APPENDICES

APPENDIX A

CA725 Form

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name:	*Vernay Laboratories, Inc.*
Facility Address:	*875 Dayton Street* *Yellow Springs, Ohio 45387*
Facility EPA ID #:	*OHD 004 243 002*

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

X If yes - check here and continue with #2 below.
___ If no - re-evaluate existing data, or
___ If data are not available skip to #6 and enter "IN" (more information needed) status code.
___

The following documents were considered:

- Current Conditions Report (Payne Firm 2002)
- First Quarter 2003 Progress Report (Payne Firm 2003a)
- Second Quarter 2003 Progress Report (Payne Firm 2003b)
- Third Quarter 2003 Progress Report (Payne Firm 2003c)
- Fourth Quarter 2003 Progress Report (Payne Firm 2004a)
- RCRA Corrective Action Technical Memorandum No. 3 Groundwater Monitoring (Payne Firm 2003d)
- RCRA Corrective Action Technical Memorandum No. 4 Soil Confirmation (Payne Firm, 2004b)
- First Quarter 2004 Progress Report (Payne Firm, 2004c)
- RCRA Phase I Facility Investigation Report (Payne Firm, 2004d)

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "Contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "Contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action programs overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air media known or reasonably suspected to be "Contaminated" above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Soil	X			See Section 2.2 of EI Report
Subsurface Water (unconsolidated)	X			See Section 2.2 of EI Report
Groundwater (Cedarville Aquifer)	X			See Section 2.2 of EI Report
Air (indoors)[2]		X		See Section 2.2 of EI Report
Surface Water	X			See Section 2.2 of EI Report
Sediment		X		See Section 2.2 of EI Report
Storm Sewer Water		X		See Section 2.2 of EI Report
Air (outdoors)		X		

___ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

X If yes (for any media) - continue after identifying key contaminants in each "Contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

___ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggests that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

Contamination has been identified in on-Facility and off-Facility soils, unconsolidated subsurface water and Cedarville Aquifer groundwater, and surface water. Section 2.2 of the EI Report (ENVIRON 2004) discusses screening criteria used to identify the presence of contamination in soil, subsurface water, groundwater, and surface water. The primary "contaminants" identified include tetrachlorethene and trichloroethene. Section 2.2.1 identifies all constituents that meet the definition of "contamination" in soil. Section 2.2.2 identifies all constituents that meet the definition of "contamination" in the unconsolidated subsurface water and Cedarville Aquifer groundwater. Section 2.2.5 identifies all constituents that meet the definition of "contamination" in surface water.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential **Human Receptors** (Under Current Conditions)						
"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Soil	*No*	***Yes***	*No*	***Yes***	***Yes***	*No*	*No*
Subsurface Water (unconsolidated)	*No*	*No*	*No*	***Yes***	*No*	*No*	*No*
Groundwater (Cedarville Aquifer)	***Yes***	*No*	*No*	*No*	*No*	*No*	*No*
~~Air (indoors)~~							
Surface Water	*No*	*No*	*No*	*No*	*No*	***Yes***	*No*
~~Storm Sewer Water~~							
~~Sediment~~							
~~Air (outdoors)~~							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors= spaces for Media which are not "Contaminated" as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

___ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

X _____

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

___ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code.

The potential for current human exposure to media that meet the definition of contamination is discussed in Section 2.3 of the EI Report (ENVIRON 2004). Section 2.3.1 addresses exposure pathways for soil. Section 2.3.2 addresses exposure pathways for subsurface water and groundwater. Section 2.3.3 addresses exposure pathways for surface water.

Rationale and Reference(s):

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "Contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

X If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "Contamination" (identified in #3) are not expected to be "significant."

___ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "Contamination" (identified in #3) are not expected to be "significant."

___ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

Under current conditions, exposures to site-related contamination for complete pathways has been determined to not be significant. Section 2.4 of the EI Report (ENVIRON 2004) discusses the significance of potential current exposures of excavation workers to contaminated soil and subsurface water, exposures of residents to groundwater, and exposure of recreators to surface water. The evaluation of potential exposure of on-Facility routine and excavation workers to contaminated soil and excavation workers to subsurface water determined that these exposures are not expected to be significant under current conditions. Evaluation of potential exposure of off-Facility excavation workers to soil and subsurface water in sewer line backfill determined that these exposures are not expected to be significant under current conditions. Evaluation of potential exposure of off-Facility recreators to contaminated surface water determined that these exposures are not expected to be significant under current conditions. Evaluation of potential exposures of residents to off-Facility potable and non-potable well water from the Cedarville Aquifer determined that these exposures are not expected to be significant under current conditions.

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

___ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "Contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

___ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

___ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

YE YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, ACurrent Human Exposures" are expected to be "Under Control" at *Vernay Laboratories, Inc.* located in *Yellow Springs, Ohio* under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

___ NO – "Current Human Exposures" are NOT "Under Control."

___ IN - More information is needed to make a determination.

Completed by	(signature) (print)	Date

Completed by	(signature) (title)	Date

Supervisor	(signature) (print) (title)	Date
	(EPA Region or State)	

Locations where References may be found:
USEPA Region 5 has the following documents, which support this determination: *RCRA Environmental Indicators Report (ENVIRON 2004)*

Contact telephone and e-mail numbers

(name)	
(phone #)	
(e-mail)	

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

APPENDIX B

Background Soil Concentrations

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Background Soil Concentrations

Background soil samples were collected during the Phase I RFI to characterize naturally occurring levels of inorganics in soil at the Facility. Background soil samples were collected from 10 locations from an area approximately 200 feet east of the Facility. The background sampling locations were selected based on proximity and historical site use (vegetable farming) that was similar to the Facility. The background soil sampling locations are listed on Table B-1 and shown on Figure 6a. At each location, one sample was collected from 0 to 2 ft bgs. Deeper samples, from 6-8 ft bgs, were collected at these locations but are not included in the calculations because they represent soil that would be rarely, if ever, encountered as part of background exposures to metals in soil. The boring logs for these locations and the analytical data for these samples will be provided in the Phase I Facility Investigation Report (Payne, 2004d).

The concentrations of inorganics in the samples from the 0 to 2 ft bgs interval are the most representative of background exposures to inorganics in soil because the general population encounters soil from this interval more often than deeper soil. The inorganic concentrations in background soil from this interval are summarized in Table B-1, which also includes summary statistics describing the concentration distributions and the 95% upper confidence limits (UCLs) on the means for site-specific background inorganics.

The UCLs presented on this table are nonparametric bootstrap confidence limits on the mean (Efron and Tibshirani 1998) calculated from 4,000 bootstrap replications and at a 0.05 level of significance. Nonparametric bootstrap statistical limits are more reliable than parametric statistical limits because, unlike parametric limits, they do not rely on assumptions about distribution shapes that are often difficult to justify.

Table B-1 summarizes the UCLs on the mean background levels of inorganics in the Off-Facility area. Concentrations of inorganics in soil at an AOI that are below these levels are considered to be within background and not site-related; concentrations higher than these levels are considered site-related. Table B-2 presents the cumulative cancer risks and hazard quotients that are associated with the naturally-occurring background levels, based on the exposure and toxicity assumptions that USEPA Region 9 (2002) used in deriving its Preliminary Remediation Goals (PRGs). These background levels of risks are not included in estimates of site-related risks.

Table B-1. Metal Concentrations in Background Soil (0-2 ft samples) Vernay Laboratories Inc., Yellow Springs, Ohio

		As		Cu		Zn	
Sample ID	**Location ID**	mg/kg		mg/kg		mg/kg	
GP02-032/00-02/020504	GP02-032	9.2		15.6		50	
GP02-033/00-02/020504	GP02-033	7.1		14.0		46	
GP02-034/00-02/020504	GP02-034	6.1		10.2		38	
GP02-035/00-02/020504	GP02-035	13.2		21.0		60	
GP02-088/00-02/012604	GP02-088	9.7	J	15.8		61	J
GP02-089/00-02/012604	GP02-089	11.1	J	21.5		59	J
GP02-090/00-02/012604	GP02-090	11.0	J	19.1		54	J
GP02-91/00-02/012304	GP02-091	16.4		32.8		87	
GP02-92/00-02/012304	GP02-092	15.1		25.4		71	
GP02-93/00-02/012304	GP02-093	21.4		34.0		91	
Count		**10**		**10**		**10**	
Detected		**10**		**10**		**10**	
Minimum		6.1		10.2		38	
Median		7.1		14.0		46	
Maximum		21.4		34.0		91	
Mean		7.5		13.3		45	
SD		1.6		2.8		6	
RSD		21%		21%		13%	
0.95 UCL		**10.1**		**17.9**		**54**	
0.95 Bootstrap UCL		**14.67**		**25.09**		**70.90**	
Background		**14.67**		**25.09**		**70.90**	
Notes:							

1. Concentrations for nondetects (U-qualified data) are 0.5 the quantitation limits.

Table B-2: Estimates of High End Cancer Risks and Hazard Quotient for Background Metals in Soil
Vernay Laboratories Inc., Yellow Springs, Ohio

Area	Chem Group	Chemical	CASRN	Carc Class	Conc in Soil[1] (mg/kg)	Industrial PRG at 10^{-6} Risk (mg/kg)	Industrial PRG at HQ of 1 (mg/kg)	Cancer Risk	HQ
BACKGROUND	INORG	Arsenic	7440-38-2	A	1.47E+01	1.6E+00	2.6E+02	9E-06	6E-02
BACKGROUND	INORG	Copper	7440-50-8	D	2.51E+01		4.1E+04		6E-04
BACKGROUND	INORG	Zinc	7440-66-6	D	7.09E+01		3.1E+05		2E-04
							SUM	**9E-06**	**6E-02**
Notes:									
1	The values are the surface soil background metals concentrations in Table B-1.								

APPENDIX C

Vapor Intrusion Calculations

APPENDIX C:

Vapor Intrusion Calculations

Vapor Intrusion Criteria for Soil and Subsurface Water/Ground Water

Site-specific criteria for soil (on-Facility) and subsurface water/ground water (on-Facility and off-Facility) based on the assumed migration of vapor from soil or ground water into a building are derived using a model recommended by USEPA (2003) for screening evaluations. The model is described in detail by Johnson and Ettinger (1991), USEPA (2003), and MDEQ (2002), and thus, is not repeated here. The input parameters used and the calculation of the criteria are shown in Tables C-1 through C-10 and are discussed below.

Soil Properties

As shown in the Current Conditions Report (Payne, 2002), the Technical Memorandum No. 3 Ground Water Monitoring (Payne, 2003d) and the Phase I RFI report (Payne Firm, 2004d), soil types at and near the Facility include sand, silt, and clay. Based on the soil boring logs and the geologic cross sections for on-Facility and off-Facility, the unconsolidated unit generally consists of silt and clay material with sporadic, discontinuous sand seams. Although limited in extent and generally intermixed with silt and clay soil horizons, in some on-Facility and off-Facility soil boring locations, sandy materials represent the majority of the soil profile. Therefore, as a conservative assumption, a continuous sand profile is used to represent soil in the vadose zone beneath the on-Facility buildings and off-Facility residences.

The soil-water profile in the vadose zone is estimated using the van Genuchten soil-water retention curve, and water retention parameters appropriate for sand. These parameters and the resulting soil-water profile in the vadose zone are shown in Tables C-4, C-6, C-7, C-8, and C-10. The effective diffusion coefficient term D_T^{eff} in the equation for the attenuation coefficient is calculated based on a "sand" soil type, which is representative of the soil in the vadose zone at the Facility.

The estimated soil-water retention parameters are used with a conservative estimate of the depth to ground water (3.5 m for slab-on-grade On-Facility building, and 0.9 m for Off-Facility building with basement).

Building Characteristics

Assumptions for characteristics of on-Facility (industrial) and off-Facility (residential) buildings

are based on default values from MDEQ (2002) as shown in as shown in Tables C-6, C-7 and C-10. This approach is highly conservative for evaluating existing buildings at the Facility, because the MDEQ's assumed industrial building size is much smaller than the size of the main on-Facility buildings, and overestimates indoor air concentrations from vapor intrusion. For on-Facility, a slab-on-grade building is used. For off-Facility, a home with a basement is used to conservatively estimate vapor migration to indoor air.

Inhalation Benchmarks

The industrial criteria are calculated based on occupational inhalation exposure limits, and the residential criteria are calculated based on inhalation toxicity values. The occupational inhalation exposure limits are exposure limits for air contaminants as established in the permissible exposure limits (PELs) established by the Occupational Safety and Health Administration (OSHA) (NIOSH 1997), and threshold limit values (TLVs) recommended by the American Conference of Government Industrial Hygienists (ACGIH 2003) for chemicals without PELs. These inhalation benchmarks are shown in Table C-1.

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Table C-1: Occupational Criteria
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	OSHA PEL (mg/m^3)			TLV-TWA (mg/m^3)			Criteria (mg/m^3)
			Value	Ref	Notes	Value	Ref	Notes	
VOC	Acetone	67-64-1	2.4E+03	46		1.2E+03	47		2.4E+03
VOC	Benzene	71-43-2	3.2E+00	46		1.6E+00	47		3.2E+00
VOC	Bromochloromethane	74-97-5	1.1E+03	46		1.1E+03	47		1.1E+03
VOC	Bromodichloromethane	75-27-4							
VOC	Bromoform	75-25-2	5.0E+00	46		5.2E+00	47		5.0E+00
VOC	Bromomethane	74-83-9				3.9E+00	47		3.9E+00
VOC	2-Butanone	78-93-3	5.9E+02	46		5.9E+02	47		5.9E+02
VOC	Carbon Disulfide	75-15-0				3.1E+01	47		3.1E+01
VOC	Carbon Tetrachloride	56-23-5	6.3E+01	46		3.1E+01	47		6.3E+01
VOC	Chlorobenzene	108-90-7	3.5E+02	46		4.6E+01	47		3.5E+02
VOC	Chloroethane	75-00-3	2.6E+03	46		2.6E+02	47		2.6E+03
VOC	Chloroform	67-66-3				4.9E+01	47		4.9E+01
VOC	Chloromethane	74-87-3				1.0E+02	47		1.0E+02
VOC	Cumene	98-82-8	2.5E+02	46		2.5E+02	47		2.5E+02
VOC	Cyclohexane	110-82-7	1.1E+03	46		3.4E+02	47		1.1E+03
VOC	1,2-Dibromo-3-chloropropane	96-12-8							
VOC	Dibromochloromethane	124-48-1							
VOC	1,2-Dibromoethane	106-93-4							
VOC	1,2-Dichlorobenzene	95-50-1				1.5E+02	47		1.5E+02
VOC	1,3-Dichlorobenzene	541-73-1							
VOC	1,4-Dichlorobenzene	106-46-7	4.5E+02	46		6.0E+01	47		4.5E+02
VOC	Dichlorodifluoromethane	75-71-8	5.0E+03	46		4.9E+03	47		5.0E+03
VOC	1,1-Dichloroethane	75-34-3	4.0E+02	46		4.0E+02	47		4.0E+02
VOC	1,2-Dichloroethane	107-06-2				4.0E+01	47		4.0E+01
VOC	1,1-Dichloroethene	75-35-4				2.0E+01	47		2.0E+01
VOC	1,2-Dichloroethene (total)	540-59-0	7.9E+02	46		7.9E+02	47		7.9E+02
VOC	cis-1,2-Dichloroethene	156-59-2				7.9E+02	47		7.9E+02
VOC	trans-1,2-Dichloroethene	156-60-5				7.9E+02	47		7.9E+02
VOC	1,2-Dichloropropane	78-87-5	3.5E+02	46		3.5E+02	47		3.5E+02
VOC	1,3-Dichloropropene (total)	542-75-6				4.5E+00	47		4.5E+00
VOC	cis-1,3-Dichloropropene	10061-01-5							
VOC	trans-1,3-Dichloropropene	10061-02-6							
VOC	Ethyl Benzene	100-41-4	4.4E+02	46		4.3E+02	47		4.4E+02
VOC	2-Hexanone	591-78-6	4.1E+02	46		2.0E+01	47		4.1E+02
VOC	Methyl Acetate	79-20-9	6.1E+02	46		6.1E+02	47		6.1E+02
VOC	Methyl tert-butyl ether	1634-04-4				1.8E+02	47		1.8E+02
VOC	4-Methyl-2-pentanone	108-10-1	4.1E+02	46		2.0E+02	47		4.1E+02
VOC	Methylcyclohexane	108-87-2	2.0E+03	46		1.6E+03	47		2.0E+03
VOC	Methylene Chloride	75-09-2	8.7E+01	46		1.7E+02	47		8.7E+01
VOC	Styrene	100-42-5	4.3E+02	46		8.5E+01	47		4.3E+02
VOC	1,1,2,2-Tetrachloroethane	79-34-5	3.5E+01	46		6.9E+00	47		3.5E+01
VOC	Tetrachloroethene	127-18-4	6.8E+02	46		1.7E+02	47		6.8E+02
VOC	Toluene	108-88-3	7.5E+02	46		1.9E+02	47		7.5E+02
VOC	1,2,4-Trichlorobenzene	120-82-1							
VOC	1,1,1-Trichloroethane	71-55-6	1.9E+03	46		1.9E+03	47		1.9E+03
VOC	1,1,2-Trichloroethane	79-00-5	4.5E+01	46		5.5E+01	47		4.5E+01
VOC	Trichloroethene	79-01-6	5.4E+02	46		2.7E+02	47		5.4E+02
VOC	Trichlorofluoromethane	75-69-4	5.6E+03	46					5.6E+03
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	7.6E+03	46		7.7E+03	47		7.6E+03
VOC	Vinyl Chloride	75-01-4	2.6E+00	46		2.6E+00	47		2.6E+00
VOC	Xylenes (total)	1330-20-7	4.4E+02	46		4.3E+02	47		4.4E+02
SVOC	Acenaphthene	83-32-9							
SVOC	Acenaphthylene	208-96-8							
SVOC	Acetophenone	98-86-2				4.9E+01	47		4.9E+01
SVOC	Anthracene	120-12-7							
SVOC	Atrazine	1912-24-9				5.0E+00	47		5.0E+00
SVOC	Benzaldehyde	100-52-7							
SVOC	Benzo(a)anthracene	56-55-3					47		
SVOC	Benzo(a)pyrene	50-32-8					47		

