67663	1 005	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2225 04	762	304 8	1158 24	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

7041228

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1 04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2210 04	0 230	0.150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4 22E-03	1.07E-03	6 40E-04	7 36E-04	9 74E-04	2210 04

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	1.04E+02	0.10	6 67E-01	4 22E-03	3 84E+02	4.80E+02	4 49E-06	4 67E-04	2 3E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
2 26E+02	NA	2 26E+02	7 92E+06	2 26E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4.95E-06	2 50E-02	3 32E-04	8 10E-06	25	533.15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4.37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1.50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1.59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1.23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1.86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1.06E-05	6.74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12 155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1.56E+02	7 79E-02	1 90E-03	25	453 57	705.00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1.9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6.35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2.00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_w (µg/L)	Chemical
75274	3 743205128	Bromodichloromethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc, RfC (mg/m^3)
2.98E-02	1.06E-05	1.60E-03	25	7,000	363.15	585.85	5.50E+01	6.74E+03	1.8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0.130	0 419	9.36E-10	0 746	6 98E-10	17.05	0.43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4 16E-04	15	7,723	1 07E-03	4 49E-02	1 77E-04	1 21E-03	3 22E-04	2 04E-04	2 30E-04	3 27E-04	1509

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	4 49E+01	0 10	6 67E-01	1 21E-03	3.84E+02	2 07E+09	2 73E-06	1 23E-04	1 8E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1.10E+03	NA	1 10E+03	6 74E+06	1 10E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8.10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636.44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-05	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1.04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12 155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491.14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2.13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409.34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7.76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	8 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0.0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
56235	3 141282051	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7 80E-02	8 80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1.5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0.136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3 16E-03	7 99E-04	4 74E-04	5 46E-04	7 73E-04	1509

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	8.53E+02	0 10	6 67E-01	3 16E-03	3 84E+02	3 77E+03	4 91E-06	4.19E-03	1 5E-05	NA

7041242

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
3 87E+01	NA	3 87E+01	7 93E+05	3 87E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0.26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1.02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613.32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3.5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5.56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7.28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1.17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552.00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3.10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3.16E+01	7 42E-02	1 05E-05	5.06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1.80E-01	4 47E-02	1 09E-03	25	603 69	846.31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2.7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369.52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7.83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	144 508	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1.7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1 7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0.230	0 150	0.130	0 419	9 36E-10	0 746	6 98E-10	17 05	0.43	0 136	0.294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	4 82E-04	5 55E-04	7 35E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3 84E+02	3,39E+03	3 92E-06	1 09E-03	1 7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 31E+03	NA	1 31E+03	1 10E+06	1 31E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1.04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0.12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0.25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0.011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1.02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5.18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349.90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9.00E-06	9 40E-03	1 37E-04	3.34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6.80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329.20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3.88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2.28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4.38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3.18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6.17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4.55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1.82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0.0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79005	5 054	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	9 12E-04	25	8,322	386 15	602,00	5 01E+01	4 42E+03	1 6E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	9,507	5 53E-04	2 33E-02	1 77E-04	3 17E-03	8 25E-04	5.10E-04	5 80E-04	7 69E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	2 33E+01	0.10	6 67E-01	3 17E-03	3 84E+02	3 68E+03	4 04E-06	9 42E-05	1 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1.61E+03	NA	1 61E+03	4 42E+06	1 61E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0.291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF (µg/m^3) [1]	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8.10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990.41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708.15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1.20E+05	1 18E-02	4.37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7.34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4.47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-05	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3.10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386.15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7.90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3.1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4.34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617.20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1.55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667.95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
127184	5 6584	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration.

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	4 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 419	9 36E-10	0 746	6.98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	4 38E-04	5 05E-04	6 68E-04	2057.64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2 92E-03	3 84E+02	7 48E+03	3 67E-06	1 73E-03	5 8E-07	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2 43E+03	NA	2 43E+03	2 00E+05	2,43E+03

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2.49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4.0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7.40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7.05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422.35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330.55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603.69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7.0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7.69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12 155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757.00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1.29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1.82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1.55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79345	120 6884	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

7041264

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661.15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 419	9 36E-10	0 746	6.98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	5 23E-04	5 83E-04	7 75E-04	2057 64

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 36E+00	0 10	6.67E-01	2 90E-03	3 84E+02	7 88E+03	4 06E-06	3 39E-05	5 8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 24E+03	NA	1 24E+03	2 97E+06	1 24E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0.095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29.70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0.100	0 025
SCL	1 31	0 059	1.48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0.070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8.10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2.73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605.28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708.15	1004 79	15 000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5.36E-02	7 97E-06	3.50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334.32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1.75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4.74E-06	2 50E-01	3.08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1.00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1,3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2,72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7.10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3.11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8.0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2.00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER initial groundwater conc , C_W (µg/L)	Chemical
156605	4 340714286	trans-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 07E-02	1 19E-05	9 39E-03	25	6,717	320 85	516 50	5 25E+01	6 30E+03	0 0E+00	7 0E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 419	9 36E-10	0 746	6.98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,073	6 48E-03	2 73E-01	1 77E-04	2 87E-03	7 26E-04	4 33E-04	4 98E-04	6 60E-04	2057 64

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 73E+02	0.10	6 67E-01	2 87E-03	3 84E+02	8 80E+03	3 64E-06	9 93E-04	NA	7.0E-02

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	7 35E+04	7 35E+04	6 30E+06	7.35E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0.26	0 019	1 31	0 237	0 41	0 095	0.016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839.36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5.75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6 247	5 0E-05	0 0E+00
76448	Heptachlor	1.41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1.09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4.68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9.12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7.10E-02	7 90E-06	2 97E+03	1.41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1.55E-04	25	550 54	803.15	12 155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2.8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4.83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630.30	8,661	0.0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1.8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383.78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1.72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3.51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5.42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
156592	7 6425	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 36E-02	1 13E-05	4 07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0 0E+00	3 5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,674	2 72E-03	1 15E-01	1.77E-04	2 98E-03	7 60E-04	4 56E-04	5 24E-04	6 94E-04	2057 64

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	1 15E+02	0 10	6 67E-01	2 98E-03	3 84E+02	6 13E+03	3 77E-06	4 32E-04	NA	3 5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	8 45E+04	8 45E+04	3 50E+06	8 45E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15 000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4.46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1.06E-01	1 23E-06	2 76E+03	1.11E+00	2 71E-02	25	259.25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1.17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5.34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9.00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2.00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4.68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4.37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7.90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360.36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661.15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7.79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754.00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814.00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381.15	587.38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
56235	31 392	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8.80E-06	3 05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057 64	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0.43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1 77E-04	3 16E-03	7 99E-04	4 74E-04	5 46E-04	7 23E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 53E+02	0.10	6 67E-01	3 16E-03	3 84E+02	3 77E+03	3 88E-06	3 31E-03	1 5E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
4 91E+01	NA	4 91E+01	7 93E+05	4 91E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0.359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0.39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0.187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0.41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1.74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1.10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1.56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1.44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860.38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1.04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3,10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1.3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5.8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1.74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3.12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632.28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705.00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519.13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3.71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825.00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078.24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
75274	4 1516	Bromodichloromethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
2.98E-02	1 06E-05	1 60E-03	25	7,000	363 15	585.85	5 50E+01	6 74E+03	1 8E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057.64	0 230	0 150	0.130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,723	1 07E-03	4 49E-02	1 77E-04	1 21E-03	3.22E-04	2 04E-04	2.30E-04	3 05E-04	2057 64

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	4 49E+01	0 10	6.67E-01	1 21E-03	3 84E+02	2 07E+09	2 02E-06	9.07E-05	1.8E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 49E+03	NA	1 49E+03	6 74E+06	1 49E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0.068	0 0092
CL	0 26	0.019	1 31	0.237	0 41	0 095	0.016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1.48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708.15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1.18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6.31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347.24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1.1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1.23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313.00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3.10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488.35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7.10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4.38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526.15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1.06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8.32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2.00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
75014	22 33434783	Vinyl chloride (chloroethene)

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
1 06E-01	1 23E-06	2 71E-02	25	5,250	259 25	432 00	1 86E+01	2 76E+03	8 4E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 120	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	4,933	2 09E-02	8 81E-01	1 77E-04	4 29E-03	1 08E-03	0 00E+00	6 02E-04	1 71E-03	2331 96

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	8 81E+02	0 10	5 70E-01	4 29E-03	3 84E+02	1 78E+02	5 51E-06	4 86E-03	8 4E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final Indoor exposure groundwater conc , (µg/L)
5 96E+00	NA	5 96E+00	2 76E+06	5 96E+00

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0.036	1 56	0 359	0 43	0 078	0 020
LS	14.59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0.43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1.14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3.5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585.85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5.0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2.25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6.76E-06	1.20E+04	2 72E-04	6 63E-06	25	488 35	715.00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2.80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1.55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464.19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4.07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1.12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862.22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345.50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
67663	24 15217391	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
1 04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0.230	0 150	0 130	0 365	7.49E-10	0 797	5 97E-10	17 05	0 42	0.126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4 16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4 22E-03	1 07E-03	0 00E+00	6 00E-04	1 69E-03	2331 96

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 04E+02	0 10	5 70E-01	4 22E-03	3 84E+02	1 96E+02	5 48E-06	5.70E-04	2 3E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 86E+02	NA	1 86E+02	7 92E+06	1 86E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0.078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1.09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5.18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1.14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508.10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9.77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0.0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2.19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	383 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5.61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2.25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512.15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4.68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572.00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7.90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661.15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1.29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1.12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7.54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809.15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1.14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
79016	1834 652174	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm-s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1.7E-06	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7.49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	0 00E+00	4 52E-04	1 28E-03	2331 96

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	2.78E+02	0 10	5 70E-01	3 20E-03	3.84E+02	1 05E+03	4 76E-06	1 32E-03	1.7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 08E+03	NA	1 08E+03	1 10E+06	1.08E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0.0092
CL	0.26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0.145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4.42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7.92E+03	1 50E-01	3 66E-03	25	334 32	536.40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5.89E+01	8 80E-02	9 80E-06	1.75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7.28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1.24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1.20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486.15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2.0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5.10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4.18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582.55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0.0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2.14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79005	26 19434783	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, (Enter value or 0) h_B (cm)	Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	9.12E-04	25	8,322	386.15	602.00	5.01E+01	4.42E+03	1.6E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0.126	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,507	5 53E-04	2.33E-02	1.77E-04	3 17E-03	8 25E-04	0 00E+00	4 79E-04	1 29E-03	2331 96

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.33E+01	0 10	5 70E-01	3 17E-03	3 84E+02	1 12E+03	4 79E-06	1 12E-04	1 6E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1.36E+03	NA	1 36E+03	4 42E+06	1.36E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0.095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14.59	0 124	2 28	0.561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0.044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{v_b} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7.80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004.79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1.18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2.14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751.00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863.77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1.04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2.25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7.69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

VLOOKUP TABLES

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2.69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1.0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1.1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and Initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_w (µg/L)	Chemical
127184	18 24217391	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1.7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7 20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620 20	1 55E+02	2 00E+02	5 8E-07	0 0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0.150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4 16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	0.00E+00	4 11E-04	1.16E-03	2331 96

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4 71E+02	0 10	5 70E-01	2 92E-03	3 84E+02	2 06E+03	4 52E-06	2 13E-03	5 8E-07	NA

7041320

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 97E+03	NA	1 97E+03	2 00E+05	1 97E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0.005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8.80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885.73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596.55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6.19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720.00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1.04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8.98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1.49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5.89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1.11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7.10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7.08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1.55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3.5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3.50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1.07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6.21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (ug/L)	Chemical
79345	2228 043478	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 10E-02	7 90E-06	3 44E-04	25	8,996	419 60	661 15	9.33E+01	2 97E+03	5 8E-05	0.0E+00

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7.49E-10	0 797	5 97E-10	17.05	0.42	0 126	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	0 00E+00	4 94E-04	1 23E-03	2331 96

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	8.36E+00	0 10	5 70E-01	2 90E-03	3.84E+02	2 15E+03	4 67E-06	3 91E-05	5 8E-05	NA

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
1 07E+03	NA	1 07E+03	2 97E+06	1 07E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14.59	0 124	2.28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743.24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7.34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1.54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1.04E-01	1 00E-05	1 19E+03	1.24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3.10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1.6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544.20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7.69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1.74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0.0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6.74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0.0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678.20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041330

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_w (µg/L)	Chemical
78875	27 78888889	1,2-Dichloropropane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 82E-02	8 73E-06	2 80E-03	25	7,590	369 52	572 00	4 37E+01	2 80E+03	0 0E+00	4 0E-03

7041332

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,566	1 79E-03	7 52E-02	1 77E-04	3 17E-03	8 08E-04	0 00E+00	4 55E-04	1 27E-03	2331 96

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	7 52E+01	0 10	5 70E-01	3,17E-03	3 84E+02	1 12E+03	4 75E-06	3 57E-04	NA	4 0E-03

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	1.17E+04	1 17E+04	2 80E+06	1 17E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041334

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567.15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9.39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2.44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3 3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7.03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1,13E-01	2 76E-03	25	418 31	636.00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707.60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6.68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2.95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3.00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1.9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7.24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1.60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4.55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2.48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2.45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1.70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402.50	539.37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2.14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

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DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
156605	23 575	trans-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm-s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 07E-02	1 19E-05	9 39E-03	25	6,717	320.85	516 50	5.25E+01	6 30E+03	0 0E+00	7 0E-02

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5.63E+04	9 24E+05	4 16E-04	15	7,073	6 48E-03	2.73E-01	1 77E-04	2 87E-03	7 26E-04	0.00E+00	4 06E-04	1 14E-03	2331 96

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2.73E+02	0 10	5 70E-01	2 87E-03	3.84E+02	2 36E+03	4 48E-06	1 22E-03	NA	7 0E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	5 97E+04	5.97E+04	6 30E+06	5 97E+04

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

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VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0.0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2.8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1.4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870.00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486.15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491.14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0.0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3.89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8.60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404.87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5.10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4.18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4.34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7.46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1.32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5.20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2.90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1.19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3.40E-01	2 13E-02	5 20E-04	25	345.50	482 20	18,000	1 0E-04	0 0E+00

7041342

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
156592	95 61333333	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7.36E-02	1 13E-05	4 07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0.0E+00	3.5E-02

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331.96	0 230	0.150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,674	2 72E-03	1 15E-01	1.77E-04	2 98E-03	7 60E-04	0 00E+00	4 28E-04	1 20E-03	2331 96

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	1 15E+02	0 10	5 70E-01	2 98E-03	3 84E+02	1 74E+03	4 60E-06	5 27E-04	NA	3 5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	6 93E+04	6 93E+04	3 50E+06	6 93E+04

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

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Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0.145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1.41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6.48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1.41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1.11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1.38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627.87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1.95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7.24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4.00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7.90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0.0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7,50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8.20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2.19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8.20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0.0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8.29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1.70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1.14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4.32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041343

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_w (µg/L)	Chemical
75354	21 87434783	1,1-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
9 00E-02	1 04E-05	2.61E-02	25	6,247	304 75	576 05	5 89E+01	2 25E+03	5 0E-05	0 0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2331 96	0.230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17.05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	6,353	1 87E-02	7 88E-01	1 77E-04	3 65E-03	9 22E-04	0 00E+00	5.12E-04	1 45E-03	2331 96

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	7 88E+02	0 10	5 70E-01	3 65E-03	3 84E+02	4 48E+02	5 09E-06	4 01E-03	5 0E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 21E+01	NA	1 21E+01	2 25E+06	1.21E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. - (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

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VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0.019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0.0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2.3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1.38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5.92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582.15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3.81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1.98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3.10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484.13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6.17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684.75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2.14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0.0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715.90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6.35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714.15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2.45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1.70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1.8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2.40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8.17E-06	9 89E+03	9.23E-05	2 25E-06	25	509.60	746.87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5.31E-06	3 40E-01	2 13E-02	5.20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
107062	21 96826087	1,2-Dichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1.7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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 (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1 04E-01	9 90E-06	9 78E-04	25	7,643	356 65	561 00	1.74E+01	8 52E+03	2 6E-05	0.0E+00

7041356

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0.797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,457	6 27E-04	2 64E-02	1 77E-04	4 22E-03	1 09E-03	0 00E+00	6 27E-04	1 71E-03	2331 96

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	2 64E+01	0 10	5 70E-01	4 22E-03	3 84E+02	1 95E+02	5 52E-06	1 46E-04	2 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
6 42E+02	NA	6 42E+02	8.52E+06	6 42E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041358

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0.029
SI	0 25	0 016	1.37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334.32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7.80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4.74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	839 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259.25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 6E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7,48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1,94E-02	6,74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9.12E+01	7.40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2.76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383,78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1.51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657.15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3,80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2.60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1,13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320,85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2.45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1.26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1.77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3,90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6,30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
56235	22 1126087	Carbon tetrachloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	Totals must add up to value of L_{WT} (cell D28)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0		B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 80E-02	8 80E-06	3.05E-02	25	7,127	349 90	556 60	1 74E+02	7 93E+02	1 5E-05	0 0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,798	2 02E-02	8 53E-01	1.77E-04	3 16E-03	7 99E-04	0 00E+00	4.44E-04	1 26E-03	2331 96

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	8 53E+02	0 10	5 70E-01	3 16E-03	3 84E+02	1 15E+03	4 72E-06	4 03E-03	1 5E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
4 02E+01	NA	4 02E+01	7 93E+05	4 02E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041364

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0.100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1.02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5.36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7.92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4.46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304.75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1,29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6,26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1,3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1,8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1,20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2,76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7,66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7,38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5,12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4,07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6,92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1,12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4,18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7,36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9,39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2,48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5,42E-06	4 20E-01	1 19E-02	2,90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2,13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES	X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES	

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
71432	21 9	Benzene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2346 96	1173 48	1173 48	0	B	S	C		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

7041367

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
8 80E-02	9 80E-06	5 56E-03	25	7,342	353 24	562 16	5,89E+01	1 75E+03	8 3E-06	0.0E+00

7041368

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2331 96	0 230	0 150	0 130	0 365	7 49E-10	0 797	5 97E-10	17 05	0 42	0 126	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4 16E-04	15	8,061	3 64E-03	1 53E-01	1 77E-04	3 57E-03	9 05E-04	0 00E+00	5 06E-04	1 43E-03	2331 96

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc, $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc, RfC (mg/m^3)
15	1 53E+02	0 10	5 70E-01	3.57E-03	3 84E+02	5 13E+02	5 04E-06	7 73E-04	8.3E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
3 79E+02	NA	3 79E+02	1 75E+06	3 79E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041370

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5.10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8.4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510.00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422.35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2.72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4.0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3.39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1.74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5.00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582,15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7.50E-06	3 10E+01	1 98E-02	4 83E-04	25	491.14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1.64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6.46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1.01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2.88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3,40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704.09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0.0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4.50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8,20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4.51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1.38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2.00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041372

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_w (µg/L)	Chemical
67663	6 357051282	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
1 04E-01	1.00E-05	3 66E-03	25	6,988	334 32	536 40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4 22E-03	1 07E-03	6 40E-04	7.36E-04	1 04E-03	1509

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 04E+02	0 10	6 67E-01	4 22E-03	3 84E+02	4 80E+02	5 79E-06	6 03E-04	2 3E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 75E+02	NA	1 75E+02	7 92E+06	1 75E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

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VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v\,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5.75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3.98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9.30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1.1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1.03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4.68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2.7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7.10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2.13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2.0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1.69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3.14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9.90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2.10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3.3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1,51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1.32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814.00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3.21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5.62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1.19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES | X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES |

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79016	82 77423077	Trichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 90E-02	9 10E-06	1 03E-02	25	7,505	360 36	544 20	1 66E+02	1 10E+03	1 7E-06	0 0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,483	6 60E-03	2 78E-01	1 77E-04	3 20E-03	8 11E-04	4 82E-04	5 55E-04	7 86E-04	1509

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
15	2 78E+02	0 10	6 67E-01	3 20E-03	3 84E+02	3 39E+03	4 96E-06	1 38E-03	1 7E-06	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 04E+03	NA	1 04E+03	1 10E+06	1 04E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041382

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0.029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2,3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2.10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1.01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1.7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	681 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798.67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6.46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7.10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2.6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5.12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8.20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1.51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1.05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1.00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7.26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629.88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041384

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
79005	3 578461538	1,1,2-Trichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7 80E-02	8 80E-06	9 12E-04	25	8,322	386 15	602 00	5 01E+01	4 42E+03	1 6E-05	0 0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-fil'ed porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	9,507	5 53E-04	2 33E-02	1 77E-04	3 17E-03	8 25E-04	5 10E-04	5 80E-04	8 24E-04	1509

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
15	2 33E+01	0 10	6 67E-01	3 17E-03	3 84E+02	3 68E+03	5 10E-06	1 19E-04	1 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 28E+03	NA	1 28E+03	4 42E+06	1 28E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

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VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2.28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1.18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3.39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3.12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1.38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3.63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0.0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2.91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7.80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1.82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2.70E+02	3 80E-06	9 27E-08	25	590.00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5.25E+01	7 07E-02	1 19E-05	6.30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7.0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5.3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6.26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746.87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8.20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041390

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES:

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
127184	29 37435897	Tetrachloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8 20E-06	1 84E-02	25	8,288	394 40	620.20	1 55E+02	2 00E+02	5 8E-07	0.0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4.16E-04	15	9,492	1 12E-02	4 71E-01	1 77E-04	2 92E-03	7 38E-04	4 38E-04	5 05E-04	7.15E-04	1509

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4 71E+02	0 10	6 67E-01	2 92E-03	3 84E+02	7 48E+03	4 69E-06	2 21E-03	5 8E-07	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 90E+03	NA	1 90E+03	2 00E+05	1 90E+03

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

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VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0.078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2.79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004.79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1.64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1.3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662 Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742 Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687 Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306 N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2.05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737 Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748 Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683 Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865 Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1.00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062 2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203 Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941 3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476 o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487 2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501 1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578 2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0.0E+00	1.8E-02
95954 2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953 Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414 Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425 Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679 2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423 p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411.52	616 20	8,525	0 0E+00	7 0E+00
106467 1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478 p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062 1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054 Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383 m-Xylene	4 07E+02	7 00E-02	7 80E-06	1.81E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883 Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907 Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952 Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444 Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297 Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817 Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840 Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704.09	862 22	15,000	0 0E+00	7 0E-02
118741 Hexachlorobenzene	5 50E+04	5.42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582.55	825 00	14,447	4 6E-04	0 0E+00
120127 Anthracene	2 95E+04	3 24E-02	7.74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1.1E+00
120821 1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832 2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142 2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1.9E-04	0 0E+00
124481 Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184 Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000 Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592 cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605 trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320.85	516 50	6,717	0 0E+00	7 0E-02
193395 Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992 Benzo(b)fluoranthene	1.23E+06	2 26E-02	5 56E-06	1 50E-03	4.55E-03	1 11E-04	25	715 90	969.27	15,000	2 1E-04	0 0E+00
206440 Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089 Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019.70	16,000	2 1E-05	0 0E+00
218019 Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002 Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6.97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846 alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857 beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756 1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202 2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647 N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573 Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976 Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352 Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825 Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691 Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112 Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5.42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219 Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_w (µg/L)	Chemical
79345	12 19064103	1,1,2,2-Tetrachloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
7 10E-02	7 90E-06	3.44E-04	25	8,996	419 60	661 15	9 33E+01	2 97E+03	5 8E-05	0 0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9.24E+05	4 16E-04	15	10,480	1 98E-04	8 36E-03	1 77E-04	2 90E-03	7 95E-04	5 23E-04	5 83E-04	8 32E-04	1509

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 , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	8 36E+00	0 10	6.67E-01	2 90E-03	3 84E+02	7 88E+03	5 12E-06	4 28E-05	5.8E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
9 79E+02	NA	9 79E+02	2 97E+06	9 79E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720.75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304.75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7.10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5,75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2.61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6.10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3,81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9.12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464.19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2,0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7.60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3,10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8 525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3,32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9,20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7.30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9,10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1,1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1,30E-04	3 17E-06	25	482 15	708,17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590.00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1.13E-05	3,50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5,25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3,47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7,44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1.00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1.32E-02	4.23E-06	2.00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2,90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18 000	1 0E-04	0 0E+00

7041402

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
75092	9 843137255	Methylene chloride

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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 (°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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
1.01E-01	1 17E-05	2 19E-03	25	6,706	313 00	510 00	1 17E+01	1 30E+04	4 7E-07	3.0E+00

7041404

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0.150	0 130	0 419	9 36E-10	0 746	6 98E-10	17.05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	6,970	1 52E-03	6 40E-02	1 77E-04	4 10E-03	1 05E-03	6 30E-04	7 23E-04	1 02E-03	1509

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc , $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
15	6 40E+01	0 10	6 67E-01	4 10E-03	3 84E+02	5 74E+02	5 74E-06	3.67E-04	4 7E-07	3.0E+00

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 41E+04	8 51E+06	1 41E+04	1 30E+07	1 41E+04

INCREMENTAL RISK CALCULATIONS.

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041406

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachlonde	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4.85E-05	25	624 24	885 73	13,000	3.7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4.74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chlonde (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chlonde	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304.75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1,12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660.60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3,39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6.17E+02	6 90E-02	7 90E-06	1 58E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2,20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7,03E-06	1 20E+03	1 78E-04	4.34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8,69E-06	7 87E+03	8 20E-05	2,00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4,83E-02	1 01E-05	5,30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4,01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3,58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5,50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7.0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714,15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6.92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746.87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2,00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6,30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2,90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5,70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_W (µg/L)	Chemical
156605	10 70764706	trans-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1

Used to calculate risk-based groundwater concentration

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 (°C)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7 07E-02	1 19E-05	9 39E-03	25	6,717	320 85	516 50	5.25E+01	6 30E+03	0 0E+00	7 0E-02

7041410

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0.230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,073	6 48E-03	2 73E-01	1 77E-04	2.87E-03	7 26E-04	4 33E-04	4 98E-04	7 06E-04	1509

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 73E+02	0 10	6 67E-01	2 87E-03	3 84E+02	8 80E+03	4 65E-06	1 27E-03	NA	7 0E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	5.75E+04	5 75E+04	6 30E+06	5 75E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

70411412

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0,124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0,059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1.19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1.7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8.70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1.56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9 700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447.53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,586	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3.14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0.0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1.4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2.72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8 410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0.0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809.15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1.23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4.57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2.0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES:

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
156592	6 171851852	cis-1,2-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
7 36E-02	1 13E-05	4 07E-03	25	7,192	333 65	544 00	3 55E+01	3 50E+03	0 0E+00	3 5E-02

7041416

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,674	2 72E-03	1 15E-01	1 77E-04	2 98E-03	7.60E-04	4 56E-04	5 24E-04	7 42E-04	1509

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 15E+02	0 10	6 67E-01	2 98E-03	3 84E+02	6 13E+03	4 80E-06	5 50E-04	NA	3 5E-02

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
NA	6 64E+04	6 64E+04	3 50E+06	6 64E+04

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

70-1418

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0.20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0.100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556.60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4.74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334.32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562.16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1.11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1.15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1.38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2.13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0.0E+00	1.8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1.74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2.00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4.0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8.70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 08E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7,20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667.95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5.25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1.60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1.23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1.23E+06	2 26E-02	5.56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6.21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1.70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1.42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3.27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9.51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3.07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2.14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1.2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_w (µg/L)	Chemical
75354	19 67987179	1,1-Dichloroethylene

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
9 00E-02	1 04E-05	2 61E-02	25	6,247	304.75	576 05	5 89E+01	2 25E+03	5 0E-05	0 0E+00

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INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0.43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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 groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	6,353	1 87E-02	7 88E-01	1.77E-04	3 65E-03	9 22E-04	5 47E-04	6 30E-04	8 92E-04	1509

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	7.88E+02	0 10	6 67E-01	3 65E-03	3 84E+02	1 26E+03	5 33E-06	4.20E-03	5 0E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
1 16E+01	NA	1 16E+01	2 25E+06	1 16E+01

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041424

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3.05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1.20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3.5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1.19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419.60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613.15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6.35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890.45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1,38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3.39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2,44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8.70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417.60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2,19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2,14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2,74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5,41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2,1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2,45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2.00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848.76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1,38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4,20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

7041426

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc , C_w (µg/L)	Chemical
107062	3 822307692	1,2-Dichloroethane

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell D28)							
16	15	1524	670 56	60 96	792 48	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

7014427

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)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
1 04E-01	9 90E-06	9 78E-04	25	7,643	356 65	561 00	1 74E+01	8 52E+03	2 6E-05	0 0E+00

7041428

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w\,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	1509	0.230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	8,457	6 27E-04	2 64E-02	1 77E-04	4 22E-03	1 09E-03	6 67E-04	7 62E-04	1 08E-03	1509

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	2 64E+01	0.10	6 67E-01	4 22E-03	3 84E+02	4 75E+02	5 90E-06	1 56E-04	2 6E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
6 00E+02	NA	6 00E+02	8 52E+06	6 00E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

70-11430

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0 20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1.04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1.72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363,15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4.51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3.39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0 0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1 29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13 000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1 98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3 18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3.10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447.53	675.00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7 10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418 31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2 00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1 85E+02	3 14E-01	7.66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3.32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1.74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2.10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3 71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9 10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1 80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806 00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582.55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615 18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9.27E-08	25	590 00	814 00	13,467	1 9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7.83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8.20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667 95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5.25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078 24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2.26E-02	5 56E-06	1 50E-03	4.55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019 70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2.48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1 32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4.57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3 06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1 14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7 40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2.90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1 19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2 14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482.20	18,000	1 0E-04	0 0E+00

7041432

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

VERSION 1 2
September, 1998

YES [X]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc below)

YES [ ]

ENTER Chemical CAS No (numbers only, no dashes)	ENTER Initial groundwater conc, C_W (µg/L)	Chemical
67663	318 8892	Chloroform

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell D28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
16	15	2072 64	701 04	304 8	1066 8	C	S	SI		

ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1 5	0 43	0 2	1 7	0 42	0 27	1 7	0 43	0 3

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0 1	0 45

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)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1 0E-06	1
				Used to calculate risk-based groundwater concentration	

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, ΔH_{vb} (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc , RfC (mg/m^3)
1.04E-01	1 00E-05	3 66E-03	25	6,988	334 32	536.40	3 98E+01	7 92E+03	2 3E-05	0 0E+00

7041434

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a\,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9 46E+08	2057.64	0 230	0 150	0 130	0 419	9 36E-10	0 746	6 98E-10	17 05	0 43	0 136	0 294	3,844

Bldg ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v\,TS}$ (cal/mol)	Henry's law constant at ave groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
5 63E+04	9 24E+05	4 16E-04	15	7,492	2 47E-03	1 04E-01	1 77E-04	4 22E-03	1 07E-03	6 40E-04	7 36E-04	9 74E-04	2057 64

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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1 04E+02	0 10	6 67E-01	4 22E-03	3 84E+02	4 80E+02	4 69E-06	4 88E-04	2 3E-05	NA

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

Indoor exposure groundwater conc , carcinogen (µg/L)	Indoor exposure groundwater conc , noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc , (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc , (µg/L)
2.17E+02	NA	2 17E+02	7.92E+06	2 17E+02

INCREMENTAL RISK CALCULATIONS

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

7041436

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α (1/cm)	N (unitless)	M (unitless)	θ_s (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)
C	0.20	0 008	1 09	0 083	0 38	0 068	0 0092
CL	0 26	0 019	1 31	0 237	0 41	0 095	0 016
L	1 04	0 036	1 56	0 359	0 43	0 078	0 020
LS	14 59	0 124	2 28	0 561	0 41	0 057	0 040
S	29 70	0 145	2 68	0 627	0 43	0 045	0 044
SC	0 12	0 027	1 23	0 187	0 38	0 100	0 025
SCL	1 31	0 059	1 48	0 324	0 39	0 100	0 029
SI	0 25	0 016	1 37	0 270	0 46	0 034	0 0046
SIC	0 02	0 005	1 09	0 083	0 26	0 070	0 0039
SICL	0 07	0 010	1 23	0 187	0 43	0 089	0 0056
SIL	0 45	0 020	1 41	0 291	0 45	0 067	0 011
SL	4 42	0 075	1 89	0 471	0 41	0 065	0 030