Table C-1: Occupational Criteria
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	OSHA PEL (mg/m^3)			TLV-TWA (mg/m^3)			Criteria (mg/m^3)
			Value	Ref	Notes	Value	Ref	Notes	
SVOC	Benzo(b)fluoranthene	205-99-2					47		
SVOC	Benzo(g,h,i)perylene	191-24-2							
SVOC	Benzo(k)fluoranthene	207-08-9							
SVOC	Biphenyl	92-52-4	1.0E+00	46		1.3E+00	47		1.0E+00
SVOC	bis(2-Chloroethoxy)methane	111-91-1							
SVOC	bis(2-Chloroethyl) ether	111-44-4				2.9E+01	47		2.9E+01
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	5.0E+00	46		5.0E+00	47		5.0E+00
SVOC	4-Bromophenyl-phenyl ether	101-55-3							
SVOC	Butylbenzylphthalate	85-68-7							
SVOC	Caprolactam	105-60-2				5.0E+00	47		5.0E+00
SVOC	Carbazole	86-74-8							
SVOC	4-Chloro-3-methylphenol	59-50-7							
SVOC	4-Chloroaniline	106-47-8							
SVOC	2-Chloronaphthalene	91-58-7							
SVOC	2-Chlorophenol	95-57-8							
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3							
SVOC	Chrysene	218-01-9					47		
SVOC	Dibenz(a,h)anthracene	53-70-3							
SVOC	Dibenzofuran	132-64-9							
SVOC	3,3'-Dichlorobenzidine	91-94-1					47		
SVOC	2,4-Dichlorophenol	120-83-2							
SVOC	Diethylphthalate	84-66-2				5.0E+00	47		5.0E+00
SVOC	2,4-Dimethylphenol	105-67-9							
SVOC	Dimethylphthalate	131-11-3	5.0E+00	46		5.0E+00	47		5.0E+00
SVOC	Di-n-butylphthalate	84-74-2	5.0E+00	46		5.0E+00	47		5.0E+00
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	2.0E-01	46		2.0E-01	47		2.0E-01
SVOC	2,4-Dinitrophenol	51-28-5							
SVOC	2,4-Dinitrotoluene	121-14-2							
SVOC	2,6-Dinitrotoluene	606-20-2							
SVOC	Di-n-octylphthalate	117-84-0							
SVOC	Fluoranthene	206-44-0							
SVOC	Fluorene	86-73-7							
SVOC	Hexachlorobenzene	118-74-1				2.0E-03	47		2.0E-03
SVOC	Hexachlorobutadiene	87-68-3				2.1E-01	47		2.1E-01
SVOC	Hexachlorocyclopentadiene	77-47-4				1.1E-01	47		1.1E-01
SVOC	Hexachloroethane	67-72-1	1.0E+01	46		9.7E+00	47		1.0E+01
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5							
SVOC	Isophorone	78-59-1	1.4E+02	46					1.4E+02
SVOC	2-Methylnaphthalene	91-57-6							
SVOC	2-Methylphenol	95-48-7	2.2E+01	46		5.0E+00	47		2.2E+01
SVOC	4-Methylphenol	106-44-5	2.2E+01	46		2.2E+01	47		2.2E+01
SVOC	Naphthalene	91-20-3	5.0E+01	46		5.2E+01	47		5.0E+01
SVOC	2-Nitroaniline	88-74-4							
SVOC	3-Nitroaniline	99-09-2							
SVOC	4-Nitroaniline	100-01-6	6.0E+00	46		3.0E+00	47		6.0E+00
SVOC	Nitrobenzene	98-95-3	5.0E+00	46		5.0E+00	47		5.0E+00
SVOC	2-Nitrophenol	88-75-5							
SVOC	4-Nitrophenol	100-02-7							
SVOC	N-Nitrosodiphenylamine	86-30-6							
SVOC	N-Nitroso-di-n-propylamine	621-64-7							
SVOC	N-Nitrosomorpholine	59-89-2							
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1							
SVOC	Pentachlorophenol	87-86-5	5.0E-01	46		5.0E-01	47		5.0E-01
SVOC	Phenanthrene	85-01-8							
SVOC	Phenol	108-95-2	1.9E+01	46		1.9E+01	47		1.9E+01
SVOC	Pyrene	129-00-0							
SVOC	2,4,5-Trichlorophenol	95-95-4							
SVOC	2,4,6-Trichlorophenol	88-06-2							
P/PCB	PCBs (total)	1336-36-3	5.0E-01	46	351	5.0E-01	47	351	5.0E-01

Table C-1: Occupational Criteria
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	OSHA PEL (mg/m^3)			TLV-TWA (mg/m^3)			Criteria (mg/m^3)
			Value	Ref	Notes	Value	Ref	Notes	
P/PCB	Aroclor-1016	12674-11-2							
P/PCB	Aroclor-1221	11104-28-2							
P/PCB	Aroclor-1232	11141-16-5							
P/PCB	Aroclor-1242	53469-21-9	1.0E+00	46		1.0E+00	47		1.0E+00
P/PCB	Aroclor-1248	12672-29-6							
P/PCB	Aroclor-1254	11097-69-1	5.0E-01	46		5.0E-01	47		5.0E-01
P/PCB	Aroclor-1260	11096-82-5							
P/PCB	Aldrin	309-00-2	2.5E-01	46		2.5E-01	47		2.5E-01
P/PCB	alpha-BHC	319-84-6							
P/PCB	beta-BHC	319-85-7							
P/PCB	delta-BHC	319-86-8							
P/PCB	gamma-BHC	58-89-9	5.0E-01	46		5.0E-01	47		5.0E-01
P/PCB	Chlordane	57-74-9	5.0E-01	46		5.0E-01	47		5.0E-01
P/PCB	alpha-Chlordane	5103-71-9							
P/PCB	gamma-Chlordane	5103-74-2							
P/PCB	4,4'-DDD	72-54-8							
P/PCB	4,4'-DDE	72-55-9							
P/PCB	4,4'-DDT	50-29-3	1.0E+00	46		1.0E+00	47		1.0E+00
P/PCB	Dieldrin	60-57-1	2.5E-01	46		2.5E-01	47		2.5E-01
P/PCB	Endosulfan I	959-98-8							
P/PCB	Endosulfan II	33213-65-9							
P/PCB	Endosulfan sulfate	1031-07-8							
P/PCB	Endrin	72-20-8	1.0E-01	46		1.0E-01	47		1.0E-01
P/PCB	Endrin aldehyde	7421-93-4							
P/PCB	Endrin ketone	53494-70-5							
P/PCB	Heptachlor	76-44-8	5.0E-01	46		5.0E-02	47		5.0E-01
P/PCB	Heptachlor epoxide	1024-57-3				5.0E-02	47		5.0E-02
P/PCB	Methoxychlor	72-43-5				1.0E+01	47		1.0E+01
P/PCB	Toxaphene	8001-35-2	5.0E-01	46		5.0E-01	47		5.0E-01
INORG	Aluminum	7429-90-5	5.0E+00	46					5.0E+00
INORG	Antimony	7440-36-0	5.0E-01	46		5.0E-01	47		5.0E-01
INORG	Arsenic	7440-38-2	5.0E-01	46		1.0E-02	47		5.0E-01
INORG	Barium	7440-39-3	5.0E-01	46		5.0E-01	47		5.0E-01
INORG	Beryllium	7440-41-7	2.0E-03	46		2.0E-03	47		2.0E-03
INORG	Cadmium	7440-43-9	5.0E-03	46		1.0E-02	47		5.0E-03
INORG	Calcium	7440-70-2							
INORG	Chromium (total)	7440-47-3	1.0E+00	46					1.0E+00
INORG	Chromium III	16065-83-1	5.0E-01	46		5.0E-01	47		5.0E-01
INORG	Chromium VI	18540-29-9							
INORG	Cobalt	7440-48-4	1.0E-01	46		2.0E-02	47		1.0E-01
INORG	Copper	7440-50-8							
INORG	Cyanide (total)	57-12-5	5.0E+00	46					5.0E+00
INORG	Iron	7439-89-6							
INORG	Lead	7439-92-1	5.0E-02	46		5.0E-02	47		5.0E-02
INORG	Magnesium	7439-95-4							
INORG	Manganese	7439-96-5				2.0E-01	47		2.0E-01
INORG	Mercury	7439-97-6				2.5E-02	47		2.5E-02
INORG	Nickel	7440-02-0	1.0E+00	46					1.0E+00
INORG	Potassium	7440-09-7							
INORG	Selenium	7782-49-2	2.0E-01	46		2.0E-01	47		2.0E-01
INORG	Silver	7440-22-4	1.0E-02	46					1.0E-02
INORG	Sodium	7440-23-5							
INORG	Thallium	7440-28-0	1.0E-01	46		1.0E-01	47		1.0E-01
INORG	Vanadium	7440-62-2							
INORG	Zinc	7440-66-6							

Table C-2: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		URF ($mg/m^3)^{-1}$			RfC (mg/m^3)			
			Value	Ref	Value	Ref	Notes	Value	UF	Ref	Notes
VOC	Acetone	67-64-1	ID	1							
VOC	Benzene	71-43-2	A	1	7.8E-03	1	60	3.0E-02	300	1	
VOC	Bromochloromethane	74-97-5									
VOC	Bromodichloromethane	75-27-4	B2	1							
VOC	Bromoform	75-25-2	B2	1	1.1E-03	1				2	90
VOC	Bromomethane	74-83-9	D	1				5.0E-03	100	1	
VOC	2-Butanone	78-93-3	ID	1				5.0E+00	300	1	
VOC	Carbon Disulfide	75-15-0						7.0E-01	30	1	
VOC	Carbon Tetrachloride	56-23-5	B2	1	1.5E-02	1					
VOC	Chlorobenzene	108-90-7	D	1				6.0E-02	1,000	103	
VOC	Chloroethane	75-00-3						1.0E+01	300	1	
VOC	Chloroform	67-66-3	B2	1	2.3E-02	1		5.0E-02	100	117	
VOC	Chloromethane	74-87-3	D	1				9.0E-02	1,000	1	
VOC	Cumene	98-82-8	D	1				4.0E-01	1,000	1	
VOC	Cyclohexane	110-82-7	ID	1				6.0E+00	300	1	
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	2				2.0E-04	1,000	1	
VOC	Dibromochloromethane	124-48-1	C	1							
VOC	1,2-Dibromoethane	106-93-4	B2	1	2.2E-01	1					
VOC	1,2-Dichlorobenzene	95-50-1	D	1				2.0E-01	1,000	2	3
VOC	1,3-Dichlorobenzene	541-73-1	D	1							
VOC	1,4-Dichlorobenzene	106-46-7	C	2				8.0E-01	100	1	
VOC	Dichlorodifluoromethane	75-71-8						2.0E-01	10,000	2	
VOC	1,1-Dichloroethane	75-34-3	C	1				5.0E-01	1,000	2	3
VOC	1,2-Dichloroethane	107-06-2	B2	1	2.6E-02	1		5.0E-03	3,000	102	92
VOC	1,1-Dichloroethene	75-35-4	C	1				2.0E-01	30	1	
VOC	1,2-Dichloroethene (total)	540-59-0									
VOC	cis-1,2-Dichloroethene	156-59-2	D	1							
VOC	trans-1,2-Dichloroethene	156-60-5									
VOC	1,2-Dichloropropane	78-87-5	B2	2				4.0E-03	300	1	
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1	4.0E-03	1		2.0E-02	30	1	
VOC	cis-1,3-Dichloropropene	10061-01-5			4.0E-03	1	11	2.0E-02	30	1	11
VOC	trans-1,3-Dichloropropene	10061-02-6									
VOC	Ethyl Benzene	100-41-4	D	1				1.0E+00	300	1	
VOC	2-Hexanone	591-78-6						5.0E-03	10,000	108	
VOC	Methyl Acetate	79-20-9									
VOC	Methyl tert-butyl ether	1634-04-4						3.0E+00	100	1	
VOC	4-Methyl-2-pentanone	108-10-1	ID	1				3.0E+00	300	1	
VOC	Methylcyclohexane	108-87-2						3.0E+00	100	2	
VOC	Methylene Chloride	75-09-2	B2	1	4.7E-04	1		3.0E+00	100	2	
VOC	Styrene	100-42-5						1.0E+00	30	1	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1	5.8E-02	1				88	90
VOC	Tetrachloroethene	127-18-4	C-B2	77	3.1E-03	77		4.0E-01	300	109	94
VOC	Toluene	108-88-3	D	1				4.0E-01	300	1	
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1				2.0E-01	1,000	2	
VOC	1,1,1-Trichloroethane	71-55-6	D	1				2.2E+00	90	73	
VOC	1,1,2-Trichloroethane	79-00-5	C	1	1.6E-02	1					
VOC	Trichloroethene	79-01-6	C-B2	49	1.7E-03	49					
VOC	Trichlorofluoromethane	75-69-4						7.0E-01	10,000	2	3
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1						3.0E+01	100	2	
VOC	Vinyl Chloride	75-01-4	A	1	8.8E-03	1	79	1.0E-01	30	1	
VOC	Xylenes (total)	1330-20-7	ID	1				1.0E-01	300	1	
SVOC	Acenaphthene	83-32-9									
SVOC	Acenaphthylene	208-96-8	D	1							
SVOC	Acetophenone	98-86-2	D	1							
SVOC	Anthracene	120-12-7	D	1						2	90
SVOC	Atrazine	1912-24-9	C	2							
SVOC	Benzaldehyde	100-52-7									
SVOC	Benzo(a)anthracene	56-55-3	B2	1							

Table C-2: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		URF ($mg/m^3)^{-1}$			RfC (mg/m^3)			
			Value	Ref	Value	Ref	Notes	Value	UF	Ref	Notes
SVOC	Benzo(a)pyrene	50-32-8	B2	1							
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1							
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1							
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1							
SVOC	Biphenyl	92-52-4	D	1							
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	1							
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1	3.3E-01	1					
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1							
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	1							
SVOC	Butylbenzylphthalate	85-68-7	C	1							
SVOC	Caprolactam	105-60-2									
SVOC	Carbazole	86-74-8	B2	2							
SVOC	4-Chloro-3-methylphenol	59-50-7									
SVOC	4-Chloroaniline	106-47-8									
SVOC	2-Chloronaphthalene	91-58-7									
SVOC	2-Chlorophenol	95-57-8									
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3									
SVOC	Chrysene	218-01-9	B2	1							
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1							
SVOC	Dibenzofuran	132-64-9	D	1							
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1							
SVOC	2,4-Dichlorophenol	120-83-2									
SVOC	Diethylphthalate	84-66-2	D	1							
SVOC	2,4-Dimethylphenol	105-67-9									
SVOC	Dimethylphthalate	131-11-3	D	1						2	90
SVOC	Di-n-butylphthalate	84-74-2	D	1						1	90
SVOC	4,6-Dinitro-2-methylphenol	534-52-1									
SVOC	2,4-Dinitrophenol	51-28-5								2	90
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1						2	90
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1							
SVOC	Di-n-octylphthalate	117-84-0									
SVOC	Fluoranthene	206-44-0	D	1							
SVOC	Fluorene	86-73-7	D	1							
SVOC	Hexachlorobenzene	118-74-1	B2	1	4.6E-01	1				1	90
SVOC	Hexachlorobutadiene	87-68-3	C	1	2.2E-02	1					
SVOC	Hexachlorocyclopentadiene	77-47-4	E	1				2.0E-04	100	1	
SVOC	Hexachloroethane	67-72-1	C	1	4.0E-03	1					
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1							
SVOC	Isophorone	78-59-1	C	1						2	90
SVOC	2-Methylnaphthalene	91-57-6	ID	1				3.0E-03	3,000	1	61
SVOC	2-Methylphenol	95-48-7	C	1						1	90
SVOC	4-Methylphenol	106-44-5	C	1						42	90,92
SVOC	Naphthalene	91-20-3	C	1				3.0E-03	3,000	1	
SVOC	2-Nitroaniline	88-74-4						2.0E-04	10,000	2	
SVOC	3-Nitroaniline	99-09-2	C	112				1.0E-03	3,000	111	
SVOC	4-Nitroaniline	100-01-6	C	115				4.0E-03	1,000	114	
SVOC	Nitrobenzene	98-95-3	D	1				2.0E-03	10,000	2	3
SVOC	2-Nitrophenol	88-75-5									
SVOC	4-Nitrophenol	100-02-7									
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1						89	90
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1							
SVOC	N-Nitrosomorpholine	59-89-2									
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	2	1.0E-02	2					
SVOC	Pentachlorophenol	87-86-5	B2	1							
SVOC	Phenanthrene	85-01-8	D	1							
SVOC	Phenol	108-95-2	ID	1						1	90,98
SVOC	Pyrene	129-00-0	D	1							
SVOC	2,4,5-Trichlorophenol	95-95-4								2	90

Table C-2: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		URF ($mg/m^3)^{-1}$			RfC (mg/m^3)			
			Value	Ref	Value	Ref	Notes	Value	UF	Ref	Notes
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1	3.1E-03	1				2	90
P/PCB	PCBs (total)	1336-36-3	B2	1							
P/PCB	Aroclor-1016	12674-11-2	B2	1							
P/PCB	Aroclor-1221	11104-28-2	B2	1							
P/PCB	Aroclor-1232	11141-16-5	B2	1							
P/PCB	Aroclor-1242	53469-21-9	B2	1							
P/PCB	Aroclor-1248	12672-29-6	B2	1							
P/PCB	Aroclor-1254	11097-69-1	B2	1							
P/PCB	Aroclor-1260	11096-82-5	B2	1							
P/PCB	Aldrin	309-00-2	B2	1	4.9E+00	1					
P/PCB	alpha-BHC	319-84-6	B2	1	1.8E+00	1					
P/PCB	beta-BHC	319-85-7	C	1	5.3E-01	1					
P/PCB	delta-BHC	319-86-8	D	1						38	90
P/PCB	gamma-BHC	58-89-9	B2-C	2							
P/PCB	Chlordane	57-74-9	B2	1	1.0E-01	1		7.0E-04	1,000	1	
P/PCB	alpha-Chlordane	5103-71-9									
P/PCB	gamma-Chlordane	5103-74-2									
P/PCB	4,4'-DDD	72-54-8	B2	1							
P/PCB	4,4'-DDE	72-55-9	B2	1							
P/PCB	4,4'-DDT	50-29-3	B2	1	9.7E-02	1					
P/PCB	Dieldrin	60-57-1	B2	1	4.6E+00	1					
P/PCB	Endosulfan I	959-98-8									
P/PCB	Endosulfan II	33213-65-9									
P/PCB	Endosulfan sulfate	1031-07-8									
P/PCB	Endrin	72-20-8	D	1							
P/PCB	Endrin aldehyde	7421-93-4									
P/PCB	Endrin ketone	53494-70-5									
P/PCB	Heptachlor	76-44-8	B2	1	1.3E+00	1					
P/PCB	Heptachlor epoxide	1024-57-3	B2	1	2.6E+00	1					
P/PCB	Methoxychlor	72-43-5	D	1						2	90
P/PCB	Toxaphene	8001-35-2	B2	1	3.2E-01	1					
INORG	Aluminum	7429-90-5	D	90		90	90	5.0E-03	300	84	
INORG	Antimony	7440-36-0									
INORG	Arsenic	7440-38-2	A	1	4.3E+00	1					
INORG	Barium	7440-39-3	D	1						1	90
INORG	Beryllium	7440-41-7	B1	1	2.4E+00	1		2.0E-05	10	1	
INORG	Cadmium	7440-43-9	B1	1	1.8E+00	1					
INORG	Calcium	7440-70-2									
INORG	Chromium (total)	7440-47-3			1.2E+01	1	8	1.0E-04	300	1	59,8
INORG	Chromium III	16065-83-1	D	1							
INORG	Chromium VI	18540-29-9	A	1	1.2E+01	1		1.0E-04	300	1	59
INORG	Cobalt	7440-48-4	B1	106	2.8E+00	106		2.0E-05	100	86	
INORG	Copper	7440-50-8	D	1							
INORG	Cyanide (total)	57-12-5	D	1							
INORG	Iron	7439-89-6	D	91		91	90			92	90
INORG	Lead	7439-92-1	B2	1							
INORG	Magnesium	7439-95-4									
INORG	Manganese	7439-96-5	D	1				5.0E-05	1,000	1	
INORG	Mercury	7439-97-6	D	1				3.0E-04	30	1	
INORG	Nickel	7440-02-0	A	1	2.4E-01	1					
INORG	Potassium	7440-09-7									
INORG	Selenium	7782-49-2	D	1							
INORG	Silver	7440-22-4	D	1				1.0E-05	1,000	83	
INORG	Sodium	7440-23-5									
INORG	Thallium	7440-28-0									
INORG	Vanadium	7440-62-2									
INORG	Zinc	7440-66-6	D	1							

Table C-2: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		URF ($mg/m^3)^{-1}$			RfC (mg/m^3)			
			Value	Ref	Value	Ref	Notes	Value	UF	Ref	Notes
References:											
1	USEPA. Integrated Risk Information System (IRIS). On-line database.										
2	USEPA. 1997. Health Effects Assessment Summary Tables (HEAST). FY-1997 Update. EPA 540/R-97-036. July.										
3	USEPA. Region III. 2003. Risk-Based Concentration Table. April.										
4	USEPA. Region IX. 2002. Preliminary Remediation Goal Table. October.										
10	USEPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/2-93/089. July.										
12	USEPA. 1993. HEAST. Supplement No. 1 to the March 1993 Annual Update. EPA 540-R-93-058A. July.										
16	USEPA. NCEA. 1993. Provisional Subchronic RfC for Di(2-ethylhexyl)phthalate [CASRN 117-81-7]. August 25.										
22	USEPA. NCEA. 1993. Derivation of a Provisional Subchronic Oral RfD for Ethylbenzene [CASRN 100-41-4]. December 3.										
24	USEPA. NCEA. 1992. Derivation of a Provisional Subchronic Inhalation RfC for Bromomethane [CASRN 74-83-9]. October 22.										
25	USEPA. NCEA. 1994. Derivation of a Provisional Subchronic Oral RfD for Bromomethane [CASRN 74-83-9]. May 9.										
26	USEPA. NCEA. 1994. Derivation of a Provisional Subchronic Oral RfD for Hexachlorobutadiene [CASRN 87-68-3]. January 24.										
27	USEPA. NCEA. 1994. Derivation of a Provisional Subchronic Inhalation RfC for Toluene [CASRN 108-88-3]. May 25.										
28	USEPA. NCEA. 1994. Subchronic Toxicity Information for Benzene, Bromomethane, Ethylbenzene, Hexachlorobutadiene,										
	Elemental Mercury Vapor and Toluene. Letter to K. Edelmann. June 10.										
33	USEPA. NCEA. 1994. Risk Assessment Issue paper for: Derivation of a Provisional Inhalation RfC for Carbon Tetrachloride										
38	USEPA. NCEA. 1994. Risk Assessment Issue paper for: Feasibility of Deriving Provisional RfD for										
	delta-Hexachlorocyclohexane (delta-BHC) [CASRN 319-86-8]. June 22.										
40	USEPA. NCEA. 1993. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 2-Hexanone (Methyl-n-butyl ketone)										
	[CASRN 591-78-6]. June 24.										
42	USEPA. NCEA. 1994. Risk Assessment Issue paper for: Evaluation of Systemic Toxicity after Inhalation Exposure to										
	4-Methylphenol (p-cresol) [CASRN 106-44-5]. May 5.										
46	USEPA. NCEA. 1995. Risk Assessment Issue paper for: Provisional oral RfD for Trichloroethylene [CASRN 79-01-6].										
49	USEPA. NCEA. 1995. Risk Assessment Issue paper for: Carcinogenicity Information for Trichloroethylene (TCE) [CASRN 79-01-6].										
	September 6.										
50	USEPA. 56 FR 26460, June 7, 1991. Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead										
	and Copper. Final Rule.										
52	USEPA. 57 FR 31776, July 17, 1992. National Primary Drinking Water Regulations										
	-- Synthetic Organic Chemicals and Inorganic Chemicals; National Primary Drinking Water Regulations Implementation. Final Rule.										
64	USEPA. NCEA. 1994. Risk Assessment Issue Paper for: Derivation of the Subchronic Oral Reference Dose for Mixed Xylenes										
	[CASRN 1330-20-7]. September 30.										
72	USEPA. NCEA. 1999. Risk Assessment Issue paper for: Derivation of Provisional Oral Chronic RfD and Subchronic RfDs for										
	1,1,1-Trichloroethane [CASRN 71-55-6]. August 4.										
73	USEPA. NCEA. 1999. Risk Assessment Issue paper for: Derivation of Provisional Chronic and Subchronic RfCs for 1,1,1-Trichloroethane										
	[CASRN 71-55-6]. August 4.										
77	USEPA. 2001. Risk Assessment Issue Paper for Carcinogenicity Information for										
	Tetrachloroethylene (perchloroethylene, PERC) [CASRN 127-18-4]. December 20.										
78	USEPA. NCEA. 1999. Risk Assessment Paper for: The Derivation of a Provisional Oral Subchronic RfD for Carbon Tetrachloride										
	[CASRN 56-23-5]. June 14.										
79	USEPA. NCEA. 1999. Risk Assessment Paper for: The Derivation of a Provisional Oral Subchronic RfC for Carbon Tetrachloride										
	[CASRN 56-23-5]. June 14.										
83	USEPA. NCEA. 1994. Risk Assessment Issue Paper for: Derivation of a Provisional RfC for Silver [CASRN 7440-22-4]. June 30.										
84	USEPA. NCEA. 2001. Risk Assessment Issue Paper for : Provisional Inhalation RfC for Aluminum [CASRN 7429-90-5]. July 26.										
85	USEPA. NCEA. 2001. Risk Assessment Issue Paper for : Derivation of a Provisional Oral RfD for Aluminum [CASRN 7429-90-5]. July 26.										
86	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfC for Cobalt and Compounds [CASRN 7440-48-4].										
	January 15.										
87	USEPA. NCEA. 2001. Risk Assessment Issue Paper for: Derivation of a Provisional RfD for Iron [CASRN 7439-89-6]. November 14.										
88	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 1,1,2,2-Tetrachloroethane[CASRN 79-34-5].										
	January 15.										
89	USEPA. NCEA. 2001. Risk Assessment Issue paper for: Derivation of a Provisional RfC for N-Nitrosodiphenylamine [CASRN 86-30-6].										
	March 16.										
90	USEPA. NCEA. 2001. Evaluation of Carcinogenicity of Aluminum [CASRN 7429-90-5]. July 26.										
91	USEPA. NCEA. 2001. Evaluation of Carcinogenicity of Iron [CASRN 7439-89-6] and Compounds. November 14.										
92	USEPA. NCEA. 2001. Risk Assessment Issue Paper for: Derivation of a Provisional RfC for Iron [CASRN 7439-89-6] and Compounds.										

Table C-2: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		URF ($mg/m^3)^{-1}$			RfC (mg/m^3)			
			Value	Ref	Value	Ref	Notes	Value	UF	Ref	Notes
	November 14.										
93	USEPA. NCEA. 1996. Risk Assessment Issue paper for: Derivation of a Provisional Subchronic Inhalation RfD for Benzene										
	[CASRN 71-43-2]. July 2.										
94	USEPA. NCEA. 1996. Risk Assessment Issue paper for: Derivation of a Provisional Subchronic Inhalation RfC for Benzene										
	[CASRN 71-43-2]. July 2.										
97	USEPA. NCEA. Draft Risk Assessment Issue Paper for: Derivation of Systemic Toxicity of 1,2,3-Trichloropropane [CASRN 96-18-4].										
98	USEPA. NCEA. Draft Risk Assessment Issue Paper for: Evaluation of the Carcinogenicity of 1,2,3-Trichloropropane [CASRN 96-18-4].										
99	USEPA. NCEA. 1999. Risk Assessment Issue paper for: Derivation of the Subchronic Inhalation Systemic Toxicity of Antimony										
	[CASRN 7440-36-0]. July 26.										
100	USEPA. Region 8. 2002. Derivation of Acute and Subchronic Oral Reference Doses for Inorganic Arsenic. August.										
101	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 1,1,2,2-Tetrachloroethane[CASRN 79-34-5].										
	January 14.										
102	USEPA. NCEA. 1993. Risk Assessment Issue paper for: Derivation of a Provisional Inhalation RfC for 1,2-Dichloroethane										
	[CASRN 107-06-2]. April 5.										
103	USEPA. NCEA. 1998. Risk Assessment Issue Paper for: Derivation of a Provisional Chronic RfC for Chlorobenzene [CASRN 108-90-7].										
	September 18.										
104	USEPA. NCEA. 2001. Risk Assessment Issue paper for: Derivation of a Provisional RfD for N-Nitrosodiphenylamine [CASRN 86-30-6].										
	March 16.										
105	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for Cobalt and Compounds [CASRN 7440-48-4].										
	January 15.										
106	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional Carcinogenicity Assessment for Cobalt										
	and Compounds [CASRN 7440-48-4]. January 15.										
107	USEPA. NCEA. 1994. Risk Assessment Issue paper for: Derivation of a Provisional RfD for Endosulfan II [CASRN 33213-65-9]. July 1.										
108	USEPA. NCEA. 1993. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 2-Hexanone (Methyl-n-butyl ketone)										
	[CASRN 591-78-6]. June 24.										
109	USEPA. NCEA. 1997. Risk Assessment Issue Paper for: Derivation of a Provisional RfC for Tetrachloroethylene										
	(perchloroethylene, PERC) [CASRN 127-18-4]. June 20.										
110	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 3-Nitroaniline [CASRN 99-09-2] by analogy										
	to 4-Nitroaniline [CASRN 100-01-6]. June 11.										
111	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 3-Nitroaniline [CASRN 99-09-2] by analogy										
	to 4-Nitroaniline [CASRN 100-01-6]. June 11.										
112	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional Carcinogenicity Assessment for 3-Nitroaniline										
	[CASRN 99-09-2] by analogy to 4-Nitroaniline [CASRN 100-01-6]. June 11.										
113	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 4-Nitroaniline [CASRN 100-01-6]. June 20.										
114	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 4-Nitroaniline [CASRN 100-01-6]. June 20.										
115	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional Carcinogenicity Assessment for 4-Nitroaniline										
	[CASRN 100-01-6]. June 20.										
117	USEPA. NCEA. 2003. Risk Assessment Issue Paper for: Derivation of Provisional Subchronic and Chronic RfCs for Chloroform										
	[CASRN 67-66-3]. January 23.										
118	USEPA. NCEA. 2002. Provisional Toxicity Value Assessment for HWIR: RfD for 2-Methylnapthalene [CASRN 91-57-6]. August.										
120	USEPA. NCEA. 1993. Risk Assessment Issue Paper for: Derivation of Provisional RfD for p,p'-DDD										
	[CASRN 72-54-8] and p,p'-DDE [CASRN 72-55-9]. July 14.										
122	USEPA. NCEA. 1998. Risk Assessment Issue Paper for: Derivation of Provisional Subchronic RfC for Cadmium [CASRN 7440-43-9].										
	June 14.										
123	NCEA. 2003. Personal Communication -- phone call with Teresa Shannon. September 22.										
Notes:											
2	USEPA adopted chronic value as subchronic value.										
3	HEAST Alternate Method.										
4	ENVIRON obtained value by route-to-route extrapolation.										
5	Based on analogy to Benzo(a)pyrene [CASRN 50-32-8] using USEPA relative potency described in the indicated reference.										
6	Under review, according to IRIS.										
8	ENVIRON used Chromium VI [CASRN 18540-29-9] value from IRIS (reference 1) as a surrogate.										
10	ENVIRON used 1,2-Dichlorobenzene [CASRN 95-50-1] values from IRIS (chronic RfDo) (reference 1) and HEAST (chronic RfDi)										
	(reference 2) as surrogates.										

Table C-2: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		URF ($mg/m^3)^{-1}$			RfC (mg/m^3)			
			Value	Ref	Value	Ref	Notes	Value	UF	Ref	Notes
11	ENVIRON used 1,3-Dichloropropene (total) [CASRN 542-75-6] value from the indicated reference as a surrogate].										
12	ENVIRON used Chlordane [CASRN 57-74-9] value from IRIS (reference 1) or HEAST (reference 2) as a surrogate.										
13	ENVIRON used Endosulfan [CASRN 115-29-7] value from IRIS (reference 1) or HEAST (reference 2) as a surrogate.										
20	ENVIRON used Pyrene [CASRN 129-00-0] value from IRIS (reference 1) as a surrogate.										
26	USEPA obtained value by route-to-route extrapolation.										
28	USEPA used 2,4-,2,6-Dinitrotolunene mixture value from IRIS (reference 1) as a surrogate.										
30	Upper-bound slope factor.										
32	High risk & persistence tier.Use for: food chain exposure;sediment/soil ingestion;dust/aerosol inhalation;dermal exposure,										
	if an absorption factor has been applied;presence of dioxin-like,tumor-promoting/persistent congeners;all early life exposures.										
34	Lowest risk & persistence tier. Criteria for use: congener or isomer analyses verify that congeners with more than 4 chlorines										
	comprise less than 1/2 % of total PCBs.										
36	IRIS recommends applying a modifying factor of 3 when using this RfD in assessing exposures to drinking water or soil.										
44	ENVIRON derived CRFC from CRFDI value presented in the indicated reference, using standard USEPA methodology presented in HEAST.										
45	ENVIRON derived URFI from CSFI value presented in the indicated reference, using standard USEPA methodology presented in HEAST.										
48	ENVIRON used Endrin [CASRN 72-20-8] value from IRIS (reference 1) as a surrogate.										
49	ENVIRON derived CRFDO from adverse health effect level value presented in the indicated reference.										
50	Personal communication with NCEA indicated the supporting paper had been retired.										
51	ENVIRON used Mercuric Chloride [CASRN 7487-94-7] value from the indicated reference as a surrogate.										
53	ENVIRON used Polychlorinated Biphenyl [CASRN 1336-36-3] value from IRIS (Reference 1) as a surrogate.										
55	Under EPA review. Number subject to change.										
56	This toxicity value already incorporates the absorption factor of 75% that is recommended in the cited reference.										
59	Chromium VI Particulates.										
60	IRIS provides a range of 2.2E-6 to 7.8E-6 (ug/m3)-1 as the Inhalation Unit Risk Factor (URF) for Benzene.										
61	ENVIRON used Naphthalene [CASRN 91-20-3] value from indicated reference as a surrogate.										
68	IRIS provides a range of 1.5E-2 to 5.5E-2 (mg/kg/d)-1 as the Oral Slope Factor (CSFO) for Benzene.										
69	Personal communication with NCEA indicated the retired paper should be used until a new value is published in IRIS.										
72	ENVIRON used Aroclor 1254 [CASRN 11097-69-1] value from the indicated reference as a surrogate for Polychlorinated biphenyls										
	[CASRN 1336-36-3].										
77	IRIS provides an alternate slope factor of 5E-2; however, EPA does not recommend its use, due to the higher uncertainty										
	in the delivered dose in the supporting study.										
78	IRIS recommends an Oral Cancer Slope Factor(CSFO) for Vinyl Chloride of 7.2E-1 (mg/kg/d)-1 to account for continuous										
	lifetime exposure during adulthood; a twofold increase to 1.4 (mg/kg/d)-1 is recommended to account for continuous exposure from birth.										
79	IRIS recommends an Inhalation Unit Risk(URFI) for Vinyl Chloride of 4.4E-6 (ug/m3)-1 to account for continuous lifetime										
	exposure during adulthood; a twofold increase to 8.8E-6 (ug/m3)-1 is recommended to account for continuous exposure from birth.										
90	Inadequate data exist to derive a toxicity value, according to the indicated reference.										
91	This criterion is applicable to insoluable forms of the compound occurring as dust or fumes.										
92	NCEA directed ENVIRON to use outdated value.										
93	Personal communication with NCEA indicated the HEAST LOAEL of 1000 mg and the sRfD of 7E-1mg/kg-day both appear										
	to be incorrect and recommended using the IRIS RfD of 3E-1 as the sRfD.										
94	Two provisonal RfC values are presented in the indicated reference (4E-1 and 6E-1 mg/m3).										
	Personal communication with NCEA indicated that either RfC is acceptable and the RfC should be chosen on a case-by-case basis.										
95	Diet Criterion.										
97	ENVIRON used withdrawn source.										
98	Route-to-route extrapolation is not appropriate, according to the indicated reference.										
99	ENVIRON used 3-Methylphenol [CASRN 108-39-4] values from the indicated reference as a surrogate.										
100	Personal communication with NCEA confirmed the value published by Regions 3 and 9.										
102	A dose equivalency factor of 4.5 was applied to the Chronic RfC to derive the Subchronic RfC.										