Chemical Properties Lookup Table

CAS No	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc , RfC (mg/m^3)
50293	DDT	2 63E+06	1 37E-02	4 95E-06	2 50E-02	3 32E-04	8 10E-06	25	533 15	720 75	11,000	9 7E-05	0 0E+00
50328	Benzo(a)pyrene	1 02E+06	4 30E-02	9 00E-06	1 62E-03	4 63E-05	1 13E-06	25	715 90	969 27	15,000	2 1E-03	0 0E+00
51285	2,4-Dinitrophenol	1 00E-02	2 73E-02	9 06E-06	2 79E+03	1 82E-05	4 44E-07	25	605 28	827 85	15,000	0 0E+00	7 0E-03
53703	Dibenz(a,h)anthracene	3 80E+06	2 02E-02	5 18E-06	2 49E-03	6 03E-07	1 47E-08	25	743 24	990 41	16,000	2 1E-03	0 0E+00
56235	Carbon tetrachloride	1 74E+02	7 80E-02	8 80E-06	7 93E+02	1 25E+00	3 05E-02	25	349 90	556 60	7,127	1 5E-05	0 0E+00
56553	Benz(a)anthracene	3 98E+05	5 10E-02	9 00E-06	9 40E-03	1 37E-04	3 34E-06	25	708 15	1004 79	15,000	2 1E-04	0 0E+00
57749	Chlordane	1 20E+05	1 18E-02	4 37E-06	5 60E-02	1 99E-03	4 85E-05	25	624 24	885 73	13,000	3 7E-04	0 0E+00
58899	gamma-HCH (Lindane)	1 07E+03	1 42E-02	7 34E-06	6 80E+00	5 74E-04	1 40E-05	25	596 55	839 36	13,000	3 7E-04	0 0E+00
60571	Dieldrin	2 14E+04	1 25E-02	4 74E-06	1 95E-01	6 19E-04	1 51E-05	25	613 32	842 25	13,000	4 6E-03	0 0E+00
65850	Benzoic Acid	6 00E-01	5 36E-02	7 97E-06	3 50E+03	6 31E-05	1 54E-06	25	720 00	751 00	10,000	0 0E+00	1 4E+01
67641	Acetone	5 75E-01	1 24E-01	1 14E-05	1 00E+06	1 59E-03	3 88E-05	25	329 20	508 10	6,955	0 0E+00	3 5E-01
67663	Chloroform	3 98E+01	1 04E-01	1 00E-05	7 92E+03	1 50E-01	3 66E-03	25	334 32	536 40	6,988	2 3E-05	0 0E+00
67721	Hexachloroethane	1 78E+03	2 50E-03	6 80E-06	5 00E+01	1 59E-01	3 88E-03	25	458 00	695 00	9,510	4 0E-06	0 0E+00
71363	Butanol	6 92E+00	8 00E-02	9 30E-06	7 40E+04	3 61E-04	8 80E-06	25	390 88	563 05	10,346	0 0E+00	3 5E-01
71432	Benzene	5 89E+01	8 80E-02	9 80E-06	1 75E+03	2 28E-01	5 56E-03	25	353 24	562 16	7,342	8 3E-06	0 0E+00
71556	1,1,1-Trichloroethane	1 10E+02	7 80E-02	8 80E-06	1 33E+03	7 05E-01	1 72E-02	25	347 24	545 00	7,136	0 0E+00	1 0E+00
72208	Endrin	1 23E+04	1 25E-02	4 74E-06	2 50E-01	3 08E-04	7 51E-06	25	718 15	986 20	12,000	0 0E+00	1 1E-03
72435	Methoxychlor	9 77E+04	1 56E-02	4 46E-06	4 50E-02	6 48E-04	1 58E-05	25	651 02	848 49	14,000	0 0E+00	1 8E-02
72548	DDD	1 00E+06	1 69E-02	4 76E-06	9 00E-02	1 64E-04	4 00E-06	25	639 90	863 77	14,000	6 9E-05	0 0E+00
72559	DDE	4 47E+06	1 44E-02	5 87E-06	1 20E-01	8 61E-04	2 10E-05	25	636 44	860 38	13,000	9 7E-05	0 0E+00
74839	Methyl bromide	1 05E+01	7 28E-02	1 21E-05	1 52E+04	2 56E-01	6 24E-03	25	276 71	467 00	5,714	0 0E+00	5 0E-03
75014	Vinyl chloride (chloroethene)	1 86E+01	1 06E-01	1 23E-06	2 76E+03	1 11E+00	2 71E-02	25	259 25	432 00	5,250	8 4E-05	0 0E+00
75092	Methylene chloride	1 17E+01	1 01E-01	1 17E-05	1 30E+04	8 98E-02	2 19E-03	25	313 00	510 00	6,706	4 7E-07	3 0E+00
75150	Carbon disulfide	4 57E+01	1 04E-01	1 00E-05	1 19E+03	1 24E+00	3 02E-02	25	319 00	552 00	6,391	0 0E+00	7 0E-01
75252	Bromoform	8 71E+01	1 49E-02	1 03E-05	3 10E+03	2 19E-02	5 34E-04	25	422 35	696 00	9,479	1 1E-06	0 0E+00
75274	Bromodichloromethane	5 50E+01	2 98E-02	1 06E-05	6 74E+03	6 56E-02	1 60E-03	25	363 15	585 85	7,000	1 8E-05	0 0E+00
75343	1,1-Dichloroethane	3 16E+01	7 42E-02	1 05E-05	5 06E+03	2 30E-01	5 61E-03	25	330 55	523 00	6,895	0 0E+00	5 0E-01
75354	1,1-Dichloroethylene	5 89E+01	9 00E-02	1 04E-05	2 25E+03	1 07E+00	2 61E-02	25	304 75	576 05	6,247	5 0E-05	0 0E+00
76448	Heptachlor	1 41E+06	1 12E-02	5 69E-06	1 80E-01	4 47E-02	1 09E-03	25	603 69	846 31	13,000	1 3E-03	0 0E+00
77474	Hexachlorocyclopentadiene	2 00E+05	1 61E-02	7 21E-06	1 80E+00	1 11E+00	2 71E-02	25	512 15	746 00	10,931	0 0E+00	7 0E-05
78591	Isophorone	4 68E+01	6 23E-02	6 76E-06	1 20E+04	2 72E-04	6 63E-06	25	488 35	715 00	10,271	2 7E-07	0 0E+00
78875	1,2-Dichloropropane	4 37E+01	7 82E-02	8 73E-06	2 80E+03	1 15E-01	2 80E-03	25	369 52	572 00	7,590	0 0E+00	4 0E-03
79005	1,1,2-Trichloroethane	5 01E+01	7 80E-02	8 80E-06	4 42E+03	3 74E-02	9 12E-04	25	386 15	602 00	8,322	1 6E-05	0 0E+00
79016	Trichloroethylene	1 66E+02	7 90E-02	9 10E-06	1 10E+03	4 22E-01	1 03E-02	25	360 36	544 20	7,505	1 7E-06	0 0E+00
79345	1,1,2,2-Tetrachloroethane	9 33E+01	7 10E-02	7 90E-06	2 97E+03	1 41E-02	3 44E-04	25	419 60	661 15	8,996	5 8E-05	0 0E+00
83329	Acenaphthene	7 08E+03	4 21E-02	7 69E-06	4 24E+00	6 36E-03	1 55E-04	25	550 54	803 15	12,155	0 0E+00	2 1E-01

84662	Diethylphthalate	2 88E+02	2 56E-02	6 35E-06	1 08E+03	1 85E-05	4 51E-07	25	567 15	757 00	13,733	0 0E+00	2 8E+00
84742	Di-n-butyl phthalate	3 39E+04	4 38E-02	7 86E-06	1 12E+01	3 85E-08	9 39E-10	25	613 15	798 67	14,751	0.0E+00	3 5E-01
85687	Butyl benzyl phthalate	5 75E+04	1 74E-02	4 83E-06	2 69E+00	5 17E-05	1 26E-06	25	660 60	839 68	13,000	0 0E+00	7 0E-01
86306	N-Nitrosodiphenylamine	1.29E+03	3 12E-02	6 35E-06	3 51E+01	2 05E-04	5 00E-06	25	632 28	890 45	13,000	1 4E-06	0 0E+00
86737	Fluorene	1 38E+04	3 63E-02	7 88E-06	1.98E+00	2 61E-03	6 37E-05	25	570 44	870 00	12,666	0 0E+00	1 4E-01
86748	Carbazole	3 39E+03	3 90E-02	7 03E-06	7 48E+00	6 26E-07	1 53E-08	25	627 87	899 00	13,977	5 7E-06	0 0E+00
87683	Hexachloro-1,3-butadiene	5 37E+04	5 61E-02	6 16E-06	3 23E+00	3 34E-01	8 15E-03	25	486 15	738 00	10,206	2 2E-05	0 0E+00
87865	Pentachlorophenol	5 92E+02	5 60E-02	6 10E-06	1 95E+03	1 00E-06	2 44E-08	25	582 15	813 20	14,000	3 4E-05	0 0E+00
88062	2,4,6-Trichlorophenol	3 81E+02	3.18E-02	6 25E-06	8 00E+02	3 19E-04	7 78E-06	25	519 15	749 03	12,000	3 1E-06	0 0E+00
91203	Naphthalene	2 00E+03	5 90E-02	7 50E-06	3 10E+01	1 98E-02	4 83E-04	25	491 14	748 40	10,373	0 0E+00	1 4E-01
91941	3,3-Dichlorobenzidine	7 24E+02	1 94E-02	6 74E-06	3 11E+00	1 64E-07	4 00E-09	25	560 26	754 03	13,000	1 3E-04	0 0E+00
95476	o-Xylene	3 63E+02	8 70E-02	1 00E-05	1 78E+02	2 13E-01	5 20E-03	25	417 60	630 30	8,661	0 0E+00	7 0E+00
95487	2-Methylphenol (o-cresol)	9 12E+01	7 40E-02	8 30E-06	2 60E+04	4 92E-05	1 20E-06	25	464 19	697 60	10,800	0 0E+00	1 8E-01
95501	1,2-Dichlorobenzene	6 17E+02	6 90E-02	7.90E-06	1 56E+02	7 79E-02	1 90E-03	25	453 57	705 00	9,700	0 0E+00	2 0E-01
95578	2-Chlorophenol	3 88E+02	5 01E-02	9 46E-06	2 20E+04	1 60E-02	3 90E-04	25	447 53	675 00	9,572	0 0E+00	1 8E-02
95954	2,4,5-Trichlorophenol	1 60E+03	2 91E-02	7 03E-06	1 20E+03	1 78E-04	4 34E-06	25	526 15	759 13	13,000	0 0E+00	3 5E-01
98953	Nitrobenzene	6 46E+01	7 60E-02	8 60E-06	2 09E+03	9 84E-04	2 40E-05	25	483 95	719 00	10,566	0 0E+00	2 0E-03
100414	Ethylbenzene	3 63E+02	7 50E-02	7 80E-06	1 69E+02	3 23E-01	7 88E-03	25	409 34	617 20	8,501	0 0E+00	1 0E+00
100425	Styrene	7 76E+02	7.10E-02	8 00E-06	3 10E+02	1 13E-01	2 76E-03	25	418.31	636 00	8,737	0 0E+00	1 0E+00
105679	2,4-Dimethylphenol	2 09E+02	5 84E-02	8 69E-06	7 87E+03	8 20E-05	2.00E-06	25	484 13	707 60	11,329	0 0E+00	7 0E-02
106423	p-Xylene	3 89E+02	7 69E-02	8 44E-06	1.85E+02	3 14E-01	7 66E-03	26	411 52	616 20	8,525	0 0E+00	7 0E+00
106467	1,4-Dichlorobenzene	6 17E+02	6 90E-02	7 90E-06	7 38E+01	9 96E-02	2 43E-03	25	447 21	684 75	9,271	0 0E+00	8 0E-01
106478	p-Chloroaniline	6 61E+01	4 83E-02	1 01E-05	5 30E+03	1 36E-05	3 32E-07	25	503 65	754 00	11,689	0 0E+00	1 4E-02
107062	1,2-Dichloroethane	1 74E+01	1 04E-01	9 90E-06	8 52E+03	4 01E-02	9 78E-04	25	356 65	561 00	7,643	2 6E-05	0 0E+00
108054	Vinyl acetate	5 25E+00	8 50E-02	9 20E-06	2 00E+04	2 10E-02	5 12E-04	25	345 65	519 13	7,800	0 0E+00	2 0E-01
108383	m-Xylene	4 07E+02	7 00E-02	7 80E-06	1 61E+02	3 01E-01	7 34E-03	25	412 27	617 05	8,523	0 0E+00	7 0E+00
108883	Toluene	1 82E+02	8 70E-02	8 60E-06	5 26E+02	2 72E-01	6 63E-03	25	383 78	591 79	7,930	0 0E+00	4 0E-01
108907	Chlorobenzene	2 19E+02	7 30E-02	8 70E-06	4 72E+02	1 52E-01	3.71E-03	25	404 87	632 40	8,410	0 0E+00	2 0E-02
108952	Phenol	2 88E+01	8 20E-02	9.10E-06	8 28E+04	1 63E-05	3 98E-07	25	455 02	694 20	10,920	0 0E+00	2 1E+00
111444	Bis(2-chloroethyl)ether	1 55E+01	6 92E-02	7 53E-06	1 72E+04	7 38E-04	1.80E-05	25	451 15	659 79	9,000	3 3E-04	0 0E+00
115297	Endosulfan	2 14E+03	1 15E-02	4 55E-06	5 10E-01	4 59E-04	1 12E-05	25	674 43	942 94	14,000	0 0E+00	2 1E-02
117817	Bis(2-ethylhexyl)phthalate	1 51E+07	3 51E-02	3 66E-06	3 40E-01	4 18E-06	1 02E-07	25	657 15	806.00	15,999	4 0E-06	0 0E+00
117840	Di-n-octyl phthalate	8 32E+07	1 51E-02	3 58E-06	2 00E-02	2 74E-03	6 68E-05	25	704 09	862 22	15,000	0 0E+00	7 0E-02
118741	Hexachlorobenzene	5 50E+04	5 42E-02	5 91E-06	6 20E+00	5 41E-02	1 32E-03	25	582 55	825 00	14,447	4 6E-04	0 0E+00
120127	Anthracene	2 95E+04	3 24E-02	7 74E-06	4 34E-02	2 67E-03	6 51E-05	25	615.18	873 00	13,121	0 0E+00	1 1E+00
120821	1,2,4-Trichlorobenzene	1 78E+03	3 00E-02	8 23E-06	3 00E+02	5 82E-02	1 42E-03	25	486 15	725 00	10,471	0 0E+00	2 0E-01
120832	2,4-Dichlorophenol	1 47E+02	3 46E-02	8 77E-06	4 50E+03	1 30E-04	3 17E-06	25	482 15	708 17	11,000	0 0E+00	1 1E-02
121142	2,4-Dinitrotoluene	9 55E+01	2 03E-01	7 06E-06	2 70E+02	3 80E-06	9 27E-08	25	590 00	814 00	13,467	1.9E-04	0 0E+00
124481	Chlorodibromomethane	6 31E+01	1 96E-02	1 05E-05	2 60E+03	3 21E-02	7 83E-04	25	416 14	678 20	8,000	2 4E-05	0 0E+00
127184	Tetrachloroethylene	1 55E+02	7 20E-02	8 20E-06	2 00E+02	7 54E-01	1 84E-02	25	394 40	620 20	8,288	5 8E-07	0 0E+00
129000	Pyrene	1 05E+05	2 72E-02	7 24E-06	1 35E-01	4 51E-04	1 10E-05	25	667.95	936 00	14,370	0 0E+00	1 1E-01
156592	cis-1,2-Dichloroethylene	3 55E+01	7 36E-02	1 13E-05	3 50E+03	1 67E-01	4 07E-03	25	333 65	544 00	7,192	0 0E+00	3 5E-02
156605	trans-1,2-Dichloroethylene	5 25E+01	7 07E-02	1 19E-05	6 30E+03	3 85E-01	9 39E-03	25	320 85	516 50	6,717	0 0E+00	7 0E-02
193395	Indeno(1,2,3-cd)pyrene	3 47E+06	1 90E-02	5 66E-06	2 20E-05	6 56E-05	1 60E-06	25	809 15	1078.24	17,000	2 1E-04	0 0E+00
205992	Benzo(b)fluoranthene	1 23E+06	2 26E-02	5 56E-06	1 50E-03	4 55E-03	1 11E-04	25	715 90	969 27	15,000	2 1E-04	0 0E+00
206440	Fluoranthene	1 07E+05	3 02E-02	6 35E-06	2 06E-01	6 60E-04	1 61E-05	25	655 95	905 00	13,815	0 0E+00	1 4E-01
207089	Benzo(k)fluoranthene	1 23E+06	2 26E-02	5 56E-06	8 00E-04	3 40E-05	8 29E-07	25	753 15	1019.70	16,000	2 1E-05	0 0E+00
218019	Chrysene	3 98E+05	2 48E-02	6 21E-06	1 60E-03	3 88E-03	9 46E-05	25	714 15	979 00	16,455	2 1E-06	0 0E+00
309002	Aldrin	2 45E+06	1.32E-02	4 86E-06	1 80E-01	6 97E-03	1 70E-04	25	603 01	839 37	13,000	4 9E-03	0 0E+00
319846	alpha-HCH (alpha-BHC)	1 23E+03	1 42E-02	7 34E-06	2 00E+00	4 35E-04	1 06E-05	25	596 55	839 36	13,000	1 8E-03	0 0E+00
319857	beta-HCH (beta-BHC)	1 26E+03	1 42E-02	7 34E-06	2 40E-01	3 05E-05	7 44E-07	25	596 55	839 36	13,000	5 3E-04	0 0E+00
542756	1,3-Dichloropropene	4 57E+01	6 26E-02	1 00E-05	2 80E+03	7 26E-01	1 77E-02	25	381 15	587 38	7,000	3 7E-05	2 0E-02
606202	2,6-Dinitrotoluene	6 92E+01	3 27E-02	7 26E-06	1 82E+02	3.06E-05	7 46E-07	25	558 00	770 00	12,938	1 9E-04	0 0E+00
621647	N-Nitrosodi-n-propylamine	2 40E+01	5 45E-02	8 17E-06	9 89E+03	9 23E-05	2 25E-06	25	509 60	746 87	11,000	2 0E-03	0 0E+00
1024573	Heptachlor epoxide	8 32E+04	1 32E-02	4 23E-06	2 00E-01	3 90E-04	9 51E-06	25	613 96	848 76	13,000	2 6E-03	0 0E+00
7439976	Mercury (elemental)	5 20E+01	3 07E-02	6 30E-06	5 62E-02	4 67E-01	1.14E-02	25	629 88	1750 00	14,127	0 0E+00	3 0E-04
8001352	Toxaphene	2 57E+05	1 16E-02	4 34E-06	7.40E-01	2 46E-04	6 00E-06	25	657 15	873 31	14,000	3 2E-04	0 0E+00
11096825	Aroclor 1260 (PCB-1260)	2 90E+05	1 38E-02	4 32E-06	8 00E-02	1 89E-01	4 60E-03	25	402 50	539 37	19,000	1 0E-04	0 0E+00
11097691	Aroclor 1254 (PCB-1254)	2 00E+05	1 56E-02	5 00E-06	5 70E-02	8 20E-02	2 00E-03	25	377 50	512 27	19,000	1 0E-04	0 0E+00
12674112	Aroclor 1016 (PCB-1016)	3 30E+04	2 22E-02	5 42E-06	4 20E-01	1.19E-02	2 90E-04	25	340 50	475 22	18,000	1 0E-04	0 0E+00
53469219	Aroclor 1242 (PCB-1242)	3 30E+04	2.14E-02	5 31E-06	3 40E-01	2 13E-02	5 20E-04	25	345 50	482 20	18,000	1 0E-04	0 0E+00

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TAB

Appendix H

APPENDIX H

Supporting Information for Exposure Factors Development

TABLE H-1
Exposure Factors for Soil
Memphis Depot Dunn Field RI

Symbols	Parameter	FUTURE											
		Maintenance Worker		Utility Worker		Industrial Worker		Onsite Residential or Recreational Adult		Onsite Residential or Recreational Child		Onsite Recreational Youth	
BW	Body Weight (kg)	70	a	70	a	70	a	70	a	15	a	45	a
IR_Inh	Inhalation Rate (m^3/day)	20	a	20	a	20	a	20	a	15	a	20	a
IR_Inh_adj	Inhalation Rate_ age-adjusted	N/A		N/A		N/A		12 86	a,o	N/A		N/A	
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	70x365	a	70x365	a	N/A	a	70x365	a
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	25x365	a	25x365	a	30x365	a	6x365	a	10x365	a
	Soils												
IR_Ing	Incidental Ingestion Rate (mg/day)	50	b	100	b	50	b	100	b	200	b	100	b
IR_adj_Ing	Age-adjusted Incidental Ingestion Rate (mg/day)	N/A		N/A		N/A		114 29	b,p	N/A		N/A	
FI	Fraction Ingested	0 5	c	0 5	c	1	c	1	c	1	c	1	c
SA	Skin Surface Area (cm^2)	2,679	d	2,679	d	2,679	d	5,049	e	2,351	f	4,478	f
SA_adj	Age-adjusted Skin Surface Area (cm^2)	N/A		N/A		N/A		2,671	e,q	N/A		N/A	
AF	Adherence Factor for dry soil (mg/cm^2)	0 03	h	0 1	i	0 03	h	0 03	h	0 15	j	0 15	j
PEF	Particulate Emission Factor (m^3/kg)	1 32E+09	k	1 32E+09	k	1 32E+09	k	1 32E+09	k	1 32E+09	k	1 32E+09	k
ET	Exposure Time (hours/day)	8	a	8	a	8	a	4	l	4	l	4	l
EF	Exposure Frequency (days/year)	50	m	24	n	250	a	350, 45	a,b	350, 45	a,b	45	b
ED	Exposure Duration (years)	25	a	25	a	25	a	30	a	6	a	10	a

Notes

All current scenario exposure factors are subject to re-evaluation based on site-specific information

a Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03 March 25, 1991

b Ingestion rates adapted from EPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

c Fraction ingested assumed by the nature of the activity

d Worker soil exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face), hands & forearms (see Appendix G)

e Residential/recreational adult soil exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face), hands, forearms & lower legs (see Appendix G)

f Residential/recreational child soil exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands, forearms, lower legs & feet (see Appendix G)

g Recreational youth soil exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands, forearms, lower legs & feet (see Appendix G)

h 0 03 = Groundskeeper No.2 (exposure scenarios similar to urban horticulture center, campus grounds, arboretum) AFs chosen from Soil Loading calculations (see Appendix G)

i 0 1 = Construction Worker (heavy digging, exposure to mixed bare earth, concrete surfaces, dust & debris) AFs chosen from Soil Loading calculations (see Appendix G)

j 0 15 = Daycare Kids No 1b (indoor exposure to linoleum, outdoor exposure to grass, bare earth, no shoes) AFs chosen from Soil Loading calculations (see Appendix G)

k PEF adapted from EPA 1996, Soil Screening Guidance Technical Background Document

l 4 hours soil exposure are assumed for residential dermal contact and inhalation exposure time

m Worker soil exposure is assumed to be once a week per year, minus vacation time

n Worker soil exposure is assumed to be twice a month

o Age-adjusted inhalation rate for residential adult: $IR\text{-}Inh\ adj = \frac{IR\text{-}Inhc \times EDc}{BWc} + \frac{IR\text{-}Inha \times (EDa - EDc)}{BWa} = \frac{15 \times 6}{15} + \frac{20 \times (30-6)}{70} =$ *12 86 (m3-year)/(kg-day)*

p Age-adjusted ingestion rate for residential adult: $IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70} =$ *114 29 (mg-year)/(kg-day)*

q Age-adjusted dermal contact for residential adult: $SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{2351 \times 6}{15} + \frac{5049 \times (30-6)}{70} =$ *2671 (cm2-year)/(kg)*

cm^2	centimeters squared
days/year	days per year
hours/day	hours per day
kg	kilograms
m^3/day	cubic meters per day
m^3/kg	cubic meters per kilogram
mg/cm^2	milligrams per centimeters squared
mg/day	milligrams per day
N/A	Not applicable for this receptor

TABLE H-2

Exposure Factors for Sediment and Surface Water

Memphis Depot Dunn Field RI

Symbols	Parameter	FUTURE									
		Maintenance Worker ditches		Industrial Worker ditches		Onsite Recreational Adult		Onsite Recreational Child		Onsite Recreational Youth	
BW	Body Weight (kg)	70	a	70	a	70	a	15	a	45	a
IR_Inh	Inhalation Rate (m^3/day)	20	a	20	a	20	a	15	a	20	a
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	70x365	a	N/A		70x365	a
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	25x365	a	30x365	a	6x365	a	10x365	a
	Surface Water										
IR_Ing_w	Incidental Ingestion - Wading (L/hour)	0 01	b	0 01	b	0 01	b	0 01	b	0 01	b
SA_w	Skin Surface Area - Wading (cm^2)	2,679	c	2,679	c	5,671	d	1,851	e	4,785	f
ET	Exposure Time (hours/day)	2	g	2	g	2	g	2	g	2	g
EF	Exposure Frequency (days/year)	12	h	50	i	45	j	45	j	45	j
ED	Exposure Duration (years)	25	a	25	a	30	a	6	a	10	j
	Sediments										
IR_Ing	Incidental Ingestion - Wading (mg/day)	50	k	50	k	100	k	200	k	100	k
FI	Fraction Ingested	1	l	1	l	1	l	1	l	1	l
SA	Skin Surface Area - Wading (cm^2)	2,679	c	2,679	c	5,671	d	1,851	e	4,785	f
AF	Adherence Factor for wet soil (mg/cm^2)	0 1	m	0 1	m	0 1	m	0 1	m	0 1	m
ET	Exposure Time (hours/day)	2	g	2	g	2	g	2	g	2	g
EF	Exposure Frequency (days/year)	12	h	50	i	45	j	45	j	45	j
ED	Exposure Duration (years)	25	a	25	a	30	a	6	a	10	j

Notes:	All current scenario exposure factors are subject to re-evaluation based on site-specific information
a	Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b	Surface water ingestion while wading adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
c	Worker surface water/sediment exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms (see Appendix
d	Recreational adult sediment/surface water exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet. (see Appendix G)
e	Recreational youth sediment/surface water exposure is adapted from EPA Exposure Factor Handbook, August 1997 &is protective of hands, forearms, lower legs & feet (see Appendix G)
f	Recreational child sediment/surface water exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet (see Appendix G)
g	2 hours exposure to drainage ditch sediment/surface water is assumed for workers/recreational visitors based on the nature of the activities
h	Maintenance Worker surface water/sediment exposure is assumed to be once a month
i	Industrial Worker surface water & sediment exposure (sump, ditch or impoundment) is assumed to be once a week.
j	Recreational factors adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
k	Sediment ingestion rates adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
l	Fraction ingested assumed by the nature of the activity
m	0 1 = Construction Worker (heavy digging, exposure to mixed bare earth, concrete surfaces, dust & debris) AFs chosen from Soil Loading calculations (see Appendix G)
cm^2	centimeters squared
days/year	days per year
hours/day	hours per day
kg	kilograms
L/hour	liters per hour
m^3/day	cubic meters per day
m^3/kg	cubic meters per kilogram
mg/cm^2	milligrams per centimeters squared
mg/day	milligrams per day
N/A	Not applicable for this receptor

TABLE H-3
Exposure Factors for Groundwater
Memphis Depot Dunn Field RI

Symbols	Parameter	FUTURE					
		Industrial Worker		Onsite Resident (Adult)		Onsite Resident (Child)	
BW	Body Weight (kg)	70	a	70	a	15	a
IR_Inh	Inhalation Rate (m^3/day)	*		*		*	
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	N/A	
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	30x365	a	6x365	a
	Groundwater						
IR_Ing	Ingestion Rate of Water (L/day)	1	a	2	a	1	a
IR_adj_Ing	Age-adjusted Incidental Ingestion Rate (L/day,	N/A		1 1	a,f	N/A	
SA	Skin Surface Area (cm^2)	2679	b	20,000	c	6,557	d
SA_adj	Age-adjusted Skin Surface Area (cm^2)	N/A		9480	c,g	N/A	
ET	Exposure Time (hours/day)	0 007	e	0 007	e	0 007	e
EF	Exposure Frequency (days/year)	250	a	350	a	350	a
ED	Exposure Duration (years)	25	a	30	a	6	a

Notes:

* Inhalation exposures to volatiles in the groundwater are equal to the ingestion exposures as per EPA Region IV policy

a Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance' "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b Worker groundwater exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms. (see Appendix G)

c Residential adult total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)

d Residential child total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)

e Calculation for Shower dermal exposure time 10 minute event x 1 hour/60 minutes x 1 day/ 24 hours = 0 007 event/day

f Age-adjusted ingestion rate for residential adult. $IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70} =$ *1 1 (L-year)/(kg-day)*

g Age-adjusted dermal contact for residential adult $SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70} =$ *9480 (cm^2-year)/(kg)*

cm^2	centimeters squared
days/year	days per year
hours/day	hours per day
kg	kilograms
L/day	liters per day
m^3/day	cubic meters per day
N/A	Not applicable for this receptor

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TABLE H-4
Surface Areas per Receptor
Memphis Depot Dunn Field RI

Surface Area Calculations for Adult Receptors

Surface Area for Residential Adults for soil exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet		
602 5	903 5	1805	1172 5	2370	5930	N/A	**5049**	1/2 head, hands, forearms, & lower legs

Surface Area for Adults Workers for soil & water exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet		
602 5	903 5	1805	1172 5	N/A	N/A	N/A	**2679**	1/2 head hands & forearms

Surface Area for Recreational Adults for sediment (wading) exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet		
N/A	903 5	1805	1172 5	2370	5930	1225	**5671**	hands, forearms, lower legs & feet

Forearms = 45% whole Arms if not available
Lower legs = 40% entire Leg if not available
All values are averages of 50th percentile Male-Female Adults from EPA, Exposure Factors Handbook, 1997 (Tables 6 2 & 6 3)

Mean Total Body Surface Area (TBSA) for male/female adults = **20,000**
TBSA is central tendency value for Male-Female Adults from EPA, Exposure Factors Handbook, 1997 (Table 6 14)

Surface Area Calculations for Child Receptors

Total Body Surface Area for Male-Female Children

50th percentile	Male	Female	
0>1	6030	5790	
1>2	6030	5790	
2>3	6030	5790	
3>4	6640	6490	
4>5	7310	7060	
5>6	7930	7790	**Mean TBSA for Child** **6557**

All values are averages of 50th percentile Male-Female Children from EPA Exposure Factors Handbook, 1997 (Tables 6 6 & 6 7)

Percent of Total Body Surface Area for Male-Female Children by Body Part

Age	1/2 Head	Hands	Feet	Forearms	Lower legs		
0>1	18 2	5 3	6 54	13 7	20 6		
1>2	16 5	5 68	6 27	13	23 1		
2>3	14 2	5 3	7 07	11 8	23 2		
3>4	13 6	6 07	7 21	14 4	26 8		
4>5	13 8	5 7	7 29	14	27 8		
5>6							
Mean %	15	6	7	6	10	**43**	%
	500	368	451	395	637	**2351**	**Percentage of TBSA for Child**

Calculated Surface Area for Child for sediment (wading) exposure **28 %**

368	451	395	637	**1851**	**Percentage of TBSA for Child (sed exposure)**

For comparison

	Arms (entire)	Legs (entire)
Mean %	13	24
	877	1593

All values are mean values of Percentage of TBSA by body part for Male-Female Children from EPA, Exposure Factors Handbook, 1997 (Table 6 8)
Forearms = 45% whole Arms if not available
Lower legs = 40% entire Leg if not available

(Surface areas for Youth receptors on next page)

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TABLE H-4
Surface Areas per Receptor
Memphis Depot Dunn Field RI

Surface Area Calculations for Youth Receptors

Total Body Surface Area for Male-Female Youths

50th percentile	Male	Female
6>7	8660	8430
7>8	9360	9170
8>9	10000	10000
9>10	10700	10600
10>11	11800	11700
11>12	12300	13000
12>13	13400	14000
13>14	14700	14800
14>15	16100	15500
15>16	17000	15700
16>17	17600	16000
17>18	18000	16300

Mean TBSA for Youth | **13118**

All values are averages of 50th percentile Male-Female Children from EPA Exposure Factors Handbook, 1997 (Tables 6 6 & 6 7)

Percent of Total Body Surface Area for Male-Female Youths by Body Part

Age	Head	Arms	Hands	Legs	Feet	
6>7	13 1	13 1	4 71	27 1	6 9	
9>10	12	12 3	5 3	28 7	7 58	
12>13	8 74	34 7	5 39	30 5	7 03	
13>14	9 97	32.7	5 11	32	8 02	
16>17	7 96	32 7	5 68	33 6	6 93	
17>18	7 58	31 7	5 13	30 8	7 28	
Mean %	10	26	5	30	7	
% TBSA	1298	3437	685	3994	956	

All values are mean values of Percentage of TBSA by body part for Male-Female Children from EPA, Exposure Factors Handbook, 1997 (Table 6 8)

Calculated Surface Area for Youth for soil exposure

1/2 Head	Forearms	Hands	Lower legs	Feet		
649	1547	685	1598	N/A	**4479**	**%** **Percentage of TBSA for Youth (soil)**

1/2 head, hands, forearms & lower legs

Calculated Surface Area for Youth for sediment (wading) exposure

1/2 Head	Forearms	Hands	Lower legs	Feet		
N/A	1547	685	1598	956	**4785**	**%** **Percentage of TBSA for Youth (sed)**

hands forearms, lower legs & feet

Forearms = 45% whole Arms if not available
Lower legs = 40% entire Leg if not available

TABLE H-5

Chemical-specific Dermal Permeability Factors

Memphis Depot Dunn Field RI

Chemical Name	Dermal Absorption ABS		Permeability Constant PC		
1,1,2,2-Tetrachloroethane	1%	EPA Reg 4 1995	9 0E-03	EPA 1992	
1,1,2-Trichloroethane	1%	EPA Reg 4 1995	N/A		
1,1-Dichloroethene	1%	EPA Reg 4 1995	N/A		
1,2-Dichloroethane	1%	EPA Reg 4 1995	5 3E-03	EPA 1992	
2,4,6-Trichlorophenol	10%	EPA Reg 3 1995	5 0E-02	EPA 1992	
2-Nitrophenol	N/A		1 0E-01	EPA 1992	
Aluminum	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Antimony	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Arsenic	3%	Wester 1993	1 6E-04	EPA 1992	
Barium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Benzo(a)anthracene	10%	EPA Reg 3 1995	8 1E-01	EPA 1992	
Benzo(a)pyrene	13%	EPA Reg 3 1995	1 2E+00	EPA 1992	
Benzo(b)fluoranthene	10%	EPA Reg 3 1995	1 2E+00	EPA 1992	
Benzo(k)fluoranthene	10%	EPA Reg 3 1995	1 6E-04	EPA 1992	
Beryllium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Cadmium	1%	EPA Reg 4 1995	1 0E-03	EPA 1992	
Carbazole	10%	EPA Reg 3 1995	1 6E-04	EPA 1992	
Carbon tetrachloride	1%	EPA Reg 4 1995	2 2E-02	EPA 1992	
Chloroethane	1%	EPA Reg 4 1995	8 0E-03	EPA 1992	
Chloroform	1%	EPA Reg 4 1995	1 3E-01	EPA 1992	
Chloromethane	1%	EPA Reg 4 1995	4 2E-03	EPA 1992	
Chromium, total	0 1%	EPA Reg 4 1995	1 0E-03	EPA 1992	
Chrysene	10%	EPA Reg 3 1995	8 1E-01	EPA 1992	
Cobalt	0 1%	EPA Reg 4 1995	4 0E-04	EPA 1992	
Copper	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Dibenz(a,h)anthracene	10%	EPA Reg 3 1995	2 7E+00	EPA 1992	
Dieldrin	10%	Ryan 1987	1 6E-02	EPA 1992	
Heptachlor epoxide	10%	EPA Reg 3 1995	1 6E-04	EPA 1992	
Indeno(1,2,3-cd)pyrene	10%	EPA Reg 3 1995	1 9E+00	EPA 1992	
Lead	0 1%	EPA Reg 4 1995	4 0E-06	EPA 1992	
Manganese	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Mercury	0 1%	EPA Reg 4 1995	1 0E-03	EPA 1992	
Methylene chloride	1%	EPA Reg 4 1995	4 5E-03	EPA 1992	
Nickel	0 1%	EPA Reg 4 1995	1 0E-04	EPA 1992	
Pentachlorophenol	24%	Wester 1993	6 5E-01	EPA 1992	
Phenanthrene	1%	EPA Reg 4 1995	2 3E-01	EPA 1992	
Silicon	N/A		1 6E-04	EPA 1992	
Tetrachloroethene	1%	EPA Reg 4 1995	4 8E-02	EPA 1992	
Thallium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Total 1,2-Dichloroethene	1%	EPA Reg 4 1995	1 0E-02	EPA 1992	
Xylenes (total)	1%	EPA Reg 4 1995	8 0E-02	EPA 1992	*
Trichloroethene	1%	EPA Reg 4 1995	1 6E-02	EPA 1992	
Vanadium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992	
Vinyl chloride	1%	EPA Reg 4 1995	7 3E-03	EPA 1992	