Table C-3: Physical and Chemical Properties
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	K_{ow} (unitless)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			D_{air} (cm^2/s)			D_{water} (cm^2/s)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
VOC	Acetone	67-64-1	5.80E-01	40		5.75E-01	44					1.59E-03	44		1.24E-01	44		1.14E-05	44	
VOC	Benzene	71-43-2	1.30E+02	40		5.89E+01	44					2.28E-01	44		8.80E-02	44		9.80E-06		
VOC	Bromochloromethane	74-97-5										5.89E-02	1	63					44	
VOC	Bromodichloromethane	75-27-4	1.30E+02	40		5.50E+01	44					6.56E-02	44		2.98E-02	44		1.06E-05	44	
VOC	Bromoform	75-25-2	2.20E+02	40		8.71E+01	44					2.19E-02	44		1.49E-02	44		1.03E-05	44	
VOC	Bromomethane	74-83-9	1.50E+01	40		1.05E+01	44					2.56E-01	44		7.28E-02	44		1.21E-05	40	
VOC	2-Butanone	78-93-3										2.28E-03	50	92	9.49E-02	36	27	9.80E-06	44	
VOC	Carbon Disulfide	75-15-0	1.00E+02	40		4.57E+01	44					1.24E+00	44		1.04E-01	44		1.00E-05	44	
VOC	Carbon Tetrachloride	56-23-5	5.40E+02	40		1.74E+02	44					1.25E+00	44		7.80E-02	44		8.80E-06	44	
VOC	Chlorobenzene	108-90-7	7.20E+02	40		2.19E+02	44					1.52E-01	44		7.30E-02	44		8.70E-06		
VOC	Chloroethane	75-00-3				1.49E+01	3					3.60E-01	50	92	1.10E-01	36	27		44	
VOC	Chloroform	67-66-3	8.30E+01	40		3.98E+01	44					1.50E-01	44		1.04E-01	44		1.00E-05	40	
VOC	Chloromethane	74-87-3	8.10E+00	40		7.80E+00	40					3.60E-01	50	92	1.26E-01	34		6.50E-06		
VOC	Cumene	98-82-8	3.80E+03	40		3.30E+03	40					4.74E+01	50	92					52	
VOC	Cyclohexane	110-82-7										7.97E+00	50	92	1.10E-01	52		9.14E-06	40	
VOC	1,2-Dibromo-3-chloropropane	96-12-8	2.20E+02	40		2.00E+02	40					6.01E-03	50	92	8.00E-02	40		8.00E-06	44	
VOC	Dibromochloromethane	124-48-1	1.50E+02	40		6.31E+01	44					3.21E-02	44		1.96E-02	44		1.05E-05	40	
VOC	1,2-Dibromoethane	106-93-4	5.60E+01	40		5.30E+01	40					3.04E-02	50	92	8.00E-02	40		8.00E-06	44	
VOC	1,2-Dichlorobenzene	95-50-1	2.70E+03	40		6.17E+02	44					7.79E-02	44		6.90E-02	44		7.90E-06		
VOC	1,3-Dichlorobenzene	541-73-1				1.70E+03	2					1.27E-01	50	92					44	
VOC	1,4-Dichlorobenzene	106-46-7	2.60E+03	40		6.17E+02	44					9.96E-02	44		6.90E-02	44		7.90E-06	40	
VOC	Dichlorodifluoromethane	75-71-8	1.40E+02	40		1.30E+02	40					1.40E+01	50	92	8.00E-02	40		8.00E-06	44	
VOC	1,1-Dichloroethane	75-34-3	6.20E+01	40		3.16E+01	44					2.30E-01	44		7.42E-02	44		1.05E-05	44	
VOC	1,2-Dichloroethane	107-06-2	3.00E+01	40		1.74E+01	44					4.01E-02	44		1.04E-01	44		9.90E-06	44	
VOC	1,1-Dichloroethene	75-35-4	1.30E+02	40		5.89E+01	44					1.07E+00	44		9.00E-02	44		1.04E-05	44	81
VOC	1,2-Dichloroethene (total)	540-59-0				5.25E+01	44	81				3.85E-01	44	81	7.07E-02	44	81	1.19E-05	44	
VOC	cis-1,2-Dichloroethene	156-59-2	7.20E+01	40		3.55E+01	44					1.67E-01	44		7.36E-02	44		1.13E-05	44	
VOC	trans-1,2-Dichloroethene	156-60-5	1.20E+02	40		5.25E+01	44					3.85E-01	44		7.07E-02	44		1.19E-05	44	
VOC	1,2-Dichloropropane	78-87-5	9.30E+01	40		4.37E+01	44					1.15E-01	44		7.82E-02	44		8.73E-06	44	
VOC	1,3-Dichloropropene (total)	542-75-6	1.00E+02	40		4.57E+01	44					7.26E-01	44		6.26E-02	44		1.00E-05	40	
VOC	cis-1,3-Dichloropropene	10061-01-5	1.00E+02	40		9.30E+01	40					1.45E-01	1	55	8.00E-02	40		8.00E-06	40	
VOC	trans-1,3-Dichloropropene	10061-02-6	1.00E+02	40		9.30E+01	40					6.54E-02	40		8.00E-02	40		8.00E-06	44	
VOC	Ethyl Benzene	100-41-4				3.63E+02	44					3.23E-01	44		7.50E-02	44		7.80E-06	52	
VOC	2-Hexanone	591-78-6										7.15E-02	1		8.62E-02	52		8.76E-02		
VOC	Methyl Acetate	79-20-9																	52	
VOC	Methyl tert-butyl ether	1634-04-4										5.52E-02	52		1.03E-01	52		1.05E-05	40	
VOC	4-Methyl-2-pentanone	108-10-1										5.64E-03	50	92	7.50E-02	40		7.80E-06	52	
VOC	Methylcyclohexane	108-87-2													9.86E-02	52		8.52E-06	44	
VOC	Methylene Chloride	75-09-2	1.80E+01	40		1.17E+01	44					8.98E-02	44		1.01E-01	44		1.17E-05	44	
VOC	Styrene	100-42-5	8.70E+02	40		7.76E+02	44					1.13E-01	44		7.10E-02	44		8.00E-06	44	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	2.50E+02	40		9.33E+01	44					1.41E-02	44		7.10E-02	44		7.90E-06	44	
VOC	Tetrachloroethene	127-18-4	4.70E+02	40		1.55E+02	44					7.54E-01	44		7.20E-02	44		8.20E-06	44	
VOC	Toluene	108-88-3				1.82E+02	44					2.72E-01	44		8.70E-02	44		8.60E-06	44	
VOC	1,2,4-Trichlorobenzene	120-82-1	1.00E+04	40		1.78E+03	44					5.82E-02	44		3.00E-02	44		8.23E-06	44	
VOC	1,1,1-Trichloroethane	71-55-6	3.00E+02	40		1.10E+02	44					7.05E-01	44		7.80E-02	44		8.80E-06	44	
VOC	1,1,2-Trichloroethane	79-00-5	1.10E+02	40		5.01E+01	44					3.74E-02	44		7.80E-02	44		8.80E-06	44	
VOC	Trichloroethene	79-01-6	5.10E+02	40		1.66E+02	44					4.22E-01	44		7.90E-02	44		9.10E-06	40	
VOC	Trichlorofluoromethane	75-69-4	3.40E+02	40		1.59E+02	3					3.96E+00	50	92	8.33E-02	36	27	9.70E-06	40	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.40E+03	40		1.30E+03	40					1.97E+01	50	92	7.80E-02	40		8.20E-06	44	
VOC	Vinyl Chloride	75-01-4	3.20E+01	40		1.86E+01	44					1.11E+00	44		1.06E-01	44		1.23E-05	44	
VOC	Xylenes (total)	1330-20-7				3.86E+02	44					2.76E-01	44		7.80E-02	44		8.75E-06	44	
SVOC	Acenaphthene	83-32-9	8.30E+03	40		7.08E+03	44					6.36E-03	44		4.21E-02	44		7.69E-06	52	
SVOC	Acenaphthylene	208-96-8				4.90E+03	34					4.62E-03	50	92	4.42E-02	52		7.44E-06	40	
SVOC	Acetophenone	98-86-2	4.40E+01	40		4.10E+01	40					4.37E-04	50	92	8.00E-02	40		8.00E-06	44	
SVOC	Anthracene	120-12-7				2.95E+04	44					2.67E-03	44		3.24E-02	44		7.74E-06		
SVOC	Atrazine	1912-24-9																		
SVOC	Benzaldehyde	100-52-7																	44	
SVOC	Benzo(a)anthracene	56-55-3	5.00E+05	40		3.98E+05	44					1.37E-04	44		5.10E-02	44		9.00E-06	44	

Table C-3: Physical and Chemical Properties
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	K_{ow} (unitless)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			D_{air} (cm^2/s)			D_{water} (cm^2/s)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
SVOC	Benzo(a)pyrene	50-32-8	1.30E+06	40		1.02E+06	44					4.63E-05	44		4.30E-02	44		9.00E-06	44	
SVOC	Benzo(b)fluoranthene	205-99-2	1.60E+06	40		1.23E+06	44					4.55E-03	44		2.26E-02	44		5.56E-06	52	
SVOC	Benzo(g,h,i)perylene	191-24-2				1.60E+06	3					5.76E-06	50	92	2.03E-02	52		5.20E-06	44	
SVOC	Benzo(k)fluoranthene	207-08-9				1.23E+06	44					3.40E-05	44		2.26E-02	44		5.56E-06	52	
SVOC	Biphenyl	92-52-4										1.23E-02	50	92	4.04E-02	52		8.15E-05	52	
SVOC	bis(2-Chloroethoxy)methane	111-91-1				5.20E+00	3					6.95E-06	50	92	3.73E-02	52		6.89E-05	44	
SVOC	bis(2-Chloroethyl) ether	111-44-4	1.60E+01	40		1.55E+01	44					7.38E-04	44		6.92E-02	44		7.53E-06	44	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	2.00E+07	40		1.51E+07	44					4.18E-06	44		3.51E-02	44		3.66E-06		
SVOC	4-Bromophenyl-phenyl ether	101-55-3				4.20E+04	3					4.78E-03	50	92					44	
SVOC	Butylbenzylphthalate	85-68-7	6.90E+04	40		5.75E+04	44					5.17E-05	44		1.74E-02	44		4.83E-06	52	
SVOC	Caprolactam	105-60-2													6.54E-02	52		8.99E-06	44	
SVOC	Carbazole	86-74-8				3.39E+03	44					6.26E-07	44		3.90E-02	44		7.03E-06		
SVOC	4-Chloro-3-methylphenol	59-50-7				6.04E+02	3					1.63E-05	50	91					44	
SVOC	4-Chloroaniline	106-47-8	7.10E+01	40		6.61E+01	44					1.36E-05	44		4.83E-02	44		1.01E-05		
SVOC	2-Chloronaphthalene	91-58-7				4.80E+03	3					1.28E-02	50	92					44	
SVOC	2-Chlorophenol	95-57-8	1.40E+02	40		3.88E+02	44	43				1.60E-02	44		5.01E-02	44		9.46E-06		
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3				5.80E+04	3					8.99E-03	1	55					44	
SVOC	Chrysene	218-01-9	5.00E+05	40		3.98E+05	44					3.88E-03	44		2.48E-02	44		6.21E-06	44	
SVOC	Dibenz(a,h)anthracene	53-70-3	4.90E+06	40		3.80E+06	44					6.03E-07	44		2.02E-02	44		5.18E-06	52	
SVOC	Dibenzofuran	132-64-9										5.15E-04	50	92	2.70E-02	52		5.93E-06	44	
SVOC	3,3'-Dichlorobenzidine	91-94-1	3.20E+03	40		7.24E+02	44					1.64E-07	44		1.94E-02	44		6.74E-06	44	
SVOC	2,4-Dichlorophenol	120-83-2	1.20E+03	40		1.47E+02	44	43				1.30E-04	44		3.46E-02	44		8.77E-06	44	
SVOC	Diethylphthalate	84-66-2	3.20E+02	40		2.88E+02	44					1.85E-05	44		2.56E-02	44		6.35E-06	44	
SVOC	2,4-Dimethylphenol	105-67-9	2.30E+02	40		2.09E+02	44					8.20E-05	44		5.84E-02	44		8.69E-06	40	
SVOC	Dimethylphthalate	131-11-3	3.70E+01	40		3.50E+01	40					4.29E-06	50	92	5.68E-02	34		6.30E-06	44	
SVOC	Di-n-butylphthalate	84-74-2	4.10E+04	40		3.39E+04	44					3.85E-08	44		4.38E-02	44		7.86E-06	52	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1				2.40E+02	2					1.75E-05	50	92	3.13E-02	52		6.35E-05	44	
SVOC	2,4-Dinitrophenol	51-28-5	3.50E+01	40		1.00E-02	44	43				1.82E-05	44		2.73E-02	44		9.06E-06	44	
SVOC	2,4-Dinitrotoluene	121-14-2	1.00E+02	40		9.55E+01	44					3.80E-06	44		2.03E-01	44		7.06E-06	44	
SVOC	2,6-Dinitrotoluene	606-20-2	7.40E+01	40		6.92E+01	44					3.06E-05	44		3.27E-02	44		7.26E-06	44	
SVOC	Di-n-octylphthalate	117-84-0	1.10E+08	40		8.32E+07	44					2.74E-03	44		1.51E-02	44		3.58E-06	44	
SVOC	Fluoranthene	206-44-0	1.30E+05	40		1.07E+05	44					6.60E-04	44		3.02E-02	44		6.35E-06	44	
SVOC	Fluorene	86-73-7	1.60E+04	40		1.38E+04	44					2.61E-03	44		3.63E-02	44		7.88E-06	44	
SVOC	Hexachlorobenzene	118-74-1	7.80E+05	40		5.50E+04	44					5.41E-02	44		5.42E-02	44		5.91E-06	44	
SVOC	Hexachlorobutadiene	87-68-3	6.50E+04	40		5.37E+04	44					3.34E-01	44		5.61E-02	44		6.16E-06	44	
SVOC	Hexachlorocyclopentadiene	77-47-4	2.50E+05	40		2.00E+05	44					1.11E+00	44		1.61E-02	44		7.21E-06	44	
SVOC	Hexachloroethane	67-72-1	1.00E+04	40		1.78E+03	44					1.59E-01	44		2.50E-03	44		6.80E-06	44	
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	4.50E+06	40		3.47E+06	44					6.56E-05	44		1.90E-02	44		5.66E-06	44	
SVOC	Isophorone	78-59-1	5.00E+01	40		4.68E+01	44					2.72E-04	44		6.23E-02	44		6.76E-06	52	
SVOC	2-Methylnaphthalene	91-57-6										2.12E-02	50	92	9.86E-02	52		7.75E-06	44	
SVOC	2-Methylphenol	95-48-7	9.80E+01	40		9.12E+01	44					4.92E-05	44		7.40E-02	44		8.30E-06	40	
SVOC	4-Methylphenol	106-44-5	8.90E+01	40		8.30E+01	40					3.24E-05	50	92	7.40E-02	40		1.00E-05	44	
SVOC	Naphthalene	91-20-3	2.30E+03	40		2.00E+03	44					1.98E-02	44		5.90E-02	44		7.50E-06		
SVOC	2-Nitroaniline	88-74-4										3.97E-03	1		7.30E-02	11				
SVOC	3-Nitroaniline	99-09-2										5.89E-06	50	92						
SVOC	4-Nitroaniline	100-01-6										8.46E-08	50	92					44	
SVOC	Nitrobenzene	98-95-3	6.90E+01	40		6.46E+01	44					9.84E-04	44		7.60E-02	44		8.60E-06		
SVOC	2-Nitrophenol	88-75-5				2.70E+01	3					3.87E-04	50	92						
SVOC	4-Nitrophenol	100-02-7										1.70E-08	50	92					44	
SVOC	N-Nitrosodiphenylamine	86-30-6	1.40E+03	40		1.29E+03	44					2.05E-04	44		3.12E-02	44		6.35E-06	44	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	2.50E+01	40		2.40E+01	44					9.23E-05	44		5.45E-02	44		8.17E-06		
SVOC	N-Nitrosomorpholine	59-89-2																		
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1				6.10E+01	2					4.78E-03	50	92	6.02E-02	11			44	
SVOC	Pentachlorophenol	87-86-5	1.20E+05	40		5.92E+02	44	43				1.00E-06	44		5.60E-02	44		6.10E-06		
SVOC	Phenanthrene	85-01-8				1.40E+04	3					9.52E-04	50	92					44	
SVOC	Phenol	108-95-2	3.00E+01	40		2.88E+01	44					1.63E-05	44		8.20E-02	44		9.10E-06	44	
SVOC	Pyrene	129-00-0	1.30E+05	40		1.05E+05	44					4.51E-04	44		2.72E-02	44		7.24E-06	44	
SVOC	2,4,5-Trichlorophenol	95-95-4	7.90E+03	40		1.60E+03	44	43				1.78E-04	44		2.91E-02	44		7.03E-06	44	

Table C-3: Physical and Chemical Properties
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	K_{ow} (unitless)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			D_{air} (cm^2/s)			D_{water} (cm^2/s)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
SVOC	2,4,6-Trichlorophenol	88-06-2	5.00E+03	40		3.81E+02	44	43				3.19E-04	44		3.18E-02	44		6.25E-06	40	
P/PCB	PCBs (total)	1336-36-3	2.00E+06	40		3.09E+05	44					1.06E-01	50	94	8.00E-02	40		1.00E-05		
P/PCB	Aroclor-1016	12674-11-2	2.40E+04	47								1.19E-02	48		2.05E-02	34				
P/PCB	Aroclor-1221	11104-28-2	1.20E+04	47								1.43E-01	48							
P/PCB	Aroclor-1232	11141-16-5	3.50E+04	47																
P/PCB	Aroclor-1242	53469-21-9	3.80E+05	47								2.34E-02	47							
P/PCB	Aroclor-1248	12672-29-6	1.30E+06	47								1.43E-01	47							
P/PCB	Aroclor-1254	11097-69-1	1.07E+06	47								3.42E-01	47							
P/PCB	Aroclor-1260	11096-82-5	1.40E+07	47								2.91E-01	47		1.27E-02	34			44	
P/PCB	Aldrin	309-00-2	3.20E+06	40		2.45E+06	44					6.97E-03	44		1.32E-02	44		4.86E-06	44	
P/PCB	alpha-BHC	319-84-6	6.30E+03	40		1.23E+03	44					4.35E-04	44		1.42E-02	44		7.34E-06	44	
P/PCB	beta-BHC	319-85-7	6.50E+03	40		1.26E+03	44					3.05E-05	44		1.42E-02	44		7.34E-06		
P/PCB	delta-BHC	319-86-8				6.60E+03	2					1.75E-05	50	92	1.76E-02	36			44	
P/PCB	gamma-BHC	58-89-9	5.40E+03	40		1.07E+03	44					5.74E-04	44		1.42E-02	44		7.34E-06	44	
P/PCB	Chlordane	57-74-9	2.10E+06	40		1.20E+05	44					1.99E-03	44		1.18E-02	44		4.37E-06		
P/PCB	alpha-Chlordane	5103-71-9																		
P/PCB	gamma-Chlordane	5103-74-2																	44	
P/PCB	4,4'-DDD	72-54-8	1.30E+06	40		1.00E+06	44					1.64E-04	44		1.69E-02	44		4.76E-06	44	
P/PCB	4,4'-DDE	72-55-9	5.80E+06	40		4.47E+06	44					8.61E-04	44		1.44E-02	44		5.87E-06	44	
P/PCB	4,4'-DDT	50-29-3	3.40E+06	40		2.63E+06	44					3.32E-04	44		1.37E-02	44		4.95E-06	44	
P/PCB	Dieldrin	60-57-1	2.30E+05	40		2.14E+04	44					6.19E-04	44		1.25E-02	44		4.74E-06		
P/PCB	Endosulfan I	959-98-8										4.13E-03	1							
P/PCB	Endosulfan II	33213-65-9										7.81E-04	1							
P/PCB	Endosulfan sulfate	1031-07-8										8.38E-02	50	91					44	
P/PCB	Endrin	72-20-8	1.10E+05	40		1.23E+04	44					3.08E-04	44		1.25E-02	44		4.74E-06		
P/PCB	Endrin aldehyde	7421-93-4				6.70E+02	3					1.58E-05	1							
P/PCB	Endrin ketone	53494-70-5																	44	
P/PCB	Heptachlor	76-44-8	1.80E+06	40		1.41E+06	44					4.47E-02	44		1.12E-02	44		5.69E-06	44	
P/PCB	Heptachlor epoxide	1024-57-3	1.00E+05	40		8.32E+04	44					3.90E-04	44		1.32E-02	44		4.23E-06	44	
P/PCB	Methoxychlor	72-43-5	1.20E+05	40		9.77E+04	44					6.48E-04	44		1.56E-02	44		4.46E-06	44	
P/PCB	Toxaphene	8001-35-2	3.20E+05	40		2.57E+05	44					2.46E-04	44		1.16E-02	44		4.34E-06		
INORG	Aluminum	7429-90-5							1.50E+03	35									40	48
INORG	Antimony	7440-36-0		40	48				4.50E+01	44	43					40	48		40	48
INORG	Arsenic	7440-38-2		40	48				2.90E+01	44	43					40	48		40	48
INORG	Barium	7440-39-3		40	48				4.10E+01	44	43					40	48		40	48
INORG	Beryllium	7440-41-7		40	48				7.90E+02	44	43					40	48		40	48
INORG	Cadmium	7440-43-9		40	48				7.50E+01	44	43					40	48			
INORG	Calcium	7440-70-2																	40	48
INORG	Chromium (total)	7440-47-3							1.90E+01	44	43,45					40	48			
INORG	Chromium III	16065-83-1							1.80E+06	44	43								40	48
INORG	Chromium VI	18540-29-9		40	48				1.90E+01	44	43					40	48			
INORG	Cobalt	7440-48-4							4.50E+01	35									40	48
INORG	Copper	7440-50-8		40	48				3.50E+01	35						40	48			
INORG	Cyanide (total)	57-12-5							9.90E+00	44	43									
INORG	Iron	7439-89-6							2.50E+01	35									40	48
INORG	Lead	7439-92-1		40	48				9.00E+02	35						40	48			
INORG	Magnesium	7439-95-4																		
INORG	Manganese	7439-96-5							6.50E+01	35									44	
INORG	Mercury	7439-97-6		40	48				1.00E+03	65		2.90E-01	67		3.07E-02	44		6.30E-06	40	48
INORG	Nickel	7440-02-0		40	48				6.50E+01	44	43					40	48			
INORG	Potassium	7440-09-7																	40	48
INORG	Selenium	7782-49-2		40	48				5.00E+00	44	43					40	48		40	48
INORG	Silver	7440-22-4		40	48				8.30E+00	44	43					40	48			
INORG	Sodium	7440-23-5																	40	48
INORG	Thallium	7440-28-0		40	48				7.10E+01	44	43					40	48		40	48
INORG	Vanadium	7440-62-2		40	48				1.00E+03	44	43					40	48		40	48
INORG	Zinc	7440-66-6		40	48				6.20E+01	44	43					40	48			

Table C-3: Physical and Chemical Properties
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	K_{ow} (unitless)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			D_{air} (cm^2/s)			D_{water} (cm^2/s)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
References:																				
1	USEPA. 1992. Handbook of RCRA Ground-Water Monitoring Constituents. Chemical and Physical Properties (40 CFR Part 264, Appendix IX). EPA-530-R-92-022. September.																			
2	USEPA. 1986. Superfund Public Health Evaluation Manual (SPHEM). Office of Emergency and Remedial Response. Office of Solid Waste and Emergency Response. OSWER Directive 9285.4-1. October.																			
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47	USEPA. 1990. Guidance on Remedial Actions for Superfund Sites with PCB Contamination. EPA/540/G-90/007. August.																			
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52	USEPA. 1997. CHEM 9 Compound Properties Estimation and Data. Version 1.00. Office of Air Quality Planning and Standards. July.																			
55	W.G. Mallard and P.J. Linstrom, Eds., NIST Chemistry WebBook, NIST Standard Reference Database Number 69, March, 2003, National Institute of Standards and Technology, Gaithersburg MD, 20899																			
62	USEPA. 2001. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim -- Review Draft-For Public Comment.																			
64	Agency for Toxic Substances and Disease Registry (ATSDR). November 2000. Toxicological Profile for Polychlorindated Biphenyls (PCBs).																			
65	USEPA. July 1998. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities.																			
Notes:																				
27	Diffusivity value at 30 degrees Celcius.																			
43	pH associated with value is 6.8.																			
45	ENVIRON used the value for Chromium VI [CASRN 18540-29-9] presented in indicated reference as a surrogate.																			
48	Not Available or Not Applicable																			
49	At 25 degrees Celsius																			
50	At 20 degrees Celsius																			
51	min, max 1.78																			
53	min, max 1.32																			
55	Reference temperature is unspecified.																			
60	Hydrolyzes																			
61	Insoluble																			

Table C-3: Physical and Chemical Properties
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	K_{ow} (unitless)			K_{oc} (L/kg)			K_d (L/kg)			H (unitless)			D_{air} (cm^2/s)			D_{water} (cm^2/s)		
			Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes
62	Miscible																			
63	min temperature: max is 25C																			
64	min temperature: max is 30																			
65	min temperature: max is 32.1C																			
66	Slightly soluble																			
67	Soluble																			
81	ENVIRON used the value for trans-1,2-Dichloroethene [CASRN 156-60-5] as a surrogate.																			
82	ENVIRON used Equation (70) from Reference 44 to calculate Koc value using Kow value from indicated reference.																			
90	Indicated source cites CHEMCALC.																			
91	Indicated source cites CHEMEST.																			
92	Indicated source cites CHEMFATE.																			
93	Indicated source cites FATE.																			
94	Indicated source cites LIVECHEM.																			
96	ENVIRON used the value for water [CASRN 7732-18-5] from the indicated reference as a surrogate.																			
99	ENVIRON used the value for 3-Methylphenol [CASRN 108-39-4] value as a surrogate.																			
100	No data available																			
103	Identified as outside the effective prediction domain																			
104	Halogenated compound																			
105	pH associated with values is 7.																			
109	RAGS E indicates that a value of 0.001 is appropriate if the soil organic content is >10% (pp. 3-20, EPA 2001).																			

Table C-4: Soil Moisture Profile below Slab on Grade Building Vernay Laboratories Inc., Yellow Springs, Ohio		
z (m)	θ_T	θ_w
0.000	0.375	0.375
0.034	0.375	0.375
0.068	0.375	0.373
0.102	0.375	0.367
0.136	0.375	0.355
0.170	0.375	0.338
0.203	0.375	0.315
0.237	0.375	0.290
0.271	0.375	0.263
0.305	0.375	0.237
0.339	0.375	0.214
0.373	0.375	0.193
0.407	0.375	0.175
0.441	0.375	0.159
0.475	0.375	0.146
0.509	0.375	0.135
0.543	0.375	0.125
0.577	0.375	0.117
0.610	0.375	0.110
0.644	0.375	0.104
0.678	0.375	0.099
0.712	0.375	0.095
0.746	0.375	0.091
0.780	0.375	0.088
0.814	0.375	0.085
0.848	0.375	0.082
0.882	0.375	0.080
0.916	0.375	0.078
0.950	0.375	0.076
0.984	0.375	0.074
1.017	0.375	0.073
1.051	0.375	0.071
1.085	0.375	0.070
1.119	0.375	0.069
1.153	0.375	0.068
1.187	0.375	0.067
1.221	0.375	0.066
1.255	0.375	0.066
1.289	0.375	0.065
1.323	0.375	0.064
1.357	0.375	0.064
1.391	0.375	0.063
1.424	0.375	0.063
1.458	0.375	0.062
1.492	0.375	0.062
1.526	0.375	0.061
1.560	0.375	0.061
1.594	0.375	0.060
1.628	0.375	0.060
1.662	0.375	0.060
1.696	0.375	0.060
1.730	0.375	0.059
1.764	0.375	0.059
1.798	0.375	0.059
1.831	0.375	0.059

Table C-4: Soil Moisture Profile below Slab on Grade Building Vernay Laboratories Inc., Yellow Springs, Ohio		
z (m)	θ_T	θ_w
1.865	0.375	0.058
1.899	0.375	0.058
1.933	0.375	0.058
1.967	0.375	0.058
2.001	0.375	0.058
2.035	0.375	0.057
2.069	0.375	0.057
2.103	0.375	0.057
2.137	0.375	0.057
2.171	0.375	0.057
2.204	0.375	0.057
2.238	0.375	0.057
2.272	0.375	0.056
2.306	0.375	0.056
2.340	0.375	0.056
2.374	0.375	0.056
2.408	0.375	0.056
2.442	0.375	0.056
2.476	0.375	0.056
2.510	0.375	0.056
2.544	0.375	0.056
2.578	0.375	0.056
2.611	0.375	0.056
2.645	0.375	0.055
2.679	0.375	0.055
2.713	0.375	0.055
2.747	0.375	0.055
2.781	0.375	0.055
2.815	0.375	0.055
2.849	0.375	0.055
2.883	0.375	0.055
2.917	0.375	0.055
2.951	0.375	0.055
2.985	0.375	0.055
3.018	0.375	0.055
3.052	0.375	0.055
3.086	0.375	0.055
3.120	0.375	0.055
3.154	0.375	0.055
3.188	0.375	0.055
3.222	0.375	0.055
3.256	0.375	0.055
3.290	0.375	0.055
3.324	0.375	0.055
3.358	0.375	0.054
Note:		
Based on geotechnical data for sand:		
θT	0.375	
θρ	0.053	
α	0.035	
N	3.177	

Table C-5: Calculation of Effective Diffusion Coefficients for a Slab on Grade Building Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{eff}^T (cm^2/s)
VOC	Acetone	67-64-1	1.24E-01	1.14E-05	7.95E-04	1.02E-02
VOC	Benzene	71-43-2	8.80E-02	9.80E-06	1.14E-01	3.74E-04
VOC	Bromochloromethane	74-97-5			2.94E-02	
VOC	Bromodichloromethane	75-27-4	2.98E-02	1.06E-05	3.28E-02	7.67E-04
VOC	Bromoform	75-25-2	1.49E-02	1.03E-05	1.10E-02	9.81E-04
VOC	Bromomethane	74-83-9	7.28E-02	1.21E-05	1.28E-01	3.90E-04
VOC	2-Butanone	78-93-3	9.49E-02	9.80E-06	1.14E-03	7.17E-03
VOC	Carbon Disulfide	75-15-0	1.04E-01	1.00E-05	6.20E-01	9.37E-05
VOC	Carbon Tetrachloride	56-23-5	7.80E-02	8.80E-06	6.25E-01	8.01E-05
VOC	Chlorobenzene	108-90-7	7.30E-02	8.70E-06	7.60E-02	4.55E-04
VOC	Chloroethane	75-00-3	1.10E-01		1.80E-01	
VOC	Chloroform	67-66-3	1.04E-01	1.00E-05	7.50E-02	5.51E-04
VOC	Chloromethane	74-87-3	1.26E-01	6.50E-06	1.80E-01	1.92E-04
VOC	Cumene	98-82-8			2.37E+01	
VOC	Cyclohexane	110-82-7	1.10E-01	9.14E-06	3.98E+00	1.73E-05
VOC	1,2-Dibromo-3-chloropropane	96-12-8	8.00E-02	8.00E-06	3.00E-03	3.93E-03
VOC	Dibromochloromethane	124-48-1	1.96E-02	1.05E-05	1.61E-02	9.65E-04
VOC	1,2-Dibromoethane	106-93-4	8.00E-02	8.00E-06	1.52E-02	1.47E-03
VOC	1,2-Dichlorobenzene	95-50-1	6.90E-02	7.90E-06	3.90E-02	7.02E-04
VOC	1,3-Dichlorobenzene	541-73-1			6.33E-02	
VOC	1,4-Dichlorobenzene	106-46-7	6.90E-02	7.90E-06	4.98E-02	5.81E-04
VOC	Dichlorodifluoromethane	75-71-8	8.00E-02	8.00E-06	7.01E+00	9.04E-06
VOC	1,1-Dichloroethane	75-34-3	7.42E-02	1.05E-05	1.15E-01	3.80E-04
VOC	1,2-Dichloroethane	107-06-2	1.04E-01	9.90E-06	2.01E-02	1.51E-03
VOC	1,1-Dichloroethene	75-35-4	9.00E-02	1.04E-05	5.35E-01	1.08E-04
VOC	1,2-Dichloroethene (total)	540-59-0	7.07E-02	1.19E-05	1.93E-01	2.74E-04
VOC	cis-1,2-Dichloroethene	156-59-2	7.36E-02	1.13E-05	8.35E-02	5.20E-04
VOC	trans-1,2-Dichloroethene	156-60-5	7.07E-02	1.19E-05	1.93E-01	2.74E-04
VOC	1,2-Dichloropropane	78-87-5	7.82E-02	8.73E-06	5.75E-02	5.77E-04
VOC	1,3-Dichloropropene (total)	542-75-6	6.26E-02	1.00E-05	3.63E-01	1.37E-04
VOC	cis-1,3-Dichloropropene	0061-01-5	8.00E-02	8.00E-06	7.25E-02	4.49E-04
VOC	trans-1,3-Dichloropropene	0061-02-6	8.00E-02	8.00E-06	3.27E-02	8.39E-04
VOC	Ethyl Benzene	100-41-4	7.50E-02	7.80E-06	1.62E-01	2.26E-04
VOC	2-Hexanone	591-78-6	8.62E-02	8.76E-02	3.58E-02	1.71E-02
VOC	Methyl Acetate	79-20-9				
VOC	Methyl tert-butyl ether	1634-04-4	1.03E-01	1.05E-05	2.76E-02	1.25E-03
VOC	4-Methyl-2-pentanone	108-10-1	7.50E-02	7.80E-06	2.82E-03	3.88E-03
VOC	Methylcyclohexane	108-87-2	9.86E-02	8.52E-06		
VOC	Methylene Chloride	75-09-2	1.01E-01	1.17E-05	4.49E-02	9.30E-04
VOC	Styrene	100-42-5	7.10E-02	8.00E-06	5.65E-02	5.35E-04
VOC	1,1,2,2-Tetrachloroethane	79-34-5	7.10E-02	7.90E-06	7.05E-03	2.31E-03
VOC	Tetrachloroethene	127-18-4	7.20E-02	8.20E-06	3.77E-01	1.15E-04
VOC	Toluene	108-88-3	8.70E-02	8.60E-06	1.36E-01	2.90E-04
VOC	1,2,4-Trichlorobenzene	120-82-1	3.00E-02	8.23E-06	2.91E-02	7.04E-04
VOC	1,1,1-Trichloroethane	71-55-6	7.80E-02	8.80E-06	3.53E-01	1.31E-04
VOC	1,1,2-Trichloroethane	79-00-5	7.80E-02	8.80E-06	1.87E-02	1.35E-03
VOC	Trichloroethene	79-01-6	7.90E-02	9.10E-06	2.11E-01	2.07E-04
VOC	Trichlorofluoromethane	75-69-4	8.33E-02	9.70E-06	1.98E+00	3.24E-05
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	7.80E-02	8.20E-06	9.83E+00	6.84E-06
VOC	Vinyl Chloride	75-01-4	1.06E-01	1.23E-05	5.55E-01	1.23E-04
VOC	Xylenes (total)	1330-20-7	7.80E-02	8.75E-06	1.38E-01	2.85E-04
SVOC	Acenaphthene	83-32-9	4.21E-02	7.69E-06	3.18E-03	2.66E-03
SVOC	Acenaphthylene	208-96-8	4.42E-02	7.44E-06	2.31E-03	3.08E-03
SVOC	Acetophenone	98-86-2	8.00E-02	8.00E-06	2.19E-04	9.31E-03
SVOC	Anthracene	120-12-7	3.24E-02	7.74E-06	1.34E-03	3.04E-03
SVOC	Atrazine	1912-24-9				
SVOC	Benzaldehyde	100-52-7				
SVOC	Benzo(a)anthracene	56-55-3	5.10E-02	9.00E-06	6.85E-05	7.58E-03
SVOC	Benzo(a)pyrene	50-32-8	4.30E-02	9.00E-06	2.32E-05	7.32E-03
SVOC	Benzo(b)fluoranthene	205-99-2	2.26E-02	5.56E-06	2.28E-03	1.82E-03
SVOC	Benzo(g,h,i)perylene	191-24-2	2.03E-02	5.20E-06	2.88E-06	5.18E-03

Table C-5: Calculation of Effective Diffusion Coefficients for a Slab on Grade Building Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{eff}^T (cm^2/s)
SVOC	Benzo(k)fluoranthene	207-08-9	2.26E-02	5.56E-06	1.70E-05	4.07E-03
SVOC	Biphenyl	92-52-4	4.04E-02	8.15E-05	6.13E-03	4.40E-03
SVOC	bis(2-Chloroethoxy)methane	111-91-1	3.73E-02	6.89E-05	3.47E-06	2.21E-02
SVOC	bis(2-Chloroethyl) ether	111-44-4	6.92E-02	7.53E-06	3.69E-04	7.36E-03
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	3.51E-02	3.66E-06	2.09E-06	7.74E-03
SVOC	4-Bromophenyl-phenyl ether	101-55-3			2.39E-03	
SVOC	Butylbenzylphthalate	85-68-7	1.74E-02	4.83E-06	2.59E-05	3.02E-03
SVOC	Caprolactam	105-60-2	6.54E-02	8.99E-06		
SVOC	Carbazole	86-74-8	3.90E-02	7.03E-06	3.13E-07	2.43E-02
SVOC	4-Chloro-3-methylphenol	59-50-7			8.15E-06	
SVOC	4-Chloroaniline	106-47-8	4.83E-02	1.01E-05	6.80E-06	9.71E-03
SVOC	2-Chloronaphthalene	91-58-7			6.42E-03	
SVOC	2-Chlorophenol	95-57-8	5.01E-02	9.46E-06	8.00E-03	2.06E-03
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3			4.50E-03	
SVOC	Chrysene	218-01-9	2.48E-02	6.21E-06	1.94E-03	2.11E-03
SVOC	Dibenz(a,h)anthracene	53-70-3	2.02E-02	5.18E-06	3.02E-07	1.67E-02
SVOC	Dibenzofuran	132-64-9	2.70E-02	5.93E-06	2.57E-04	3.49E-03
SVOC	3,3'-Dichlorobenzidine	91-94-1	1.94E-02	6.74E-06	8.20E-08	6.39E-02
SVOC	2,4-Dichlorophenol	120-83-2	3.46E-02	8.77E-06	6.50E-05	5.38E-03
SVOC	Diethylphthalate	84-66-2	2.56E-02	6.35E-06	9.25E-06	5.03E-03
SVOC	2,4-Dimethylphenol	105-67-9	5.84E-02	8.69E-06	4.10E-05	9.01E-03
SVOC	Dimethylphthalate	131-11-3	5.68E-02	6.30E-06	2.15E-06	1.26E-02
SVOC	Di-n-butylphthalate	84-74-2	4.38E-02	7.86E-06	1.93E-08	3.06E-01
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	3.13E-02	6.35E-05	8.73E-06	1.15E-02
SVOC	2,4-Dinitrophenol	51-28-5	2.73E-02	9.06E-06	9.10E-06	5.65E-03
SVOC	2,4-Dinitrotoluene	121-14-2	2.03E-01	7.06E-06	1.90E-06	3.77E-02
SVOC	2,6-Dinitrotoluene	606-20-2	3.27E-02	7.26E-06	1.53E-05	5.89E-03
SVOC	Di-n-octylphthalate	117-84-0	1.51E-02	3.58E-06	1.37E-03	1.40E-03
SVOC	Fluoranthene	206-44-0	3.02E-02	6.35E-06	3.30E-04	3.73E-03
SVOC	Fluorene	86-73-7	3.63E-02	7.88E-06	1.31E-03	3.34E-03
SVOC	Hexachlorobenzene	118-74-1	5.42E-02	5.91E-06	2.71E-02	6.99E-04
SVOC	Hexachlorobutadiene	87-68-3	5.61E-02	6.16E-06	1.67E-01	1.72E-04
SVOC	Hexachlorocyclopentadiene	77-47-4	1.61E-02	7.21E-06	5.55E-01	5.84E-05
SVOC	Hexachloroethane	67-72-1	2.50E-03	6.80E-06	7.95E-02	1.25E-04
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	1.90E-02	5.66E-06	3.28E-05	3.24E-03
SVOC	Isophorone	78-59-1	6.23E-02	6.76E-06	1.36E-04	7.97E-03
SVOC	2-Methylnaphthalene	91-57-6	9.86E-02	7.75E-06	1.06E-02	1.97E-03
SVOC	2-Methylphenol	95-48-7	7.40E-02	8.30E-06	2.46E-05	1.17E-02
SVOC	4-Methylphenol	106-44-5	7.40E-02	1.00E-05	1.62E-05	1.25E-02
SVOC	Naphthalene	91-20-3	5.90E-02	7.50E-06	9.90E-03	1.69E-03
SVOC	2-Nitroaniline	88-74-4	7.30E-02		1.99E-03	
SVOC	3-Nitroaniline	99-09-2			2.94E-06	
SVOC	4-Nitroaniline	100-01-6			4.23E-08	
SVOC	Nitrobenzene	98-95-3	7.60E-02	8.60E-06	4.92E-04	7.62E-03
SVOC	2-Nitrophenol	88-75-5			1.94E-04	
SVOC	4-Nitrophenol	100-02-7			8.48E-09	
SVOC	N-Nitrosodiphenylamine	86-30-6	3.12E-02	6.35E-06	1.03E-04	4.50E-03
SVOC	N-Nitroso-di-n-propylamine	621-64-7	5.45E-02	8.17E-06	4.62E-05	8.31E-03
SVOC	N-Nitrosomorpholine	59-89-2				
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	6.02E-02		2.39E-03	
SVOC	Pentachlorophenol	87-86-5	5.60E-02	6.10E-06	5.00E-07	2.00E-02
SVOC	Phenanthrene	85-01-8			4.76E-04	
SVOC	Phenol	108-95-2	8.20E-02	9.10E-06	8.15E-06	1.47E-02
SVOC	Pyrene	129-00-0	2.72E-02	7.24E-06	2.26E-04	3.68E-03
SVOC	2,4,5-Trichlorophenol	95-95-4	2.91E-02	7.03E-06	8.90E-05	4.35E-03
SVOC	2,4,6-Trichlorophenol	88-06-2	3.18E-02	6.25E-06	1.60E-04	4.33E-03
P/PCB	PCBs (total)	1336-36-3	8.00E-02	1.00E-05	5.31E-02	6.86E-04
P/PCB	Aroclor-1016	2674-11-2	2.05E-02		5.93E-03	
P/PCB	Aroclor-1221	1104-28-2			7.15E-02	
P/PCB	Aroclor-1232	1141-16-5				
P/PCB	Aroclor-1242	53469-21-9			1.17E-02	