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N/A — Not Available

* = Value for *m*-Xylene used for (total) Xylenes

TABLE H-6
Soil Loading Information
Memphis Depot Dunn Field RI

APost-Activity Dermal Soil Loadings (mg/cm^2)													
Activity	**N**	**Hands**			**Arms**			**Legs**			**Faces**			**Feet**		
		Geo	Mean	std dev	Geo	Mean	std dev	Geo.	Mean	std dev	Geo	Mean	std dev	Geo	Mean	std dev
Indoor:																
Tae Kwon Do	7	0 0063		1 9	0 0019		4.1	0 002		2				0 0022		2 1
Greenhouse Workers	2	0 043		-	0 0064		-	0 0015		-	0.005		-			
Indoor Kids No 1	4	0 0073		1 9	0 0042		1 9	0 0041		2 3				0 012		1 4
Indoor Kids No 2	6	0 014		1 5	0 0041		2	0 0031		1 5				0 0091		1 7
Daycare Kids No 1a	6	0.11		1.9	0 026		1 9	0.03		1 7				0 079		2 4
Daycare Kids No 1b	6	0.15		2 1	0 031		1 8	0 023		1.2				0 13		1 4
Daycare Kids No.2	5	0 073		1 6	0 023		1 4	0 011		1 4				0 044		1 3
Daycare Kids No 3	4	0 036		1 3	0 012		1 2	0 014		3				0 0053		5 1
Outdoor:																
Soccer No 1	8	0 11		1 8	0 011		2	0.031		3 8	0 012		1 5			
Soccer No 2	8	0 035		3 9	0 0043		2 2	0.014		5 3	0 016		1 5			
Soccer No 3	7	0 019		1.5	0 0029		2 2	0.0081		1 6	0 012		1 6			
Groundskeepers No.1	2	0 15		-	0 005		-				0.0021		-	0 018		-
Groundskeepers No 2	5	0 098		2 1	0 0021		2 6	0 001		1 5	0 01		2			
Groundskeepers No 3	7	0 03		2 3	0 0022		1 9	0 0009		1 8	0 0044		2.6	0 004		2 6
Groundskeepers No 4	7	0 045		1 9	0 014		1 8	0 0008		1.9	0 0026		1 6	0 018		1 5
Groundskeepers No 5	8	0.032		1 7	0 022		2 8	0 001		1 4	0 0039		2 1			
Landscape/Rockery	4	0 072		2 1	0 03		2 1				0 0057		1 9			
Irrigation Installers	6	0 19		1 6	0.018		3 2	0 0054		1 8	0 0063		1 3			
Gardeners No 1	8	0 2		1 9	0 05		2 1	0 072		1 4	0 058		1 6	0 17		1 6
Gardeners No 2	7	0 18		3 4	0.054		2.9	0 022		2	0 047		1 6	0 26		1 6
Rugby No 1	8	0 4		1 7	0 27		1 6	0 36		1 7	0 059		2 7			
Rugby No.2	8	0 14		1 4	0 11		1 6	0 15		1 6	0 046		1 4			
Rugby No.3	7	0 049		1 7	0 031		1 3	0 057		1 2	0.02		1 5			
Archeologists	7	0 14		1 3	0 041		1 9	0 028		4 1	0 05		1 8	0 24		1 4
Construction Workers	8	0 24		1 5	0 098		1 5	0 066		1 4	0 029		1 6			
Utility Workers No 1	5	0 32		1 7	0 2		2 7				0 1		1 5			
Utility Workers No 2	6	0 27		2 1	0 3		1 8				0 1		1.5			
Equipment Operators No 1	4	0 26		2 5	0 089		1 6				0 1		1 4			
Equipment Operators No 2	4	0 32		1 6	0 27		1.4				0.223		1 7			
Farmers No 1	4	0 41		1 6	0 059		3.2	0 0058		2.7	0 018		1 4			
Farmers No 2	6	0 47		1.4	0 13		2.2	0 037		3 9	0 041		3			
Reed Gatherers	4	0 66		1 8	0 036		2.1	0.16		9 2				0 63		7 1
Kids-in-mud No 1	6	35		2 3	11		6.1	36		2				24		3 6
Kids-in-mud No 2	6	58		2 3	11		3 8	9 5		2 3				6.7		12 4

= substituted information
N = Number of subjects
Sources.
Kissel et al , 1996b, Holmes et al , 1996 (submitted for publication) adapted from EPA, Exposure Factors Handbook, 1997 (Table 6.12)

TABLE H-7

Soil Loading Information

Memphis Depot Dunn Field RI

B Calculation of UCL90 for Soil Loading of Body Parts																				
Activity	N	Hands	Hands		Hands SL	Arms	Arms		Arms SL	Legs	Legs		Legs SL	Faces	Faces		Faces SL	Feet	Feet		Feet SL
		$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90
Indoor:																					
Tae Kwon Do	7	1 9020	-5 0672	0 64	0 0127	3 1435	-6 2659	1 41	0 0314	1 9700	-6 2146	0 69	0 0044					2 0445	-6 1193	0 74	0 0054
Greenhouse Workers	2		-3 1466				-5 0515				-6 5023				-5 2983						
Indoor Kids No 1	4	3 0115	-4 9199	0 64	0 0274	3 0115	-5 4727	0 64	0 0158	3 6225	-5 4968	0 83	0 0331					2 01475	-4 4228	0 34	0 0188
Indoor Kids No 2	6	1 6810	-4 2687	0 41	0 0206	2 1270	-5 4968	0 69	0 0101	1 68	-5 7764	0 41	0 0046					1 8095	-4 6995	0 53	0 0161
Daycare Kids No 1a	6	2 0430	-2 2073	0 64	0 2430	2 0430	-3 6497	0 64	0 0574	1 8095	-3 5066	0 53	0 0531					2 5080	-2 5383	0 88	0 3094
Daycare Kids No 1b	6	2 2190	-1 8971	0 74	0 4125	1 9590	-3 4738	0 59	0 0617	1 4820	-3 7723	0 18	0 0264					1 63	-2 0402	0 34	0 1757
Daycare Kids No 2	5	1 9070	-2 6173	0 47	0 1276	1 6910	-3 7723	0 34	0 0323	1 691	-4 5099	0 34	0 0155					1 5745	-3 1236	0 26	0 0560
Daycare Kids No 3	4	1 7975	-3 3242	0 26	0 0489	1 7035	-4 4228	0 18	0 0146	5 0045	-4 2687	1 10	0 6120					7 1683	-5 2400	1 63	17
Outdoor.																					
Soccer No 1	8	2 096	-2 2073	0 59	0 2083	2 2514	-4 5099	0 69	0 0252	3 5926	-3 4738	1 34	0 4631	1 8366	-4 4228	0 41	0 0173				
Soccer No 2	8	3 5926	-3 3524	1 36	0 5609	2 4217	-5 4491	0 79	0 0121	4 1486	-4 2687	1 67	0 7687	1 8366	-4 1352	0 41	0 0230				
Soccer No 3	7	1 6070	-3 9633	0 41	0 0269	2 1190	-5 8430	0 79	0 0078	1 71	-4 8159	0 47	0 0126	1 71	-4 4228	0 47	0 0186				
Groundskeepers No.1	2		-1 8971				-5 2983														
Groundskeepers No 2	5	2 3935	-2 3228	0 74	0 3136	2 9800	-6 1658	0 96	0 0138	1 7550	-6 9078	0 41	0 0015	2 2840	-4 6052	0 69	0 0281				
Groundskeepers No 3	7	2 1190	-3 5066	0 83	0 0872	1 9020	-6 1193	0 64	0 0044	1 834	-7 0131	0 59	0 0017	2 45	-5 4262	0 96	0 0181	2 4500	-5 5215	0 96	0 0164
Groundskeepers No 4	7	1 9020	-3 1011	0 64	0 0910	1 8340	-4 2687	0 59	0 0258	1 902	-7 1309	0 64	0 0016	1 71	-5 9522	0 47	0 0040	1 6070	-4 0174	0 41	0 0255
Groundskeepers No 5	8	1 9566	-3 4420	0 53	0 0545	2 8	-3 8167	1 03	0 1111	1 7852	-6 9078	0 34	0 0013	2 3366	-5 5468	0 74	0 0099				
Landscape/Rockery	4	3 4163	-2 6311	0 74	0 4096	3 4163	-3 5066	0 74	0 1707					3 0115	-5 1673	0 64	0 0214				
Irrigation Installers	6	1 8095	-1 6607	0 47	0 3104	2 9878	-4 0174	1 16	0 1675	1 9590	-5 2214	0 59	0 0107	1 5270	-5 0672	0 26	0 0078				
Gardeners No 1	8	2 1737	-1 6094	0 64	0 4164	2 3366	-2 9957	0 74	0 1268	1 7852	-2 6311	0.34	0 0956	1 9566	-2 8473	0 47	0 0917	1 9566	-1 7720	0 47	0 2688
Gardeners No 2	7	2 9040	-1 7148	1 22	1 6240	2 4500	-2 9188	1 06	0 2761	1 9700	-3 8167	0 69	0 0488	1 71	-3 0576	0 47	0 0729	1 712	-1 3471	0 47	0 4033
Rugby No 1	8	1 9566	-0 9163	0 53	0 6817	1 9566	-1 3093	0 47	0 4269	1 9566	-1 0217	0 53	0 6136	2 8	-2 8302	0 99	0 2764				
Rugby No 2	8	1 7852	-1 9661	0 34	0 1859	1 9566	-2 2073	0 47	0 1739	1 9566	-1 8971	0 47	0 2371	1 7852	-3 0791	0 34	0 0611				
Rugby No 3	7	1 7120	-3 0159	0 53	0 0817	1 4795	-3 4738	0 26	0 0376	1 4420	-2 8647	0 18	0 0645	1 61	-3 9120	0 41	0 0283				
Archeologists	7	1 4795	-1 9661	0 26	0 1698	1 9020	-3 1942	0 64	0 0829	3 1435	-3 5756	1 41	0 4633	1 834	-2 9957	0 59	0 0923	1 5620	-1 4271	0 34	0 3148
Construction Workers	8	1 8366	-1 4271	0 41	0 3453	1 8366	-2 3228	0 41	0 1410	1 7852	-2 7181	0 34	0 0876	1 9566	-3 5405	0 47	0 0458				
Utility Workers No 1	5	1 9070	-1 1394	0 53	0 6110	2 9800	-1 6094	0 99	1 4388					1 755	-2 3026	0 41	0 1550				
Utility Workers No 2	6	2 2190	-1 3093	0 74	0 7424	1 9590	-1 2040	0 59	0 5967					1 68	-2 3026	0 41	0 1473				
Equipment Operators No 1	4	4 0425	-1 3471	0 92	3 3578	2 4485	-2 4191	0 47	0 1932					2 01475	-2 3026	0 34	0 1565				
Equipment Operators No 2	4	2 4485	-1 1394	0 47	0 6945	2 0148	-1 3093	0 34	0.4226					2 4485	-1 5006	0 53	0 5435				
Farmers No 1	4	2 4485	-0 8916	0 47	0 8898	5 0045	-2 8302	1 16	3 3434	4 4675	-5 1499	0 99	0 1231	2 01475	-4 0174	0 34	0 0282				
Farmers No 2	6	1 6265	-0 7550	0 34	0 6353	2 3110	-2 0402	0 79	0 4007	3 5450	-3 2968	1 36	0 8081	2 98775	-3 1942	1 10	0 3254				
Reed Gatherers	4	2 8130	-0 4155	0 59	2	3 4163	-3 3242	0 74	0 2048	9 8920	-1 8326	2 22	599620					8 7995	-0 4620	1 96	90853
Kids-in-mud No 1	6	2 3110	3 5553	0 83	117	4 4105	2 3979	1 81	1997	2 1270	3 5835	0 69	89					2 98775	3 1781	1 28	302
Kids-in-mud No 2	6	2 3110	4 0604	0 83	194	3 5450	2 3979	1 34	223	2 3110	2 2513	0 83	32					6 1900	1 9021	2 52	169587

=missing information

Sources

Kissel et al , 1996b, Holmes et al , 1996 (submitted for publication) adapted from EPA, Exposure Factors Handbook, 1997 (Table 6 12)

H^{90} values adapted from R O Gilbert, 1987 Statistical Methods for Environmental Pollution Monitoring (Table A10)

TABLE H-8
Soil Loading Information
Memphis Depot Dunn Field RI

C Calculation of Adherence Factors for Child Receptors

Activity	N	Hands				Arms					Legs					Faces				Feet				x =Final SA*SL (all)	Final AF
		$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	Hands, Forearms, Lower legs, Faces, Feet	x/SA
Indoor																									
Indoor Kids No 1	4	3 0115	0 0274	368	10	3 0115	0 0158	877	395	6	3 8225	0 0331	1593	637	21					2 01475	0 0188	451	8	48	0 025
Indoor Kids No 2	6	1 6810	0 0206	368	8	2 1270	0 0101	877	395	4	1 68	0 0046	1593	637	3					1 8095	0 0161	451	7	22	0 012
Daycare Kids No 1a	6	2 0430	0 2430	368	89	2 0430	0 0574	877	395	23	1 8095	0 0531	1593	637	34					2 5080	0 3094	451	140	285	0 15
Daycare Kids No 1b	6	2 2190	0 4125	368	152	1 9590	0 0617	877	395	24	1 4820	0 0264	1593	637	17					1 63	0 1757	451	79	272	0 15
Daycare Kids No 2	5	1 9070	0 1276	368	47	1 8910	0 0323	877	395	13	1 691	0 0155	1593	637	10					1 5745	0 0560	451	25	95	0 051
Daycare Kids No 3	4	1 7975	0 0489	368	18	1 7035	0 0146	877	395	6	5 0045	0 6120	1593	637	390					7 1683	17	451	7642	8055	4 4
Outdoor																									
Soccer No 1	8	2 096	0 1192	368	44	2 2514	0 0127	877	395	5	3 5926	0 4631	1593	637	295	1 8366	0 0173	501	9					352	0 19
Soccer No 2	8	3 5926	0 1938	368	71	2 4217	0 0054	877	395	2	4 1486	0 7687	1593	637	490	1 8366	0 0230	501	12					575	0 30
Soccer No 3	7	1 6070	0 0194	368	7	2 1190	0 0036	877	395	1	1 71	0 0126	1593	637	8	1 71	0 0186	501	9					26	0 014

TABLE H-9
Soil Loading Information
Memphis Depot Dunn Field RI

D Calculation of Adherence Factors for Adult Receptors

Activity	N	Hands				Arms					Legs					Faces				Feet				x =Final SA*SL (all)	Final AF
		$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	Hands, Forearms, Lower legs, Faces Feet	x/SA
Outdoor																									
Groundskeepers No 2	5	2 3935	0 1251	904	113	2 9800	0 0040	1805	1173	5	1 7550	0 0015	5930	2370	4	2 2840	0 0281	603	17					138	0 027
Groundskeepers No 3	7	2 1190	0 0385	904	35	1 9020	0 0024	1805	1173	3	1 834	0 0017	5930	2370	4	2 45	0 0181	603	11	2 4500	0 0164	1225	20	73	0 012
Groundskeepers No 4	7	1 9020	0 0499	904	45	1 8340	0 0151	1805	1173	18	1 902	0 0016	5930	2370	4	1 71	0 0040	603	2	1 6070	0 0255	1225	31	100	0 016
Groundskeepers No 5	8	1 9566	0 0338	904	31	2 8	0 0392	1805	1173	46	1 7852	0 0013	5930	2370	3	2 3366	0 0099	603	6					86	0 017
Gardeners No.1	8	2 1737	0 2229	904	201	2 3366	0 0599	1805	1173	70	1 7852	0 0956	5930	2370	227	1 9566	0 0917	603	55	1 9566	0 2688	1225	329	883	0 14
Gardeners No.2	7	2 9040	0 5335	904	482	2 4500	0 0988	1805	1173	116	1 9700	0 0488	5930	2370	116	1 71	0 0729	603	44	1 712	0 4033	1225	494	1251	0 20
Construction Workers	8	1 8366	0 2456	904	222	1 8366	0 1003	1805	1173	118	1 7852	0 0876	5930	2370	208	1 9566	0 0458	603	28					575	0 11
Utility Workers No 1	5	1 9070	0 3436	904	310	2 9800	0 4150	1805	1173	487						1 755	0 1550	603	93					890	0 33
Utility Workers No 2	6	2 2190	0 3307	904	299	1 9590	0 3279	1805	1173	384						1 68	0 1473	603	89					772	0 29

=missing information was estimated

TAB

Appendix I

APPENDIX I

Supplementary Toxicity Material

Appendix I
TOXICOLOGICAL PROFILES FOR COPCs AT DUNN FIELD

ANTIMONY

Antimony is a silvery white metal of medium hardness that breaks easily. Antimony is used as a component of lead and zinc alloys which are used in lead storage batteries, solder, sheet and pipe metal, bearings, castings, type metal, ammunition and pewter. Exposure to antimony may occur through the ingestion of food or water, via breathing of air or through contact with soil, water or other substances that contain antimony. Skin contact and inhalation are common occupational exposures. A small amount of ingested antimony is absorbed into the bloodstream after a few hours. An unknown amount of inhaled antimony is absorbed through the lungs within a few days. Most of the absorbed antimony is transported to the liver, lungs, intestines and spleen. Within several weeks, antimony is excreted in the feces and urine (ATSDR, 1990).

Acute symptoms of antimony exposure include, diarrhea, vomiting, gastric discomfort and ulcers following oral ingestion of large quantities (< 19 ppm). Animal studies indicate that acute exposures may result in lung, heart, liver and kidney damage, eye irritation following inhalation of antimony, and skin irritation following dermal contact. Subchronic exposure to antimony via inhalation leads to heart problems, stomach ulcers, pneumoconiosis and eye and skin irritation. Animal studies indicate that subchronic ingestion of antimony may cause diarrhea, weight loss, liver damage and decreased red blood cell count (ATSDR, 1990).

Antimony in the atmosphere is in the form of particulate matter or adsorbed to particulate matter. Transport to land and surface water occurs through gravitational settling and other forms of dry and wet deposition. The fate of antimony in the environment is complicated because it can exist in two oxidation states, 3+ and 5+. In the aquatic environment, antimony is mainly associated with particulate matter and tends to settle out in areas of active sedimentation. Some forms of antimony are strongly sorbed to soil, making it relatively immobile. Antimony may also adsorb strongly to colloidal materials in soil which may become mobilized and transported to groundwater. In general, adsorption is greatest at near neutral pHs. Antimony does not appear to bioconcentrate in fish and aquatic organisms (ATSDR, 1990).

ARSENIC

Arsenic is a naturally occurring element and enters the environment as a result of natural forces (volcanoes, weathering) and human activities such as metal smelting, glass manufacturing, pesticide production and application, and fossil-fuel burning (ATSDR, 1991). In general, inorganic arsenic is more toxic than organic arsenic. The most common exposure route is ingestion of arsenic in food or water. Inhalation and skin contact are secondary routes of exposure. Arsenic is quickly absorbed through the lungs or digestive tract into the bloodstream. Within a few hours most of the absorbed arsenic is cleared from the blood and is excreted in the urine (ATSDR, 1991).

Large doses of ingested inorganic arsenic (20 mg/kg or greater) induce death while smaller doses produce systemic effects such as irritation of the digestive tract, nausea, vomiting, and diarrhea. In addition, there are effects on cells that produce blood, abnormal heart function, blood vessel damage, liver or kidney injury, and impaired nerve functioning The ingestion of arsenic in drinking water has been associated with an elevated incidence of skin cancer. Epidemiological data demonstrate an association between occupational exposure to inhaled arsenic and lung cancer (ATSDR, 1991). The USEPA classifies arsenic as a group A carcinogen (sufficient evidence of carcinogenicity in humans) (IRIS, 1995).

Arsenic is a non-volatile solid. The mobility of arsenic in the environment depends on the solubility of the particular chemical form present. Most arsenic in the air is adsorbed to particulate matter and settles out according to particle size. Arsenic found in the soil is predominantly an insoluble, adsorbed form. Arsenic in soil and water may be reduced and methylated by soil organisms. Bioconcentration of arsenic occurs primarily in aquatic algae and lower invertebrates. Biomagnification varies by species with some fish and invertebrates containing elevated levels of arsenic compounds. Terrestrial plants uptake arsenic from the soil and air (ATSDR, 1991).

1,2-DICHLOROETHANE

1,2-Dichloroethane is used primarily as a starting material in the manufacture of vinyl chloride, tetrachloroethylene, trichloroethylene, and other chlorinated organic compounds. It is also used as a degreasing agent, solvent, fumigant for grain and upholstery, varnish and paint remover, and lead-scavenging agent in gasoline. Primary routes of exposure include breathing air, drinking water, and skin absorption (IRP, 1989).

Short-term exposures to vapor concentrations greater than 125 ppm produce irritation of the eyes, nose and throat. Ingestion or inhalation of the compound causes dizziness, nausea, vomiting, increasing stupor, cyanosis, rapid pulse, loss of consciousness, and injury to the liver, kidneys and lungs. The dermal LD_{50} in rabbits is 2800 mg/kg of body weight (IRP, 1989). In addition, reproductive effects have been noted in rats at an oral dose of 120 mg/kg-day (ATSDR, 1992).

Chronic exposures are associated with loss of appetite, nausea, vomiting, gastric pain, neurological disturbances, and liver and kidney impairment. In animal studies, death was outcome for inhalation exposures greater than 400 ppm The USEPA has classified 1,2-dichloromethane as a Group B2 carcinogen (probable human carcinogen) (IRP, 1989).

1,2-Dichloroethane is expected to be highly mobile in the soil/ground-water system. Adsorption to soil is low; volatilization from soils is the primary transport process. Microbial degradation in soil is not expected to be significant (IRP, 1989)

1,1-DICHLOROETHENE

1,1-Dichloroethene (1,1-DCE), also known as 1,1-dichloroethylene and vinylidene chloride, is a clear, colorless liquid that has a mild, sweet chloroform-like odor. It is a man-made chemical used to make copolymers, modacrylic fibers and other chemicals. It evaporates quickly at room temperature and is flammable. 1,1-DCE may enter the body by inhalation of contaminated air or ingestion of contaminated food or water (ATSDR, 1992).

There have been no studies that reported death of humans following inhalation exposure to 1,1,-DCE. Lethality in laboratory animals after inhalation exposure varies considerably depending on species, strain, sex and nutritional status When experimental animals were exposed to high concentrations of 1,1-DCE, damage to the liver, kidney and central nervous system has been reported. The liquid is moderately irritating to the eyes and skin (ATSDR, 1992) .

Long-term effects of 1,1-DCE include liver and kidney damage. There is also evidence of mutagenicity in several test systems. A statistically significant increase in kidney tumors was observed in mice exposed to 1,1-DCE via inhalation. Other tumor types were also reported in this study. The USEPA has classified 1,1-DCE as a Group C carcinogen (possible human carcinogen) (IRP, 1989).

The environmental fate of 1,1-DCE is influenced largely by its high volatility; the majority evaporates to the atmosphere. Because it is water soluble and weakly adsorbed to soil/sediment, the potential for surface water or ground-water contamination and transport is great. Transformation processes are not expected to be great in natural soil (IRP, 1989).

DIELDRIN

Dieldrin is a chlorinated hydrocarbon compound that has been widely used as a domestic pesticide. Its primary use in the past was as an insecticide for corn and for termite control. Human exposure can result from inhalation and ingestion. Dermal exposure is limited to the past for those involved in manufacturing or application of pesticides containing dieldrin. Dermal exposure could occur when contact at hazardous waste sites or contaminated soils/sediments.

Dieldrin is absorbed into the bloodstream from the gastrointestinal tract after ingestion or from the lungs after inhalation. It is quickly distributed throughout the body after intake, but is rapidly concentrated in fatty tissues due to its lipophilic nature where it can remain for years. Other organs which tend to have high concentrations are the liver, kidneys, brain, and blood. Dieldrin is excreted, mainly in the feces, in the form of several metabolites that are more polar than the parent compounds (ATSDR, 1991).

Signs of toxicity include effects on the central nervous system with symptoms of headache, dizziness, nausea, general malaise, and vomiting, followed by muscle twitching, myoclonic jerks,

and even convulsions. These symptoms are reversible with time after removal from the source of exposure. Death may result from anoxemia (ATSDR, 1991)

No chronic effects have been observed in humans exposed to low levels of dieldrin in the workplace. Animal studies, however, have indicated a decrease in immune function and liver damage resulting from dieldrin exposure. In addition, liver cancer has been observed in mice chronically exposed to dieldrin (ATSDR, 1991). Dieldrin has been classified by the USEPA as a probable human carcinogen, class B2. There is sufficient evidence that exposure to dieldrin has resulted in liver cancer in animal studies (IRIS, 1995).

HEPTACHLOR\HEPTACHLOR EPOXIDE

Heptachlor is a man-made pesticide used in homes, buildings, and on food crops, but it is no longer manufactured in the United States. It is a white powder in its pure form, while technical grade heptachlor is a tan powder. It is a component of the pesticide, chlordane. Heptachlor epoxide is a breakdown product of heptachlor, and is a result of bacterial activity (ATSDR, 1992).

Heptachlor is readily absorbed into the gastrointestinal tract and the skin. It is slowly eliminated via the bile duct to the feces. Heptachlor epoxide is an oxidation product which is formed by plants and animals after exposure to heptachlor. Heptachlor epoxide is often detected in human milk, blood and other body tissues and is more harmful than heptachlor itself. Other breakdown products are less harmful (ATSDR, 1992).

Heptachlor is acutely toxic via the oral and dermal routes No studies are available to show that inhalation of heptachlor is harmful to humans Hepatotoxicity is the most sensitive noncancer endpoint with animal acute and chronic studies describing evidence of severe liver damage, increased liver weight, and increased levels of serum liver enzymes Central nervous system disorders are also evident. Long-term oral exposures in animals are also associated with kidney, adrenal, and blood defects It is also fetotoxic and caused reduced fertility in laboratory rodents. Chronic oral exposure to heptachlor or heptachlor epoxide increased the incidence of liver carcinomas in several species of mice. Studies of pesticide applicators indicate a slight increased incidence in cancers of the lung, skin and bladder (ATSDR, 1992) The USEPA classifies heptachlor and heptachlor epoxide as group B2 carcinogens (probable human carcinogens) (IRIS, 1995).

Heptachlor and its epoxide are persistent in soil with half-lives of two and fourteen years, respectively. Heptachlor and its epoxide can evaporate into the air and ultimately travel long distances. Heptachlor epoxide dissolves more easily in water than does heptachlor and evaporates slowly. Heptachlor does not dissolve easily in water and will bind to sediments. In soil and water heptachlor is broken down by bacteria to its epoxide and other substances. Bioaccumulation of both heptachlor and heptachlor epoxide occur in aquatic and terrestrial organisms, where they are stored in fatty tissues for long periods of time (ATSDR, 1992).

LEAD

Lead is a commonly used, naturally occurring metal which is ubiquitous throughout the environment. Lead is found in construction materials, leaded gasoline, radiation protection gear, paint, ceramics, plastics, antimonial lead storage batteries, and ammunition. Lead is well absorbed from all portions of the respiratory tract including the nasal passages. Absorption from the gastrointestinal tract is less rapid and complete than from the respiratory tract. Dermal absorption is a much less significant route of lead absorption than inhalation or ingestion. Absorbed lead is distributed to the soft tissues of the body with the greatest distribution to the kidneys and the liver. Lead is eventually transferred to the skeleton where 90% of the body's long-term burden is stored. Approximately 70% of the absorbed lead dose is excreted. The portion of lead that is not absorbed is excreted in the feces. Most of the absorbed lead is excreted by the kidneys or through biliary clearance into the gastrointestinal tract (ATSDR, 1988).

Lead intoxication in humans can occur by ingestion and inhalation of dust or fumes. Lead interferes with the blood making process, production of energy, and transmission of nerve impulses. Symptoms of lead intoxication include anorexia, malaise, headaches, and intestinal spasms. The neuromuscular disease, lead palsy, is a result of advanced subacute poisoning (lead blood levels of 70 Tg/dL and less), and is characterized by muscle weakness leading to paralysis. Lead encephalopathy is the term used for the central nervous system manifestation which is commonly seen in children when lead blood levels reach 90 Tg/Dl. Symptoms include clumsiness, dizziness, delirium, convulsions, and coma. The mortality rate is 25% when the brain is involved, with survivors suffering long-term neurological problems (ATSDR, 1988).

Chronic low level lead exposure (lead blood levels of 30-50 Tg/Dl) is associated with learning disabilities. Lead toxicity is defined by the Centers for Disease Control as a blood level of 10 Tg/Dl or greater (child). Kidney damage occurs after prolonged exposures, and is apparently reversible. In epidemiological studies, lead intoxication is also associated with increased blood pressure which is symptomatic of kidney damage. Lead exposure is associated with reproductive effects such as miscarriages and temporary sterility. Lead readily crosses the placenta. In all systems, the concentrations of essential nutrients and elements have a significant impact on the degree of toxicity seen with lead exposures. Occupational exposure to airborne lead is associated with an increased incidence of total malignant neoplasms, cancers of the digestive tract and cancers of the respiratory tract. An increased incidence in kidney cancer was seen in lead smelter workers exposed by inhalation and in various animal species exposed by ingestion at levels of 500 ppm and above. The USEPA has classified lead as a group B2 carcinogen based on animal studies (probable human carcinogen with inadequate or no evidence in humans) (ATSDR, 1988; IRIS, 1995; USEPA, 1994c).

The mobility of lead in soil is dependent on the chemical properties of the soil. Lead can react with sulfates, carbonates, and phosphates or combine with clays and organic matter which limits the further migration of lead through the soil matrix. Lead in surface waters is usually present as suspended solids. Atmospheric lead is removed by dry deposition and rainout. Lead does not

significantly bioaccumulate in fish. Lead localizes in fish skin which serves to reduce human exposures by fish consumption. Lead is toxic to wildlife, particularly water fowl, through their consumption of lead shot. Tetraethyl lead is biodegradable, but inorganic lead concentrations above 5 Tg/L can be toxic to microorganisms. As water hardness increases, the acute toxicity of lead to freshwater aquatic species decreases (ATSDR, 1988).

POLYCYCLIC AROMATIC HYDROCARBONS

Polycyclic aromatic hydrocarbons (PAHs) are a diverse class of compounds formed as a result of incomplete combustion of organic compounds with insufficient oxygen. As pure chemicals, PAHs generally exit as colorless, white, pale yellow, or green solids. This leads to the formation of C-H free radicals which can polymerize to form various PAHs. Although the health effects of the individual PAHs are not exactly alike, the following PAHs are considered as three groups in this profile (ATSDR, 1993).

Low Molecular Weight Compounds (152-178g/mol)

- acenaphthene
- acenaphthylene
- anthracene
- fluorene
- phenanthrene

Medium Molecular Weight Compounds (202 g/mol)

- fluoranthene
- pyrene

High Molecular Weight Compounds (228-278 g/mol)

- benzo(a)anthracene (B[a]A)
- benzo(b)fluoranthene (B[b]F)
- benzo(j)fluoranthene (B[j]F)
- benzo(k)fluoranthene (B[k]F)
- benzo(g,h,i)perylene (B[ghi]P)
- benzo(a)pyrene (B[a]P)
- benzo(e)pyrene (b[e]P)
- chrysene
- dibenz(a,h)anthracene (D[ah]A)
- indeno(1,2,3-c,d)pyrene (I[123cd]P)

PAHs are present in the environment from both natural and anthropogenic sources As a group, they are widely distributed in the environment Humans may be exposed to PAHs in the environment, in tobacco smoke, in cooked food, and in the workplace. Typically, individuals are not exposed to a single PAH, but to a mixture of related chemicals (ATSDR, 1993). PAHs are readily absorbed into the bloodstream from the gastrointestinal tract after ingestion or the lungs after inhalation. PAHs are metabolized primarily in the liver and excreted in the feces.

Most of the information available for PAHs are from studies on experimental animals Adverse effects in humans are generally not observed, but have been documented Hematologic effects (myelosuppression) were produced in people after intravenous administration of anthracene-containing chemotherapeutic agents. Dermal effects have been documented Regressive verrucae followed repeated topical application of B[a]P over a four-month period In animals, oral administration of PAHs affect proliferating organs and tissue such as bone marrow, lymphoid organs, and intestinal epithelium (ATSDR, 1993)

PAHs are well established as experimental carcinogens for all routes through which humans would normally be expected to be exposed. In human occupational studies, lung and skin cancer have been demonstrated after inhalation exposure to PAHs. These workers were employed in coke production plants as roofers and as oil refinery workers In experimental animals, the site of tumor induction is generally the point of first contact with the PAHs (i e., stomach tumors after ingestion, lung tumors after inhalation, etc.) (ATSDR, 1993). The following PAHs are classified as B2 carcinogens by the USEPA: B[a]A, D[ah]A, B[a]P, B[b]F, B[k]F, chrysene and I[123cd]P; these PAHs are probable human carcinogens. Anthracene, B[ghi]P, pyrene, fluorene, naphthalene, fluoranthene, acenaphthylene and phenanthrene are class D carcinogens (not classifiable as to human carcinogenicity) No data exist on the carcinogenicity of acenaphthalene (IRIS, 1995).

Some of the transport and partitioning characteristics (Henry's law constant, K_{oc} values, K_{ow} values) of the 17 PAHs are roughly correlated to their molecular weights PAH compounds in water tend to be removed by volatilization, binding to particulates or sediments or being bioaccummulated The low molecular weight PAHs have Henry's Law constants in the range of 10^{-3} to 10^{-5} atm-m^3/mol and are therefore associated with significant volatilization. The other PAHs volatilize to a lesser extent In the atmosphere they are associated with particulate matter, especially soot, and can travel long distances PAHs suspended in the air are thought to undergo direct photolysis very quickly (ATSDR, 1993)

PAHs have low water solubilities and high propensity for binding to particulate or organic matter. In general PAHs do not easily dissolve in water although they have been detected in groundwater in some distances Medium and high molecular weight PAHs are primarily removed from the water column by deposition and some volatilization (they have K_{oc} values of 10^{-4} to 10^{-6} indicating strong tendencies to adsorb). Low molecular weight PAHs are removed by volatilization and biodegradation (they have K_{oc} values 10^{-3} to 10^{-4} indicating moderate potential to bind) In general sorption of PAHs to soil and sediment increases with increasing organic carbon content and is also directly dependent on particle size The ultimate fate of PAHs in the sediment is believed to be biodegradation and biotransformation by microbes. In soils and water PAH breakdown generally takes weeks to months and is due primarily to the actions of microorganisms. Photodegradation also plays a role in PAH breakdown in water (ATSDR, 1993).

PAHs can be accumulated in organisms· the higher molecular weight compounds accumulating more easily than the lower molecular weight ones. Most organisms, however, metabolize and excrete PAHs rapidly, resulting in short lived bioaccumulation (ATSDR, 1993).

1,1,2,2,-TETRACHLOROETHANE

1,1,2,2-Tetrachloroethane was commonly used to produce other chemicals such as paints and pesticides or as an industrial solvent and degreasing agent. Now, it is introduced into the environment as a minor impurity or chemical intermediate of other chlorinated solvents. Exposure may occur through inhalation of contaminated air, dermal contact or incidental ingestion in water or food (ATSDR, 1994).

Inhalation of airborne fumes at greater than 360 ppm can cause fatigue, vomiting, dizziness, and possibly unconsciousness. Breathing, drinking, or skin contact with lower concentrations may cause liver damage, stomach upsets, or dizziness. An oral acute LOAEL value of 75 mg/kg/day was established for liver damage in rats (ATSDR, 1994).

Long-term effects of human exposures are not established. Reproductive, systemic, or carcinogenic effects have not been noted in human populations. Chronic oral studies with rats noted reduced body weights (108 mg/kg/day) and renal effects (284 mg/kg/day). Based on a NCI mouse study, it is suspected to be a promoter of hepatic tumors. This compound has been classified as a group C carcinogen (limited evidence of carcinogenicity in animals and inadequate data for humans) (ATSDR, 1994).

1,1,2,2-Tetrachloroethane when released to the atmosphere is fairly stable with an estimated half-life in the troposphere of two years When released to water, the compound will be lost by volatilization in a period of days. The compound is not expected to adsorb to soil, suspended solids, and sediment unless in high clay, dry soils. The bioconcentration factor in fathead minnows has been reported as 49 which indicates little tendency for the compound to bioaccumulate in fish and aquatic organisms (ATSDR, 1994)

TETRACHLOROETHENE (PCE)

Tetrachloroethene or tetrachloroethylene is a clear, colorless, nonflammable liquid that has a characteristic odor. It is a widely used solvent, particularly as a dry cleaning agent, a degreaser, a chemical intermediate, and a fumigant, and was given orally as a medical treatment for hookworms. The most significant exposure probably occurs in the industrial environment by inhalation. It is readily absorbed after ingestion or inhalation, but dermal absorption is poor. However, skin irritation may result from direct contact with the undiluted liquid. The main excretion pathway is through exhalation of the unmetabolized compound (ATSDR, 1992).