Table C-5: Calculation of Effective Diffusion Coefficients for a Slab on Grade Building Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{eff}^T (cm^2/s)
P/PCB	Aroclor-1248	2672-29-6			7.17E-02	
P/PCB	Aroclor-1254	1097-69-1			1.71E-01	
P/PCB	Aroclor-1260	1096-82-5	1.27E-02		1.46E-01	
P/PCB	Aldrin	309-00-2	1.32E-02	4.86E-06	3.49E-03	1.05E-03
P/PCB	alpha-BHC	319-84-6	1.42E-02	7.34E-06	2.18E-04	2.09E-03
P/PCB	beta-BHC	319-85-7	1.42E-02	7.34E-06	1.53E-05	2.90E-03
P/PCB	delta-BHC	319-86-8	1.76E-02		8.77E-06	
P/PCB	gamma-BHC	58-89-9	1.42E-02	7.34E-06	2.87E-04	2.03E-03
P/PCB	Chlordane	57-74-9	1.18E-02	4.37E-06	9.95E-04	1.32E-03
P/PCB	alpha-Chlordane	5103-71-9				
P/PCB	gamma-Chlordane	5103-74-2				
P/PCB	4,4'-DDD	72-54-8	1.69E-02	4.76E-06	8.20E-05	2.59E-03
P/PCB	4,4'-DDE	72-55-9	1.44E-02	5.87E-06	4.31E-04	1.89E-03
P/PCB	4,4'-DDT	50-29-3	1.37E-02	4.95E-06	1.66E-04	2.00E-03
P/PCB	Dieldrin	60-57-1	1.25E-02	4.74E-06	3.10E-04	1.70E-03
P/PCB	Endosulfan I	959-98-8			2.06E-03	
P/PCB	Endosulfan II	33213-65-9			3.90E-04	
P/PCB	Endosulfan sulfate	1031-07-8			4.19E-02	
P/PCB	Endrin	72-20-8	1.25E-02	4.74E-06	1.54E-04	1.85E-03
P/PCB	Endrin aldehyde	7421-93-4			7.89E-06	
P/PCB	Endrin ketone	53494-70-5				
P/PCB	Heptachlor	76-44-8	1.12E-02	5.69E-06	2.24E-02	4.50E-04
P/PCB	Heptachlor epoxide	1024-57-3	1.32E-02	4.23E-06	1.95E-04	1.86E-03
P/PCB	Methoxychlor	72-43-5	1.56E-02	4.46E-06	3.24E-04	2.03E-03
P/PCB	Toxaphene	8001-35-2	1.16E-02	4.34E-06	1.23E-04	1.76E-03
INORG	Aluminum	7429-90-5				
INORG	Antimony	7440-36-0				
INORG	Arsenic	7440-38-2				
INORG	Barium	7440-39-3				
INORG	Beryllium	7440-41-7				
INORG	Cadmium	7440-43-9				
INORG	Calcium	7440-70-2				
INORG	Chromium (total)	7440-47-3				
INORG	Chromium III	6065-83-1				
INORG	Chromium VI	8540-29-9				
INORG	Cobalt	7440-48-4				
INORG	Copper	7440-50-8				
INORG	Cyanide (total)	57-12-5				
INORG	Iron	7439-89-6				
INORG	Lead	7439-92-1				
INORG	Magnesium	7439-95-4				
INORG	Manganese	7439-96-5				
INORG	Mercury	7439-97-6	3.07E-02	6.30E-06	1.45E-01	1.76E-04
INORG	Nickel	7440-02-0				
INORG	Potassium	7440-09-7				
INORG	Selenium	7782-49-2				
INORG	Silver	7440-22-4				
INORG	Sodium	7440-23-5				
INORG	Thallium	7440-28-0				
INORG	Vanadium	7440-62-2				
INORG	Zinc	7440-66-6				

Table C-6: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Soil
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	K_{oc} (L/kg)	K_d (L/kg)	$C_{s, vap}$ (kg-soil/m^3)	C_{bldg} (kg-soil/m^3)	Criteria (mg/kg)
VOC	Acetone	67-64-1	1.24E-01	1.14E-05	7.95E-04	1.99E-02	1.99E-02	8.14E-05	5.75E-01	3.45E-03	2.18E+01	1.78E-03	1.4E+06
VOC	Benzene	71-43-2	8.80E-02	9.80E-06	1.14E-01	1.41E-02	1.41E-02	8.12E-05	5.89E+01	3.53E-01	2.79E+02	2.27E-02	1.4E+02
VOC	Bromochloromethane	74-97-5			2.94E-02								
VOC	Bromodichloromethane	75-27-4	2.98E-02	1.06E-05	3.28E-02	4.78E-03	4.78E-03	7.94E-05	5.50E+01	3.30E-01	8.89E+01	7.06E-03	
VOC	Bromoform	75-25-2	1.49E-02	1.03E-05	1.10E-02	2.39E-03	2.39E-03	7.69E-05	8.71E+01	5.23E-01	1.96E+01	1.51E-03	3.3E+03
VOC	Bromomethane	74-83-9	7.28E-02	1.21E-05	1.28E-01	1.17E-02	1.17E-02	8.10E-05	1.05E+01	6.30E-02	1.06E+03	8.60E-02	4.5E+01
VOC	2-Butanone	78-93-3	9.49E-02	9.80E-06	1.14E-03	1.52E-02	1.52E-02	8.12E-05					
VOC	Carbon Disulfide	75-15-0	1.04E-01	1.00E-05	6.20E-01	1.67E-02	1.67E-02	8.13E-05	4.57E+01	2.74E-01	1.45E+03	1.18E-01	2.6E+02
VOC	Carbon Tetrachloride	56-23-5	7.80E-02	8.80E-06	6.25E-01	1.25E-02	1.25E-02	8.11E-05	1.74E+02	1.04E+00	5.22E+02	4.23E-02	1.5E+03
VOC	Chlorobenzene	108-90-7	7.30E-02	8.70E-06	7.60E-02	1.17E-02	1.17E-02	8.10E-05	2.19E+02	1.31E+00	5.58E+01	4.52E-03	7.7E+04
VOC	Chloroethane	75-00-3	1.10E-01		1.80E-01				1.49E+01	8.94E-02	1.15E+03		
VOC	Chloroform	67-66-3	1.04E-01	1.00E-05	7.50E-02	1.67E-02	1.67E-02	8.13E-05	3.98E+01	2.39E-01	2.62E+02	2.13E-02	2.3E+03
VOC	Chloromethane	74-87-3	1.26E-01	6.50E-06	1.80E-01	2.02E-02	2.02E-02	8.14E-05	7.80E+00	4.68E-02	1.58E+03	1.28E-01	8.0E+02
VOC	Cumene	98-82-8			2.37E+01				3.30E+03	1.98E+01	9.71E+02		
VOC	Cyclohexane	110-82-7	1.10E-01	9.14E-06	3.98E+00	1.76E-02	1.76E-02	8.14E-05					
VOC	1,2-Dibromo-3-chloropropane	96-12-8	8.00E-02	8.00E-06	3.00E-03	1.28E-02	1.28E-02	8.11E-05	2.00E+02	1.20E+00	2.44E+00	1.97E-04	
VOC	Dibromochloromethane	124-48-1	1.96E-02	1.05E-05	1.61E-02	3.14E-03	3.14E-03	7.81E-05	6.31E+01	3.79E-01	3.87E+01	3.02E-03	
VOC	1,2-Dibromoethane	106-93-4	8.00E-02	8.00E-06	1.52E-02	1.28E-02	1.28E-02	8.11E-05	5.30E+01	3.18E-01	4.29E+01	3.48E-03	
VOC	1,2-Dichlorobenzene	95-50-1	6.90E-02	7.90E-06	3.90E-02	1.11E-02	1.11E-02	8.09E-05	6.17E+02	3.70E+00	1.04E+01	8.42E-04	1.8E+05
VOC	1,3-Dichlorobenzene	541-73-1			6.33E-02				1.70E+03	1.02E+01	6.18E+00		
VOC	1,4-Dichlorobenzene	106-46-7	6.90E-02	7.90E-06	4.98E-02	1.11E-02	1.11E-02	8.09E-05	6.17E+02	3.70E+00	1.33E+01	1.08E-03	4.2E+05
VOC	Dichlorodifluoromethane	75-71-8	8.00E-02	8.00E-06	7.01E+00	1.28E-02	1.28E-02	8.11E-05	1.30E+02	7.80E-01	3.24E+03	2.62E-01	1.9E+04
VOC	1,1-Dichloroethane	75-34-3	7.42E-02	1.05E-05	1.15E-01	1.19E-02	1.19E-02	8.10E-05	3.16E+01	1.90E-01	4.70E+02	3.81E-02	1.1E+04
VOC	1,2-Dichloroethane	107-06-2	1.04E-01	9.90E-06	2.01E-02	1.67E-02	1.67E-02	8.13E-05	1.74E+01	1.04E-01	1.42E+02	1.16E-02	3.5E+03
VOC	1,1-Dichloroethene	75-35-4	9.00E-02	1.04E-05	5.35E-01	1.44E-02	1.44E-02	8.12E-05	5.89E+01	3.53E-01	1.09E+03	8.87E-02	2.2E+02
VOC	1,2-Dichloroethene (total)	540-59-0	7.07E-02	1.19E-05	1.93E-01	1.13E-02	1.13E-02	8.09E-05	5.25E+01	3.15E-01	5.00E+02	4.05E-02	2.0E+04
VOC	cis-1,2-Dichloroethene	156-59-2	7.36E-02	1.13E-05	8.35E-02	1.18E-02	1.18E-02	8.10E-05	3.55E+01	2.13E-01	3.19E+02	2.58E-02	3.1E+04
VOC	trans-1,2-Dichloroethene	156-60-5	7.07E-02	1.19E-05	1.93E-01	1.13E-02	1.13E-02	8.09E-05	5.25E+01	3.15E-01	5.00E+02	4.05E-02	2.0E+04
VOC	1,2-Dichloropropane	78-87-5	7.82E-02	8.73E-06	5.75E-02	1.25E-02	1.25E-02	8.11E-05	4.37E+01	2.62E-01	1.88E+02	1.52E-02	2.3E+04
VOC	1,3-Dichloropropene (total)	542-75-6	6.26E-02	1.00E-05	3.63E-01	1.00E-02	1.00E-02	8.08E-05	4.57E+01	2.74E-01	9.63E+02	7.78E-02	5.8E+01
VOC	cis-1,3-Dichloropropene	10061-01-5	8.00E-02	8.00E-06	7.25E-02	1.28E-02	1.28E-02	8.11E-05	9.30E+01	5.58E-01	1.20E+02	9.72E-03	
VOC	trans-1,3-Dichloropropene	10061-02-6	8.00E-02	8.00E-06	3.27E-02	1.28E-02	1.28E-02	8.11E-05	9.30E+01	5.58E-01	5.48E+01	4.44E-03	
VOC	Ethyl Benzene	100-41-4	7.50E-02	7.80E-06	1.62E-01	1.20E-02	1.20E-02	8.10E-05	3.63E+02	2.18E+00	7.20E+01	5.84E-03	7.5E+04
VOC	2-Hexanone	591-78-6	8.62E-02	8.76E-02	3.58E-02	1.49E-02	1.49E-02	8.12E-05					
VOC	Methyl Acetate	79-20-9											
VOC	Methyl tert-butyl ether	1634-04-4	1.03E-01	1.05E-05	2.76E-02	1.65E-02	1.65E-02	8.13E-05					
VOC	4-Methyl-2-pentanone	108-10-1	7.50E-02	7.80E-06	2.82E-03	1.20E-02	1.20E-02	8.10E-05					
VOC	Methylcyclohexane	108-87-2	9.86E-02	8.52E-06									
VOC	Methylene Chloride	75-09-2	1.01E-01	1.17E-05	4.49E-02	1.62E-02	1.62E-02	8.13E-05	1.17E+01	7.02E-02	4.02E+02	3.27E-02	2.7E+03
VOC	Styrene	100-42-5	7.10E-02	8.00E-06	5.65E-02	1.14E-02	1.14E-02	8.10E-05	7.76E+02	4.66E+00	1.20E+01	9.73E-04	4.4E+05
VOC	1,1,2,2-Tetrachloroethane	79-34-5	7.10E-02	7.90E-06	7.05E-03	1.14E-02	1.14E-02	8.10E-05	9.33E+01	5.60E-01	1.19E+01	9.61E-04	3.6E+04
VOC	Tetrachloroethene	127-18-4	7.20E-02	8.20E-06	3.77E-01	1.15E-02	1.15E-02	8.10E-05	1.55E+02	9.30E-01	3.64E+02	2.95E-02	2.3E+04
VOC	Toluene	108-88-3	8.70E-02	8.60E-06	1.36E-01	1.39E-02	1.39E-02	8.12E-05	1.82E+02	1.09E+00	1.18E+02	9.59E-03	7.9E+04
VOC	1,2,4-Trichlorobenzene	120-82-1	3.00E-02	8.23E-06	2.91E-02	4.81E-03	4.81E-03	7.94E-05	1.78E+03	1.07E+01	2.71E+00	2.16E-04	
VOC	1,1,1-Trichloroethane	71-55-6	7.80E-02	8.80E-06	3.53E-01	1.25E-02	1.25E-02	8.11E-05	1.10E+02	6.60E-01	4.63E+02	3.75E-02	5.1E+04
VOC	1,1,2-Trichloroethane	79-00-5	7.80E-02	8.80E-06	1.87E-02	1.25E-02	1.25E-02	8.11E-05	5.01E+01	3.01E-01	5.55E+01	4.50E-03	1.0E+04
VOC	Trichloroethene	79-01-6	7.90E-02	9.10E-06	2.11E-01	1.27E-02	1.27E-02	8.11E-05	1.66E+02	9.96E-01	1.97E+02	1.60E-02	3.4E+04
VOC	Trichlorofluoromethane	75-69-4	8.33E-02	9.70E-06	1.98E+00	1.33E-02	1.33E-02	8.11E-05	1.59E+02	9.54E-01	1.45E+03	1.17E-01	4.8E+04
VOC	1,1,2-Trichloro-1,2,2-trifluoroetl	76-13-1	7.80E-02	8.20E-06	9.83E+00	1.25E-02	1.25E-02	8.11E-05	1.30E+03	7.80E+00	1.01E+03	8.19E-02	9.3E+04
VOC	Vinyl Chloride	75-01-4	1.06E-01	1.23E-05	5.55E-01	1.70E-02	1.70E-02	8.13E-05	1.86E+01	1.12E-01	2.21E+03	1.79E-01	1.4E+01
VOC	Xylenes (total)	1330-20-7	7.80E-02	8.75E-06	1.38E-01	1.25E-02	1.25E-02	8.11E-05	3.86E+02	2.32E+00	5.80E+01	4.70E-03	9.2E+04
SVOC	Acenaphthene	83-32-9	4.21E-02	7.69E-06	3.18E-03	6.75E-03	6.75E-03	8.02E-05	7.08E+03	4.25E+01	7.48E-02	6.00E-06	
SVOC	Acenaphthylene	208-96-8	4.42E-02	7.44E-06	2.31E-03	7.08E-03	7.08E-03	8.03E-05	4.90E+03	2.94E+01	7.85E-02	6.30E-06	
SVOC	Acetophenone	98-86-2	8.00E-02	8.00E-06	2.19E-04	1.28E-02	1.28E-02	8.11E-05	4.10E+01	2.46E-01	7.84E-01	6.36E-05	7.7E+05
SVOC	Anthracene	120-12-7	3.24E-02	7.74E-06	1.34E-03	5.19E-03	5.19E-03	7.96E-05	2.95E+04	1.77E+02	7.54E-03	6.00E-07	
SVOC	Atrazine	1912-24-9											

Table C-6: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Soil
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	K_{oc} (L/kg)	K_d (L/kg)	$C_{s, vap}$ (kg-soil/m^3)	C_{bldg} (kg-soil/m^3)	Criteria (mg/kg)
SVOC	Benzaldehyde	100-52-7											
SVOC	Benzo(a)anthracene	56-55-3	5.10E-02	9.00E-06	6.85E-05	8.23E-03	8.23E-03	8.05E-05	3.98E+05	2.39E+03	2.87E-05	2.31E-09	
SVOC	Benzo(a)pyrene	50-32-8	4.30E-02	9.00E-06	2.32E-05	7.06E-03	7.06E-03	8.03E-05	1.02E+06	6.12E+03	3.78E-06	3.04E-10	
SVOC	Benzo(b)fluoranthene	205-99-2	2.26E-02	5.56E-06	2.28E-03	3.62E-03	3.62E-03	7.86E-05	1.23E+06	7.38E+03	3.08E-04	2.42E-08	
SVOC	Benzo(g,h,i)perylene	191-24-2	2.03E-02	5.20E-06	2.88E-06	4.04E-03	4.04E-03	7.89E-05	1.60E+06	9.60E+03	3.00E-07	2.37E-11	
SVOC	Benzo(k)fluoranthene	207-08-9	2.26E-02	5.56E-06	1.70E-05	3.76E-03	3.76E-03	7.87E-05	1.23E+06	7.38E+03	2.30E-06	1.81E-10	
SVOC	Biphenyl	92-52-4	4.04E-02	8.15E-05	6.13E-03	6.48E-03	6.48E-03	8.01E-05					
SVOC	bis(2-Chloroethoxy)methane	111-91-1	3.73E-02	6.89E-05	3.47E-06	1.46E-02	1.46E-02	8.12E-05	5.20E+00	3.12E-02	5.43E-02	4.41E-06	
SVOC	bis(2-Chloroethyl) ether	111-44-4	6.92E-02	7.53E-06	3.69E-04	1.11E-02	1.11E-02	8.09E-05	1.55E+01	9.30E-02	2.93E+00	2.37E-04	1.2E+05
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	3.51E-02	3.66E-06	2.09E-06	6.39E-03	6.39E-03	8.01E-05	1.51E+07	9.06E+04	2.31E-08	1.85E-12	2.7E+12
SVOC	4-Bromophenyl-phenyl ether	101-55-3			2.39E-03				4.20E+04	2.52E+02	9.49E-03		
SVOC	Butylbenzylphthalate	85-68-7	1.74E-02	4.83E-06	2.59E-05	2.87E-03	2.87E-03	7.77E-05	5.75E+04	3.45E+02	7.49E-05	5.82E-09	
SVOC	Caprolactam	105-60-2	6.54E-02	8.99E-06									
SVOC	Carbazole	86-74-8	3.90E-02	7.03E-06	3.13E-07	1.60E-02	1.60E-02	8.13E-05	3.39E+03	2.03E+01	1.54E-05	1.25E-09	
SVOC	4-Chloro-3-methylphenol	59-50-7			8.15E-06				6.04E+02	3.62E+00	2.23E-03		
SVOC	4-Chloroaniline	106-47-8	4.83E-02	1.01E-05	6.80E-06	8.39E-03	8.39E-03	8.05E-05	6.61E+01	3.97E-01	1.58E-02	1.28E-06	
SVOC	2-Chloronaphthalene	91-58-7			6.42E-03				4.80E+03	2.88E+01	2.23E-01		
SVOC	2-Chlorophenol	95-57-8	5.01E-02	9.46E-06	8.00E-03	8.03E-03	8.03E-03	8.05E-05	3.88E+02	2.33E+00	3.39E+00	2.73E-04	
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3			4.50E-03				5.80E+04	3.48E+02	1.29E-02		
SVOC	Chrysene	218-01-9	2.48E-02	6.21E-06	1.94E-03	3.98E-03	3.98E-03	7.89E-05	3.98E+05	2.39E+03	8.12E-04	6.41E-08	
SVOC	Dibenz(a,h)anthracene	53-70-3	2.02E-02	5.18E-06	3.02E-07	1.07E-02	1.07E-02	8.09E-05	3.80E+06	2.28E+04	1.32E-08	1.07E-12	
SVOC	Dibenzofuran	132-64-9	2.70E-02	5.93E-06	2.57E-04	4.34E-03	4.34E-03	7.91E-05					
SVOC	3,3'-Dichlorobenzidine	91-94-1	1.94E-02	6.74E-06	8.20E-08	3.89E-02	3.89E-02	8.18E-05	7.24E+02	4.34E+00	1.87E-05	1.53E-09	
SVOC	2,4-Dichlorophenol	120-83-2	3.46E-02	8.77E-06	6.50E-05	5.60E-03	5.60E-03	7.98E-05	1.47E+02	8.82E-01	7.11E-02	5.67E-06	
SVOC	Diethylphthalate	84-66-2	2.56E-02	6.35E-06	9.25E-06	4.40E-03	4.40E-03	7.92E-05	2.88E+02	1.73E+00	5.25E-03	4.16E-07	1.2E+07
SVOC	2,4-Dimethylphenol	105-67-9	5.84E-02	8.69E-06	4.10E-05	9.45E-03	9.45E-03	8.07E-05	2.09E+02	1.25E+00	3.19E-02	2.57E-06	
SVOC	Dimethylphthalate	131-11-3	5.68E-02	6.30E-06	2.15E-06	1.04E-02	1.04E-02	8.08E-05	3.50E+01	2.10E-01	8.84E-03	7.14E-07	7.0E+06
SVOC	Di-n-butylphthalate	84-74-2	4.38E-02	7.86E-06	1.93E-08	1.85E-01	1.85E-01	8.20E-05	3.39E+04	2.03E+02	9.46E-08	7.76E-12	6.4E+11
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	3.13E-02	6.35E-05	8.73E-06	8.19E-03	8.19E-03	8.05E-05	2.40E+02	1.44E+00	5.92E-03	4.77E-07	4.2E+05
SVOC	2,4-Dinitrophenol	51-28-5	2.73E-02	9.06E-06	9.10E-06	4.81E-03	4.81E-03	7.94E-05	1.00E-02	6.00E-05	2.77E-01	2.20E-05	
SVOC	2,4-Dinitrotoluene	121-14-2	2.03E-01	7.06E-06	1.90E-06	3.41E-02	3.41E-02	8.17E-05	9.55E+01	5.73E-01	3.14E-03	2.56E-07	
SVOC	2,6-Dinitrotoluene	606-20-2	3.27E-02	7.26E-06	1.53E-05	5.45E-03	5.45E-03	7.97E-05	6.92E+01	4.15E-01	3.41E-02	2.72E-06	
SVOC	Di-n-octylphthalate	117-84-0	1.51E-02	3.58E-06	1.37E-03	2.42E-03	2.42E-03	7.70E-05	8.32E+07	4.99E+05	2.74E-06	2.11E-10	
SVOC	Fluoranthene	206-44-0	3.02E-02	6.35E-06	3.30E-04	4.85E-03	4.85E-03	7.94E-05	1.07E+05	6.42E+02	5.14E-04	4.08E-08	
SVOC	Fluorene	86-73-7	3.63E-02	7.88E-06	1.31E-03	5.82E-03	5.82E-03	7.99E-05	1.38E+04	8.28E+01	1.58E-02	1.26E-06	
SVOC	Hexachlorobenzene	118-74-1	5.42E-02	5.91E-06	2.71E-02	8.69E-03	8.69E-03	8.06E-05	5.50E+04	3.30E+02	8.20E-02	6.61E-06	3.0E+02
SVOC	Hexachlorobutadiene	87-68-3	5.61E-02	6.16E-06	1.67E-01	8.99E-03	8.99E-03	8.07E-05	5.37E+04	3.22E+02	5.18E-01	4.18E-05	5.1E+03
SVOC	Hexachlorocyclopentadiene	77-47-4	1.61E-02	7.21E-06	5.55E-01	2.58E-03	2.58E-03	7.73E-05	2.00E+05	1.20E+03	4.62E-01	3.57E-05	3.1E+03
SVOC	Hexachloroethane	67-72-1	2.50E-03	6.80E-06	7.95E-02	4.01E-04	4.01E-04	5.85E-05	1.78E+03	1.07E+01	7.41E+00	4.33E-04	2.3E+04
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	1.90E-02	5.66E-06	3.28E-05	3.12E-03	3.12E-03	7.81E-05	3.47E+06	2.08E+04	1.58E-06	1.23E-10	
SVOC	Isophorone	78-59-1	6.23E-02	6.76E-06	1.36E-04	1.00E-02	1.00E-02	8.08E-05	4.68E+01	2.81E-01	4.34E-01	3.50E-05	4.0E+06
SVOC	2-Methylnaphthalene	91-57-6	9.86E-02	7.75E-06	1.06E-02	1.58E-02	1.58E-02	8.13E-05					
SVOC	2-Methylphenol	95-48-7	7.40E-02	8.30E-06	2.46E-05	1.20E-02	1.20E-02	8.10E-05	9.12E+01	5.47E-01	4.24E-02	3.44E-06	6.4E+06
SVOC	4-Methylphenol	106-44-5	7.40E-02	1.00E-05	1.62E-05	1.21E-02	1.21E-02	8.10E-05	8.30E+01	4.98E-01	3.05E-02	2.47E-06	8.9E+06
SVOC	Naphthalene	91-20-3	5.90E-02	7.50E-06	9.90E-03	9.45E-03	9.45E-03	8.07E-05	2.00E+03	1.20E+01	8.23E-01	6.64E-05	7.5E+05
SVOC	2-Nitroaniline	88-74-4	7.30E-02		1.99E-03								
SVOC	3-Nitroaniline	99-09-2			2.94E-06								
SVOC	4-Nitroaniline	100-01-6			4.23E-08								
SVOC	Nitrobenzene	98-95-3	7.60E-02	8.60E-06	4.92E-04	1.22E-02	1.22E-02	8.10E-05	6.46E+01	3.88E-01	1.17E+00	9.48E-05	5.3E+04
SVOC	2-Nitrophenol	88-75-5			1.94E-04				2.70E+01	1.62E-01	9.93E-01		
SVOC	4-Nitrophenol	100-02-7			8.48E-09								
SVOC	N-Nitrosodiphenylamine	86-30-6	3.12E-02	6.35E-06	1.03E-04	5.03E-03	5.03E-03	7.95E-05	1.29E+03	7.74E+00	1.32E-02	1.05E-06	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	5.45E-02	8.17E-06	4.62E-05	8.81E-03	8.81E-03	8.06E-05	2.40E+01	1.44E-01	2.61E-01	2.10E-05	
SVOC	N-Nitrosomorpholine	59-89-2											
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	6.02E-02		2.39E-03				6.10E+01	3.66E-01	5.99E+00		
SVOC	Pentachlorophenol	87-86-5	5.60E-02	6.10E-06	5.00E-07	1.43E-02	1.43E-02	8.12E-05	5.92E+02	3.55E+00	1.39E-04	1.13E-08	4.4E+07

Table C-6: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Soil
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	K_{oc} (L/kg)	K_d (L/kg)	$C_{s,\,vap}$ ($kg\text{-}soil/m^3$)	C_{bldg} ($kg\text{-}soil/m^3$)	Criteria (mg/kg)
SVOC	Phenanthrene	85-01-8			4.76E-04				1.40E+04	8.40E+01	5.67E-03		
SVOC	Phenol	108-95-2	8.20E-02	9.10E-06	8.15E-06	1.36E-02	1.36E-02	8.11E-05	2.88E+01	1.73E-01	3.96E-02	3.22E-06	5.9E+06
SVOC	Pyrene	129-00-0	2.72E-02	7.24E-06	2.26E-04	4.37E-03	4.37E-03	7.92E-05	1.05E+05	6.30E+02	3.58E-04	2.83E-08	
SVOC	2,4,5-Trichlorophenol	95-95-4	2.91E-02	7.03E-06	8.90E-05	4.70E-03	4.70E-03	7.94E-05	1.60E+03	9.58E+00	9.26E-03	7.35E-07	
SVOC	2,4,6-Trichlorophenol	88-06-2	3.18E-02	6.25E-06	1.60E-04	5.11E-03	5.11E-03	7.96E-05	3.81E+02	2.29E+00	6.88E-02	5.47E-06	
P/PCB	PCBs (total)	1336-36-3	8.00E-02	1.00E-05	5.31E-02	1.28E-02	1.28E-02	8.11E-05	3.09E+05	1.85E+03	2.87E-02	2.32E-06	2.2E+05
P/PCB	Aroclor-1016	12674-11-2	2.05E-02		5.93E-03								
P/PCB	Aroclor-1221	11104-28-2			7.15E-02								
P/PCB	Aroclor-1232	11141-16-5											
P/PCB	Aroclor-1242	53469-21-9			1.17E-02								
P/PCB	Aroclor-1248	12672-29-6			7.17E-02								
P/PCB	Aroclor-1254	11097-69-1			1.71E-01								
P/PCB	Aroclor-1260	11096-82-5	1.27E-02		1.46E-01								
P/PCB	Aldrin	309-00-2	1.32E-02	4.86E-06	3.49E-03	2.12E-03	2.12E-03	7.63E-05	2.45E+06	1.47E+04	2.37E-04	1.81E-08	1.4E+07
P/PCB	alpha-BHC	319-84-6	1.42E-02	7.34E-06	2.18E-04	2.29E-03	2.29E-03	7.67E-05	1.23E+03	7.38E+00	2.93E-02	2.25E-06	
P/PCB	beta-BHC	319-85-7	1.42E-02	7.34E-06	1.53E-05	2.49E-03	2.49E-03	7.71E-05	1.26E+03	7.56E+00	2.01E-03	1.55E-07	
P/PCB	delta-BHC	319-86-8	1.76E-02		8.77E-06				6.60E+03	3.96E+01	2.21E-04		
P/PCB	gamma-BHC	58-89-9	1.42E-02	7.34E-06	2.87E-04	2.29E-03	2.29E-03	7.67E-05	1.07E+03	6.42E+00	4.45E-02	3.41E-06	1.5E+05
P/PCB	Chlordane	57-74-9	1.18E-02	4.37E-06	9.95E-04	1.89E-03	1.89E-03	7.56E-05	1.20E+05	7.20E+02	1.38E-03	1.05E-07	4.8E+06
P/PCB	alpha-Chlordane	5103-71-9											
P/PCB	gamma-Chlordane	5103-74-2											
P/PCB	4,4'-DDD	72-54-8	1.69E-02	4.76E-06	8.20E-05	2.73E-03	2.73E-03	7.75E-05	1.00E+06	6.00E+03	1.37E-05	1.06E-09	
P/PCB	4,4'-DDE	72-55-9	1.44E-02	5.87E-06	4.31E-04	2.31E-03	2.31E-03	7.67E-05	4.47E+06	2.68E+04	1.61E-05	1.23E-09	
P/PCB	4,4'-DDT	50-29-3	1.37E-02	4.95E-06	1.66E-04	2.21E-03	2.21E-03	7.65E-05	2.63E+06	1.58E+04	1.05E-05	8.05E-10	1.2E+09
P/PCB	Dieldrin	60-57-1	1.25E-02	4.74E-06	3.10E-04	2.01E-03	2.01E-03	7.60E-05	2.14E+04	1.28E+02	2.41E-03	1.83E-07	1.4E+06
P/PCB	Endosulfan I	959-98-8			2.06E-03								
P/PCB	Endosulfan II	33213-65-9			3.90E-04								
P/PCB	Endosulfan sulfate	1031-07-8			4.19E-02								
P/PCB	Endrin	72-20-8	1.25E-02	4.74E-06	1.54E-04	2.02E-03	2.02E-03	7.60E-05	1.23E+04	7.38E+01	2.09E-03	1.59E-07	6.3E+05
P/PCB	Endrin aldehyde	7421-93-4			7.89E-06				6.70E+02	4.02E+00	1.95E-03		
P/PCB	Endrin ketone	53494-70-5											
P/PCB	Heptachlor	76-44-8	1.12E-02	5.69E-06	2.24E-02	1.79E-03	1.79E-03	7.53E-05	1.41E+06	8.46E+03	2.64E-03	1.99E-07	2.5E+06
P/PCB	Heptachlor epoxide	1024-57-3	1.32E-02	4.23E-06	1.95E-04	2.12E-03	2.12E-03	7.63E-05	8.32E+04	4.99E+02	3.91E-04	2.98E-08	1.7E+06
P/PCB	Methoxychlor	72-43-5	1.56E-02	4.46E-06	3.24E-04	2.51E-03	2.51E-03	7.71E-05	9.77E+04	5.86E+02	5.53E-04	4.26E-08	2.3E+08
P/PCB	Toxaphene	8001-35-2	1.16E-02	4.34E-06	1.23E-04	1.87E-03	1.87E-03	7.56E-05	2.57E+05	1.54E+03	7.98E-05	6.03E-09	8.3E+07
INORG	Aluminum	7429-90-5								1.50E+03			
INORG	Antimony	7440-36-0								4.50E+01			
INORG	Arsenic	7440-38-2								2.90E+01			
INORG	Barium	7440-39-3								4.10E+01			
INORG	Beryllium	7440-41-7								7.90E+02			
INORG	Cadmium	7440-43-9								7.50E+01			
INORG	Calcium	7440-70-2											
INORG	Chromium (total)	7440-47-3								1.90E+01			
INORG	Chromium III	16065-83-1								1.80E+06			
INORG	Chromium VI	18540-29-9								1.90E+01			
INORG	Cobalt	7440-48-4								4.50E+01			
INORG	Copper	7440-50-8								3.50E+01			
INORG	Cyanide (total)	57-12-5								9.90E+00			
INORG	Iron	7439-89-6								2.50E+01			
INORG	Lead	7439-92-1								9.00E+02			
INORG	Magnesium	7439-95-4											
INORG	Manganese	7439-96-5								6.50E+01			
INORG	Mercury	7439-97-6	3.07E-02	6.30E-06	1.45E-01	4.92E-03	4.92E-03	7.95E-05		1.00E+03	1.45E-01	1.15E-05	2.2E+03
INORG	Nickel	7440-02-0								6.50E+01			
INORG	Potassium	7440-09-7											
INORG	Selenium	7782-49-2								5.00E+00			

Table C-6: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Soil
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	K_{oc} (L/kg)	K_d (L/kg)	$C_{s,\,vap}$ (kg-soil/m^3)	C_{bldg} (kg-soil/m^3)	Criteria (mg/kg)
INORG	Silver	7440-22-4								8.30E+00			
INORG	Sodium	7440-23-5											
INORG	Thallium	7440-28-0								7.10E+01			
INORG	Vanadium	7440-62-2								1.00E+03			
INORG	Zinc	7440-66-6								6.20E+01			
Notes:	**Soil and Building Characteristics**			Crack	Vadose								
	Bulk density	kg/L	ρ_b	**1.66**	1.66								
	Total porosity	L/L-soil	θ	**0.375**	0.375								
	Water-filled porosity	L/L-soil	θ_w	0.054	0.054								
	Air-filled porosity	L/L-soil	θ_a	0.321	0.321								
	Organic carbon fraction	unitless	f_{oc}		0.006								
	Residual saturation	L/L-soil	θ_r	**0.053**									
	Hydraulic conductivity	cm/s	K	**7.4E-03**									
	Dynamic viscosity of water	g/cm-s	μ	0.01307									
	Density of water	g/cm^3	ρ_w	1.0									
	Gravitational acceleration	cm/s^2	g	980.7									
	Intrinsic permeability	cm^2	k	9.9E-08									
	Effective total saturation	unitless	S_{te}	0.005									
	van Genuchten N	unitless	N	**3.177**									
	van Genuchten M	unitless	M	0.685									
	Relative air permeability	unitless	k_{rg}	0.997									
	Permeability to vapor	cm^2	k_v	9.8E-08									
	Distance from building foundation to source	m	L_T	**0.15**									
	Bldg foundation thickness	m	L_{crack}	0.15									
	Bldg foundation length	m		**19.29**									
	Bldg foundation width	m		**19.29**									
	Bldg occupied height	m		**2.44**									
	Bldg occupied volume	m^3		907.68									
	Bldg depth below ground	m		**0.15**									
	Bldg area for vapor intrusion	m^2	A_B	383.6									
	Ratio of A_{crack} to A_B		η	1E-04									
	Area of cracks	m^2	A_{crack}	3.86E-02									
	Air exchange rate	$hour^{-1}$	ac/h	**2.0**									
	Building ventilation rate	m^3/s	Q_{bldg}	5.04E-01									
	Pressure difference between outdoors-indoors	$kg/m\text{-}s^2$	ΔP	1.0									
	Air viscosity	kg/m-s	μ	1.8E-05									
	Crack length (bldg perimeter)	m	X_{crack}	77.149206									
	Crack depth below ground	m	Z_{crack}	0.15									
	Crack radius	m	r_{crack}	**5E-04**									
	Soil gas flow rate into bldg	m^3/s	Q_{soil}	4.14E-05									
	Averaging period	s	T	9.46E+08									
	Contaminant thickness	m	ΔH	0									