In confined, poorly ventilated areas, single exposures to high concentrations of tetrachloroethene can result in dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, and possibly unconsciousness and death. The consequences of chronic exposure to

tetrachloroethene by breathing or ingesting low levels of the chemical are not known. In laboratory animals, studies were conducted using higher concentrations than normally found in an environmental setting. These studies suggested the potential for tetrachloroethene to result in liver and kidney damage, birth defects, toxicity to pregnant animals, liver cancer and leukemia. Based on evidence from animal studies, tetrachloroethene is considered to be carcinogenic. The USEPA classifies tetrachloroethene as a B2 carcinogen (probable human carcinogen based on animal studies, but inadequate or no evidence in humans)

Tetrachloroethene found in surface waters or on soil surfaces will predominantly evaporate into the atmosphere. However, tetrachloroethene is moderately to highly mobile in soil and susceptible to leaching. In subsurface soils where volatilization cannot occur, tetrachloroethene is only slowly degraded and may be relatively persistent. Studies have shown that tetrachloroethene has a low bioaccumulation potential (ATSDR, 1992).

TETRACHLOROMETHANE (Carbon Tetrachloride)

Tetrachloromethane, more commonly referred to as carbon tetrachloride, is a clear, heavy liquid with a sweet aromatic odor. It is a synthetic chemical with no natural sources. Because it evaporates very easily, it is not usually encountered in its liquid state in the environment. Carbon tetrachloride is readily absorbed from the gastrointestinal tract and more slowly absorbed through the lungs and skin. Most carbon tetrachloride leaves the body by being exhaled through the lungs within a few hours after exposure.

Acute exposures of carbon tetrachloride to humans have shown a wide range of effects. Prior exposure to alcohol, phenobarbital, and some pesticides have been shown to increase the effects of carbon tetrachloride. Single exposures to low concentrations may cause symptoms such as irritation of the eyes, moderate dizziness and headache which disappear once exposure is discontinued. Exposure to higher concentrations will cause the same symptoms as above, but additional symptoms of nausea, loss of appetite, mental confusion, agitation and the feeling of suffocation may be seen. Chronic exposure to carbon tetrachloride produces symptoms of fatigue, lassitude, giddiness, anxiety, headache and muscle twitching. Organ damage is usually restricted to the liver, although there are some reported cases of kidney damage. After chronic exposure there is usually regeneration in these organs. Carbon tetrachloride is carcinogenic in animals producing mainly liver tumors. The USEPA has classified carbon tetrachloride as a group B2 carcinogen indicating that, based on animal studies, it is probably a human carcinogen, although there are no adequate studies of cancer in humans.

Most carbon tetrachloride is released to the environment in the atmosphere. Although it is moderately soluble in water, its high rate of volatilization results in only about 1% of the total carbon tetrachloride in the environment being in surface waters and oceans. Likewise, carbon tetrachloride tends to volatilize from tap water used for showering, bathing and cooking inside a home (ATSDR, 1989).

1,1,1-TRICHLOROETHANE

1,1,1-Trichloroethane (1,1,1-TCA) is a colorless liquid with a sweet characteristic odor. It is used as a solvent for adhesives, in metal degreasing, in textile processing, as an aerosol propellant and in spot cleaners. 1,1,1-TCA can enter the body through the lungs by breathing contaminated air or through the digestive system by eating or drinking contaminated food or water. Most 1,1,1-TCA is exhaled regardless of how it entered the body, but small metabolized amounts leave in the urine (ATSDR, 1990).

Acute inhalation exposure to concentrations greater than 500 ppm of 1,1,1-TCA in humans may result in dizziness, lightheadedness and loss of balance and coordination. These effects are reversible when the exposure is discontinued. Continued breathing of higher concentrations of 1,1,1-TCA could lead to unconsciousness, a decrease in blood pressure and cardiac arrest. Although the health effects of long-term low dose exposure in humans is unknown, studies in experimental animals have shown that damage occurs to the breathing passages, lungs and liver following inhalation of high levels. Studies in experimental animals have shown that exposure to high concentrations of 1,1,1-TCA during pregnancy could result in birth defects. If 1,1,1-TCA comes into direct contact with skin for more than five minutes, a mild irritation may occur, but would disappear in a few hours after removal of the 1,1,1-TCA. The USEPA classifies 1,1,1-TCA in group D (not classifiable as to human carcinogenicity).

1,1,1-TCA evaporates easily and is moderately water soluble. It volatilizes from soil, surface water, and from unconfined ground water to the soil. If released to soil as a liquid, 1,1,1-TCA does not sorb to soil and may leach to groundwater. 1,1,1-TCA is not believed to bioconcentrate in fish and aquatic organisms (ATSDR, 1990).

TRICHLOROETHENE (TCE)

Trichloroethene (TCE) or trichloroethylene is a colorless liquid at room temperature with an odor similar to ether. The major use of this chemical is as a solvent for degreasing metal parts. Exposure to TCE can occur via inhalation and by ingestion of contaminated food and water. Absorption of TCE following inhalation exposure is high with approximately 50% of the inhaled dose absorbed and 50% exhaled. Dermal absorption is poor in humans. Once absorbed the majority of the TCE is metabolized and then excreted in the urine, only a relatively small amount of absorbed TCE is exhaled via the lungs (ATSDR, 1991).

Trichloroethene is not acutely toxic by the inhalation or oral routes. Oral and inhalation exposures affect the central nervous system, liver and kidney. Trichloroethane was once used as an anesthetic; inhalation of high doses (5000 ppm) produces anesthetic effects. Human epidemiology studies have not shown a clear connection between exposure to trichloroethene and increased cancer risk (ATSDR, 1991). Laboratory animals exposed by inhalation developed cancers in the lung and liver, while animals exposed orally had increased incidence of liver and kidney carcinomas. The USEPA classifies TCE as a group B2 carcinogen (probable human carcinogen but inadequate or no

evidence in humans)(HEAST, 1994). The USEPA is currently re-evaluating the toxicity and carcinogenicity of trichloroethene (IRIS, 1994).

Environmentally, trichloroethene volatilizes rapidly from water. It is highly mobile in soil and quickly leaches to the ground water. It exists predominantly in the vapor phase with some removal from the atmosphere via wet deposition. TCE is believed to have a low bioaccumulation potential in fish and other aquatic creatures (ATSDR. 1991).

TRICHLOROMETHANE (Chloroform)

Chloroform is a colorless or water-white liquid with a pleasant non-irritating odor. It can enter the body by breathing air, drinking water or eating food that contains chloroform. Because chloroform can penetrate the skin, it may enter the body by bathing or showering in water containing chloroform. Water that has been chlorinated for disinfectant purposes may contain chloroform as a by-product. In general chloroform is rapidly eliminated from the body (ATSDR, 1991).

Short-term inhalation exposure to high concentrations (900 ppm) results in CNS effects such as tiredness, dizziness and headache while higher concentrations (8,000 to 10,000 ppm) may result in unconsciousness and death. Longer-term exposure to chloroform can affect liver and kidney function. Dermal exposures may cause sores on the skin. Chloroform was used as a surgical anesthetic for many years before its harmful effects on the liver and kidneys were recognized. Chronic oral doses of chloroform at concentrations greater than 60 mg/kg/day have been found to result in liver and kidney cancer in laboratory animals. Epidemiological studies found a correlation between chlorinated drinking water and cancer of the bladder, large intestine and rectum in humans. However, chloroform is only one of many chlorinated compounds found in chlorinated drinking water that are potentially carcinogenic. The USEPA classifies chloroform as a group B2 carcinogen (probable human carcinogen based on animal studies, but inadequate or no evidence in humans) (IRIS, 1994).

Chloroform is released to the environment as a result of its manufacture and use in the chlorination of water and from other water treatment processes. Most of the chloroform released to the environment will eventually volatilize from water and soil to the atmosphere. Chloroform in the atmosphere may be degraded by photochemical reactions. Because of its limited ability to sorb to soil and its high water solubility, chloroform will leach from soil to groundwater where it may persist for a long time (ATSDR, 1991).

VINYL CHLORIDE

Vinyl chloride is a colorless gas with a mild, sweet odor. It is used to make polyvinyl chloride (PVC), as a refrigerant gas, and in the manufacture chlorinated compounds.

Acute exposure in humans to approximately 10,000 ppm vinyl chloride for five minutes results in central nervous system effects including dizziness, disorientation, nausea, and headaches. Death

has resulted when humans were acutely exposed to high levels of vinyl chloride. Acute inhalation of 100,000 to 400,000 ppm vinyl chloride has resulted in death in laboratory animals Inhalation of vinyl chloride has been reported to result in impaired liver function, liver damage, and central nervous system effects at doses as low as 10 ppm in laboratory animals. Chronic inhalation exposure has also resulted in a syndrome known as vinyl chloride disease. Symptoms include circulatory disturbances in the extremities, and blood, lung, and liver effects. In animals, chronic exposure to oral and inhaled vinyl chloride resulted in decreased longevity, vinyl chloride syndrome, toxic hepatitis, kidney effects, and cancer (ATSDR, 1991). Vinyl chloride has been classified as a group A carcinogen in humans (HEAST, 1994). Increases in the occurrence of tumors in the liver (angiosarcomas), brain, lung, and blood making tissues have been associated with occupational exposure to vinyl chloride in humans (ATSDR, 1991).

Vinyl chloride is a highly mobile compound and may leach into ground water. It does not adsorb to soil. Vinyl chloride in surface water will volatilize to the atmosphere. In the atmosphere, vinyl chloride exists as a vapor and is rapidly degraded. It does not bioconcentrate significantly in aquatic organisms (ATSDR, 1991; Howard, 1990).

Appendix A

Toxicology Profiles for Contaminants

A.1 Inorganic Arsenic

Toxicity Classification:

EPA:	Group A (known human carcinogen)

Toxicity Criteria:

Reference Dose (RfD)–Oral:	0.0003 milligrams per kilogram (mg/kg)/day
Uncertainty/Modifying Factor:	3
Principal Studies:	Tseng et al., 1968; Tseng, 1977
Cancer Slope Factor–Oral:	1.5 $(mg/kg/day)^{-1}$
Principal Studies:	Tseng et al., 1968; Tseng, 1977
Cancer Slope Factor–Inhalation:	4.3 E^{-3} $(mg/m^3)^{-1}$
Principal Studies:	Brown and Chu, 1983a-c; Lee-Feldstein, 1983; Higgins, 1982; Enterline and Marsh, 1982

Target Organs (Primary):

- skin (hyperpigmentation and hyperkeratosis)
- nervous system (peripheral neuropathy)
- vascular system
- hematopoietic system
- gastrointestinal
- lungs
- liver
- kidney

A.1.1 General Information

The toxicity of inorganic arsenic (As) depends on its valence state (-3, +3, or +5), and also on the physical and chemical properties of the compound in which it occurs. Trivalent (As^{+3}) compounds are generally more toxic than pentavalent (As^{+5}) compounds, and the more water soluble compounds are usually more toxic and more likely to have systemic effects than the less soluble compounds, which are more likely to cause chronic pulmonary effects if inhaled.

One of the most toxic inorganic arsenic compounds is arsine gas (AsH_3). It should be noted that laboratory animals are generally less sensitive than humans to the toxic effects of inorganic arsenic. In addition, in rodents, the critical effects appear to be immunosuppression and hepato-

renal dysfunction, whereas in humans the skin, vascular system, and peripheral nervous system are the primary target organs.

Water soluble inorganic arsenic compounds are absorbed through the G.I. tract (>90 percent) and lungs; distributed primarily to the liver, kidney, lung, spleen, aorta, and skin; and excreted mainly in the urine at rates as high as 80 percent in 61 hrs following oral dosing (EPA, 1984). Pentavalent arsenic is reduced to the trivalent form and then methylated in the liver to less toxic methylarsinic acids (ATSDR, 1989).

A.1.2 Basis for Toxicity Criteria

The Reference Dose (RfD) for chronic oral exposures, 0.0003 mg/kg/day, is based on a No Observed Adverse Effects Level (NOAEL) of 0.0008 mg/kg/day and a Lowest Observed Adverse Effects Level (LOAEL) of 0.014 mg/kg/day for hyperpigmentation, keratosis, and possible vascular complications in a human population consuming arsenic-contaminated drinking water (EPA, 1991a). Because of uncertainties in the data, the U.S. Environmental Protection Agency (EPA) (1991a) states that "strong scientific arguments can be made for various values within a factor of 2 or 3 of the currently recommended RfD value." The subchronic Reference Dose is the same as the chronic RfD, 0.0003 mg/kg/day (EPA, 1992).

Acute inhalation exposures to inorganic arsenic can damage mucous membranes, cause rhinitis, pharyngitis and laryngitis, and result in nasal septum perforation (EPA, 1984). Epidemiological studies have revealed an association between arsenic concentrations in drinking water and increased incidences of skin cancers (including squamous cell carcinomas and multiple basal cell carcinomas), as well as cancers of the liver, bladder, respiratory, and gastrointestinal tracts (EPA, 1987; IARC, 1987; Chen et al., 1985, 1986). Occupational exposure studies have shown a clear correlation between exposure to arsenic and lung cancer mortality (IARC, 1987; EPA, 1991a). EPA (1991a) has placed inorganic arsenic in weight-of-evidence group A, human carcinogen. A drinking water unit risk of 5E-5$(mg/L)^{-1}$ has been proposed (EPA, 1991a); derived from drinking water unit risks for females and males that are equivalent to slope factors of 1.0E-3 $(mg/kg/day)^{-1}$ (females) and 2.0E-3 $(mg/kg/day)^{-1}$ (males) (EPA, 1987). For inhalation exposures, a unit risk of 4.3E-3 $(mg/m^3)^{-1}$ (EPA, 1991a) and a slope factor of 5.0E+1 $(mg/kg/day)^{-1}$ have been derived (EPA, 1992).

Symptoms of acute inorganic arsenic poisoning in humans are nausea, anorexia, vomiting, epigastric and abdominal pain, and diarrhea. Dermatitis (exfoliative erythroderma), muscle cramps, cardiac abnormalities, hepatotoxicity, bone marrow suppression and hematologic abnormalities (anemia), vascular lesions, and peripheral neuropathy (motor dysfunction, paresthesia) have also been reported (U.S. Air Force, 1990; ATSDR, 1989; EPA, 1984). Primary target organs are the skin (hyperpigmentation and hyperkeratosis) [Terada et al. 1960; Tseng et al., 1968;], nervous system (peripheral neuropathy), and vascular system [Tseng et al., 1968]. Anemia, leukopenia, hepatomegaly, and portal hypertension have been reported. In addition, possible reproductive effects include a high male-to-female birth ratio.

In animals, acute oral exposures can cause gastrointestinal and neurological effects. Chronic exposures have also resulted in mild hyperkeratosis and bile duct enlargement with hyperplasia, focal necrosis, and fibrosis. Reduction in litter size, high male-to-female birth ratios, and fetotoxicity without significant fetal abnormalities occur after oral dosing; however, parenteral

dosing has resulted in exencephaly, encephaloceles, skeletal defects, and urogenital system abnormalities.

It is reported that a 12 percent incidence of skin abnormalities occurred in children whose drinking water contained 0.6 to 0.8 mg As/L. The earliest cases occurred about 4 to 5 years after the initial exposure. Cardiovascular effects, including Raynaud's syndrome, acrocyanosis, angina pectoris, hypertension, myocardial infarction, mesenteric thrombosis, systemic occlusive arterial disease, bronchiectasis, and recurrent broncho-pneumonia were also observed in this group of subjects). The bronchiectasis and recurrent broncho-pneumonia were attributed to an immunosuppressive action of arsenic in the lungs. A significant decrease in the incidence of skin abnormalities was observed after a reduction in drinking water concentration to about 0.04 mg/L. After 4 years at the lower exposure, effects were rarely seen in children younger than 12 years old). Central nervous system deficits (hearing loss, eye damage, abnormal EEGs, mental retardation, and epilepsy), electrocardiographic changes (elevated ST wave and extended QT interval), and skin abnormalities (melanosis, desquamation, rashes, and hyperkeratosis) occurred in infants who had been fed arsenic-contaminated milk for 1 to 2 months. It was estimated that the daily arsenic intake was about 3 mg/day (EPA, 1984).

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A.2 Polycyclic Aromatic Hydrocarbons (PAHs)

Toxicity Classification:

EPA: B2 (probable human carcinogen, includes carcinogenic PAHs; B(a)P, B(a)A, B(b)F, B(k)F, carbazole, chrysene, D(ah)A, indeno(1,2,3-cd)pyrene, EPA, 1995)

Comment: Classification is based on multiple studies indicating carcinogenicity of individual components of PAHs mixture through inhalation, and dermal contact exposures

Toxicity Criteria:

Reference Dose (RfD)–Oral: Acenaphthene = 6.0E-2, anthracene = 3.0E-1, fluoranthene, and fluorene = 4.0E-2, and pyrene = 3.0 E-2

Cancer Slope Factor–Oral: B(a)P - 7 3 $(mg/kg/day)^{-1}$

Comment: Mouse skin carcinogenesis. Other carcinogenic PAHs are evaluated based on their relative potency compared with B(a)P.

The relative potency factors areas follows: B(a)P = 1.0, B(a)A = 0.1, B(b)F = 0.1, B(k)F = 0.01, chrysene = 0.001, D(ah)A = 1.0, indeno(123-cd)pyrene = 0.1.

Target Organs (Primary):

- skin (cancer)
- immune system
- nervous system

A.2.1 General Information

PAHs are products of incomplete combustion of organic materials from sources such as cigarette smoke, municipal incinerators, wood stove emissions, coal conversion, and fossil

fuel burning (diesel and gasoline automobile exhausts). PAHs are a diverse class of compounds formed as a result of incomplete combustion of organic compounds with insufficient oxygen This leads to the formation of C-H free radicals, which can polymerize to form various PAHs. Among these PAHs are compounds such as benzo(a)pyrene (B[a]P), benz(a)anthraene (B[a]A) and Dibenz(a,h)anthracene (ATSDR, 1988).

PAHs are present in the environment from both natural and anthropogenic sources. As a group, they are widely distributed in the environment, having been detected in animal and plant tissue, sediments, soils, air, and surface water. Humans may be exposed to PAHs in the environment, in tobacco smoke and cooked food, and in the work place. Typically, individuals are not exposed to a single type of PAHs, but to a mixture of related chemicals (ATSDR, 1988).

The environmental fate of PAHs is determined largely by their low water solubilities and high propensity for binding to particulate or organic matter. In the atmosphere they are associated with particulate matter, especially soot. In aquatic environments, PAHs are usually bound to suspended particles or bed sediments. PAHs suspended in the air are thought to undergo direct photolysis very quickly. The ultimate fate of PAHs in the sediment is believed to be biodegradation and biotransformation by benthic organisms (EPA, 1986).

Unsubstituted lower molecular weight PAH compounds that contain 2 or 3 rings exhibit significant acute toxicity and other adverse effects to some organisms, but are noncarcinogenic. The higher molecular weight PAHs that contain 4 to 7 rings are significantly less toxic, but many of these are demonstrably carcinogenic, mutagenic, or teratogenic to a wide variety of organisms including fish, birds, and mammals. These animals have been exposed to PAHs (particularly B[a]P) by several routes of exposure including dermal absorption, ingestion, injection, and inhalation. The metabolism is important in determining their carcinogenicity and effects and many of the metabolites are more toxic than the parent compound. PAHs in the water column also accumulate in organisms, but many organisms metabolize and excrete PAHs rapidly, resulting in short-lived bioaccumulation (EPA, 1986).

A.2.2 Basis for Toxicity Criteria

There is no direct information available for the effects of PAHs on humans. All of the information available for PAHs is from studies on experimental animals. PAHs are well-established as experimental carcinogens for all routes to which humans would normally be exposed. Non-carcinogenic effects reported for PAHs include skin lesions and non-cancer lung diseases such as bronchitus. Benzo(a)pyrene has been associated with developmental toxicity and adverse reproductive effects in experimental animals (ATSDR, 1988).

Risk is assessed separately for carcinogens and noncarcinogens. Benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, B(a)P, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene are classified as B2 carcinogens (probable human carcinogen; sufficient evidence of carcinogenicity in animals; inadequate evidence of carcinogenicity in humans). The other PAHs have a D classification (not classified; inadequate evidence of carcinogenicity in animals). Because of recent changes in the interpretation of toxicological data, the following discussion regarding the source of information used to develop the action

levels is presented. The animal data consist of dietary, gavage, inhalation, intratracheal instillation, and dermal and subcutaneous studies in numerous strains of at least four species of rodents and several primates. Repeated B(a)P administration has been associated with increased incidences of total tumors and of tumors at the site of exposure. Distant site tumors have also been observed after B(a)P administration by various routes. B(a)P is frequently used as a positive control in carcinogenicity bioassays.

B(a)P administered in the diet or by gavage to mice, rats, and hamsters has produced increased incidences of stomach tumors. Neal and Rigdon (1967) fed B(a)P (purity not reported) at concentrations of zero, 1, 10, 20, 30, 40, 45, 50, 100 and 250 parts per million (ppm) in the diets of male and female CFW-Swiss mice. The age of the mice ranged from 17 to 180 days old, the treatment time from 1 to 197 days, and the size of the treated groups from 9 to 73. There were 289 mice (number of mice/sex not stated) in the control group. No forestomach tumors were reported in the zero-, 1- and 10-ppm dose groups. The incidence of forestomach tumors in the 20-, 30-, 40-, 45-, 50-, 100- and 250-ppm dose groups were 1/23, 0/37, 1/40, 4/40, 23/34, 19/23 and 66/73, respectively. The authors felt that the increasing tumor incidences were related to both the concentration and the number of doses administered. Historical control forestomach tumor data are not available for CFW-Swiss strain mice. In historical control data from a related mouse strain, SWR/J Swill, the forestomach tumor incidence rate was 2/268 and 1/402 for males and females, respectively (Rabstein et al., 1973)

Brune et al. (1981) fed 0.15 mg/kg B(a)P (reported to be highly pure) in the diet of 32 Sprague-Dawley rats/sex/group either every 9th day or 5 times per week. These treatments resulted in annual average doses of 6 or 39 mg/kg, respectively. An untreated group of 32 rats/sex served as the control. Rats were treated until moribund or dead; survival was similar in all groups. Histologic examinations were performed on each rat. The combined incidence of tumors of the forestomach, esophagus, and larynx was 3/64, 3/64 and 10/64 in the control group, the group fed B(a)P every 9th day and the group fed B(a)P 5 times/week, respectively. A trend analysis showed a statistically significant tendency for the proportion of animals with tumors of the forestomach, esophagus, or larynx to increase steadily with dose (Knauf and Rice, 1992).

As part of the same study, Brune et al. (1981) administered B(a)P (highly pure) orally to Sprague-Dawley rats by caffeine gavage. The rats were treated until moribund or dead; all rats were subjected to terminal histopathologic examination. Gavaged rats were divided into three dose groups of 32 rats/sex/group; the groups received 0.15 mg/kg per gavage either every 9th day (Group A), every 3rd day (Group B), or 5 times per week (Group C). These treatments resulted in annual average doses of 6, 18 or 39 mg/kg, respectively. Untreated and gavage (5 times/week) controls (32 rats/sex/group) were included. The median survival times for the untreated control group; the gavage control group; and groups A, B, and C were 129, 102, 112, 113, and 87 weeks, respectively. The survival time of Group C was short compared with controls, and may have precluded tumor formation (Knauf and Rice, 1992). The combined tumor incidence in the forestomach, esophagus, and larynx was 3/64, 6/64, 13/64, 26/64, and 14/64 for the untreated control group, gavage control group, group A, group B, and group C, respectively. There was a statistically significant association between the dose and the proportions of rats with tumors of the forestomach, esophagus, or larynx.

This association is not characterized by a linear trend. The linearity was affected by the apparently reduced tumor incidence that is seen in the high-dose group (Knauf and Rice, 1992).

Intratracheal instillation and inhalation studies in guinea pigs, hamsters, and rats have resulted in elevated incidences of respiratory tract and upper digestive tract tumors (EPA, 1991a). Intraperitoneal B(a)P injections have caused increases in the number of injection site tumors in mice and rats (reviewed in EPA, 1991a). B(a)P has also been reported to be carcinogenic in animals when administered by the following routes–i.v.; transplacentally; implantation in the stomach wall, lung, renal parenchyma, and brain; injection into the renal pelvis; and vaginal painting (EPA, 1991a).

At the June 1992 CRAVE Work Group meeting, it was noted that an error had been made in the 1991 document Dose-Response Analysis of Ingested Benzo[a]pyrene which is quoted in the Drinking Water Criteria Document for PAH. In the calculation of the doses in the Brune et al. (1981) study, it was erroneously concluded that doses were given in units of mg/year, whereas it was in fact mg/kg/year. When the doses are corrected, the slope factor is correctly calculated as 11.7 per (mg/kg)/day, as opposed to 4.7 per (mg/kg)/day as reported in the Drinking Water Criteria Document. The correct range of slope factors is 4.5 to 11.7 per (mg/kg)/day, with a geometric mean of 7.3 per (mg/kg)/day. A drinking water unit risk based on the revised slope factor is 2.1E-4 per (µg/L). Therefore, these values have been changed on IRIS, and an Erratum to the Drinking Water Criteria Document is being prepared.

Risk estimates were calculated from two different studies in two species of outbred rodents (Neal and Rigdon, 1967; Brune et al., 1981). These studies have several commonalities, including mode of administration, tumor sites, tumor types, and the presumed mechanisms of action. The data sets were not combined before modeling (the preferred approach) because they used significantly dissimilar protocols.

The geometric mean from several slope factors, each considered to be of equal merit, was used to calculate a single unit risk. These four slope factor estimates span less than a factor of three, and each is based on an acceptable, but less-than-optimal, data set. Each estimate is based on a low-dose extrapolation procedure that entails the use of multiple assumptions and default procedures.

Clement Associates (1990) fit the Neal and Rigdon (1967) data to a two-stage dose response model. In this model, the transition rates and the growth rate of preneoplastic cells were both considered to be exposure-dependent. A term to permit the modeling of B(a)P as its own promoter was also included. Historical control stomach tumor data from a related, but not identical, mouse strain, SWR/J Swill (Rabstein et al., 1973) and the CFW Texas colony (Neal and Rigdon, 1967) were used in the modeling. In calculating the lifetime unit risk for humans, several standard assumptions were made–mouse food consumption was 13 percent of its body weight/day; human body weight was assumed to be 70 kg; and the assumed body weight of the mouse was 0.034 kg. The standard assumption of surface area equivalence between mice an humans was the cube root of 70/0.034. A conditional upper bound estimate was calculated to be 5.9 per (mg/kg)/day (EPA, 1991a).

An EPA report (1991b) argued that the upper-bound estimate calculated in Clement Associates (1990) involved the use of unrealistic conditions placed on certain parameters of the equation. Other objections to this slope factor were also raised. The authors of this report used the Neal and Rigdon (1967) data to generate an upper-bound estimate extrapolated linearly from the 10 percent response point to the background of an empirically fitted dose-response curve (Clement Associates, 1990). Other results, from similar concepts and approaches used for other compounds, suggest that the potency slopes calculated in this manner are comparable to those obtained from a linearized multistage procedure for the majority of the other compounds. The upper bound estimate calculated in EPA (1991b) is 9.0 per (mg/kg)/day. The authors of EPA (1991b) selected a model to reflect the partial lifetime exposure pattern over different parts of the animals' lifetimes. The authors thought that this approach more closely reflected the Neal and Rigdon (1967) regimen. A Weibull-type dose-response model was selected to accommodate the partial lifetime exposure; the upper-bound slope factor calculated from this method was 4.5 per (mg/kg)/day.

EPA selected a slope factor for B(a)P of 7.3, which is a geometric mean of 4.5 to 11.7. EPA currently proposes to regulate carcinogenic PAHs based on their relative potency in producing skin tumors in mouse skin painting studies. The toxicity values (RfDs), critical effects, and uncertainties for five of the noncarcinogenic PAH compounds are verified and currently available on IRIS as listed above.

A.2.3 Standards and Criteria

Occupational Exposures: OSHA PEL (B[a]P) 0.2 mg/m^3

The proposed maximum contaminant level (MCL) value for B(a)P is 0.0002 mg/L (proposed, 1990). The World Health Organization European standards for drinking water recommend a concentration of PAHs not to exceed 0.2 µg/L (EPA, 1988).

For ambient water quality criteria (AWQC) for protection of humans to water and fish, the consumption is 2.8E-3 µg/L; fish consumption alone is 3.11E-2 µg/L. The AWQC for protection of aquatic organisms is not available for fresh water organisms or for marine organisms: the acute LEC is 3.0E+2 µg/L and no chronic LEC is available. The values that are indicated as LEC are not criteria, but are the lowest effect levels found in the literature. LECs are given when the minimum data required to derive water quality criteria are not available. The values given represent PAHs as a class (45 FR 79318 (11/28/80).

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A.3 Tetrachloroethylene

Toxicity Classification:

Classification: B2, probable human carcinogen (EPA, 1991).

Toxicity Criteria:

Reference dose (RfD)–Oral: 0.01 mg/kg/day (EPA, 1991)

Uncertainty Factor: 100

NOAEL: 20 mg/kg/day (converted to 14 mg/kg/day)

Principal Study: Buben and O'Flaherty, 1985

Cancer Slope Factor–Oral: 5.1×10^{-2} $(mg/kg/day)^{-1}$

Unit Risk: 1.5×10^{-6} $(\mu g/L)^{-1}$
(CRAVE-EPA group verified, pending input into IRIS; quantitative estimates were not calculated by the CRAVE Workgroup [EPA, 1991].)

Cancer Slope Factor–Inhalation: 2.03E-3 $(mg/kg/day)^{-1}$ (provisional value)

Unit Risk: 5.8 E-7 $(\mu g/m^3)^{-1}$
(CRAVE-EPA group verified, pending input into IRIS; quantitative estimates were not calculated by the CRAVE Workgroup [EPA, 1991].)

Target Organs:

- liver and kidney (oral and inhalation exposure)
- central nervous system (inhalation exposure)

A.3.1 General Information

Tetrachloroethylene (CAS No. 127-18-4) is a halogenated aliphatic hydrocarbon with a vapor pressure of 17.8 mm Hg at 25°C (EPA, 1982). The chemical is used primarily as a solvent in industry and, less frequently, in commercial dry-cleaning operations (ATSDR, 1990). Occupational exposure to tetrachloroethylene occurs via inhalation, resulting in systemic effects, and via dermal contact, resulting in local effects. Exposure to the general population can occur through contaminated air, food, and water (ATSDR, 1990).

The respiratory tract is the primary route of entry for tetrachloroethylene (NTP, 1986; EPA, 1988). The chemical is rapidly absorbed by this route and reaches an equilibrium in the blood within 3 hours after the initiation of exposure. Tetrachloroethylene is also significantly absorbed by the gastrointestinal (g.i.) tract, but not through the skin (ATSDR, 1990). The chemical accumulates in tissues with high lipid content, where the half-life is estimated to be 55 hours (ATSDR, 1990), and has been identified in perirenal fat, brain, liver, placentofetal tissue, and amniotic fluid. The proposed first step for the biotransformation of tetrachloroethylene is the formation of an epoxide thought to be responsible for the carcinogenic potential of the chemical. Tetrachloroethylene is excreted mainly unchanged through the lungs, regardless of route of administration (NTP, 1986). The urine and feces comprise secondary routes of excretion. The major urinary metabolite of tetrachloroethylene, trichloroacetic acid, is formed via the cytochrome P-450 system (ATSDR, 1990).

A.3.2 Basis for Toxicity Criteria

A.3.2.1 Non-carcinogenicity

Acute exposure to high concentrations of the chemical (estimated to be greater than 1,500 ppm for a 30-minute exposure) may be fatal to humans. Chronic exposure causes respiratory tract irritation, headache, nausea, sleeplessness, abdominal pains, constipation, cirrhosis of the liver, hepatitis, and nephritis in humans; and microscopic changes in renal tubular cells, squamous metaplasia of the nasal epithelium, necrosis of the liver, and congestion of the lungs in animals (NTP, 1986). Some epidemiology studies have found an association between inhalation exposure to tetrachloroethylene and an increased risk for spontaneous abortion, idiopathic infertility, and sperm abnormalities among dry-cleaning workers. The adverse effects in humans are supported in part by the results of animal studies in which tetrachloroethylene induced fetotoxicity (but did not cause malformations) in the offspring of treated dams.

A carcinogenicity bioassay in mice and rats (NCI, 1977) provided the only available chronic oral toxicity data for tetrachloroethylene. For both mice and rats, dosage adjustments were made during the study. The time-weighted average doses of the chemical, administered for 78 weeks in corn oil, were as follows: male $B6C3F_1$ mice, 536 or 1,072 mg/kg; female mice, 386 or 772 mg/kg; Osborne-Mendel male rats, 471 or 941 mg/kg; and female rats, 474 or 949 mg/kg. Toxic nephropathy was observed at all doses in both sexes of mice and rats. The nephropathy was characterized by degenerative changes in the proximal convoluted tubule at the junction of the cortex and medulla, with fatty degeneration, cloudy swelling, and necrosis of the tubular epithelium.

RfDs for chronic and subchronic oral exposure to tetrachloroethylene are 0.1 mg/kg/day and 0.01 mg/kg/day, respectively (Buben and Flaherty, 1985; EPA, 1990; 1991). These values are based on hepatotoxicity observed in mice given $\geq$ 100 mg tetrachloroethylene/kg body weight for 6 weeks and a NOAEL of 20 mg/kg.

A.3.2.2 Carcinogenicity

Epidemiology studies of dry cleaning and laundry workers have demonstrated excesses in mortality due to various types of cancer, including liver cancer, but the data are regarded as

inconclusive because of various confounding factors (Lynge and Thygesen, 1990; EPA, 1988). The tenuous finding of an excess of liver tumors in humans is strengthened by the results of carcinogenicity bioassays in which tetrachloroethylene, administered either orally or by inhalation, induced hepatocellular tumors in mice (NCI, 1977; NTP, 1986). The chemical also induced mononuclear cell leukemia and renal tubular cell tumors in rats. Tetrachloroethylene was negative for tumor initiation in a dermal study and for tumor induction in a pulmonary tumor assay (Van Duuren et al., 1979; Theiss et al., 1977).

On the basis of the sufficient evidence from oral and inhalation studies for carcinogenicity in animals and none or inadequate evidence for carcinogenicity to humans, tetrachloroethylene is placed in EPA's weight-of-evidence Group B2, probable human carcinogen (NCI, 1977; NTP, 1986; EPA, 1991). For oral exposure, the slope factor is 5.1×10^{-2} $(mg/kg/day)^{-1}$; the unit risk is 1.5×10^{-6} $(mg/L)^{-1}$. For inhalation exposure, the slope factor was not calculated; the unit risk is $5\ 2 \times 10^{-7}$ $(mg/m^3)^{-1}$.

Human health effects resulting from chronic exposure to various concentrations of tetrachloroethylene include respiratory tract irritation, headache, nausea, sleeplessness, abdominal pains, constipation, cirrhosis of the liver, hepatitis, and nephritis (Coler and Rossmiller, 1953; Stewart et al., 1970; von Ottingen, 1964, Stewart, 1969). In one study, 16 of 25 workers, exposed to 59 to 442 ppm for 2 months to 27 years had significantly elevated SGOT and SGPT activity compared with controls (Chmielewski et al., 1976).

An NTP bioassay provided chronic toxicity data for animals exposed to tetrachloroethylene. Groups of 50 male and 50 female F344/N rats and $B6C3F_1$ mice inhaled the chemical 6 hours/day, 5 days/week for 103 weeks (NTP, 1986). The exposure concentrations consisted of zero, 200, or 400 ppm for rats and zero, 100, or 200 ppm for mice. In rats, nonneoplastic effects consisted of dose-related renal tubular cell karyomegaly (males and females), renal tubular cell hyperplasia (males only), and dose-related increases in the incidences of nasal thromboses and squamous metaplasia (the thromboses were believed to have been secondary to tetrachloroethylene-induced leukemia). The incidence of renal tubular cell karyomegaly was higher in males than in females. In mice, nonneoplastic effects consisted of dose-related hepatic degeneration, hepatic necrosis, and hepatic nuclear inclusion; dose-related renal tubular cell karyomegaly; and pulmonary congestion.

Pegg et al. (1978), reported in a fate and disposition study that rats inhaling a tetrachloroethylene concentration of 600 ppm (4 g/m^3) 6 hours/day, 5 days/week for 12 months developed unspecified reversible liver damage.

In a Danish study, a cohort of laundry and dry-cleaning workers was studied for cancer incidence among persons exposed to tetrachloroethylene (the most commonly used solvent in Danish dry-cleaning shops) (Lynge and Thygesen, 1990). The 10-year follow-up study evaluated 8,567 women and 2,033 men employed in laundry and dry-cleaning in 1970. The study revealed a significant excess risk for primary liver cancer among the women (7 observed, 2.1 expected); but not one case of primary liver cancer was found among the men, for whom the expected value was 1.1. Although the majority of primary liver cancer cases in Denmark has been associated with excess alcohol consumption, the investigators did not believe this to be the exclusive explanation for the excess tumors among the dry-cleaning workers.

A retrospective mortality epidemiologic study of dry cleaning workers with exposure to tetrachloroethylene reported an excess of mortality from kidney and bladder cancer (8 cases versus 2.7 expected; SMR=296) and cancer of the cervix (10 observed versus 5.1 expected; SMR=296) (Brown and Kaplan, 1985). The cohort consisted of 1,690 workers with $\geq$ 23 years of employment The results of this study were inconclusive because the workers had potential occupational exposure to petroleum solvents, in addition to tetrachloroethylene. However, a subcohort of the study, consisting of 615 workers with no known exposure to petroleum solvents, demonstrated no excess risk for cancer at any site (Brown and Kaplan, 1985). Other studies of dry cleaning and laundry workers have demonstrated increases in mortality due to various types of cancer (lung, cervix, kidney, skin and/or colon), but the data are also regarded as inconclusive because of various confounding factors (EPA, 1988).

In a carcinogenicity bioassay, groups of 50 male and 50 female F344/N rats and $B6C3F_1$ mice inhaled tetrachloroethylene 6 hours/day, 5 days/week for 103 weeks (NTP, 1986) The exposure concentrations were zero, 200, or 400 ppm for rats and zero, 100, or 200 ppm for mice. Exposure to tetrachloroethylene under the conditions of the study resulted in: (a) clear evidence of carcinogenicity for male F344/N rats as shown by an increased incidence of mononuclear cell leukemia (controls, 28/50; low dose, 37/50; high dose, 37/50) and renal tubular cell adenomas or carcinomas combined (1/49, 3/49, 4/50) (the incidence of the renal tumors was not statistically significant, but these uncommon tumors had been found consistently at low incidences in male rats in other studies of chlorinated ethanes and ethylenes); (b) some evidence of carcinogenicity for female rats as shown by increased incidences of mononuclear cell leukemia (18/50, 30/50, 29/50); and (c) clear evidence of carcinogenicity for mice as shown by increased incidences of hepatocellular adenomas (11/49, 8/49, 18/50) and carcinomas (7/49, 25/49, 26/50) in males and of hepatocellular carcinomas (1/48, 13/50, 36/50) in females. There were no neoplastic changes in the respiratory tract of either species, but there was an increased incidence (non-dose-related) of squamous metaplasia in the nasal cavities of treated male rats.

Tumors were not observed in groups of 96 male and 96 female Sprague-Dawley rats exposed to tetrachloroethylene concentrations of 300 or 600 ppm, 6 hours/day, 5 days per week for 52 weeks and observed for the rest of their lives (Rampy et al., 1978).

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A.4 Polychlorinated Biphenyls (PCBs)

Toxicity Classification: B2 carcinogens (EPA, 1995)
(Comment: Classification is based on hepatocellular carcinomas in rats and mice, suggestive evidence of excess risk of liver cancer in humans by ingestion, inhalation, and dermal contact.)

Toxicity Criteria:

Reference Dose (RfD)–Oral: 7.0E-5 mg/kg/day (Arochlor-1016)
2.0E-5 mg/kg/day (Arochlor-1254)

Cancer Slope Factor–Oral: 7.7 $(mg/kg/day)^{-1}$

Cancer Slope Factor–Inhalation: To be determined

Target Organs (primary):

- skin (hyperpigmentation and hyperkeratosis)

A.4.1 General Information

There are four commercial PCB mixtures marketed in the U.S. under the name Aroclor® (Aroclor®1016, 1242, 1254, and 1260) (USAF, 1989). Aroclor® formulations are complex mixtures of PCBs produced by progressive chlorination of biphenyl with anhydrous chlorine, and because they are mixtures, their physical properties and chemical behavior cannot be precisely defined (USAF, 1989). PCBs have been used as heat transfer liquids, hydraulic fluids, lubricants, plasticizers, surface coatings, inks, adhesives, pesticide and extenders, and for microencapsulation of dyes for carbonless duplicating paper (USAF, 1989).

The environmental behavior of the Aroclor® mixtures is a direct function of their relative composition with respect to the individual PCB species (USAF, 1989). Individual PCBs vary widely in their physical and chemical properties according to the degree of chlorination and position of the chlorines on the biphenyl structure. In general, as chlorine content increases, adsorption increases while transport and transformation processes decrease (USAF, 1989).

Because of their very low solubility in water (~2.70×10^{-3} mg/L at 20°C), high log octanol-water partitioning coefficients (K_{ow}) of 6.1 to 9.3, and extremely high organic carbon partition coefficients (K_{oc}) of 100,000 to 1,000,000,000, adsorption to soils and sediments is the major fate process affecting PCBs in the environment, particularly in soils with high organic carbon content (USAF, 1989). As a result, PCBs are expected to be highly immobile in the soil, and leaching to the groundwater system is unlikely. However, in the presence of organic solvents, PCBs are found to be highly mobile in the soil despite the high percent retained by the organic carbon present (USAF, 1989).

Transport of PCB vapors through the air-filled pores of unsaturated soils is not expected to be a rapid transport pathway. Volatilization (mostly from aqueous systems) followed by atmospheric transport is expected to be slow, but may be a significant long-term transport process and is thought to account for the widespread, almost ubiquitous, distribution of PCBs in the environment. PCBs have been reported to be strongly resistant to chemical degradation by oxidation or hydrolysis; however, PCBs have been shown to be susceptible to slow-rate photolytic and biological degradation. Highly chlorinated PCBs can be photolytically degraded, resulting in the formation of lower chlorinated species and substituted products, as well as potential formation of biphenylenes and chlorinated dibenzofurans. The presence of oxygen retards the photolytic degradation of PCBs (USAF, 1989).

Microbial degradation has been reported to be an important transformation process for PCBs to include both aerobic oxidative and anaerobic dechlorination biodegradation. In general, the less chlorinated PCBs were more easily degraded than the more chlorinated species. However, the presence of the lower chlorinated biphenyls has been shown to increase the rate of biodegradation of the more chlorinated PCBs through co-metabolism (USAF, 1989).

The high bioconcentration factor combined with the persistence of PCBs suggests that these compounds bioaccumulate and can be biomagnified (EPA, 1979b).

A.4.2 Basis for Toxicity Criteria

A.4.2.1 Non-carcinogenic Effects

EPA currently has not established an RfD/RfC for the noncarcinogenic effects of oral or inhalation exposures to PCBs (IRIS, 1995; HEAST, 1994). Because PCBs are slowly metabolized compounds, toxic symptoms of noncarcinogenic effects usually occur after long-term exposure and bioaccumulation. Initial symptoms of PCB poisoning are non-specific, such as loss or reduced weight gain, while more severe poisoning in rats have resulted in ataxia, diarrhea, lack of response to pain stimuli; and histopathological changes primarily in the liver and kidney (USAF, 1989). In humans exposed to PCBs in the workplace, reported adverse effects include chloracne (a long-lasting, disfiguring skin disease), impairment of liver function, neurobehavioral disorders, menstrual disorders, and minor birth abnormalities (ATSDR, 1988b; EPA, 1985b). Animals experimentally exposed to PCBs have shown most of the same symptoms as well as impaired reproduction and fetotoxicity; pathological changes in the liver, stomach, skin, spleen, lymph nodes, and thymus; and suppression of the immunological system (ATSDR, 1988b; EPA, 1985b; and USAF, 1989).

PCBs are almost completely absorbed from the digestive tract (>90 percent) with subsequent distribution to the liver and muscle tissue, followed by redistribution to body fat, skin, and other fat-containing organs (ATSDR, 1988b). Absorption via the skin is also fairly efficient, as indicated by occupational exposures where effects of PCB exposure can be detected even at doses too low to produce pathologic effects (ATSDR, 1988b).

A.4.2.2 Carcionogenicity

On the basis of the increased incidence of liver tumors following dietary exposure of rats to Aroclor® (Norback and Weltman, 1985), PCBs have been classified by EPA as B2 carcinogens (IRIS, 1995) for both the oral and inhalation routes of exposure. A classification of B2 indicates that sufficient evidence exist to show carcinogenicity in animals, but inadequate evidence of carcinogenicity in humans. Based on a statistically significant increase in the occurrence of liver tumors following oral exposure, EPA (IRIS, 1995) has developed an oral cancer potency slope factor of 7.7 $(mg/kg/day)^{-1}$ for PCBs; a CPF has not yet been determined for the inhalation route of exposure (IRIS, 1992; HEAST, 1992).

A.4.3 Standards And Criteria

EPA has promulgated the enforceable (for public water supplies) maximum contaminant level (MCL) of 0.0005 mg/L for PCBs, based on a practical quantitation limit (PQL) of 0.0005 mg/L, which is associated with a maximum lifetime individual risk of 1×10^{-4}. EPA has also proposed an MCL Goal (MCLG) of zero mg/L PCBs based on the evidence of carcinogenic potential (classification group B2) (IRIS, 1995).

EPA has also established ambient water quality criterion (AWQC) for human consumption of water and aquatic organisms contaminated with PCBs at 7.9×10^{-5} ug/L (IRIS, 1995). An AWQC of 7.9×10^{-6} µg/L has also been set for the consumption of aquatic organisms alone

(IRIS, 1995). The proposed federal AWQC for the protection of aquatic life are 2.0 mg/L (acute) and 0.014 mg/L (chronic) (IRIS, 1992).

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Table PCB-2

Acute Toxicities of Aroclor® PCBs to Freshwater Aquatic Organisms

Organism, Compound Tested	Exposure Period (days)	LC50 (µg/L)	Reference*
Invertebrates			
Orconectes nais (Crayfish)			
1242	7	30	NAS, 1979
1254	7	80 to 100	NAS, 1979
Gammarus pseudolimnaeus (Scud)			
1242	4	10	NAS, 1979
1242	10	5	NAS, 1979
1248	4	52	NAS, 1979
1254	4	2,400	NAS, 1979
Palaemonetes kadiakensis (Glass shrimp)			
1254	7	3	NAS, 1979
Ischnura verticalis (Damselfly)			
1242	4	400	Johnson and Finley, 1980
1254	4	200	Johnson and Finley, 1980
Macromia sp (Dragonfly)			
1242	4	800	Johnson and Finley, 1980
1254	5	800	Johnson and Finley, 1980
Daphnia magna (Cladoceran)			
1254	14	1 8 to 24 0	EPA, 1980c
1254	21	1.3	EPA, 1980c
Pteronarcella badia (Stonefly)			
1016	4	424 to 878	Johnson and Finley, 1980
Hydra oligactis (Hydra)			
1016	3	5,000	Adams and Haileselassie, 1984

Table PCB-2

Acute Toxicities of Aroclor® PCBs to Freshwater Aquatic Organisms

Organism, Compound Tested	Exposure Period (days)	LC50 (µg/L)	Reference*
1254	3	10,000	Adams and Haileselassie, 1984
Fish			
Oncorhyncus mykiss (Rainbow trout)			
1016	4	114 to 159	Johnson and Finley, 1980
1242	5	67	Johnson and Finley, 1980
1248	5	54	Johnson and Finley, 1980
1254	5	142	Johnson and Finley, 1980
1254	10	8	NAS, 1979
1260	20	21	NAS, 1979
Lepomis macrochirus (Bluegill)			
1016	4	390 to 540	Johnson and Finley, 1980
1242	5	125	Johnson and Finley, 19801
1242	15	54	NAS, 1979
1248	20	10	NAS, 1979
1254	25	54	NAS, 1979
1260	30	150	NAS, 1979
Ictalurus punctatus (Channel catfish)			
1016	4	340 to 560	Johnson and Finley, 1980
1242	15	110	NAS, 1979
1248	15	130	NAS, 1979
1254	15	740	NAS, 1979
1260	30	140	NAS, 1979
Salmonids, 4 spp.			
1016	4	134 to 1,154	Johnson and Finley, 1980
Catostomids, 2 spp			
1016	4	222 to 582	Johnson and Finley, 1980

Table PCB-2

Acute Toxicities of Aroclor® PCBs to Freshwater Aquatic Organisms

Organism, Compound Tested	Exposure Period (days)	LC50 (µg/L)	Reference*
Fish, cont'd			
Salmo clarki (Cutthroat trout)			
1221	4	1,170	Johnson and Finley, 1980
1232	4	2,500	Johnson and Finley, 1980
1242	4	5,420	Johnson and Finley, 1980
1248	4	5,750	Johnson and Finley, 1980
1254	4	42,500	Johnson and Finley, 1980
1260	4	60,900	Johnson and Finley, 1980
1262	4	>50,000	Johnson and Finley, 1980
1268	4	>50,000	Johnson and Finley, 1980
Perca flavescens (Yellow perch)			
1016	4	240	Johnson and Finley, 1980
1242	4	>150	Johnson and Finley, 1980
1248	4	>100	Johnson and Finley, 1980
1254	4	>150	Johnson and Finley, 1980
1260	4	>200	Johnson and Finley, 1980

*References cited are from USFWS, 1986b.

Table PCB-1
Effects of PCBs on Aquatic Plants

Species	Chemical	Duration	Effect	Result (mg/L)	Reference*
Euglena gracilis (Alga)	Aroclor® 1221	48 hrs	LD50	4,400	Ewald et al , 1976
Euglene gracilis (Alga)	Aroclor® 1242	8 days	Reduced growth	10,000	Bryan and Olafsson, 1978
Scenedesmus obtusiusculus (Alga)	Aroclor® 1242	24 hrs	Growth inhibition	300	Larsson and Tillberg, 1975
Scenedesmus quadricauda (Alga)	Aroclor® 1254	24 hrs	Reduction in rate of carbon fixation	0 1	Laird, 1973
Chlorella pyrenoidosa (Alga)	Aroclor® 1268	191 hrs	Depressed cell productivity	1,000	Hawes et al , 1976
Chlorella pyrenoidosa (Alga)	Aroclor® 1254	73 hrs	Reduced population growth	1,000	Hawes et al , 1976
Chlamydomonas reinhardtii (Alga)	Aroclor® 1242	22 days	Reduced growth	2,000	Morgan, 1972
Phormidium sp (Alga)	Dichlorobiphenyl	3 hrs	Reduced motility	50	Zullei and Benecke, 1978

*References cited are from EPA, 1980c

Table PCB-4
BCFs for Aroclor® PCBs

Species	Tissue	BCF	Duration (days)	Reference*
Daphnia magna (Cladoceran)				
1254	Whole body	3,800	4	Mayer et al , 1977
Gammarus pseudolimnaeus (Scud)				
1248	Whole body	108,000	60	Nebeker and Puglisi, 1974
Chaoborus punctipennis (Phantom midge)				
1254	Whole body	2,700	14	Mayer et al , 1977
Pimephales promelas (Fathead minnow) (female)				
1248	Whole body	120,000	240	DeFoe et al , 1978
1260	Whole body	270,000	240	DeFoe et al , 1978
1242	Whole body	274,000	255	Nebeker et al , 1974
Lepomis macrochirus (Bluegill)				
1248	Whole body	52,000	77	Stalling, 1971
Ictalurus punctatus (Channel catfish)				
1248	Whole body	56,400	77	Mayer et al , 1977

*References cited are from EPA (1980c)

A.5 Trichloroethene

Toxicity Classification:

Classification B2:	Probable human carcinogen (EPA, 1990)

Toxicity Criteria:

Reference dose (RfD)–Oral:	6E-3 mg/kg/day (provisional value)
Uncertainty/modifying factor:	N/A
Cancer Slope Factor–Oral:	1.1E-2 $(mg/kg/day)^{-1}$ (provisional value) (Withdrawn from IRIS, pending review)
Cancer Slope Factor–Inhalation:	6E-3 $(mg/kg/day)^{-1}$ (provisional value)

Target Organs:

- Nervous system: CNS symptoms in workers exposed to TCE by inhalation included headache, sleepiness, vision distortion, nausea, abnormal reflexes, tremors, ataxia, nystagmus, and increased respiration.
- Liver: After inhalation exposure to TCE, rodents developed enlarged livers and biochemical changes indicative of liver damage. Liver damage in humans is primarily associated with acute exposure to TCE. The hepatotoxic effects of TCE are enhanced by concomitant exposure to alcohol.
- Kidney: Rats developed renal cytokaryomegaly after chronic inhalation exposure to TCE.
- Cardiovascular system: Occupational exposure to TCE has been associated with vasomotor changes, tachycardia, bradycardia, extrasystoles, conduction disturbances, and precordial pain. TCE sensitizes the heart to cardiac arrhythmias.
- Hematopoietic system: Inhalation of TCE induced myelotoxic anemia in rabbits and produced dose-related changes in several hematological indices in rats.
- Reproduction: Inhalation studies with rodents indicate that TCE may cause increased resorptions, reduced fetal body weight, and ossification anomalies. Exposure to high concentrations produced sperm abnormalities in mice.
- Skin: Reddening of the skin after mechanical or heat insults and dermographism was seen in workers exposed to TCE by inhalation.

A.5.1 General Information

Trichloroethene is widely used as an industrial solvent, particularly in metal degreasing (USAF, 1989). It is also used in a variety of miscellaneous applications such as a low-temperature heat exchange fluid, as a fumigant, as a diluent in paints and adhesives, in aerospace operations to flush liquid oxygen, and in textile processing. It was previously used as an extractant in food processing and as an anesthetic, but it is no longer used for these purposes because of possible carcinogenic activity (USAF, 1989).

Trichloroethene is expected to be relatively mobile in the soil/groundwater system as, at 1,000 mg/L at 20°C, it is soluble in water. Trichloroethene has a low soil sorption coefficient (K_{oc}) that, with an estimated value of 127 and a log octanol-water partition coefficient (log K_{ow}) of 2.42, indicates that it will not be strongly bound to soils (USAF, 1989). On the basis of the vapor pressure of 60 torr at 20°C, transport of trichloroethene vapors through the air-filled pores of unsaturated soils, followed by photooxidation, is an important loss mechanism for near-surface contaminated soils (USAF, 1989). Upon reaching the atmosphere from surface waters and soil surfaces, trichloroethene reacts with hydroxyl radicals to produce hydrochloric acid, carbon monoxide, carbon dioxide, and carboxylic acid. In saturated subsurface soils (where soil organic carbon and soil air are negligible), a much higher fraction of the trichloroethene is expected to be present in the soil-water phase and transported with flowing groundwater. Because trichloroethene is a low molecular weight chloroaliphatic, it is not rapidly metabolized in the environment, although it can be degraded by acclimated microbial populations. Under normal environmental conditions, trichloroethene is not expected to undergo rapid hydrolysis (USAF, 1989).

A.5.2 Basis for Toxicity Criteria

EPA (IRIS, 1995; HEAST, 1994) does not provide any RfDs or slope factors (SFs) for trichloroethene. Because a chronic health hazard assessment for noncarcinogenic effects is currently under review by an EPA Work Group, an oral RfD is listed as pending. EPA's Environmental Criteria and Assessment office does provide an interim oral health-based value of 0.006 mg/kg/day. No data are available for developing an inhalation RfD for trichloroethene (IRIS, 1994).

Effects of short-term human exposure include mild eye irritation, nausea, vertigo, headache, and confusion. Unconsciousness and death may occur after exposure to excessive concentrations (ATSDR, 1988). Chronic oral exposure of humans to trichloroethene is characterized by dizziness, nausea, headache, ataxia, decreased appetite, and sleep disturbances (ATSDR, 1988). The acute oral toxicity of trichloroethene is low in animals, as indicated by acute oral LD_{50} values that range from 2,400 mg/kg for a mouse to 7,330 mg/kg for a rabbit (ATSDR, 1988). EPA (1984) reported 18 mg/kg/day as the NOAEL for trichloroethene.

A.5.3 Carcinogenicity

A.5.3.1 Oral Studies

EPA has classified trichloroethene as a group B2 (probable human) carcinogen. This classification indicates that sufficient evidence exists, based on an increased incidence of lung and liver tumors after exposure, to support carcinogenicity in animals, but inadequate evidence exists of carcinogenicity in humans (IRIS, 1992). The results of several mouse bioassays indicated an increased incidence of liver tumors following oral gavage exposure and an increased incidence of lung tumors following inhalation exposure (EPA, 1984). EPA has developed an interim oral slope factor of 0.011 $(mg/kg/day)^{-1}$ and an interim inhalation slope factor of 0.017 $(mg/kg/day)^{-1}$. EPA (IRIS, 1991) had listed final slope factor values, but has withdrawn them (IRIS, 1995) pending further review by an EPA Work Group.

Maltoni et al. (1986) treated male and female Sprague-Dawley rats by gavage with TCE (99.9 percent pure) in olive oil at doses of 50 or 250 mg/kg/day, 4 to 5 days/week for 52 weeks. There was a dose-related increase in the incidence of leukemia in males, but no increased tumor incidence in females.

Significantly increased incidences of hepatocellular carcinomas occurred in $B6C3F_1$ mice that were administered time-weighted-average doses of 1,170 or 1,340 mg/kg/day (males) or 870 or 1,740 mg/kg/day (females) by gavage, 5 days/week for 78 weeks. No compound-related carcinogenic effects were found in Osborne-Mendel rats similarly treated with 550 or 1,100 mg/kg/day, but this finding was inconclusive because of poor survival. The TCE used in the study was $\geq$ 99 percent pure but contained stabilizers, including epichlorohydrin, a known carcinogen (NCI, 1976).

Studies by NTP (1982, 1986a) showed significantly increased incidences of hepatocellular carcinomas in male and female $B6C3F_1$ mice treated by gavage with epichlorohydrin-free TCE at a dose of 1,000 mg/kg/day, 5 days/week for 103 weeks. F344 rats treated with 1,000 mg/kg/day by the same regimen exhibited renal adenomas and adenocarcinomas; this effect was not seen at 500 mg/kg/day or in females at either dose level. Due to poor survival, the results in rats were considered inadequate. A third NTP study (NTP, 1988) exposed groups of male and female ACI, August, Marshall, and Osborne-Mendel rats by gavage to epichlorohydrin-free TCE in corn oil at doses of zero, 500, or 1,000 mg/kg, 5 days/week for 103 weeks. There were significantly increased incidences of renal tubular cell neoplasms in low dose male Osborne-Mendel rats and interstitial cell neoplasms of the testis in high-dose Marshall rats. This study also was considered inadequate for the assessment of carcinogenic activity because of toxic nephrosis and low survival.

Henschler et al. (1984) compared the carcinogenicity of TCE stabilized with epichlorohydrin (0.8 percent) or 1,2-epoxybutane (0.8 percent) to that of industrial-grade TCE in male and female ICR/Ha Swiss mice. TCE was administered daily by gavage (2.4 g/kg, females; 1.8

g/kg, males) for 18 months, with and without the addition of the epoxides. Animals exposed to epichlorohydrin- or 1,2-epoxybutane-stabilized TCE exhibited an increased incidence of papillomas and carcinomas of the forestomach. This effect was not observed without stabilizers.

A.5.3.2 Inhalation Exposures

Epidemiologic studies conducted by Axelson et al. (1978), Malek et al. (1979), and Tola et al. (1980) reported no significant excess cancer risks associated with occupational exposure to TCE, but the studies do not permit definite conclusions because of various study limitations such as inadequate latency periods, small sample size, lack of analysis by tumor site, and multiple chemical exposure (ATSDR, 1989; EPA, 1985) An update of one of the studies (Axelson, 1986) found a slight increase of bladder cancer and lymphomas in an expanded cohort study; however, details of TCE exposure were not given. A retrospective cohort mortality study of dry-cleaning and/or laundry workers (Blair et al., 1979) found significant increases in the incidence of cancer at several sites (lung/bronchi/trachea, cervix, and skin) among a group of 330 deceased workers. This cancer increase was possibly due to dry-cleaning chemicals (carbon tetrachloride, tetrachloroethylene, and TCE) but could not be related to TCE alone. Paddle (1983) examined tumor registry records in Great Britain and found no association between liver cancer and TCE exposure in workers employed in one TCE production facility.

Bell et al. (1978) reported no carcinogenic effects in Charles River rats exposed to technical grade TCE at concentrations of zero, 100, 300, or 600 ppm, 6 hours/day, 5 days/week for 24 months. Hepatocellular carcinomas were seen in $B6C3F_1$ mice similarly exposed to TCE, with a greater incidence of tumors occurring in males than in females. The TCE employed contained 0.148 percent epichlorohydrin and several other additives.

Wistar rats, NMR mice, and Syrian hamsters were exposed to purified TCE at zero, 100, or 500 ppm, 6 hours/day, 5 days/week for 18 months (Henschler et al., 1980). The only statistically significant effect was an increased incidence of malignant lymphomas in female mice. EPA (1987) suggested that lymphoma susceptibility may have been enhanced by virus and immunosuppression.

Fukuda et al. (1983) exposed female ICR mice and Sprague-Dawley rats to reagent-grade TCE (containing 0.019 percent epichlorohydrin) at concentrations of zero, 50, 150, or 450 ppm, 7 hours/day, 5 days/week for 104 weeks. Although there were a number of tumors at several sites in rats and mice, only lung adenocarcinomas were significantly increased in mice at the two highest concentrations, as compared with controls.

Maltoni et al. (1986, 1988) exposed male and female Sprague-Dawley rats, Swiss mice, and $B6C3F_1$ mice to 100, 300, or 600 ppm epoxide-free TCE, 7 hours/day, 5 days/week for 104 weeks (rats) or 78 weeks (mice). Statistically significant increased incidences of tumors included testicular Leydig cell tumors in rats at 100 ppm, lung adenomas in male Swiss mice at 300 ppm, hepatomas in male Swiss mice at 600 ppm, and lung adenomas in female $B6C3F_1$ mice at 600 ppm.

A.5.3.3 Teratogenicity/Reproductive Effects

No epidemiological studies of congenital anomalies in children born to women exposed to trichloroethene during pregnancy have been reported (TERIS, 1995).

Developmental toxicity studies with trichloroethene indicate that it is fetotoxic, but is neither mutagenic nor teratogenic to rodents after inhalation exposure; however, one of the potential intermediate metabolites, chloral hydrate, is mutagenic. No fetotoxicity or teratogenicity were reported in pregnant mice and rats exposed to air levels of 300 ppm for 7 hours/day on gestational days 6 through 15. However, anomalies of skeletal and soft tissues indicative of developmental delay were reported in offspring of pregnant rats exposed to high doses.

A.5.4 Standards and Criteria

EPA has promulgated an enforceable (for public water supplies) MCL of 5 mg/L for trichloroethene based on 10X the MDL; it is associated with a maximum lifetime individual risk of 1E-6 (IRIS, 1992). EPA has also promulgated a nonenforceable MCL Goal (MCLG) of zero mg/L based on the potential carcinogenic effects associated with exposure to this Group B2 carcinogen. EPA is currently re-evaluating the carcinogenic ranking for trichloroethene.

EPA has also established ambient water quality criteria (AWQC) for human consumption of water and aquatic organisms (W + F) of 2.7 mg/L and for human consumption of aquatic organisms alone (F) of 80.7 mg/L (IRIS, 1992). These AWQC would yield a value for human consumption of water alone (W) of 2.8 mg/L based on the following formula:

$$\frac{1}{W+F} = \frac{1}{W} + \frac{1}{F}$$

A.5.5 References

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A.6 *cis*- and *trans*-1,2-Dichloroethene

Toxicity Classification:

EPA:	Group D (not classifiable as a carcinogen)

Toxicity Criteria:

Reference Dose (RfD)–Oral:	1E-2 mg/kg/day (EPA, 1990b) (cis 1,2-DCE)
Uncertainty/modifying factor:	3,000
trans-1,2-Dichloroethene	
Oral RfD:	2E-2 mg/kg/day (EPA, 1990a,b)
Uncertainty Factor:	1,000
Modifying Factor:	1
NOAEL:	0.1 mg/L (17 mg/kg/day)
LOAEL:	1 mg/L (175 mg/kg/day)

Target Organs:

- liver
- nervous system
- eyes
- heart
- liver
- lungs

A.6.1 General Information

1,2-dichloroethene exists in two isomeric forms: *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene, that are colorless, volatile liquids with a slightly acrid odor. Although not used extensively in industry, 1,2-dichloroethene is used in the production of other chlorinated solvents and as a solvent for dyes, perfumes and lacquers. Humans are exposed to 1,2-dichloroethene primarily by inhalation, but exposure can also occur by oral and dermal routes.

Limited information exists about the absorption, distribution, and excretion of 1,2-dichloroethene in either humans or animals. *In vitro* studies have shown that the mixed function oxidases will metabolize 1,2-dichloroethene; the final metabolic products being dependent on the initial isomer of 1,2-dichloroethene.

Information about the toxicity of 1,2-dichloroethene in humans and animals is limited. Workers acutely exposed to 1,2-dichloroethene have been reported to suffer from drowsiness, dizziness, nausea, fatigue, and eye irritation (ATSDR, 1990). Acute and subchronic oral and inhalation studies of *trans*-1,2-dichloroethene and acute inhalation studies of *cis*-1,2-dichloroethene indicate that the liver is the primary target organ in animals; toxicity being expressed by increased activities of liver associated enzymes, fatty degeneration, and necrosis (McCauley et al., n.d.; Barnes et al., 1985). Secondary target organs include the central nervous system and lungs.

A.6.2 Basis for Toxicity Criteria

On the basis of an unpublished study describing decreased hemoglobin and hematocrits in rats treated by gavage for 90 days, EPA (1990a,b) assigned a subchronic and chronic oral RfD for *cis*-1,2-dichloroethene of 1E-1 mg/kg/day and 1E-2 mg/kg/day, respectively. The RfDs were derived from NOAEL/LOAEL of 32 mg/kg/day. No inhalation reference concentration (RfC) for *cis*-1,2-dichloroethene has been derived.

Subchronic and chronic RfDs of 2E-1 mg/kg/day and 2E-2 mg/kg/day, respectively, for *trans*-1,2-dichloroethene have been calculated The RfDs were derived from a LOAEL of 175 mg/kg/day based on the increase of serum alkaline phosphatase activity in mice that received *trans*-1,2-dichloroethene in their drinking water (EPA, 1990a,b). No RfC for *trans*-1,2-dichloroethene has been derived.

No information was available concerning the chronic, developmental or reproductive toxicity of *cis*-1,2-dichloroethene or *trans*-1,2-dichloroethene. No cancer bioassays or epidemiological studies were available to assess the carcinogenicity of 1,2-dichloroethene. EPA (1990a,b) has placed *cis*-1,2-dichloroethene in weight-of-evidence group D; not classifiable as to human carcinogenicity, based on the lack of human or animal carcinogenicity data and on essentially negative mutagenicity data. *trans*-1,2-dichloroethene has not been classified.

Freundt et al. (1977) reported that groups of six adult female Wistar rats exposed to *trans*-1,2-dichloroethene at concentrations of 200, 1,000, or 3,000 ppm for 8 hours or to 200 ppm 5 days/week for 1 or 2 weeks developed fat accumulation in the hepatocytes and Kupffer cells of the liver and capillary hyperemia of the lung. Rats exposed to 1,000 ppm *trans*-1,2-dichloroethene for 8 hours had significantly decreased ($p<0.05$) serum concentrations of albumin and urea nitrogen and decreased alkaline phosphatase activity. These results are of questionable biological significance because none were outside the established normal range for the species. In addition, rats exposed to 3,000 ppm *trans*-1,2-dichloroethene developed fibrous swelling and hyperemia of the cardiac muscle.

Freundt and Macholz (1978) reported the results of studies in which adult female SPF Wistar rats were exposed for 8 hours to concentrations of zero, 200, 600, 1,000, or 3,000 ppm *cis*-1,2-dichloro-ethene and *trans*-1,2-dichloroethene. Although the inhalation treatment of rats with either isomer of 1,2-dichloroethene produced a significant ($p<0.05$) and dose-dependent increase in the hexobarbital sleeping time and zoxazolamine paralysis time, the effects

produced by *cis*-1,2-dichloroethene were greater than those of *trans*-1,2-dichloroethene. In addition, both isomers of 1,2-dichloroethene produced a significant ($p<0.05$) and dose-dependent reversible inhibition in the formation of free aminoantipyrene. Freundt and Macholz (1978) also reported that the addition of 1,000 ppm *trans*-1,2-dichloroethene to rat microsomes competitively inhibited the N-demethylation of aminopyrine and the O-demethylation of *p*-nitroanisole.

A.6.3 References

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A.7 1,1,1-Trichloroethane

Toxicity Classification:

EPA's weight-of-evidence group D, "not classifiable as to human carcinogenicity" (EPA, 1990).

Toxicity Criteria:

Reference dose (RfD)–Oral:	0.035 mg/kg/day
Uncertainty Factor:	1,000
NOAEL:	500 ppm

(Comment: Value based on the hepatotoxicity observed in a 6-month inhalation study in the guinea pig by Torkelson et al. (1958). The Torkelson et al. (1958) study provided a NOAEL of 500 ppm that was converted to 90 mg/kg/day (EPA, 1991). Uncertainty factors of 10 each were employed for use of a subchronic assay, for extrapolation from animal data, and for protection of sensitive human subpopulations. The oral RfD is withdrawn from IRIS (EPA, 1995).)

Reference Dose (RfD)–Inhalation:	2.86E-1 mg/kg/day
Inhalation RfC_C:	1 $\mu g/m^3$ (0.3 g/kg/day)
Uncertainty Factor:	1,000
NOAEL:	500 ppm

(Comment: Value cited in EPA (1991). Uncertainty factors of 10 each were employed for use of a subchronic assay, for extrapolation from animal data, and for protection of sensitive human subpopulations. This value has been withdrawn from IRIS (EPA, 1995).)

Target Organs:

- Liver: Increased bilirubin levels, observed in one individual following accidental ingestion of 1,1,1-trichloroethane, is the main available evidence for hepatotoxicity of the chemical following oral exposure.
- Central nervous system: Anesthesia is one of the main effects of 1,1,1-trichloroethane administered orally to animals, resulting in death at high doses.

A.7.1 General Information

1,1,1-trichloroethane (methyl chloroform) (CAS No. 71-55-6) has a typical sweetish odor that may be noticeable at concentrations near 100 ppm, significantly less than those that cause toxic response. At 1,000 ppm, the odor is not unpleasant enough to discourage exposure, but at 1,500 and 2,000 ppm, the odor has been described as strong and unpleasant (Torkelson and Rowe, 1981). 1,1,1-trichloroethane has a molecular weight of 133.42, a specific gravity of 1.3249 (26/4°C), and a vapor pressure of 127 torr at 25°C (Torkelson and Rowe, 1981). It is soluble in acetone, benzene, carbon tetrachloride, methanol, and ether, but is insoluble in water (Budavari et al., 1989).

The 1989 use pattern for 1,1,1-trichloroethane is as follows: vapor degreasing (34 percent), cold cleaning (12 percent), aerosols (10 percent), adhesives (8 percent), intermediate (7percent), coatings (5 percent), electronics (4 percent), other (5 percent), and exports (15 percent) (Chem. Mark. Rep., 1989).

Both OSHA (1989) and ACGIH (1990) have established time-weighted averages (TWAs) of 350 ppm for 1,1,1-trichloroethane. The ACGIH short-term exposure limit (STEL) is 450 ppm. In 1989, the Chemical Marketing Reporter (1989) noted that the chemical was under study by EPA as a possible threat to the ozone layer.

1,1,1-trichloroethane is absorbed via inhalation, oral, and dermal exposure routes (ATSDR, 1990). After cessation of exposure, clearance of the chemical from the blood is rapid–60 to 80 percent is eliminated within 2 hours, and more than 95 percent is eliminated within 50 hours. A large fraction of the absorbed dose is excreted unchanged in exhaled air, regardless of route of exposure (Torkelson and Rowe, 1981). Humans metabolize less than 10 percent of the inhaled dose of 1,1,1-trichloroethane; the major urinary metabolites are trichloroethanol and its glucuronide conjugate, trichloroacetic acid, and volatile carbon dioxide (ATSDR, 1990; Nolan et al., 1984).

A.7.2 Basis for Toxicity Criteria

In both humans and animals, the first and primary response to acute, high concentrations of inhaled 1,1,1-trichloroethane is central nervous system (CNS) depression. The chemical also can sensitize the heart to epinephrine at high levels, but has little effect on other organs. Accidental exposures to concentrations ranging from 6,000 to 70,000 ppm have been fatal to humans (ATSDR, 1990; Torkelson and Rowe, 1981).

The effects of subchronic and chronic inhalation exposure to 1,1,1-trichloroethane are generally mild, characterized by growth reduction in guinea pigs (650 ppm), and minimal hepatic effects in mice (247 ppm, continuous exposure) and rats (1,500 ppm, intermittent exposure). Fatty liver in humans has been associated with exposure to 1,1,1-trichloroethane.

Subchronic and chronic oral RfD values for 1,1,1-trichloroethane are 0.9 mg/kg/day and 0 09 mg/kg/day, respectively (Torkelson et al., 1958; EPA, 1991), subchronic and chronic inhalation RfC values for the chemical are 10 mg/m^3 (3 mg/kg/day) and 1 mg/m^3 (0.3 mg/kg/day), respectively (Torkelson et al., 1958, EPA, 1991)

Oral bioassays were inconclusive regarding the carcinogenicity of 1,1,1-trichloroethane, and inhalation studies were negative (NCI, 1977; Maltoni et al., 1986). No epidemiological data for 1,1,1-trichloroethane and inadequate carcinogenicity data for animals place the chemical in EPA's weight-of-evidence group D, "not classifiable as to human carcinogenicity" (EPA, 1990).

A.7.2.1 Oral Exposures

Information about the chronic oral toxicity of 1,1,1-trichloroethane in humans was not available. In an NCI bioassay (NCI, 1977), Osborne-Mendel rats were treated by gavage with 750 or 1,500 mg of 1,1,1-trichloroethane/kg body weight in corn oil 5 days a week for 78 weeks. The only adverse effects observed in the rats were decreased body weights at both doses and more severe signs of aging in treated versus control animals. In the same bioassay, B6C3F$_1$ male and female mice given TWA doses of 2,500 or 4,011 mg/kg/day 5 days/week

for 78 weeks exhibited a reduced body weight gain, and female mice had a dose-related decrease in survival. In an analysis of this study, ATSDR (1990) identified the higher doses for both rats and mice as NOAELs for respiratory, cardiovascular, gastrointestinal, hematological, musculo-skeletal, hepatic, dermatological, immunological, and reproductive effects.

A.7.2.2 Inhalation Exposures

Intentional and accidental inhalation of 1,1,1-trichloroethane has resulted in human fatalities, as reported in several case studies (Hall and Hine, 1966; MacDougall et al., 1987; Stahl et al., 1969). Estimations for fatal exposure concentrations range from 6,000 to 70,000 ppm (ATSDR, 1990). Death has been attributed to either depression of the central nervous system (CNS), resulting in respiratory arrest , or sensitization of the heart to epinephrine, resulting in cardiac arrythmia. A 15-year-old boy who sniffed typing eraser fluid containing 1,1,1-trichloroethane had complained of double vision and hallucinations before he collapsed and died. Autopsy revealed a grossly edematous brain, edema of the lungs, liver and gut, and tonsillar herniation. Levels of 1,1,1-trichloroethane in the blood were 1.7 ng/mL (1.7 ppb). Levels of 1,1,1-trichloroethane in the blood of three other victims of fatal intoxication (ingested or inhaled) were estimated at 60, 62, and 120 ppm.

In one study, a NOAEL of 370 ppm was defined for Long-Evans and Sprague-Dawley rats, Hartley guinea pigs, squirrel monkeys, New Zealand rabbits, and beagle dogs exposed continuously to 1,1,1-trichloroethane concentrations of 135 or 370 ppm for 90 days (EPA, 1982). In another study, the following species were exposed to 1,1,1-trichloroethane 7 hours/day, 5 days/week for approximately 1 to 3 months: guinea pigs (650, 1,500, 3,000, or 5,000 ppm), rats (5,000 or 3,000 ppm); rabbits (5,000 ppm); and monkeys (3,000 ppm). Body weights, relative organ weights, and BUN levels were measured and histopathological examinations were performed on selected major organs. Rats were unaffected by exposure; rabbits showed slight retardation of growth at 5,000 ppm; and guinea pigs had "slight" liver degeneration at 3,000 ppm, "slight to moderate" degeneration at 5,000 ppm, testicular degeneration at 5,000 ppm, and slight, but significantly reduced growth rates at all exposure levels. The LOAEL for guinea pigs in this study was 650 ppm.

Torkelson et al. (1958) exposed rats, rabbits, guinea pigs, and monkeys to 1,1,1-trichloroethane concentrations of 500, 1,000, 2,000, or 10,000 ppm 7 hours/day, 5 days/week for 6 months. Growth rate, general appearance, mortality, hematology, organ weights and gross and microscopic pathology were evaluated. The female guinea pig was the most sensitive species. At 1,000 ppm, the female guinea pigs had fatty changes in the liver and statistically significant increases in liver weights. The NOAEL for the guinea pigs of this study was 500 ppm.

In an occupational exposure study, cardiovascular and hepatic functions were unaffected in employees exposed to 1,1,1-trichloroethane at an 8-hour TWA of 4 to 217 ppm for approximately 6 years (Kramer et al., 1976).

A.7.2.3 Carcinogenicity

Two oral carcinogenicity assays in animals were found. The NCI (1977) tested technical grade 1,1,1-trichloroethane in Osborne-Mendel rats. Fifty rats were given doses of 750 or 1,500 mg/kg/day, by gavage, 5 days/week for 78 weeks. The controls were untreated. An observation

period of 32 weeks followed. Treated males and females exhibited early mortality with a statistically significant dose-related trend ($P<0.04$). A variety of neoplasms was observed in both treated and matched control rats, but these were common to aged rats and were not dose-related. The investigators suggested that the low survival of rats of both sexes possibly precluded the detection of tumors late in life. The NCI (1977) also treated $B6C3F_1$ mice with time weighted average doses of 2,807 or 5615 mg 1,1,1-trichloroethane/kg/day, by gavage, 5 days/week for 78 weeks. An observation period of 12 weeks followed. A variety of neoplasms were observed in both treated and control groups, but only 25 to 45 percent of the treated animals survived until terminal sacrifice. Because of the high early mortality in both species, the investigators did not consider this study to be an adequate test of carcinogenicity.

Maltoni et al. (1986) conducted a carcinogenicity screening study in rats, using only one dose, a small sample size, and no statistical analyses. The animals received 500 mg/kg/day for 104 weeks and were examined for the induction of leukemia. An increase in the total incidence of "leukemias" (13 in treated rats and 4 in vehicle controls) was observed. The biological and statistical significance of these data were not clear. The investigators, unable to draw definite conclusions from these data because of limitations in experimental design, suggested that further carcinogenicity studies were needed.

A.7.3 References

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February 2, 2000

Ted Simon
Region IV

ASSISTANCE REQUESTED: Requested toxicity information on 1,1,2,2-tetrachloroethane. *(Defense Depot Memphis)*

ENCLOSED INFORMATION:

Attachment 1: **Risk Assessment Issue Paper for: Evaluation Cancer Assessment for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

Attachment 2: **Risk Assessment Issue Paper for: Evaluation of a Provisional RfC for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

Attachment 3: **Risk Assessment Issue Paper for: Derivation of a Provisional RfD for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)**

BE ADVISED: It is to be noted that the attached Risk Assessment Issue Papers have not been through the U.S. EPA's formal review process. Therefore, they do not represent a U S. EPA verified assessment. If you have any questions regarding this information, please contact the STSC at (513) 569-7300.

Attachments

Attachment 1

(97-024 / 06-24-98)

Risk Assessment Issue Paper for: Evaluation
Cancer Assessment for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)

INTRODUCTION

A cancer assessment for 1,1,2,2-tetrachloroethane is currently available on IRIS (U.S. EPA, 1997). Based on the lack of human carcinogenicity data and the finding of increased incidences of hepatocellular carcinomas in male and female mice, U.S. EPA considered 1,1,2,2-tetrachloroethane a possible human carcinogen, weight-of-evidence category Group C (U.S. EPA, 1986). NCI (1978) found significant dose-related increases in the incidence of hepatocellular carcinomas in groups of 50 male and 50 female B6C3F1 mice exposed to 142 or 282 mg/kg-day 1,1,2,2-tetrachloroethane in corn oil administered via gavage 5 days/week for 78 weeks followed by a 32-week observation period. NCI (1978) did not find any significant increases in the incidence of neoplasms in Osborne Mendel rats similarly exposed to 62 or 108 mg/kg-day (males) or 43 and 76 mg/kg-day (females). Using the results of the mouse NCI (1978) study, U.S. EPA (1997) derived an oral slope factor of 2.0E-1 per (mg/kg-day) and an inhalation unit risk of 5.8E-5 per ($\mu g/m^3$).

The cancer weight-of-evidence classification, oral slope factor, and inhalation unit risk were verified by the CRAVE Work Group in June 1986 (U.S. EPA, 1995). To determine if studies published after 1986 would impact the current cancer risk assessment, a recent ATSDR toxicological profile on 1,1,2,2-tetrachloroethane (ATSDR, 1996) and a literature search of the following databases: TOXLINE (1992-November 1997), CANCERLINE (1992-November 1997), RTECS, DART, CCRIS, EMIC, GENETOX, and TSCATS were reviewed.

Data on the carcinogenicity of 1,1,2,2-tetrachloroethane published after 1986 are limited to several genotoxicity studies; none of these studies would impact the current cancer assessment.

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Attachment 2

(97-024 / 06-24-98)

Risk Assessment Issue Paper for:
Evaluation of a Provisional RfC for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)

INTRODUCTION

An RfC for 1,1,2,2-tetrachloroethane is not available on IRIS (U.S. EPA, 1997) or HEAST (U.S. EPA, 1997). ATSDR (1996) has derived an intermediate inhalation minimal risk level (MRL) of 0.4 ppm for 1,1,2,2-tetrachloroethane. This MRL is based an increase in relative liver weight and signs of hyperplasia, granulation, and cell vacuolization in the livers of rats exposed to 130 ppm 1,1,2,2-tetrachloroethane 5 days/week, 5-6 hours/day for 15 weeks (Truffert et al., 1977). ACGIH (1997) adopted a TWA TLV of 1 ppm with a skin notation for 1,1,2,2-tetrachloroethane; the NIOSH (1997) REL is also 1 ppm with a skin notation. The current enforceable OSHA PEL is 5 ppm with a skin notation (OSHA, 1997).

The most recent document on 1,1,2,2-tetrachloroethane listed in the CARA database (U.S. EPA, 1991, 1994) is a HEA (U.S. EPA, 1984). This HEA, the Toxicological Profile on 1,1,2,2-tetrachloroethane (ATSDR, 1996), and a literature search of the following databases (conducted in November 1997): TOXLINE (1992-November 1997), CANCERLINE (1992-November 1997), RTECS, DART, CCRIS, EMIC, GENETOX, and TSCATS were used to identify relevant data for the derivation of a provisional RfC for 1,1,2,2-tetrachloroethane:.

REVIEW OF PERTINENT LITERATURE

The toxicity of 1,1,2,2-tetrachloroethane was first reported in workers applying 1,1,2,2-tetrachloroethane to cloth airplane wings during World War I (as reviewed by NIOSH, 1976). The primary effects observed in these workers included symptoms of liver damage (jaundice, enlarged livers), gastrointestinal disturbances (anorexia, nausea), and neurological effects (hand tremors, headaches, reduced patellar reflexes, paresthesias in the extremities, and sensations of deafness). Exposure concentrations were not reported and it is likely that the workers were also dermally-exposed to 1,1,2,2-tetrachloroethane.

Lobo-Mendonca (1963) observed a number of adverse health effects in a group of 380 workers at 23 Indian bangle manufacturing facilities (80% of workers employed at these facilities were examined). In addition to the inhalation exposure, approximately 50% of the examined workers had a substantial amount of dermal exposure to the 1,1,2,2-tetrachloroethane. Some of the workers were exposed to a mixture of equal parts acetone and 1,1,2,2-tetrachloroethane. Air samples were collected at several work areas in seven facilities. Levels of 1,1,2,2-tetrachloroethane ranged from 9.1 to 98.00 ppm (1-14 mg/m^3). High incidences of a number of effects were reported including anemia (33.7%), loss of appetite (22.6%), abdominal pain (23.7%), headaches (26.6%), vertigo (30.5%), and tremors (35%). The significance of these effects can not be

determined because a control group of unexposed workers was not examined. Lobo-Mendonca (1963) noted that the incidence of tremors appeared to be directly related to 1,1,2,2-tetrachloroethane exposure concentrations.

Over a three-year period, Jeney et al. (1957) examined 34-75 workers employed at a penicillin production facility. 1,1,2,2-Tetrachloroethane was used as an emulsifier and wide fluctuations in atmospheric levels occurred throughout the day. The investigators noted that the workers were only in the areas with high 1,1,2,2-tetrachloroethane concentrations for short periods of time and gauze masks with organic solvent filters were worn in these areas. During the first year of the study, 1,1,2,2-tetrachloroethane levels ranged from 0.016 to 1.7 mg/L (16-1700 mg/m^3; 2-248 ppm). In the second year of the study, ventilation in the work room was improved and 1,1,2,2-tetrachloroethane levels ranged from 0.01 to 0.85 mg/L (10-850 mg/m^3; 1-124 ppm). In the third year of the study, the workers were transferred to a newly built facility; 1,1,2,2-tetrachloroethane levels in the new facility ranged from 0.01 to 0.25 mg/L (10-250 mg/m^3; 1-36 ppm). At 2-month intervals, the workers received a general physical examination, and blood was drawn for measurement of hematological parameters, serum bilirubin levels, and liver function tests; urinary hippuric acid levels were measured every 6 months. It appears that workers with positive signs of liver damage were transferred to other areas of the facility and were not examined further. In the first year of the study, 31% of the examined workers had "general or gastrointestinal symptoms." Loss of appetite, bad taste in the mouth, epigastric pain, and a "dull straining pressure feeling in the area of the liver" was reported by 66% of the workers (presumably this is 66% of the workers with symptoms). Other symptoms included headaches, general weakness, and fatigue in 29%, severe weight loss in 4%, and "tormenting itching" in 1%. Enlargement of the liver was observed in 38% of the screened workers. Urobilinogenuria was detected in 50% of the workers; 31% of the workers with urobilinogenuria also had palpable livers. In the second year of the study, there was a decline in the number of symptomatic workers (13% of examined workers) and in workers with positive urobilonogenuria findings (24%). Liver enlargement was observed in 20% of the examined workers. In the third year, the number of workers reporting symptoms decreased to 2% and positive urobilinogen findings were found in 12% (the investigators noted that the increased urobilinogen levels were probably secondary to excessive alcohol consumption or dietary excess). Enlarged livers were found in 5% of the examined workers. In the first 3 years of the study, no alterations in erythrocyte or hemoglobin levels were found. Leukopenia (defined as leukocyte levels of less than 5800) was found in 20% of the workers, but no relationship between the number of cases and duration of 1,1,2,2-tetrachloroethane exposure was found. A positive relationship between duration of exposure and frequency of abnormal liver function test results was found; statistically significant correlations were found on the thymol and Takata-Ucko liver function tests, but not the gold sol reaction test. Abnormal hippuric acid levels were only detected in 1% of the examined workers during the first 2 years and no abnormalities were observed during the third year. Increased serum bilirubin levels (greater than 1 mg/dL) were observed in 20, 18.7, and 7.6% of the workers during the first, second, and third years, respectively. The prevalence of hepatitis was assessed using sickness benefit files. In the 1-year period prior to the study, 21 cases of hepatitis were found (total number of workers not reported). Three cases of hepatitis were found in the first year of the study, 8 cases in the second year, and 4 cases in the third year The lack of a control group and poor reporting of study design and results, precludes using this study for quantitative risk assessment.

Several animal studies have assessed the toxicity of inhaled 1,1,2,2-tetrachloroethane in animals (Shmuter, 1977; Truffert et al., 1977; Schmidt et al., 1972; Horiuchi et al., 1962). As discussed below, there are

a number of limitations to these studies. A recently conducted oral exposure study (Microbiological Associates, 1994) is also discussed. Data on the reproductive and/or developmental toxicity study is limited to a subchronic study in which exposed males were mated to unexposed females (Schmidt et al., 1972).

Shmuter (1977) exposed groups of 12 Chinchilla rabbits to 0, 2, 10, or 100 mg/m^3 (0.29, 1, and 14 ppm) 1,1,2,2-tetrachloroethane for 3 hours/day, 6 days/week for 8-10 months. Animals were vaccinated with 1 mL suspensions containing heated typhoid vaccine (1.5 billion), 1.5, 4.5-5, and 7.5-8 months after the initiation of 1,1,2,2-tetrachloroethane exposure. Significant increases and decreases in total antibody levels were observed in the 2 and 100 mg/m^3 groups, respectively. No significant alterations in 7S-typhoid antibody levels were observed. Significant alterations in the levels of "normal hemolysins to the Forsman antigen of RAM erythrocytes" were observed in the 10 and 100 mg/m^3 groups; levels were increased in the 10 mg/m^3 after 1.5, 2, and 2.5 months of exposure, decreased in the 10 mg/m^3 group after 4 months of exposure and decreased in the 100 mg/m^3 group during the first 6 months of exposure. Shmuter (1977) also reported increases in the electrophoretic mobility of specific antibodies. Exposure to 100 mg/m^3 resulted in a decrease in the relative content of antibodies in the γ globulin fraction and an increase in the T and β fractions.

Truffert et al. (1977) exposed a group of 55 female Sprague Dawley rats to 1,1,2,2-tetrachloroethane 5 days/week for 15 weeks (78 exposures). The daily exposure duration for the first 8 exposures was 6 hours, thereafter the duration was 5 hours (TWA daily exposure was 5.1 hours/day). The authors reported the calculated atmospheric concentration as 560 mL/m^3, this would correspond to a concentration of approximately 888,000 mg/m^3 (130,000 ppm); it is likely that the reported concentration is not correct: (1) it is not likely that any animals would have survived 15 weeks of exposure to such a high concentration of 1,1,2,2-tetrachloroethane [LC_{50} is approximately 1300 ppm (ATSDR, 1996)] and (2) this concentration exceeds the saturation point of 6600 ppm at 21°C. A group of 55 rats was used as controls. Interim sacrifices were conducted after 2, 4, 9, 19, 39, and 63 exposures (number of animals killed at each time period was not reported). Abnormal clinical signs were limited to pronounced prostration after the first exposure to 1,1,2,2-tetrachloroethane Decreases in weight gain were observed, however the authors did not report the magnitude of the change or the statistical significance. Increases in relative liver weights were observed beginning 2 weeks of exposure initiation. Hematological alterations were limited to a slight decrease in hematocrit. A dramatic increase (313%) in thymidine uptake in hepatic DNA was observed after 4 exposures; by the ninth exposure, thymidine uptake had decreased but still remained higher than in controls. Histological alterations were observed in the liver after nine exposures, these included granular appearance, cytoplasmic vacuolization, and evidence of hyperplasia (increase in number of binuclear cells and appearance of mitosis); the hepatic histological alterations regressed after 19 exposures and were no longer observed after 39 exposures. No histological alterations were observed in the kidneys, lungs, adrenals, ovaries, or uterus. Due to the uncertainty in the exposure concentration, a LOAEL can not be identified from this study.

In a subchronic inhalation study conducted by Schmidt et al. (1972), groups of 105 rats were exposed to 0 or 0.0133 mg/L (13.3 mg/m^3; 1.94 ppm) "daily" for 4 hours/day for 265 days. Groups of seven rats were killed after 110 or 265 days of exposure and 60 days after exposure termination, the remaining animals were observed until natural death. No significant alterations in survival were observed. Significant decreases in body weight gain were observed after 90-170 days of exposure; after 110 days of exposure, the 1,1,2,2-

tetrachloroethane-exposed rats weighed 3% less than controls, body weight data were not provided for other time periods. The following statistically significant alterations were observed after 110 days of exposure: increases in leukocyte levels, increases in β_1 globulin levels, and decreases in ACTH activity in the pituitary gland. After 265 days of exposure, there were significant increases in the percentage of segmented nucleated neutrophils, decreases in the percentage of lymphocytes, increases in total fat content of the liver, and decreases in pituitary ACTH activity (leukocyte levels did not differ from controls). γ-Globulin levels were not affected at either time period. This study is insufficient for identification of a NOAEL/LOAEL for subchronic exposure because the study design and results were poorly reported and gross and/or histological examinations of the major tissues/organs were not performed.

The Schmidt et al. (1972) study also included a reproductive/developmental toxicity substudy. One week before the end of the 9-month exposure, groups of seven control and 1,1,2,2-tetrachloroethane-exposed rats were mated with unexposed virgin female rats. It appears that each male with was mated with five females. The offspring were observed for 12 weeks and were examined macroscopically for malformations. No significant differences in the percentage of females having offspring (77.1% in controls vs 62.9% in exposed), number of pups per litter, average birth weight, gestation length, sex ratio, offspring mortality at postnatal days 1, 2, 7, 14, 21, and 84), and average weight on postnatal day 84). No macroscopic malformations were found.

Horiuchi et al. (1962) exposed an adult male monkey (*Macaca cynomolga Linné*) to 1,1,2,2-tetrachloroethane 2 hours/day, 6 days/week for 9 months (190 exposures). The 1,1,2,2-tetrachloroethane exposure level was 2000-4000 ppm (291-583 mg/m^3) for the first 20 exposures, 1000-2000 ppm (146-291 mg/m^3) for the next 140 exposures, and 3000-4000 ppm (437-583 mg/m^3) for the last 30 exposures. The authors noted that the monkey was weak after seven exposures and had diarrhea and anorexia between the twelfth and fifteenth exposures. Beginning at the fifteenth exposure, the monkey was "almost completely unconscious falling upon his side" 20 to 60 minutes after each exposure. Although the authors noted some changes in body weight gain and hematological parameters, the significance of these findings can not be determined because only one monkey was tested and there was no control group. Histological alterations consisted of fatty degeneration in the liver and splenic congestion. This study can not be used to identify a NOAEL/LOAEL for subchronic exposure because only one animal was tested.

In a subchronic study conducted for NTP (Microbiological Associates, 1994), groups of male and female F344 rats and B6C3F1 mice (10/sex/group/species) were fed diets containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks. The reported dosages were 18, 37, 75, 150, and 300 mg/kg-day for rats and 88, 175, 350, 700, and 1400 mg/kg-day for mice; vehicle and untreated control groups were used for each species. In the rats, no chemical-related alterations in mortality were observed. Significant decreases in body weight gain were observed in the male and female rats exposed to 75 (10.5 and 24.1% difference from vehicle controls for males and females) and 150 (45.4 and 63.2%) mg/kg-day, and weight loss was observed at the 300 mg/kg-day dose level. The decrease in body weight gain in the 150 mg/kg-day group and weight loss in the 300 mg/kg-day group were associated with reductions in food consumption. Thinness and pallor were observed in all animals in the 150 and 300 mg/kg-day groups. Statistically significant increases in absolute and relative liver weights were observed in males and females exposed to 37 mg/kg-day and higher. Significant alterations in absolute and/or relative weights were also observed in several other organs, these changes were considered secondary to the decreased body weight gain. A number of alterations in serum clinical chemistry parameters

consistent with liver damage were found: increased alanine aminotransferase, alkaline phosphatase, and sorbitol dehydrogenase levels in the 150 and 300 mg/kg-day groups, increased bile acid levels in the 300 mg/kg-day group, and decreased total protein, cholesterol, and/or albumin levels in the 150 and 300 mg/kg-day groups. Other alterations in serum chemistry parameters were not considered chemical-related. The liver appeared to be the primary target of 1,1,2,2-tetrachloroethane toxicity, histopathological alterations consisted of basophilic, eosinophilic, mixed cell, and/or clear cell foci of cellular alterations (incidence significantly higher in males exposed to 300 mg/kg-day and females exposed to ≥150 mg/kg-day), hepatocyte necrosis (males and females: ≥150 mg/kg-day), mitotic alterations in hepatocytes (males: 300 mg/kg-day; females: ≥150 mg/kg-day), liver pigmentation (males and females: ≥150 mg/kg-day), bile duct hyperplasia (males: 300 mg/kg-day; females: ≥150 mg/kg-day), hepatocyte hypertrophy (males: ≥150 mg/kg-day; females. ≥75 mg/kg-day), and cytoplasmic vacuolization (males: ≥18 mg/kg-day; females: ≥37 mg/kg-day). Other histopathological alterations consisted of spleen pigmentation (males: ≥75 mg/kg-day; females: ≥150 mg/kg-day), bone marrow atrophy (males and females: ≥150 mg/kg-day), spleen red pulp atrophy (males: ≥150 mg/kg-day; females: 300 mg/kg-day), clitoral gland and uterus atrophy (females: ≥150 mg/kg-day), bone metaphysis atrophy (males: 300 mg/kg-day; females: ≥150 mg/kg-day), and atrophy of the preputial gland, prostate, seminal vesicle, and testes (males: 300 mg/kg-day); the atrophy was considered secondary to the decrease in body weight gain. To summarize, this study provides evidence that the liver is a primary target of 1,1,2,2-tetrachloroethane toxicity. At the lowest dose tested, 18 mg/kg-day, there was a significant increase in the incidence of cytoplasmic vacuolization, this minimal effect was not considered adverse. At 37 mg/kg-day, significant increases in absolute and relative liver weights were observed, hepatocellular hypertrophy, spleen pigmentation, and decreases in body weight gain were observed at the next highest dosage (75 mg/kg-day). At 150 and 300 mg/kg-day, alterations in liver-related serum chemistry parameters (e.g., alanine aminotransferase, cholesterol), hepatocyte necrosis, bile duct hyperplasia, hepatocellular mitotic alterations, foci of cellular alterations, and liver pigmentation were observed (other effects observed at these dose levels were probably related to the marked decrease in body weight gain). Thus, this study identifies a NOAEL of 18 mg/kg-day and LOAEL of 37 mg/kg-day for liver effects in rats fed a diet containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks.

In mice, no chemical-related deaths were observed (Microbiological Associates, 1994). Significant decreases in body weight gain were observed in the male and female mice exposed to 350, 700, or 1400 mg/kg-day (difference from vehicle control: 43.8, 52.1, and 69.8%, respectively, for males and 13.5, 28.4, and 39.2% for females). Significant increases in absolute and relative liver weights were observed in the male mice exposed to 175 mg/kg-day or higher and in female mice exposed to 88 mg/kg-day or higher. Other changes in organ weights were considered to be secondary to the body weight changes. Chemical-related alterations in serum clinical chemistry consisted of decreases in total protein levels (males exposed to ≥175 mg/kg-day and females exposed to ≥700 mg/kg-day), decreases in cholesterol levels (males and females: ≥175 mg/kg-day), and increases in alanine aminotransferase, alkaline phosphatase, sorbitol dehydrogenase, and bile acids (males and females: ≥350 mg/kg-day). Histopathological evidence suggested that the liver was the most sensitive target of 1,1,2,2-tetrachloroethane toxicity. The hepatic alterations consisted of hepatocyte hypertrophy (males: ≥175 mg/kg-day; females: ≥88 mg/kg-day), and hepatocyte necrosis, focal pigmentation, bile duct hyperplasia, and/or hepatocyte hypertrophy (male and female: ≥ 350 mg/kg-day). An increase in lung focal lymphocyte cellular infiltration was observed in the female mice exposed to 700 or 1400 mg/kg-day, however the number of infiltrates was within the normal range and was not considered to be related to 1,1,2,2-tetrachloroethane

exposure. An increase in the number of residual bodies present in the seminiferous tubules of mice exposed to 1400 mg/kg-day and increases in the incidence of thymus atrophy in male and female mice exposed to 1400 mg/kg-day were observed; these effects were considered to be secondary to the decrease in body weight gain. Thus, this study identifies a minimal LOAEL of 88 mg/kg-day for liver effects (increased absolute and relative liver weights and hepatocyte hypertrophy at 88 mg/kg-day and multiple liver effects at higher doses) in mice exposed to dietary 1,1,2,2-tetrachloroethane for 13 weeks; a NOAEL was not identified.

DERIVATION OF PROVISIONAL RfC

The human and animal inhalation studies are inadequate for the derivation of a provisional RfC for 1,1,2,2-tetrachloroethane. However, the results of these studies suggest that the liver is a sensitive target of toxicity following inhalation exposure. Additionally, the available inhalation data suggest that the respiratory tract is not a particularly sensitive target. The oral toxicity database is sufficient to support derivation of a provisional RfD for 1,1,2,2-tetrachloroethane. A provisional RfD of 6E-2 mg/kg-day was derived from the Microbiological Associates (1994) study using an uncertainty factor of 300 (for additional information, please see the Issue Paper for the Provisional RfD).

In the absence of adequate inhalation data, a route-to-route extrapolation was considered. This approach is supported by the toxicokinetic data (as reviewed by ATSDR, 1996) which suggest that 1,1,2,2-tetrachloroethane is well-absorbed following oral or inhalation exposure and toxicity data which provide evidence that the liver may be the most sensitive target of toxicity following oral or inhalation exposure. The mechanisms of toxicity of 1,1,2,2-tetrachloroethane on the liver most likely involves oxidative and/or reductive reactions to form the proximate toxicant Following oral exposure, 1,1,2,2-tetrachloroethane is likely to be delivered to the liver via the portal vein and metabolized prior to entering the systemic circulation ("first pass" effect). Thus, it is likely that orally administered 1,1,2,2-tetrachloroethane will be more potent than inhaled 1,1,2,2-tetrachloroethane. No pharmacokinetic/pharmacodynamic data are available for this chemical which could be used to make adjustments for the first pass effect. It is likely that deriving an RfC based on oral exposure data will result in a value that is overprotective of liver effects following inhalation exposure. However, this uncertainty coupled with other uncertainties in the 1,1,2,2-tetrachloroethane database (lack of adequate reproductive and/or developmental toxicity data) precludes deriving an RfC for 1,1,2,2-tetrachloroethane.

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Attachment 3

(97-0024 / 06-24-98)

Risk Assessment Issue Paper for:
Derivation of a Provisional RfD for 1,1,2,2-Tetrachloroethane (CASRN 79-34-5)

INTRODUCTION

An RfD for 1,1,2,2-tetrachloroethane is not available on IRIS (U.S. EPA, 1997a) or HEAST (U.S. EPA, 1997b). Drinking water health advisories have not been derived for 1,1,2,2-tetrachloroethane. ATSDR (1996) derived an intermediate oral minimal risk level (MRL) and a chronic oral MRL for this chemical. The intermediate MRL of 0.6 mg/kg-day is based on a NOAEL of 56 mg/kg for decreases in body weight gain in female rats receiving gavage doses of 100 mg/kg 1,1,2,2-tetrachloroethane 5 days/week for 6 weeks (NCI, 1978). The basis for the chronic MRL of 0.04 mg/kg-day is a LOAEL for labored respiration, wheezing, and nasal discharge observed in female rats receiving gavage doses of 43 mg/kg 5 days/week for 78 weeks (NCI, 1978).

The most recent document on 1,1,2,2-tetrachloroethane listed in the CARA database (U.S. EPA, 1991, 1994) is a HEA (U.S. EPA, 1984). The HEA, Toxicological Profile on 1,1,2,2-tetrachloroethane (ATSDR, 1996), and a literature search of the following databases (conducted in November 1997): TOXLINE (1992-November 1997), CANCERLINE (1992-November 1997), RTECS, DART, CCRIS, EMIC, GENETOX, and TSCATS were used to identify relevant data for the derivation of a provisional RfD for 1,1,2,2-tetrachloroethane.

REVIEW OF PERTINENT LITERATURE

There are several reports of accidental and intentional ingestion of a single dose of 1,1,2,2-tetrachloroethane (as reviewed by NIOSH, 1976). Loss of consciousness, CNS depression, and death were the most common outcomes. Data on the effects associated with repeated oral exposure are not available for humans.

NCI (1978) and NTP (1996; Microbiological Associates, 1994) have investigated the subchronic and chronic oral toxicity of 1,1,2,2-tetrachloroethane in rats and mice. Data on the reproductive and developmental toxicity of 1,1,2,2-tetrachloroethane is limited to an inhalation study in which subchronically exposed male rats were mated to unexposed female rats (Schmidt et al., 1972).

In the NCI (1978) study, groups of male and female Osborne-Mendel rats and B6C3F1 mice (50/sex/group/species) were administered 1,1,2,2-tetrachloroethane in corn oil via gavage 5 days/week for 78 weeks. The TWA average doses were 62 and 109 mg/kg for male rats, 43 and 77 mg/kg for female rats, and 142 and 283 mg/kg for male and female mice. The exposure period was followed by a 32- or 12-week period in

which the rats and mice, respectively, were not exposed to 1,1,2,2-tetrachloroethane. Vehicle control and untreated control groups (20 animals/sex/species/group) were also used. A statistically significant association between increased mortality and dose was observed in the female rats; 10 of the high-dose females died during the first 5 weeks of the study (8 had pneumonia and no lesions were reported in the other 2 rats); NCI (1978) considered the deaths to be related to 1,1,2,2-tetrachloroethane exposure. No significant effects on survival were observed in the low-dose female rats and in both male dose groups. Clinical signs observed in the rats included a hunched appearance in the high-dose females and squinted or reddened eyes in both groups of 1,1,2,2-tetrachloroethane-exposed rats. The investigators noted that there was a low or moderate incidence of labored breathing, wheezing, and/or nasal discharge in all groups of animals during the first year of the study; near the end of the study, these respiratory signs were more frequently observed in the 1,1,2,2-tetrachloroethane-exposed animals; no additional information on this effect was provided. Dose-related decreases in body weight gain were observed in the rats; the differences between body weights of the vehicle control rats and the low- and high-dose rats were less than 10% for the low-dose group and 20 and 15% for the high-dose male and female rats, respectively. No significant increases in tumor incidence were observed in the rats. The incidences of hepatic fatty metamorphosis in high-dose male rats (0/20, 2/50, 9/49 in the vehicle control, low, and high-dose groups) and chronic murine pneumonia in low- and high-dose female rats (8/20, 34/50, 38/50, respectively) were significantly increased ($p<0.05$, Fisher Exact Test). Thus, this study identifies a LOAEL of 43 mg/kg (31 mg/kg-day) for an increased incidence of chronic murine pneumonia in female rats exposed to gavage doses of 1,1,2,2-tetrachloroethane for 78 weeks and FEL of 77 mg/kg (55 mg/kg-day).

A statistically significant association between mortality and dose was found in mice (NCI, 1978). There was a dramatic decrease in probability of survival after 45 weeks of exposure in the high-dose male and female mice. Acute toxic tubular nephrosis was determined to be the apparent cause of death in 33 high-dose males dying between weeks 69 and 70; the cause of death was not reported in the female mice. A high incidence (95%) of pronounced abdominal distension, probably resulting from liver tumors, was observed in the high-dose females beginning in week 60 and continuing throughout the recovery period. A very slight decrease in body weight gain (less than 10%) was observed in the high dose male mice; no other effects on body weight gain were observed. Significant increases in the incidence of hepatocellular carcinoma were observed in the low- and high-dose male and female mice. Significant increases in the incidence of nonneoplastic lesions were limited to hydronephrosis (0/20, 0/ 46, 16/46 in the control, low and high dose groups) and chronic inflammation (0/20, 0/46, and 5/46) in the kidneys of high-dose females. This study identifies a NOAEL of 142 mg/kg (101 mg/kg-day) and a FEL of 283 mg/kg (202 mg/kg-day) in mice exposed to 1,1,2,2-tetrachloroethane for 78 weeks.

NCI (1978) also conducted a subchronic range-finding study in rats and mice. In this study, groups of five male and five female Osborne Mendel rats received gavage doses of 0 (vehicle control group), 56, 100, 178, 316, and 562 mg/kg 1,1,2,2-tetrachloroethane in corn oil 5 days/week for 6 weeks followed by a 2 week observation period. Groups of five male and five female B6C3F1 mice were similarly exposed to 0, 32, 56, 100, 178, and 316 mg/kg 1,1,2,2-tetrachloroethane. It appears that mortality and body weight gain were the only endpoints used to assess toxicity. In the rats, increased mortality was observed in one male exposed to 100 mg/kg, and all five females exposed to 316 mg/kg (mortality rates in the 516 mg/kg group were not discussed). Decreases in body weight gain were observed in the rats at the 56, 100, and 178 mg/kg doses; the differences were 3, 9, and 38% for the males and 9, 24, and 41% for the females. No deaths were observed in the mice and

there were no significant alterations in body weight gain. The limited number of endpoints examined in this study precludes identifying NOAELs and/or LOAELs for subchronic exposure.

In a subchronic study conducted for NTP (Microbiological Associates, 1994), groups of male and female F344 rats and B6C3F1 mice (10/sex/group/species) were fed diets containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks. The reported dosages were 18, 37, 75, 150, and 300 mg/kg-day for rats and 88, 175, 350, 700, and 1400 mg/kg-day for mice; vehicle and untreated control groups were used for each species. In the rats, no chemical-related alterations in mortality were observed. Significant decreases in body weight gain were observed in the male and female rats exposed to 75 (10.5 and 24.1% difference from vehicle controls for males and females) and 150 (45.4 and 63.2%) mg/kg-day, and weight loss was observed at the 300 mg/kg-day dose level. The decrease in body weight gain in the 150 mg/kg-day group and weight loss in the 300 mg/kg-day group were associated with reductions in food consumption. Thinness and pallor were observed in all animals in the 150 and 300 mg/kg-day groups. Statistically significant increases in absolute and relative liver weights were observed in males and females exposed to 37 mg/kg-day and higher. Significant alterations in absolute and/or relative weights were also observed in several other organs, these changes were considered secondary to the decreased body weight gain. A number of alterations in serum clinical chemistry parameters consistent with liver damage were found: increased alanine aminotransferase, alkaline phosphatase, and sorbitol dehydrogenase levels in the 150 and 300 mg/kg-day groups, increased bile acid levels in the 300 mg/kg-day group, and decreased total protein, cholesterol, and/or albumin levels in the 150 and 300 mg/kg-day groups. Other alterations in serum chemistry parameters were not considered chemical-related. The liver appeared to be the primary target of 1,1,2,2-tetrachloroethane toxicity, histopathological alterations consisted of basophilic, eosinophilic, mixed cell, and/or clear cell foci of cellular alterations (incidence significantly higher in males exposed to 300 mg/kg-day and females exposed to ≥150 mg/kg-day), hepatocyte necrosis (males and females: ≥150 mg/kg-day), mitotic alterations in hepatocytes (males: 300 mg/kg-day; females: ≥150 mg/kg-day), liver pigmentation (males and females: ≥150 mg/kg-day), bile duct hyperplasia (males: 300 mg/kg-day; females: ≥150 mg/kg-day), hepatocyte hypertrophy (males: ≥150 mg/kg-day; females: ≥75 mg/kg-day), and cytoplasmic vacuolization (males: ≥18 mg/kg-day; females: ≥37 mg/kg-day). Other histopathological alterations consisted of spleen pigmentation (males: ≥75 mg/kg-day; females ≥150 mg/kg-day), bone marrow atrophy (males and females: ≥150 mg/kg-day), spleen red pulp atrophy (males: ≥150 mg/kg-day; females: 300 mg/kg-day), clitoral gland and uterus atrophy (females: ≥150 mg/kg-day), bone metaphysis atrophy (males: 300 mg/kg-day; females: ≥150 mg/kg-day), and atrophy of the preputial gland, prostate, seminal vesicle, and testes (males: 300 mg/kg-day); the atrophy was considered secondary to the decrease in body weight gain. To summarize, this study provides evidence that the liver is a primary target of 1,1,2,2-tetrachloroethane toxicity. At the lowest dose tested, 18 mg/kg-day, there was a significant increase in the incidence of cytoplasmic vacuolization, this minimal effect was not considered adverse. At 37 mg/kg-day, significant increases in absolute and relative liver weights were observed; hepatocellular hypertrophy, spleen pigmentation, and decreases in body weight gain were observed at the next highest dosage (75 mg/kg-day). At 150 and 300 mg/kg-day, alterations in liver-related serum chemistry parameters (e.g., alanine aminotransferase, cholesterol), hepatocyte necrosis, bile duct hyperplasia, hepatocellular mitotic alterations, foci of cellular alterations, and liver pigmentation were observed (other effects observed at these dose levels were probably related to the marked decrease in body weight gain). Thus, this study identifies a NOAEL of 18 mg/kg-day and LOAEL of 37 mg/kg-day for liver effects in rats fed a diet containing microencapsulated 1,1,2,2-tetrachloroethane for 13 weeks.

In mice, no chemical-related deaths were observed (Microbiological Associates, 1994). Significant decreases in body weight gain were observed in the male and female mice exposed to 350, 700, or 1400 mg/kg-day (difference from vehicle control· 43.8, 52.1, and 69.8%, respectively, for males and 13.5, 28.4, and 39.2% for females). Significant increases in absolute and relative liver weights were observed in the male mice exposed to 175 mg/kg-day or higher and in female mice exposed to 88 mg/kg-day or higher. Other changes in organ weights were considered to be secondary to the body weight changes. Chemical-related alterations in serum clinical chemistry consisted of decreases in total protein levels (males exposed to ≥175 mg/kg-day and females exposed to ≥700 mg/kg-day), decreases in cholesterol levels (males and females: ≥175 mg/kg-day), and increases in alanine aminotransferase, alkaline phosphatase, sorbitol dehydrogenase, and bile acids (males and females: ≥350 mg/kg-day). Histopathological evidence suggested that the liver was the most sensitive target of 1,1,2,2-tetrachloroethane toxicity. The hepatic alterations consisted of hepatocyte hypertrophy (males: ≥175 mg/kg-day; females: ≥88 mg/kg-day), and hepatocyte necrosis, focal pigmentation, bile duct hyperplasia, and/or hepatocyte hypertrophy (male and female: ≥ 350 mg/kg-day). An increase in lung focal lymphocyte cellular infiltration was observed in the female mice exposed to 700 or 1400 mg/kg-day, however the number of infiltrates was within the normal range and was not considered to be related to 1,1,2,2-tetrachloroethane exposure. An increase in the number of residual bodies present in the seminiferous tubules of mice exposed to 1400 mg/kg-day and increases in the incidence of thymus atrophy in male and female mice exposed to 1400 mg/kg-day were observed; these effects were considered to be secondary to the decrease in body weight gain. Thus, this study identifies a minimal LOAEL of 88 mg/kg-day for liver effects (increased absolute and relative liver weights and hepatocyte hypertrophy at 88 mg/kg-day and multiple liver effects at higher doses) in mice exposed to dietary 1,1,2,2-tetrachloroethane for 13 weeks, a NOAEL was not identified.

In a study examining the potential renal toxicity of orally administered halogenated ethanes, groups of five male F344/N rats received via gavage 0, 0.62, or 1.24 mmol/kg-day 1,1,2,2-tetrachloroethane in corn oil (0, 104, 208 mg/kg-day) daily for 21 days (NTP, 1996). All animals were grossly examined, the right kidney, liver, and right testis were weighed and the right kidney, left liver lobe, and gross lesions were examined histopathologically. Rats in the high-dose group died or were killed moribund before the end of the study; clinical observations included thin and lethargic (5/5 animals) and diarrhea accompanied by abnormal breathing and ruffled fur (3/5). In the low-dose group, no effects on survival, body weight gain, absolute and relative liver and kidney weights, or kidney histopathology were observed. Mild to moderate cytoplasmic vacuolization, consisting of multifocal areas of hepatocytes with clear droplets within the cytoplasm, was observed in the hepatocytes of all rats in the low dose group. The cytoplasmic vacuolization observed at 104 mg/kg-day was considered a minimal effect Thus, the 104 mg/kg-day dose is a NOAEL in rats exposed to 1,1,2,2-tetrachloroethane for 21 days and 208 mg/kg-day is a FEL.

In a 9-month inhalation study conducted by Schmidt et al. (1972), groups of 105 male rats were exposed to 0 or 0.0133 mg/L (1.94 ppm) 1,1,2,2-tetrachloroethane "daily" for 4 hours/day. One week before the end of the study, groups of seven control and 1,1,2,2-tetrachloroethane-exposed rats were mated with unexposed virgin female rats. It appears that each male was mated with five females. The offspring were observed for 12 weeks and were examined macroscopically for malformations. There were no statistically significant differences in the percentage of females having offspring (77.1% in controls vs 62.9% in exposed), number of pups per litter,

average birth weight, gestation length, sex ratio, offspring mortality at postnatal days 1, 2, 7, 14, 21, and 84, or average weight on postnatal day 84. No macroscopic malformations were found.

DERIVATION OF PROVISIONAL RfD

The subchronic toxicity studies conducted by Microbiological Associates (1994) for NTP suggest that the liver may be the most sensitive endpoint. Liver effects were observed at the lowest doses tested in rats and mice (18 and 88 mg/kg-day, respectively). The liver effects consisted of hepatocellular vacuolization and increases in absolute and relative liver weights at the low doses and hepatocyte necrosis and bile duct hyperplasia at higher doses. In the rat study, the increased incidence of cytoplasmic vacuolization observed at 18 mg/kg-day was not considered adverse. The increases in absolute and relative liver weight observed in rats exposed to 37 mg/kg-day were considered adverse and this dose was identified as the LOAEL. Liver effects were also reported in the 21-day rat study by NTP (1996) and the NCI (1978) chronic rat study. NTP (1996) found an increase in the incidence of cytoplasmic vacuolization in rats receiving gavage doses of 104 mg/kg-day (lowest dose tested) for 21 days and NCI (1978) observed a slight increase in the incidence of hepatic fatty metamorphosis in rats gavaged with 55 mg/kg-day (no liver effects were observed at 31 mg/kg-day) for 78 weeks. No nonneoplastic liver effects were observed in mice receiving gavage doses of 101 or 202 mg/kg-day for 78 weeks (an increase in the incidence of hepatocellular carcinomas were observed at both doses) (NCI, 1978). An increase in the incidence of chronic murine pneumonia was observed in rats receiving gavage doses of 31 mg/kg-day for 78 weeks (NCI, 1978).

Derivation of a provisional RfD for 1,1,2,2-tetrachloroethane based on the NOAEL of 18 mg/kg-day and LOAEL of 37 mg/kg-day identified in the rat subchronic study (Microbiological Associates, 1994) is recommended. The chronic rat study was not selected as the basis for the RfD because the chronic murine pneumonia observed at the lowest dose tested has not been observed in other oral or inhalation studies, is common age-related effect (incidence in the untreated control group was 90%), and the incidence was not dose-related. The NOAEL of 18 mg/kg-day was divided by an uncertainty factor of 300 (10 for interspecies extrapolation, 10 for intrahuman variability, and 3 for database deficiencies) to yield a provisional **RfD of 6E-2 mg/kg-day**. An uncertainty factor to account for the extrapolation from a subchronic study was not used because the results of the chronic rat study (NCI, 1978) do not suggest that more serious liver effects would occur at lower doses following chronic exposure. Thus, a partial uncertainty factor was used to extrapolate from a subchronic study to a chronic study. The uncertainty factor for database deficiencies was used to account for the lack of a 2-generation reproductive performance study and adequate developmental toxicity studies in two species.

Confidence in the Microbiological Associates (1994) study is high, it is a well-conducted study using an adequate number of animals and monitoring appropriate toxicity endpoints. Confidence in the database is low-to-medium because a NOAEL was not identified for hepatic effects and adequate reproductive and developmental toxicity studies are not available. Reflecting the low-to-medium confidence in the database, confidence in this provisional RfD is low.

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TAB

Appendix J

APPENDIX J

Ecological Assessment Checklist

7041521

Checklist for Ecological Assessment

I. SITE DESCRIPTION

1. Site Name: Northeast Open Area

   Location: Dunn Field

   County: Shelby City: Memphis State: TN

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 16 acres

4 Is this the first site visit? ☒Yes ☐No *If no, attach trip report of previous site visit(s), if available.*

   Date(s) of previous site visit(s):

5. Please attach to the checklist USGS topographic map(s) of the site, if available. See Section 2 of main report for site topographic map.

6. Are aerial or other site photographs available? ☒Yes ☐No *If yes, please attach any available photo(s) to the site map at the conclusion of this section.* see attached

7. The land use on the site is:

   The area surrounding the site is:
   0.5 mile radius

_____% Urban	_____% Urban
_____% Rural	_____% Rural
_____% Residential	30% Residential
100 % Industrial (☒light ☐heavy)	70% Industrial (☒light ☐heavy)
_____% Agriculture	_____% Agriculture
(Crops _____)	*(Crops_____)*
_____% Recreational	_____% Recreational
(Describe; note if it is a park, etc)	*(Describe; note if it is a park, etc.)*
_____% Undisturbed	_____% Undisturbed
_____% Other	_____% Other

8 Has any movement of soil taken place at the site? ☐Yes ☒No *If yes, please identify the most likely cause of this disturbance:*

☐Agricultural Use ☐Heavy Equipment ☐Mining

☐Natural Events ☐Erosion ☐Other

Please describe.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information* No

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map. Correspondence with US Fish and Wildlife Service and Tennessee Department of Environment and Conservation regarding protected species (1996), US Fish and Wildlife Service National Wetland Inventory Maps.

10 What type of facility is located at the site?

☐Chemical ☐Manufacturing ☐Mixing ☐Waste Disposal

☒Other (specify) several former pistol ranges.

11. What are the suspected contaminants of concern at the site? *If known, what are the maximum concentration levels?* Various inorganic and organic chemicals detected in surface soils, surface water, and sediment See Section 8 of RFI report for specifics.

12. Check any potential routes of off-site migration of contaminants observed at the site

☐Swales ☐Depressions ☒Drainage Ditches

☐Runoff ☐Windblown Particulates ☐Vehicular Traffic

☐Other(specify)

13. If known, what is the approximate depth to the water table? 37 bgs

14. Is the direction of surface runoff apparent from site observations? ☒Yes ☐No *If yes, to which of the following does the surface runoff discharge?* Indicate all that apply.

☒Suface Water ☐Groundwater ☐Sewer ☐Collection Impoundment

15 Is there a navigable waterbody or tributary to a navigable waterbody? ☐Yes ☒No

16. Is there a waterbody anywhere on or in the vicinity of the site? *If yes, also complete Section III: Aquatic Habitat Checklist – Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist – Flowing Systems.*

☐Yes (approximate distance_____) ☒No

17. Is there evidence of flooding? ☐Yes ☒No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information. If yes, complete Section V· Wetland Habitat Checklist.*

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. *[Use a blank sheet if additional space is needed for text.]* A Field Guide to the Birds - Peterson, R.T., 1980. Approximately 1 hour was spent at this site observing site conditions.

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐Yes ☒No *If yes, you are required to verify this information with the U.S Fish and Wildlife Service. If species' identities are known, please list them next.*

20 Record weather conditions at the time this checklist was prepared.

DATE:6/19/97

80oF Temperature (°C/°F) _____Normal daily high temperature

calm Wind (direction/speed) 0 Precipitation (rain, snow)

30% Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

The Northeast Open Area is a relatively inactive portion of Dunn Field that is completely grassed with patches of mature hardwood trees. The area is generally open with a sloping terrain that is routinely maintained by mowing. There are no open water bodies onsite; an onsite system of concrete lined stormwater drainageways is typically dry except during rainfall events. The site is surrounded by residential areas to the north and east (beyond the perimeter fence), and by Dunn Field property to the west and south. Overall, the maintained terrestrial areas provide minimal ecological habitat for plants or animals. This site is expected to serve as a future public open space for recreational purposes, therefore no future improvement in wildlife habitat quality is expected.

A few urban adapted wildlife species have been observed at Dunn Field. Species observed at Dunn Field include eastern gray squirrel, red fox, northern mockingbird, American kestrel, boat-tailed grackle, European starling, mourning dove, common bobwhite, rock dove, and killdeer. It is possible that other small mammals (e.g. mice, shrews, rabbits), birds (e.g. American robin, sparrows), and reptiles (e.g. five-lined skink, eastern garter snake) may also occur in the grassed areas at the site. The entire facility is fenced and therefore reduces use by large mammals (e.g. whitetail deer). A few wild dogs have been consistently observed roaming the Northeast Open Area. Overall the terrestrial habitat within the Northeast Open Area is of poor quality and provides limited habitat value for terrestrial wildlife.

There are no wetlands, and no state or federally listed or proposed endangered or threatened species are known to inhabit the area of the site.

Land use within a one-mile radius of Dunn Field is highly developed and is primarily residential or industrial. A few undeveloped and isolated forested areas also occur in the general area.

Completed by: John R Martin Affiliation CH2M HILL

Additional Preparers: NA

Site Manager:

Date: 6/19/97

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1 Are there any wooded areas at the site? ☒Yes ☐No *If no, go to Section IIB: Shrub/Scrub.*

2. What percentage of area of the site is wooded? (5 %_____acres). *Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site* Qualitative field estimate

3. What is the dominant type of vegetation in the wooded area?

   (Check one: ☐Evergreen ☒Deciduous ☐Mixed) *Provide a photograph, if available.*

   Dominant plant, if known: Oaks

4. What is the predominant size of the trees at the site? *Use diameter at breast height.*

   ☐0-6 inches ☐6-12 inches ☒> 12 inches

5. Specify type of understory present, if known. *Provide a photograph, if available.* Mowed bermuda and other grasses

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐Yes ☒No *If no, go to Section IIC: Open Field.*

2. What percentage of the site is covered by scrub/shrub vegetation? (_____%_____acres). *Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.*

3. What is the dominant type of scrub/shrub vegetation, if known? *Provide a photograph, if available.*

4. What is the approximate average height of the scrub/shrub vegetation?

   ☐0-2 feet ☐2-5 feet ☐>5 feet

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐Dense ☐Patchy ☐Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field present at the site? ☐Yes ☒No *If yes, please indicate the type below:*

☐Prarie/Plains ☐Savannah ☐Old Field ☐Other (specify)

2. What percentage of the site is open field? (_____%_____acres). *Indicate the open fields on the site map.*

3. What is/are the dominant plant(s)? *Provide a photograph, if available.*

IID. MISCELLANEOUS

1 Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☒Yes ☐No *If yes, identify and describe them below.*

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map. Entire site primarily open grass Low quality ecological habitat.Primarily Bermuda grass, frequently mowed.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? northern mockingbird, American kestrel, boat-tailed grackle, European starling, rock doves, killdeer. No mammals observed, but likely to include squirrels and other small mammals.

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

7041529

Northeast Open Area - 6/19/97

Southeast corner showing mowed grass, concrete lined drainage ditch, eastern perimeter fence, offsite residential area.

Northeast corner showing extensive mowed grass, few mature trees, concrete lined drainage ditch, and part of shed at Site 60 Pistol Range.

Checklist for Ecological Assessment

I. SITE DESCRIPTION

1. Site Name: Stockpile Area

   Location. Dunn Field

   County: Shelby City: Memphis State: TN

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 30 acres

4. Is this the first site visit? ☒Yes ☐No *If no, attach trip report of previous site visit(s), if available.*

   Date(s) of previous site visit(s):

5. Please attach to the checklist USGS topographic map(s) of the site, if available. See Section 2 of main report for site topographic map.

6. Are aerial or other site photographs available? ☒Yes ☐No *If yes, please attach any available photo(s) to the site map at the conclusion of this section.* see attached 2 photos

7. The land use on the site is:

   The area surrounding the site is:
   0.5 mile radius

_____% Urban	_____% Urban
_____% Rural	_____% Rural
_____% Residential	40% Residential
100 % Industrial (☒light ☐heavy)	60% Industrial (☒light ☐heavy)
_____% Agriculture	_____% Agriculture
(Crops:_____)	*(Crops_____)*
_____% Recreational	_____% Recreational
(Describe; note if it is a park, etc.)	*(Describe; note if it is a park, etc.)*
_____% Undisturbed	_____% Undisturbed
_____% Other	_____% Other

8. Has any movement of soil taken place at the site? ☒Yes ☐No *If yes, please identify the most likely cause of this disturbance:*

☐Agricultural Use ☒Heavy Equipment ☐Mining

☐Natural Events ☐Erosion ☐Other

Please describe. This area was used for long term storage of massive piles of fluorspar and bauxite. Recently all surface material was removed, and a clean cover of soil was put in place.

9 Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.* No

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map. Correspondence with US Fish and Wildlife Service and Tennessee Department of Environment and Conservation regarding protected species (1996); US Fish and Wildlife Service National Wetland Inventory Maps.

10. What type of facility is located at the site?

☐Chemical ☐Manufacturing ☐Mixing ☐Waste Disposal

☒Other (specify) Surface storage of mineral ores, including fluorspar and bauxite

11. What are the suspected contaminants of concern at the site? *If known, what are the maximum concentration levels?* A few inorganic and organic chemicals detected in the surface soil fill material. See Section 11 of RFI report for specifics.

12 Check any potential routes of off-site migration of contaminants observed at the site:

☐Swales ☐Depressions ☐Drainage Ditches

☐Runoff ☒Windblown Particulates ☒Vehicular Traffic

☐Other(specify)

13. If known, what is the approximate depth to the water table? 37 bgs

14 Is the direction of surface runoff apparent from site observations? ☐Yes ☒No *If yes, to which of the following does the surface runoff discharge?* Indicate all that apply.

☐Suface Water ☐Groundwater ☐Sewer ☐Collection Impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐Yes ☒No

16 Is there a waterbody anywhere on or in the vicinity of the site? *If yes, also complete Section III: Aquatic Habitat Checklist – Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist – Flowing Systems.*

☐Yes (approximate distance_____) ☒No

17. Is there evidence of flooding? ☐Yes ☒No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information. If yes, complete Section V: Wetland Habitat Checklist.*

18 If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. *[Use a blank sheet if additional space is needed for text.]* A Field Guide to the Birds - Peterson, R.T , 1980. Approximately 1 hour was spent at this site observing site conditions

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐Yes ☒No *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service. If species' identities are known, please list them next.*

20. Record weather conditions at the time this checklist was prepared.

DATE:6/19/97

80oF Temperature (°C/°F)

_____Normal daily high temperature

calm Wind (direction/speed)

0 Precipitation (rain, snow)

_____Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

The Stockpile Area is a currently inactive portion of Dunn Field that is completely grassed and has no trees. The area is entirely open with a relatively level terrain that is routinely maintained by mowing. Former large piles of fluorspar and bauxite were recently removed and clean soil was added as a cover in portions of the site. There are no water bodies onsite. The site is surrounded by a residential area to the east (beyond the perimeter fence), by Dunn Field property to the north (Northeast Open Area) and west (Disposal Area), and by DDMT Main Installation to the south beyond the perimeter fence and Dunn Avenue. Overall, the maintained terrestrial areas provide insignificant ecological habitat for plants or animals. This site is expected to be developed into a light industrial area, therefore no future improvement in wildlife habitat quality is expected.

A few urban adapted wildlife species have been observed at Dunn Field. Species observed at Dunn Field that may occur in the grassed Stockpile Area include red fox, northern mockingbird, American kestrel, boat-tailed grackle, European starling, mourning dove, common bobwhite, rock dove, and killdeer. It is possible that other small mammals (e.g. mice, shrews, rabbits), birds (e.g. American robin, sparrows), and reptiles (e.g. five-lined skink, eastern garter snake) may also occur at the site. The entire facility is fenced and therefore reduces use by large mammals (e.g. whitetail deer). Overall the terrestrial habitat within the Stockpile Area is of poor quality and provides limited habitat value for terrestrial wildlife.

There are no wetlands onsite, and no state or federally listed or proposed endangered or threatened species are known to inhabit the area of the site (TDEC, 1996, USFWS, 1996; Appendix ?).

Land use within a one-mile radius of Dunn Field is highly developed and is primarily residential or industrial. A few undeveloped and isolated forested areas also occur in the general area.

Completed by: John R. Martin Affiliation CH2M HILL

Additional Preparers: NA

Site Manager:

Date: 6/19/97

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐Yes ☒No *If no, go to Section IIB: Shrub/Scrub.*

2. What percentage of area of the site is wooded? (_____%_____acres). *Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.*0

3. What is the dominant type of vegetation in the wooded area?

   (Check one: ☐Evergreen ☐Deciduous ☐Mixed) *Provide a photograph, if available.*

   Dominant plant, if known:0

4. What is the predominant size of the trees at the site? *Use diameter at breast height.*

   ☐0-6 inches ☐6-12 inches ☐> 12 inches

5. Specify type of understory present, if known. *Provide a photograph, if available.*

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐Yes ☒No *If no, go to Section IIC: Open Field.*

2. What percentage of the site is covered by scrub/shrub vegetation? (_____%_____acres). *Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.*

3. What is the dominant type of scrub/shrub vegetation, if known? *Provide a photograph, if available.*

4 What is the approximate average height of the scrub/shrub vegetation?

   ☐0-2 feet ☐2-5 feet ☐>5 feet

5. Based on site observations, how dense is the scrub/shrub vegetation?

   ☐Dense ☐Patchy ☐Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field present at the site? ☐Yes ☒No *If yes, please indicate the type below.*

   ☐Prairie/Plains ☐Savannah ☐Old Field ☐Other (specify)

2. What percentage of the site is open field? (_____%_____acres). *Indicate the open fields on the site map*

3. What is/are the dominant plant(s)? *Provide a photograph, if available.*

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☒Yes ☐No *If yes, identify and describe them below.*

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map. Entire site open grass Low quality ecological habitat Primarily Bermuda grass, frequently mowed.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? northern mockingbird, American kestrel, boat-tailed grackle, European starling, rock doves, killdeer. No mammals observed, but likely to include squirrels and other small mammals

4 Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

Stockpile Area - 6/19/97

Central portion showing stockpiles, truck hauling activity, railroad tracks, mowed grass
The treeline is offsite beyond the perimeter fence

View of the southwest corner of the area showing mowed grass, perimeter fence, Dunn Avenue and Main Installation in background, and offsite active warehouse to the west

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Checklist for Ecological Assessment

I. SITE DESCRIPTION

1. Site Name: Disposal Area

   Location: Dunn Field

   County: Shelby City Memphis State: TN

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 10 acres

4. Is this the first site visit? ☒Yes ☐No *If no, attach trip report of previous site visit(s), if available.*

   Date(s) of previous site visit(s):

5. Please attach to the checklist USGS topographic map(s) of the site, if available. See Section 2 of main report for site topographic map

6. Are aerial or other site photographs available? ☒Yes ☐No *If yes, please attach any available photo(s) to the site map at the conclusion of this section.* see attached 2 photos

7. The land use on the site is:

   The area surrounding the site is:
   0.5 mile radius

_____% Urban	_____% Urban
_____% Rural	_____% Rural
_____% Residential	10% Residential
100 % Industrial (☒light ☐heavy)	90% Industrial (☒light ☐heavy)
_____% Agriculture	_____% Agriculture
(Crops._____)	*(Crops_____)*
_____% Recreational	_____% Recreational
(Describe; note if it is a park, etc.)	*(Describe; note if it is a park, etc.)*
_____% Undisturbed	_____% Undisturbed
_____% Other	_____% Other

8. Has any movement of soil taken place at the site? ☐Yes ☒No *If yes, please identify the most likely cause of this disturbance·*

☐Agricultural Use ☐Heavy Equipment ☐Mining

☐Natural Events ☐Erosion ☐Other

Please describe:

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*No

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map. Correspondence with US Fish and Wildlife Service and Tennessee Department of Environment and Conservation regarding protected species (1996); US Fish and Wildlife Service National Wetland Inventory Maps.

10. What type of facility is located at the site?

☐Chemical ☐Manufacturing ☐Mixing ☐Waste Disposal

☒Other (specify) Subsurface disposal of hazardous waste materials

11. What are the suspected contaminants of concern at the site? *If known, what are the maximum concentration levels?* Various inorganic and organic chemicals detected in surface soils. See Section 11 of RFI report for specifics.

12. Check any potential routes of off-site migration of contaminants observed at the site.

☒Swales ☐Depressions ☐Drainage Ditches

☐Runoff ☐Windblown Particulates ☐Vehicular Traffic

☐Other(specify)

13. If known, what is the approximate depth to the water table? 37 bgs

14. Is the direction of surface runoff apparent from site observations? ☒Yes ☐No *If yes, to which of the following does the surface runoff discharge?* Indicate all that apply.

☒Suface Water ☐Groundwater ☐Sewer ☐Collection Impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐Yes ☒No

16. Is there a waterbody anywhere on or in the vicinity of the site? *If yes, also complete Section III: Aquatic Habitat Checklist – Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist – Flowing Systems.*

☐Yes (approximate distance_____) ☒No

17. Is there evidence of flooding? ☐Yes ☒No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information. If yes, complete Section V: Wetland Habitat Checklist.*

18 If a field guide was used to aid any of the identifications, please provide a reference Also, estimate the time spent identifying fauna. *[Use a blank sheet if additional space is needed for text]* A Field Guide to the Birds - Peterson, R T., 1980. Approximately 1 hour was spent at this site observing site conditions.

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐Yes ☒No *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service. If species' identities are known, please list them next.*

20. Record weather conditions at the time this checklist was prepared:

DATE: 6/19/97

80oF Temperature (°C/°F) _____ Normal daily high temperature

calm Wind (direction/speed) 0 Precipitation (rain, snow)

30% Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

The Disposal Area is a currently inactive portion of Dunn Field that is completely grassed and has no trees. The area is entirely open with a relatively level terrain that is routinely maintained by mowing. There are no water bodies onsite. A large drainage swale occurs near the southwest corner of the Disposal Area that discharges to the western fenceline through Outfall 010, however this swale does not retain water following storm events. The site is surrounded by a sparse residential area to the north (beyond the perimeter fence), by Dunn Field property to the east (Northeast Open Area) and south (Stockpile Area), and by an active warehouse and MLGW substation opposite the west fenceline. Overall, the maintained terrestrial areas provide insignificant ecological habitat for plants or animals. This site is expected to be developed into a light industrial area, therefore no future improvement in wildlife habitat quality is expected

A few urban adapted wildlife species have been observed at Dunn Field. Species observed at Dunn Field that may occur in the grassed Disposal Area include red fox, northern mockingbird, American kestrel, boat-tailed grackle, European starling, mourning dove, common bobwhite, rock dove, and killdeer. It is possible that other small mammals (e.g. mice, shrews, rabbits), birds (e.g. American robin, sparrows), and reptiles (e.g. five-lined skink, eastern garter snake) may also occur at the site. The entire facility is fenced and therefore reduces use by large mammals (e.g whitetail deer). Overall the terrestrial habitat within the Disposal Area is of poor quality and provides limited habitat value for terrestrial wildlife.

There are no wetlands onsite, and no state or federally listed or proposed endangered or threatened species are known to inhabit the area of the site

Land use within a one-mile radius of Dunn Field is highly developed and is primarily residential or industrial. A few undeveloped and isolated forested areas also occur in the general area.

Completed by: John R Martin Affiliation CH2M HILL

Additional Preparers: NA

Site Manager:

Date. 6/19/97

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐Yes ☒No *If no, go to Section IIB: Shrub/Scrub.*

2. What percentage of area of the site is wooded? (_____%_____acres). *Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.*0

3. What is the dominant type of vegetation in the wooded area?

   (Check one: ☐Evergreen ☐Deciduous ☐Mixed) *Provide a photograph, if available.*

   Dominant plant, if known:0

4. What is the predominant size of the trees at the site? *Use diameter at breast height.*

   ☐0-6 inches ☐6-12 inches ☐> 12 inches

5. Specify type of understory present, if known. *Provide a photograph, if available.*

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐Yes ☒No *If no, go to Section IIC: Open Field.*

2. What percentage of the site is covered by scrub/shrub vegetation? (_____%_____acres) *Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.*

3. What is the dominant type of scrub/shrub vegetation, if known? *Provide a photograph, if available.*

4. What is the approximate average height of the scrub/shrub vegetation?

   ☐0-2 feet ☐2-5 feet ☐>5 feet

5. Based on site observations, how dense is the scrub/shrub vegetation?

   ☐Dense ☐Patchy ☐Sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field present at the site? ☐Yes ☒No *If yes, please indicate the type below:*

   ☐Prarie/Plains ☐Savannah ☐Old Field ☐Other (specify)

2. What percentage of the site is open field? (_____%_____acres). *Indicate the open fields on the site map.*

3. What is/are the dominant plant(s)? *Provide a photograph, if available.*

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? ☒Yes ☐No *If yes, identify and describe them below.*

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map. Entire site open grass. Low quality ecological habitat Primarily Bermuda grass, frequently mowed.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? northern mockingbird, American kestrel, boat-tailed grackle, European starling, rock doves, killdeer. No mammals observed, but likely to include squirrels and other small mammals.

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

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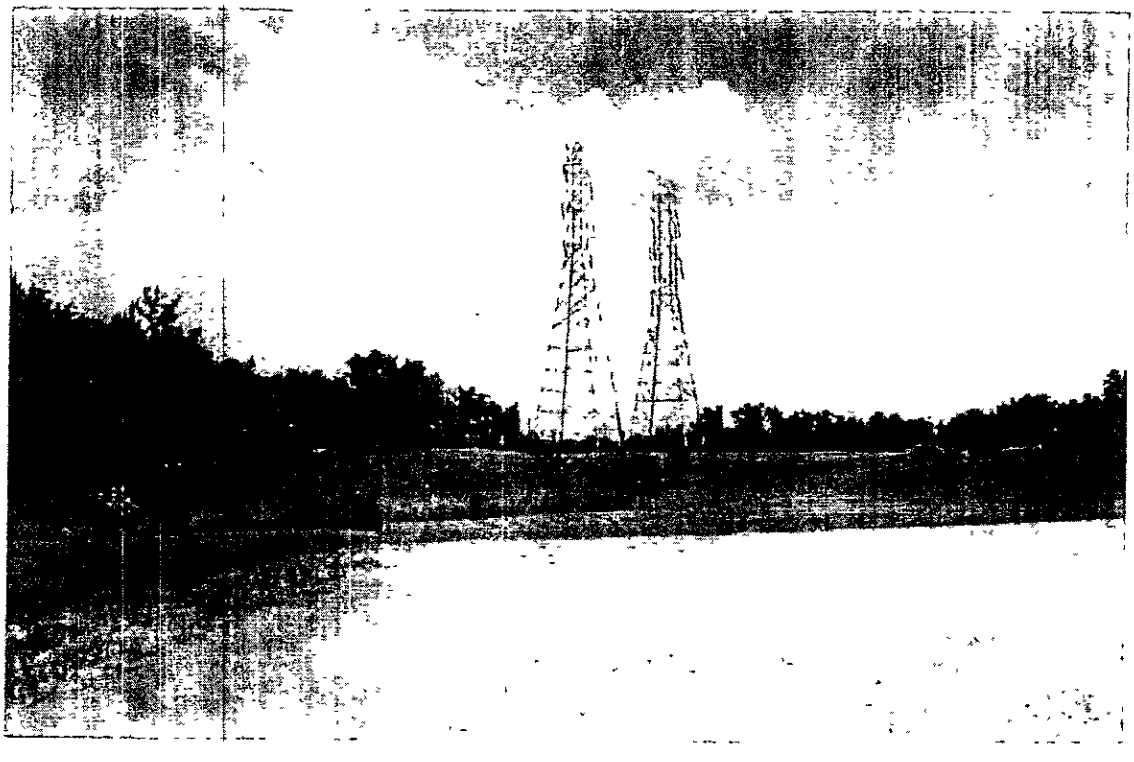
Disposal Area - 6/19/97

Northern portion showing extensive mowed grass, western perimeter fence and onsite monitoring wells, and offsite MLG&W substation.



View from the southern end, facing north, showing concrete pad in foreground, extensive mowed grass, and drainage swale leading to western perimeter fence.

TAB

Appendix K

APPENDIX K

Chemical Warfare Materiel Removal Conformation Soil Sample Analytical Data Summary

	StationID	CWM-1	CWM-1	CWM-1	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24
	SiteID	Site 01	Site 01	Site 01	Site 24A	Site 24A	Site 24A	Site 24B	Site 24B	Site 24B
	Sample Type :	Floor Sample	Floor Sample	Floor Sample	Floor Sample	Sidewall Sample	Sidewall Sample	Floor Sample	Floor Sample	Sidewall Sample
	SampleID	DFCWM001FD1	DFCWM001FS001	DFCWM001FS002	DFCWM24AFS001	DFCWM24ASW001	DFCWM24ASW002	DFCWM24BFS01	DFCWM24BFS02	DFCWM24BSS01
	Date Collected :	06/21/2000	06/21/2000	06/21/2000	10/30/2000	11/14/2000	11/14/2000	03/09/2001	03/09/2001	03/09/2001
	Time Collected .	12 55 PM		1 05 PM	4 50 PM	3 00 PM	3 15 PM	10 15 AM	10 30 AM	10 00 AM
	Sample Matrix .	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
	Sample Type .	Duplicate of FS001	N	N	N	N	N	N	N	N
	Parameters	Units								
TAL Metals										
	ALUMINUM	MG/KG	10500 =	12700 =	10200 =	7880 =	11200 =	11200 =	9900 =	7100 =	12700 =
	ANTIMONY	MG/KG	2 6 J	4 3 J	3 3 J	2 U	1 9 UJ	1 8 UJ	2 U	2 U	2 U
	ARSENIC	MG/KG	7 2 J	7 7 J	9 J	14 7 =	10 3 J	14 7 =	8 8 J	6.9 J	14 J
	BARIUM	MG/KG	114 =	124 =	146 =	125 =	209 =	98 4 =	63 2 =	73 7 =	123 =
	BERYLLIUM	MG/KG	0 5 J	0 59 J	0 52 J	0 48 J	0 7 J	0 47 J	0 28 J	0 5 J	0 47 J
	CADMIUM	MG/KG	0 3 J	0 38 J	0 37 J	0 23 J	0 17 J	0 22 J	0 17 U	0 27 U	0 38 U
	CALCIUM	MG/KG	3900 =	3490 =	13000 =	1960 =	1420 J	1070 J	940 J	1440 =	859 J
	CHROMIUM, TOTAL	MG/KG	16 1 J	18 9 J	14 5 J	11 6 =	10 8 J	13 9 J	13 3 =	11 3 =	60 6 =
	COBALT	MG/KG	7 7 J	8 J	6 8 J	7 3 J	11 4 J	6 6 J	5 3 J	7 4 J	5 3 J
	COPPER	MG/KG	17 3 =	18 3 =	21 4 =	18 1 =	20 1 =	20 5 =	14 8 =	16 1 =	20 2 =
	IRON	MG/KG	20000 =	22100 =	18500 =	20800 =	21500 =	22900 =	19100 =	15900 =	24000 =
	LEAD	MG/KG	13 8 =	11 2 =	22 8 =	20 =	15 =	29 1 =	16 6 =	17 7 =	30 2 =
	MAGNESIUM	MG/KG	2930 =	3280 =	2640 =	2040 =	2550 =	1950 =	2080 =	1860 =	2470 =
	MANGANESE	MG/KG	517 =	548 =	466 =	421 =	975 =	456 =	394 =	456 =	226 =
	MERCURY	MG/KG	0 03 U	0 03 U	0 03 J	0 04 J	0 02 U	0 05 J	0 01 U	0 03 J	0 05 J
	NICKEL	MG/KG	20 =	20 3 =	19 =	17 6 =	21 1 =	17 2 =	16 8 =	16 7 =	19 3 =
	POTASSIUM	MG/KG	1010 J	1530 J	845 J	681 J	818 J	771 J	811 J	526 J	1240 J
	SELENIUM	MG/KG	0 44 UJ	0 44 UJ	0 42 UJ	0 45 U	0 45 U	0 42 U	0 09 U	0 09 U	0 09 U
	SILVER	MG/KG	0 38 U	0 38 U	0 36 U	0 4 U	0 39 U	0 36 U	0 25 U	0 25 U	0 25 U
	SODIUM	MG/KG	72 7 J	97 9 J	73 4 J	55 6 J	63 J	41 J	58 2 J	83 2 J	218 J
	THALLIUM	MG/KG	0 26 U	0 39 U	0 24 U	0 27 J	0 34 U	0 51 U	0 21 J	0 18 J	0 42 J
	VANADIUM	MG/KG	26 9 =	33 6 =	23 7 =	22 9 =	24 6 =	23 9 =	24 3 =	19 4 =	28 3 =
	ZINC	MG/KG	56 7 =	61 6 =	56 2 =	62 3 =	64 5 =	57 =	47 2 =	52 9 =	249 =
TCL PCBs											
	PCB-1016 (AROCHLOR 1016)	UG/KG	42 U	42 U	39 U	42 U	41 U	40 U	810 U	820 U	840 U
	PCB-1221 (AROCHLOR 1221)	UG/KG	85 U	85 U	80 U	85 U	83 U	81 U	1600 U	1700 U	1700 U
	PCB-1232 (AROCHLOR 1232)	UG/KG	42 U	42 U	39 U	42 U	41 U	40 U	810 U	820 U	840 U
	PCB-1242 (AROCHLOR 1242)	UG/KG	42 U	42 U	39 U	42 U	41 U	40 U	810 U	820 U	840 U
	PCB-1248 (AROCHLOR 1248)	UG/KG	42 U	42 U	39 U	42 U	41 U	40 U	810 U	820 U	840 U
	PCB-1254 (AROCHLOR 1254)	UG/KG	42 U	42 U	39 U	42 U	41 U	40 U	810 U	820 U	840 U
	PCB-1260 (AROCHLOR 1260)	UG/KG	42 U	42 U	39 U	42 U	41 U	40 U	810 U	820 U	840 U
s	DECACHLOROBIPHENYL	%	88 =	89 =	91 =	86 =	83 =	85 =	128 =	133 =	111 =
TCL Pesticides											
	ALDRIN	UG/KG	2 2 U	2 2 U	2 U	0 91 J	2 1 U	2 U	21 UR	21 UR	22 UR
	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	2 U	21 UR	140 J	22 UR
	ALPHA ENDOSULFAN (ENDOSULFAN I)	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	2 U	21 UR	14 J	22 UR
	ALPHA-CHLORDANE	UG/KG	2 2 U	2 2 U	2 U	0 35 J	0 21 J	17 =	21 J	21 UR	22 UR
	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	2 U	21 UR	21 UR	22 UR
	BETA ENDOSULFAN (ENDOSULFAN II)	UG/KG	4 2 U	4 2 U	3 9 U	4 2 U	4 1 U	4 U	41 UR	41 UR	42 UR
	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	2 U	21 UR	21 UR	22 UR
	DIELDRIN	UG/KG	0 74 J	4 2 U	12 J	4 2 U	4 1 U	4 U	31 J	41 UR	42 UR
	ENDOSULFAN SULFATE	UG/KG	4 2 U	4 2 U	3 9 U	4 2 U	4 1 UJ	4 UJ	41 J	41 UR	42 UR
	ENDRIN	UG/KG	4 2 U	4 2 U	3 9 U	4 2 U	4 1 U	4 U	41 UR	41 UR	42 UR
	ENDRIN ALDEHYDE	UG/KG	4 2 U	4 2 U	3 9 U	4 2 UJ	4 1 UJ	4 UJ	41 J	41 UR	42 UR
	ENDRIN KETONE	UG/KG	4 2 U	4 2 U	3 9 U	1 3 J	4 1 U	4 U	41 J	41 UR	42 UR
	GAMMA BHC (LINDANE)	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	2 U	21 UR	33 J	22 UR
	GAMMA-CHLORDANE	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	19 =	21 J	21 UR	22 UR
	HEPTACHLOR	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	1 7 J	21 UR	21 UR	22 UR
	HEPTACHLOR EPOXIDE	UG/KG	2 2 U	2 2 U	2 U	2 2 U	2 1 U	2 U	21 UR	21 UR	22 UR
	METHOXYCHLOR	UG/KG	22 U	22 U	15 J	22 U	21 U	20 U	210 J	210 UR	220 UR

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	StationID :	CWM-1	CWM-1	CWM-1	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24
	SiteID:	Site 01	Site 01	Site 01	Site 24A	Site 24A	Site 24A	Site 24B	Site 24B	Site 24B
	Sample Type	Floor Sample	Floor Sample	Floor Sample	Floor Sample	Sidewall Sample	Sidewall Sample	Floor Sample	Floor Sample	Sidewall Sample
	SampleID .	DFCWM001FD1	DFCWM001FS001	DFCWM001FS002	DFCWM24AFS001	DFCWM24ASW001	DFCWM24ASW002	DFCWM24BFS01	DFCWM24BFS02	DFCWM24BSS01
	Date Collected	06/21/2000	06/21/2000	06/21/2000	10/30/2000	11/14/2000	11/14/2000	03/09/2001	03/09/2001	03/09/2001
	Time Collected ·	12 55 PM		1 05 PM	4 50 PM	3 00 PM	3 15 PM	10 15 AM	10 30 AM	10 00 AM
	Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
	Sample Type :	Duplicate of FS001	N	N	N	N	N	N	N	N
Parameters	Units									
p,p'-DDD	UG/KG	4 2 U	4 2 U	2 8 J	4 2 U	4 1 U	4 U	9 3 J	41 UR	120 J
p,p'-DDE	UG/KG	0 64 J	4 2 U	12 =	0 95 J	4 1 U	1 2 J	15 J	41 UR	42 UR
p,p'-DDT	UG/KG	4 2 U	4 2 U	14 J	4 2 UJ	4 1 U	2 4 J	41 J	41 UR	42 UR
TOXAPHENE	UG/KG	220 U	220 U	200 U	220 UJ	210 U	200 U	2100 J	2100 UR	2200 UR
s 2,4,5,6-TETRACHLORO-META-XYLENE	%	82 =	89 =	95 =	71 =	88 =	88 =	96 =	0 =	0 =
s DECACHLOROBIPHENYL	%	75 =	79 =	88 =	68 =	76 =	74 =	0 =	0 =	99 =
TCL SVOCs										
1,2,4-TRICHLOROBENZENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	230 J	98 J	840 U
1,2-DICHLOROBENZENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	910 =	280 J
1,3-DICHLOROBENZENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
1,4-DICHLOROBENZENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	670 J
2,2'-OXYBIS(1-CHLORO)PROPANE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
2,4,5-TRICHLOROPHENOL	UG/KG	1000 U	1000 U	990 U	2100 U	2000 U	2000 U	2000 U	2100 UJ	2100 U
2,4,6-TRICHLOROPHENOL	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	3000 =	520 J	840 U
2,4-DICHLOROPHENOL	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
2,4-DIMETHYLPHENOL	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	660 J
2,4-DINITROPHENOL	UG/KG	1000 UJ	1000 UJ	990 UJ	2100 U	2000 U	2000 U	2000 U	2100 UJ	2100 U
2,4-DINITROTOLUENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
2,6-DINITROTOLUENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
2-CHLORONAPHTHALENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
2-CHLOROPHENOL	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 UJ	840 U
2-METHYLNAPHTHALENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	140 J	400 J
2-METHYLPHENOL (o-CRESOL)	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 UJ	840 U
2-NITROANILINE	UG/KG	1000 U	1000 U	990 U	2100 U	2000 U	2000 U	2000 U	2100 U	2100 U
2-NITROPHENOL	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
3,3'-DICHLOROBENZIDINE	UG/KG	420 U	420 U	390 U	840 U	1600 U	1600 U	1600 U	1600 U	1700 U
3-NITROANILINE	UG/KG	1000 U	1000 U	990 U	2100 U	2000 U	2000 U	2000 U	2100 U	2100 U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	1000 U	1000 U	990 U	2100 U	2000 U	2000 U	2000 U	2100 U	2100 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
4-CHLORO-3-METHYLPHENOL	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
4-CHLOROANILINE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
4-METHYLPHENOL (p-CRESOL)	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 UJ	840 U
4-NITROANILINE	UG/KG	1000 U	1000 U	990 U	2100 U	2000 U	2000 U	2000 U	2100 U	2100 U
4-NITROPHENOL	UG/KG	1000 U	1000 U	990 U	2100 U	2000 U	2000 U	2000 U	2100 UJ	2100 U
ACENAPHTHENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
ACENAPHTHYLENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
ANTHRACENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
BENZO(a)ANTHRACENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
BENZO(a)PYRENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
BENZO(b)FLUORANTHENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	63 J	820 U	840 U
BENZO(g,h,i)PERYLENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
BENZO(k)FLUORANTHENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
BENZYL BUTYL PHTHALATE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
bis(2-CHLOROETHOXY) METHANE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
bis(2-ETHYLHEXYL) PHTHALATE	UG/KG	110 U	110 U	110 J	840 U	810 U	800 U	810 U	820 U	840 U
CARBAZOLE	UG/KG	420 U	420 U	390 U	840 U			810 U	820 U	840 U
CHRYSENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	50 J	820 U	840 U
DI-n-BUTYL PHTHALATE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	150 J	6300 =
DI-n-OCTYLPHTHALATE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U

	StationID		CWM-1	CWM-1	CWM-1	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24
	SiteID		Site 01	Site 01	Site 01	Site 24A	Site 24A	Site 24A	Site 24B	Site 24B	Site 24B
	Sample Type		Floor Sample	Floor Sample	Floor Sample	Floor Sample	Sidewall Sample	Sidewall Sample	Floor Sample	Floor Sample	Sidewall Sample
	SampleID :		DFCWM001FD1	DFCWM001FS001	DFCWM001FS002	DFCWM24AFS001	DFCWM24ASW001	DFCWM24ASW002	DFCWM24BFS01	DFCWM24BFS02	DFCWM24BSS01
	Date Collected		06/21/2000	06/21/2000	06/21/2000	10/30/2000	11/14/2000	11/14/2000	03/09/2001	03/09/2001	03/09/2001
	Time Collected		12 55 PM		1 05 PM	4 50 PM	3 00 PM	3 15 PM	10 15 AM	10 30 AM	10 00 AM
	Sample Matrix :		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
	Sample Type '		Duplicate of FS001	N	N	N	N	N	N	N	N
	Parameters	Units									
	DIBENZ(a,h)ANTHRACENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	DIBENZOFURAN	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	DIETHYL PHTHALATE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	82 J	160 J
	DIMETHYL PHTHALATE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	FLUORANTHENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	120 J	73 J	86 J
	FLUORENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	HEXACHLOROBENZENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	870 =	160 J	840 U
	HEXACHLOROBUTADIENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	HEXACHLOROCYCLOPENTADIENE	UG/KG	420 U	420 U	390 U	840 U	810 UJ	800 UJ	810 U	820 U	840 U
	HEXACHLOROETHANE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	INDENO(1,2,3-c,d)PYRENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	ISOPHORONE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	N-NITROSODI-n-PROPYLAMINE	UG/KG	420 U	420 U	390 U	840 U	810 UJ	800 UJ	810 U	820 U	840 U
	N-NITROSODIPHENYLAMINE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	NAPHTHALENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	73 J	1000 =
	NITROBENZENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	840 U
	PENTACHLOROPHENOL	UG/KG	210 U	210 U	200 U	420 U	410 U	400 U	3200 =	570 J	420 U
	PHENANTHRENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 U	68 J
	PHENOL	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	810 U	820 UJ	840 U
	PYRENE	UG/KG	420 U	420 U	390 U	840 U	810 U	800 U	100 J	820 U	70 J
s	2,4,6-TRIBROMOPHENOL	%	83 =	77 =	84 =	85 =	87 =	84 =	101 =	3 =	96 =
s	2-FLUOROBIPHENYL	%	95 =	82 =	92 =	89 =	97 =	96 =	94 =	86 =	81 =
s	2-FLUOROPHENOL	%	92 =	82 =	88 =	92 =	77 =	91 =	103 =	10 =	95 =
s	NITROBENZENE-D5	%	83 =	67 =	79 =	77 =	82 =	89 =	85 =	77 =	73 =
s	PHENOL-D5	%	85 =	71 =	75 =	85 =	89 =	87 =	98 =	0 =	83 =
s	TERPHENYL-D14	%	94 =	86 =	93 =	94 =	93 =	96 =	101 =	105 =	94 =
	TCL VOCs										
	1,1,1-TRICHLOROETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	1,1,2,2-TETRACHLOROETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	1,1,2-TRICHLOROETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	1,1-DICHLOROETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	1,1-DICHLOROETHENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	1,2-DICHLOROETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	1,2-DICHLOROPROPANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	2-HEXANONE	UG/KG	13 U	13 U	12 U	32 U	31 U	30 U	12 U	12 UJ	13 U
	ACETONE	UG/KG	23 J	21 J	30 J	32 U	27 J	28 =	12 UJ	24 UJ	90 J
	BENZENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	1 J	190 J
	BROMODICHLOROMETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	BROMOFORM	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	BROMOMETHANE	UG/KG	13 U	13 U	12 U	6 UJ	6 UJ	6 UJ	12 U	12 UJ	13 U
	CARBON DISULFIDE	UG/KG	13 U	13 U	2 J	6 U	6 U	6 U	12 U	12 UJ	1 J
	CARBON TETRACHLORIDE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	CHLOROBENZENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 =
	CHLOROETHANE	UG/KG	13 UJ	13 UJ	12 UJ	6 UJ	6 UJ	6 UJ	12 U	12 UJ	13 U
	CHLOROFORM	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 =	110 J	13 U
	CHLOROMETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	cis-1,2-DICHLOROETHYLENE	UG/KG				6 U	6 U	6 U			
	cis-1,3-DICHLOROPROPENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	DIBROMOCHLOROMETHANE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	ETHYLBENZENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	1 J	170 J
	M,P-XYLENE (SUM OF ISOMERS)	UG/KG				32 U	31 U	30 U			

	StationID	CWM-1	CWM-1	CWM-1	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24	CWM-24
	SiteID	Site 01	Site 01	Site 01	Site 24A	Site 24A	Site 24A	Site 24B	Site 24B	Site 24B
	Sample Type	Floor Sample	Floor Sample	Floor Sample	Floor Sample	Sidewall Sample	Sidewall Sample	Floor Sample	Floor Sample	Sidewall Sample
	SampleID	DFCWM001FD1	DFCWM001FS001	DFCWM001FS002	DFCWM24AFS001	DFCWM24ASW001	DFCWM24ASW002	DFCWM24BFS01	DFCWM24BFS02	DFCWM24BSS01
	Date Collected	06/21/2000	06/21/2000	06/21/2000	10/30/2000	11/14/2000	11/14/2000	03/09/2001	03/09/2001	03/09/2001
	Time Collected	12 55 PM		1 05 PM	4 50 PM	3 00 PM	3 15 PM	10 15 AM	10 30 AM	10 00 AM
	Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
	Sample Type	Duplicate of FS001	N	N	N	N	N	N	N	N
	Parameters	Units								
	METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	6 J	6 J	7 J	32 U	6 J	6 J	12 U	12 UJ	16 =
	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANON	UG/KG	13 U	13 U	12 U	32 U	31 U	30 U	12 U	12 UJ	13 U
	METHYLENE CHLORIDE	UG/KG	13 U	13 U	12 U	6 U	1 J	1 J	12 U	0 9 J	13 U
	O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG				6 U	6 U	6 U			
	STYRENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	TETRACHLOROETHYLENE(PCE)	UG/KG	13 U	13 U	3 J	6 U	6 U	6 U	12 U	12 UJ	13 U
	TOLUENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	40 =
	TOTAL 1,2-DICHLOROETHENE	UG/KG	13 U	13 U	12 U				12 U	12 UJ	13 U
	trans-1,2-DICHLOROETHENE	UG/KG				6 U	6 U	6 U			
	trans-1,3-DICHLOROPROPENE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	TRICHLOROETHYLENE (TCE)	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	VINYL CHLORIDE	UG/KG	13 U	13 U	12 U	6 U	6 U	6 U	12 U	12 UJ	13 U
	XYLENES, TOTAL	UG/KG	13 U	13 U	12 U				3 J	14 J	1200 =
s	1-BROMO-4-FLUOROBENZENE (4-BROMOFLUOROBEN	%	102 =	106 =	99 =	70 =	102 =	91 =	105 =	82 =	105 =
s	DIBROMOFLUOROMETHANE	%	102 =	104 =	100 =	88 =	108 =	105 =	107 =	95 =	114 =
s	TOLUENE-D8	%	98 =	101 =	98 =	81 =	103 =	95 =	100 =	64 =	105 =

MG/KG - milligrams per kilogram
UG/KG - micrograms per kilogram
'U' - not detected
'=' - detected concentration
'J' - estimated value
'R' - rejected value
s - surrogate

7041554

		StationID :	CWM-1	FIELDQC
		SampleID :	DFCWM001EB1	TRIP BLANK
		Date Collected :	06/21/2000	10/30/2000
		Time Collected :	12:00 PM	5 20 PM
		Sample Matrix :	SQ	WQ
		Sample Type :	EB	TB
	Parameter	Units		
Metals				
	ALUMINUM	UG/L	17 U	
	ANTIMONY	UG/L	14 U	
	ARSENIC	UG/L	0 6 U	
	BARIUM	UG/L	1 U	
	BERYLLIUM	UG/L	1 U	
	CADMIUM	UG/L	1 U	
	CALCIUM	UG/L	99.8 J	
	CHROMIUM, TOTAL	UG/L	13 =	
	COBALT	UG/L	2 U	
	COPPER	UG/L	2 U	
	IRON	UG/L	84.8 J	
	LEAD	UG/L	0 6 U	
	MAGNESIUM	UG/L	31 U	
	MANGANESE	UG/L	2 5 J	
	MERCURY	UG/L	0 1 U	
	NICKEL	UG/L	11 9 J	
	POTASSIUM	UG/L	370 U	
	SELENIUM	UG/L	0 4 U	
	SILVER	UG/L	2 U	
	SODIUM	UG/L	66 U	
	THALLIUM	UG/L	0 24 J	
	VANADIUM	UG/L	1 U	
	ZINC	UG/L	3 3 J	
PCBs				
	PCB-1016 (AROCHLOR 1016)	UG/L	1 U	
	PCB-1221 (AROCHLOR 1221)	UG/L	2 U	
	PCB-1232 (AROCHLOR 1232)	UG/L	1 U	
	PCB-1242 (AROCHLOR 1242)	UG/L	1 U	
	PCB-1248 (AROCHLOR 1248)	UG/L	1 U	
	PCB-1254 (AROCHLOR 1254)	UG/L	1 U	
	PCB-1260 (AROCHLOR 1260)	UG/L	1 U	
S	DECACHLOROBIPHENYL	%	42 =	
Pesticides				
	ALDRIN	UG/L	0.05 U	
	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	
	ALPHA ENDOSULFAN (ENDOSULFAN I)	UG/L	0.05 U	
	ALPHA-CHLORDANE	UG/L	0.05 U	
	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	
	BETA ENDOSULFAN (ENDOSULFAN II)	UG/L	0.1 U	
	DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L	0.05 U	
	DIELDRIN	UG/L	0.1 U	
	ENDOSULFAN SULFATE	UG/L	0.1 U	
	ENDRIN	UG/L	0.1 U	
	ENDRIN ALDEHYDE	UG/L	0.1 U	
	ENDRIN KETONE	UG/L	0.1 U	
	GAMMA BHC (LINDANE)	UG/L	0 05 U	
	GAMMA-CHLORDANE	UG/L	0.05 U	

		StationID :	CWM-1	FIELDQC
		SampleID :	DFCWM001EB1	TRIP BLANK
		Date Collected :	06/21/2000	10/30/2000
		Time Collected :	12.00 PM	5.20 PM
		Sample Matrix :	SQ	WQ
		Sample Type :	EB	TB
	Parameter	Units		
	HEPTACHLOR	UG/L	0.05 U	
	HEPTACHLOR EPOXIDE	UG/L	0 05 U	
	METHOXYCHLOR	UG/L	0.5 U	
	p,p'-DDD	UG/L	0 1 U	
	p,p'-DDE	UG/L	0 1 U	
	p,p'-DDT	UG/L	0.1 U	
	TOXAPHENE	UG/L	5 U	
S	2,4,5,6-TETRACHLORO-META-XYLENE	%	98 =	
S	DECACHLOROBIPHENYL	%	43 =	
SVOCs				
	1,2,4-TRICHLOROBENZENE	UG/L	10 U	
	1,2-DICHLOROBENZENE	UG/L	10 U	
	1,3-DICHLOROBENZENE	UG/L	10 U	
	1,4-DICHLOROBENZENE	UG/L	10 U	
	2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10 U	
	2,4,5-TRICHLOROPHENOL	UG/L	25 U	
	2,4,6-TRICHLOROPHENOL	UG/L	10 U	
	2,4-DICHLOROPHENOL	UG/L	10 U	
	2,4-DIMETHYLPHENOL	UG/L	10 U	
	2,4-DINITROPHENOL	UG/L	25 U	
	2,4-DINITROTOLUENE	UG/L	10 U	
	2,6-DINITROTOLUENE	UG/L	10 U	
	2-CHLORONAPHTHALENE	UG/L	10 U	
	2-CHLOROPHENOL	UG/L	10 U	
	2-METHYLNAPHTHALENE	UG/L	10 U	
	2-METHYLPHENOL (o-CRESOL)	UG/L	10 U	
	2-NITROANILINE	UG/L	25 U	
	2-NITROPHENOL	UG/L	10 U	
	3,3'-DICHLOROBENZIDINE	UG/L	10 U	
	3-NITROANILINE	UG/L	25 U	
	4,6-DINITRO-2-METHYLPHENOL	UG/L	25 U	
	4-BROMOPHENYL PHENYL ETHER	UG/L	10 U	
	4-CHLORO-3-METHYLPHENOL	UG/L	10 U	
	4-CHLOROANILINE	UG/L	10 U	
	4-CHLOROPHENYL PHENYL ETHER	UG/L	10 U	
	4-METHYLPHENOL (p-CRESOL)	UG/L	10 U	
	4-NITROANILINE	UG/L	25 U	
	4-NITROPHENOL	UG/L	25 U	
	ACENAPHTHENE	UG/L	10 U	
	ACENAPHTHYLENE	UG/L	10 U	
	ANTHRACENE	UG/L	10 U	
	BENZO(a)ANTHRACENE	UG/L	10 U	
	BENZO(a)PYRENE	UG/L	10 U	
	BENZO(b)FLUORANTHENE	UG/L	10 U	
	BENZO(g,h,i)PERYLENE	UG/L	10 U	
	BENZO(k)FLUORANTHENE	UG/L	10 U	
	BENZYL BUTYL PHTHALATE	UG/L	10 U	
	bis(2-CHLOROETHOXY) METHANE	UG/L	10 U	

7041556

		StationID :	CWM-1	FIELDQC
		SampleID :	DFCWM001EB1	TRIP BLANK
		Date Collected :	06/21/2000	10/30/2000
		Time Collected :	12:00 PM	5:20 PM
		Sample Matrix :	SQ	WQ
		Sample Type :	EB	TB
	Parameter	Units		
	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10 U	
	bis(2-ETHYLHEXYL) PHTHALATE	UG/L	10 U	
	CARBAZOLE	UG/L	10 U	
	CHRYSENE	UG/L	10 U	
	DI-n-BUTYL PHTHALATE	UG/L	10 U	
	DI-n-OCTYLPHTHALATE	UG/L	10 U	
	DIBENZ(a,h)ANTHRACENE	UG/L	10 U	
	DIBENZOFURAN	UG/L	10 U	
	DIETHYL PHTHALATE	UG/L	0.9 J	
	DIMETHYL PHTHALATE	UG/L	10 U	
	FLUORANTHENE	UG/L	10 U	
	FLUORENE	UG/L	10 U	
	HEXACHLOROBENZENE	UG/L	10 U	
	HEXACHLOROBUTADIENE	UG/L	10 U	
	HEXACHLOROCYCLOPENTADIENE	UG/L	10 U	
	HEXACHLOROETHANE	UG/L	10 U	
	INDENO(1,2,3-c,d)PYRENE	UG/L	10 U	
	ISOPHORONE	UG/L	10 U	
	N-NITROSODI-n-PROPYLAMINE	UG/L	10 U	
	N-NITROSODIPHENYLAMINE	UG/L	10 U	
	NAPHTHALENE	UG/L	10 U	
	NITROBENZENE	UG/L	10 U	
	PENTACHLOROPHENOL	UG/L	5 U	
	PHENANTHRENE	UG/L	10 U	
	PHENOL	UG/L	10 U	
	PYRENE	UG/L	10 U	
S	2,4,6-TRIBROMOPHENOL	%	90 =	
S	2-FLUOROBIPHENYL	%	88 =	
S	2-FLUOROPHENOL	%	96 =	
S	NITROBENZENE-D5	%	86 =	
S	PHENOL-D5	%	91 =	
S	TERPHENYL-D14	%	85 =	
VOCs				
	1,1,1-TRICHLOROETHANE	UG/L	10 U	1 U
	1,1,2,2-TETRACHLOROETHANE	UG/L	10 U	1 U
	1,1,2-TRICHLOROETHANE	UG/L	10 U	1 U
	1,1-DICHLOROETHANE	UG/L	10 U	1 U
	1,1-DICHLOROETHENE	UG/L	10 U	1 U
	1,2-DICHLOROETHANE	UG/L	10 U	1 U
	1,2-DICHLOROPROPANE	UG/L	10 U	1 U
	2-HEXANONE	UG/L	10 U	5 U
	ACETONE	UG/L	2 J	5 U
	BENZENE	UG/L	10 U	1 U
	BROMODICHLOROMETHANE	UG/L	10 U	1 U
	BROMOFORM	UG/L	10 U	1 U
	BROMOMETHANE	UG/L	10 U	1 U
	CARBON DISULFIDE	UG/L	10 U	1 U
	CARBON TETRACHLORIDE	UG/L	10 U	1 U

		StationID :	CWM-1	FIELDQC
		SampleID :	DFCWM001EB1	TRIP BLANK
		Date Collected :	06/21/2000	10/30/2000
		Time Collected :	12.00 PM	5.20 PM
		Sample Matrix :	SQ	WQ
		Sample Type :	EB	TB
	Parameter	**Units**		
	CHLOROBENZENE	UG/L	10 U	1 U
	CHLOROETHANE	UG/L	10 U	1 U
	CHLOROFORM	UG/L	10 U	1 U
	CHLOROMETHANE	UG/L	10 U	1 U
	cis-1,2-DICHLOROETHYLENE	UG/L		1 U
	cis-1,3-DICHLOROPROPENE	UG/L	10 U	1 U
	DIBROMOCHLOROMETHANE	UG/L	10 U	1 U
	ETHYLBENZENE	UG/L	10 U	1 U
	M,P-XYLENE (SUM OF ISOMERS)	UG/L		2 U
	METHYL ETHYL KETONE (2-BUTANONE)	UG/L	10 U	5 U
	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	10 U	5 U
	METHYLENE CHLORIDE	UG/L	0 3 J	0 3 J
	O-XYLENE (1,2-DIMETHYLBENZENE)	UG/L		1 U
	STYRENE	UG/L	10 U	1 U
	TETRACHLOROETHYLENE(PCE)	UG/L	10 U	1 U
	TOLUENE	UG/L	10 U	1 U
	TOTAL 1,2-DICHLOROETHENE	UG/L	10 U	
	trans-1,2-DICHLOROETHENE	UG/L		1 U
	trans-1,3-DICHLOROPROPENE	UG/L	10 U	1 U
	TRICHLOROETHYLENE (TCE)	UG/L	10 U	1 U
	VINYL CHLORIDE	UG/L	10 U	1 U
	XYLENES, TOTAL	UG/L	10 U	
s	1-BROMO-4-FLUOROBENZENE (4-BROMOFLUOROBENZENE)	%	102 =	98 =
s	DIBROMOFLUOROMETHANE	%	94 =	95 =
s	TOLUENE-D8	%	105 =	100 =

MG/L - milligrams per liter
UG/L - micrograms per liter
'U' - not detected
'=' - detected concentration
'J' - estimated value
'R' - rejected value
s - surrogate
EB - equipment blank
TB - trip blank

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ADMINISTRATIVE RECORD

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