Table C-7: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Groundwater
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	C_{bldg} (L-water/m^3)	Criteria (mg/l)
VOC	Acetone	67-64-1	1.24E-01	1.14E-05	7.95E-04	1.99E-02	1.02E-02	6.06E-05	4.82E-05	5.0E+07
VOC	Benzene	71-43-2	8.80E-02	9.80E-06	1.14E-01	1.41E-02	3.74E-04	7.68E-06	8.75E-04	3.7E+03
VOC	Bromochloromethane	74-97-5			2.94E-02					
VOC	Bromodichloromethane	75-27-4	2.98E-02	1.06E-05	3.28E-02	4.78E-03	7.67E-04	1.43E-05	4.70E-04	
VOC	Bromoform	75-25-2	1.49E-02	1.03E-05	1.10E-02	2.39E-03	9.81E-04	1.75E-05	1.91E-04	2.6E+04
VOC	Bromomethane	74-83-9	7.28E-02	1.21E-05	1.28E-01	1.17E-02	3.90E-04	7.97E-06	1.02E-03	3.8E+03
VOC	2-Butanone	78-93-3	9.49E-02	9.80E-06	1.14E-03	1.52E-02	7.17E-03	5.45E-05	6.23E-05	9.5E+06
VOC	Carbon Disulfide	75-15-0	1.04E-01	1.00E-05	6.20E-01	1.67E-02	9.37E-05	2.07E-06	1.28E-03	2.4E+04
VOC	Carbon Tetrachloride	56-23-5	7.80E-02	8.80E-06	6.25E-01	1.25E-02	8.01E-05	1.77E-06	1.11E-03	5.7E+04
VOC	Chlorobenzene	108-90-7	7.30E-02	8.70E-06	7.60E-02	1.17E-02	4.55E-04	9.15E-06	6.95E-04	5.0E+05
VOC	Chloroethane	75-00-3	1.10E-01		1.80E-01					
VOC	Chloroform	67-66-3	1.04E-01	1.00E-05	7.50E-02	1.67E-02	5.51E-04	1.08E-05	8.13E-04	6.0E+04
VOC	Chloromethane	74-87-3	1.26E-01	6.50E-06	1.80E-01	2.02E-02	1.92E-04	4.13E-06	7.44E-04	1.4E+05
VOC	Cumene	98-82-8			2.37E+01					
VOC	Cyclohexane	110-82-7	1.10E-01	9.14E-06	3.98E+00	1.76E-02	1.73E-05	3.91E-07	1.56E-03	6.7E+05
VOC	1,2-Dibromo-3-chloropropane	96-12-8	8.00E-02	8.00E-06	3.00E-03	1.28E-02	3.93E-03	4.27E-05	1.28E-04	
VOC	Dibromochloromethane	124-48-1	1.96E-02	1.05E-05	1.61E-02	3.14E-03	9.65E-04	1.73E-05	2.77E-04	
VOC	1,2-Dibromoethane	106-93-4	8.00E-02	8.00E-06	1.52E-02	1.28E-02	1.47E-03	2.37E-05	3.60E-04	
VOC	1,2-Dichlorobenzene	95-50-1	6.90E-02	7.90E-06	3.90E-02	1.11E-02	7.02E-04	1.33E-05	5.19E-04	2.9E+05
VOC	1,3-Dichlorobenzene	541-73-1			6.33E-02					
VOC	1,4-Dichlorobenzene	106-46-7	6.90E-02	7.90E-06	4.98E-02	1.11E-02	5.81E-04	1.13E-05	5.65E-04	8.0E+05
VOC	Dichlorodifluoromethane	75-71-8	8.00E-02	8.00E-06	7.01E+00	1.28E-02	9.04E-06	2.04E-07	1.43E-03	3.5E+06
VOC	1,1-Dichloroethane	75-34-3	7.42E-02	1.05E-05	1.15E-01	1.19E-02	3.80E-04	7.80E-06	8.97E-04	4.5E+05
VOC	1,2-Dichloroethane	107-06-2	1.04E-01	9.90E-06	2.01E-02	1.67E-02	1.51E-03	2.42E-05	4.85E-04	8.3E+04
VOC	1,1-Dichloroethene	75-35-4	9.00E-02	1.04E-05	5.35E-01	1.44E-02	1.08E-04	2.37E-06	1.27E-03	1.6E+04
VOC	1,2-Dichloroethene (total)	540-59-0	7.07E-02	1.19E-05	1.93E-01	1.13E-02	2.74E-04	5.77E-06	1.11E-03	7.1E+05
VOC	cis-1,2-Dichloroethene	156-59-2	7.36E-02	1.13E-05	8.35E-02	1.18E-02	5.20E-04	1.03E-05	8.60E-04	9.2E+05
VOC	trans-1,2-Dichloroethene	156-60-5	7.07E-02	1.19E-05	1.93E-01	1.13E-02	2.74E-04	5.77E-06	1.11E-03	7.1E+05
VOC	1,2-Dichloropropane	78-87-5	7.82E-02	8.73E-06	5.75E-02	1.25E-02	5.77E-04	1.13E-05	6.48E-04	5.4E+05
VOC	1,3-Dichloropropene (total)	542-75-6	6.26E-02	1.00E-05	3.63E-01	1.00E-02	1.37E-04	2.99E-06	1.09E-03	4.2E+03
VOC	cis-1,3-Dichloropropene	10061-01-5	8.00E-02	8.00E-06	7.25E-02	1.28E-02	4.49E-04	9.06E-06	6.57E-04	
VOC	trans-1,3-Dichloropropene	10061-02-6	8.00E-02	8.00E-06	3.27E-02	1.28E-02	8.39E-04	1.54E-05	5.05E-04	
VOC	Ethyl Benzene	100-41-4	7.50E-02	7.80E-06	1.62E-01	1.20E-02	2.26E-04	4.82E-06	7.78E-04	5.6E+05
VOC	2-Hexanone	591-78-6	8.62E-02	8.76E-02	3.58E-02	1.49E-02	1.71E-02	6.77E-05	2.42E-03	1.7E+05
VOC	Methyl Acetate	79-20-9								
VOC	Methyl tert-butyl ether	1634-04-4	1.03E-01	1.05E-05	2.76E-02	1.65E-02	1.25E-03	2.10E-05	5.79E-04	3.1E+05
VOC	4-Methyl-2-pentanone	108-10-1	7.50E-02	7.80E-06	2.82E-03	1.20E-02	3.88E-03	4.24E-05	1.20E-04	3.4E+06
VOC	Methylcyclohexane	108-87-2	9.86E-02	8.52E-06						
VOC	Methylene Chloride	75-09-2	1.01E-01	1.17E-05	4.49E-02	1.62E-02	9.30E-04	1.68E-05	7.53E-04	1.2E+05
VOC	Styrene	100-42-5	7.10E-02	8.00E-06	5.65E-02	1.14E-02	5.35E-04	1.06E-05	5.97E-04	7.1E+05
VOC	1,1,2,2-Tetrachloroethane	79-34-5	7.10E-02	7.90E-06	7.05E-03	1.14E-02	2.31E-03	3.20E-05	2.25E-04	1.6E+05
VOC	Tetrachloroethene	127-18-4	7.20E-02	8.20E-06	3.77E-01	1.15E-02	1.15E-04	2.52E-06	9.50E-04	7.1E+05
VOC	Toluene	108-88-3	8.70E-02	8.60E-06	1.36E-01	1.39E-02	2.90E-04	6.08E-06	8.26E-04	9.1E+05
VOC	1,2,4-Trichlorobenzene	120-82-1	3.00E-02	8.23E-06	2.91E-02	4.81E-03	7.04E-04	1.34E-05	3.89E-04	
VOC	1,1,1-Trichloroethane	71-55-6	7.80E-02	8.80E-06	3.53E-01	1.25E-02	1.31E-04	2.85E-06	1.01E-03	1.9E+06
VOC	1,1,2-Trichloroethane	79-00-5	7.80E-02	8.80E-06	1.87E-02	1.25E-02	1.35E-03	2.23E-05	4.16E-04	1.1E+05
VOC	Trichloroethene	79-01-6	7.90E-02	9.10E-06	2.11E-01	1.27E-02	2.07E-04	4.44E-06	9.37E-04	5.7E+05
VOC	Trichlorofluoromethane	75-69-4	8.33E-02	9.70E-06	1.98E+00	1.33E-02	3.24E-05	7.27E-07	1.44E-03	3.9E+06
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	7.80E-02	8.20E-06	9.83E+00	1.25E-02	6.84E-06	1.55E-07	1.52E-03	5.0E+06
VOC	Vinyl Chloride	75-01-4	1.06E-01	1.23E-05	5.55E-01	1.70E-02	1.23E-04	2.70E-06	1.50E-03	1.7E+03
VOC	Xylenes (total)	1330-20-7	7.80E-02	8.75E-06	1.38E-01	1.25E-02	2.85E-04	5.98E-06	8.25E-04	5.3E+05
SVOC	Acenaphthene	83-32-9	4.21E-02	7.69E-06	3.18E-03	6.75E-03	2.66E-03	3.48E-05	1.11E-04	
SVOC	Acenaphthylene	208-96-8	4.42E-02	7.44E-06	2.31E-03	7.08E-03	3.08E-03	3.77E-05	8.71E-05	
SVOC	Acetophenone	98-86-2	8.00E-02	8.00E-06	2.19E-04	1.28E-02	9.31E-03	5.91E-05	1.29E-05	3.8E+06

Table C-7: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Groundwater
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	C_{bldg} (L-water/m^3)	Criteria (mg/l)
SVOC	Anthracene	120-12-7	3.24E-02	7.74E-06	1.34E-03	5.19E-03	3.04E-03	3.75E-05	5.00E-05	
SVOC	Atrazine	1912-24-9								
SVOC	Benzaldehyde	100-52-7								
SVOC	Benzo(a)anthracene	56-55-3	5.10E-02	9.00E-06	6.85E-05	8.23E-03	7.58E-03	5.56E-05	3.81E-06	
SVOC	Benzo(a)pyrene	50-32-8	4.30E-02	9.00E-06	2.32E-05	7.06E-03	7.32E-03	5.49E-05	1.27E-06	
SVOC	Benzo(b)fluoranthene	205-99-2	2.26E-02	5.56E-06	2.28E-03	3.62E-03	1.82E-03	2.74E-05	6.24E-05	
SVOC	Benzo(g,h,i)perylene	191-24-2	2.03E-02	5.20E-06	2.88E-06	4.04E-03	5.18E-03	4.83E-05	1.39E-07	
SVOC	Benzo(k)fluoranthene	207-08-9	2.26E-02	5.56E-06	1.70E-05	3.76E-03	4.07E-03	4.34E-05	7.38E-07	
SVOC	Biphenyl	92-52-4	4.04E-02	8.15E-05	6.13E-03	6.48E-03	4.40E-03	4.50E-05	2.76E-04	3.6E+03
SVOC	bis(2-Chloroethoxy)methane	111-91-1	3.73E-02	6.89E-05	3.47E-06	1.46E-02	2.21E-02	7.05E-05	2.45E-07	
SVOC	bis(2-Chloroethyl) ether	111-44-4	6.92E-02	7.53E-06	3.69E-04	1.11E-02	7.36E-03	5.50E-05	2.03E-05	1.4E+06
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	3.51E-02	3.66E-06	2.09E-06	6.39E-03	7.74E-03	5.59E-05	1.17E-07	4.3E+07
SVOC	4-Bromophenyl-phenyl ether	101-55-3			2.39E-03					
SVOC	Butylbenzylphthalate	85-68-7	1.74E-02	4.83E-06	2.59E-05	2.87E-03	3.02E-03	3.73E-05	9.65E-07	
SVOC	Caprolactam	105-60-2	6.54E-02	8.99E-06						
SVOC	Carbazole	86-74-8	3.90E-02	7.03E-06	3.13E-07	1.60E-02	2.43E-02	7.15E-05	2.24E-08	
SVOC	4-Chloro-3-methylphenol	59-50-7			8.15E-06					
SVOC	4-Chloroaniline	106-47-8	4.83E-02	1.01E-05	6.80E-06	8.39E-03	9.71E-03	5.98E-05	4.07E-07	
SVOC	2-Chloronaphthalene	91-58-7			6.42E-03					
SVOC	2-Chlorophenol	95-57-8	5.01E-02	9.46E-06	8.00E-03	8.03E-03	2.06E-03	2.97E-05	2.38E-04	
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3			4.50E-03					
SVOC	Chrysene	218-01-9	2.48E-02	6.21E-06	1.94E-03	3.98E-03	2.11E-03	3.02E-05	5.87E-05	
SVOC	Dibenz(a,h)anthracene	53-70-3	2.02E-02	5.18E-06	3.02E-07	1.07E-02	1.67E-02	6.74E-05	2.03E-08	
SVOC	Dibenzofuran	132-64-9	2.70E-02	5.93E-06	2.57E-04	4.34E-03	3.49E-03	4.03E-05	1.04E-05	
SVOC	3,3'-Dichlorobenzidine	91-94-1	1.94E-02	6.74E-06	8.20E-08	3.89E-02	6.39E-02	7.77E-05	6.37E-09	
SVOC	2,4-Dichlorophenol	120-83-2	3.46E-02	8.77E-06	6.50E-05	5.60E-03	5.38E-03	4.91E-05	3.19E-06	
SVOC	Diethylphthalate	84-66-2	2.56E-02	6.35E-06	9.25E-06	4.40E-03	5.03E-03	4.77E-05	4.41E-07	1.1E+07
SVOC	2,4-Dimethylphenol	105-67-9	5.84E-02	8.69E-06	4.10E-05	9.45E-03	9.01E-03	5.86E-05	2.40E-06	
SVOC	Dimethylphthalate	131-11-3	5.68E-02	6.30E-06	2.15E-06	1.04E-02	1.26E-02	6.38E-05	1.37E-07	3.7E+07
SVOC	Di-n-butylphthalate	84-74-2	4.38E-02	7.86E-06	1.93E-08	1.85E-01	3.06E-01	8.12E-05	1.56E-09	3.2E+09
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	3.13E-02	6.35E-05	8.73E-06	8.19E-03	1.15E-02	6.25E-05	5.45E-07	3.7E+05
SVOC	2,4-Dinitrophenol	51-28-5	2.73E-02	9.06E-06	9.10E-06	4.81E-03	5.65E-03	5.00E-05	4.55E-07	
SVOC	2,4-Dinitrotoluene	121-14-2	2.03E-01	7.06E-06	1.90E-06	3.41E-02	3.77E-02	7.49E-05	1.42E-07	
SVOC	2,6-Dinitrotoluene	606-20-2	3.27E-02	7.26E-06	1.53E-05	5.45E-03	5.89E-03	5.08E-05	7.78E-07	
SVOC	Di-n-octylphthalate	117-84-0	1.51E-02	3.58E-06	1.37E-03	2.42E-03	1.40E-03	2.29E-05	3.14E-05	
SVOC	Fluoranthene	206-44-0	3.02E-02	6.35E-06	3.30E-04	4.85E-03	3.73E-03	4.16E-05	1.37E-05	
SVOC	Fluorene	86-73-7	3.63E-02	7.88E-06	1.31E-03	5.82E-03	3.34E-03	3.94E-05	5.14E-05	
SVOC	Hexachlorobenzene	118-74-1	5.42E-02	5.91E-06	2.71E-02	8.69E-03	6.99E-04	1.33E-05	3.59E-04	5.6E+00
SVOC	Hexachlorobutadiene	87-68-3	5.61E-02	6.16E-06	1.67E-01	8.99E-03	1.72E-04	3.72E-06	6.21E-04	3.4E+02
SVOC	Hexachlorocyclopentadiene	77-47-4	1.61E-02	7.21E-06	5.55E-01	2.58E-03	5.84E-05	1.30E-06	7.23E-04	1.5E+02
SVOC	Hexachloroethane	67-72-1	2.50E-03	6.80E-06	7.95E-02	4.01E-04	1.25E-04	2.73E-06	2.17E-04	4.6E+04
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	1.90E-02	5.66E-06	3.28E-05	3.12E-03	3.24E-03	3.87E-05	1.27E-06	
SVOC	Isophorone	78-59-1	6.23E-02	6.76E-06	1.36E-04	1.00E-02	7.97E-03	5.64E-05	7.67E-06	1.8E+07
SVOC	2-Methylnaphthalene	91-57-6	9.86E-02	7.75E-06	1.06E-02	1.58E-02	1.97E-03	2.89E-05	3.06E-04	
SVOC	2-Methylphenol	95-48-7	7.40E-02	8.30E-06	2.46E-05	1.20E-02	1.17E-02	6.27E-05	1.54E-06	1.4E+07
SVOC	4-Methylphenol	106-44-5	7.40E-02	1.00E-05	1.62E-05	1.21E-02	1.25E-02	6.36E-05	1.03E-06	2.1E+07
SVOC	Naphthalene	91-20-3	5.90E-02	7.50E-06	9.90E-03	9.45E-03	1.69E-03	2.61E-05	2.59E-04	1.9E+05
SVOC	2-Nitroaniline	88-74-4	7.30E-02		1.99E-03					
SVOC	3-Nitroaniline	99-09-2			2.94E-06					
SVOC	4-Nitroaniline	100-01-6			4.23E-08					
SVOC	Nitrobenzene	98-95-3	7.60E-02	8.60E-06	4.92E-04	1.22E-02	7.62E-03	5.56E-05	2.74E-05	1.8E+05
SVOC	2-Nitrophenol	88-75-5			1.94E-04					
SVOC	4-Nitrophenol	100-02-7			8.48E-09					
SVOC	N-Nitrosodiphenylamine	86-30-6	3.12E-02	6.35E-06	1.03E-04	5.03E-03	4.50E-03	4.55E-05	4.66E-06	

Table C-7: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Groundwater
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	C_{bldg} (L-water/m^3)	Criteria (mg/l)
SVOC	N-Nitroso-di-n-propylamine	621-64-7	5.45E-02	8.17E-06	4.62E-05	8.81E-03	8.31E-03	5.72E-05	2.64E-06	
SVOC	N-Nitrosomorpholine	59-89-2								
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	6.02E-02		2.39E-03					
SVOC	Pentachlorophenol	87-86-5	5.60E-02	6.10E-06	5.00E-07	1.43E-02	2.00E-02	6.95E-05	3.48E-08	1.4E+07
SVOC	Phenanthrene	85-01-8			4.76E-04					
SVOC	Phenol	108-95-2	8.20E-02	9.10E-06	8.15E-06	1.36E-02	1.47E-02	6.58E-05	5.36E-07	3.5E+07
SVOC	Pyrene	129-00-0	2.72E-02	7.24E-06	2.26E-04	4.37E-03	3.68E-03	4.14E-05	9.33E-06	
SVOC	2,4,5-Trichlorophenol	95-95-4	2.91E-02	7.03E-06	8.90E-05	4.70E-03	4.35E-03	4.48E-05	3.99E-06	
SVOC	2,4,6-Trichlorophenol	88-06-2	3.18E-02	6.25E-06	1.60E-04	5.11E-03	4.33E-03	4.47E-05	7.13E-06	
P/PCB	PCBs (total)	1336-36-3	8.00E-02	1.00E-05	5.31E-02	1.28E-02	6.86E-04	1.31E-05	6.94E-04	7.2E+02
P/PCB	Aroclor-1016	12674-11-2	2.05E-02		5.93E-03					
P/PCB	Aroclor-1221	11104-28-2			7.15E-02					
P/PCB	Aroclor-1232	11141-16-5								
P/PCB	Aroclor-1242	53469-21-9			1.17E-02					
P/PCB	Aroclor-1248	12672-29-6			7.17E-02					
P/PCB	Aroclor-1254	11097-69-1			1.71E-01					
P/PCB	Aroclor-1260	11096-82-5	1.27E-02		1.46E-01					
P/PCB	Aldrin	309-00-2	1.32E-02	4.86E-06	3.49E-03	2.12E-03	1.05E-03	1.85E-05	6.44E-05	3.9E+03
P/PCB	alpha-BHC	319-84-6	1.42E-02	7.34E-06	2.18E-04	2.29E-03	2.09E-03	3.01E-05	6.54E-06	
P/PCB	beta-BHC	319-85-7	1.42E-02	7.34E-06	1.53E-05	2.49E-03	2.90E-03	3.65E-05	5.57E-07	
P/PCB	delta-BHC	319-86-8	1.76E-02		8.77E-06					
P/PCB	gamma-BHC	58-89-9	1.42E-02	7.34E-06	2.87E-04	2.29E-03	2.03E-03	2.94E-05	8.45E-06	5.9E+04
P/PCB	Chlordane	57-74-9	1.18E-02	4.37E-06	9.95E-04	1.89E-03	1.32E-03	2.19E-05	2.18E-05	2.3E+04
P/PCB	alpha-Chlordane	5103-71-9								
P/PCB	gamma-Chlordane	5103-74-2								
P/PCB	4,4'-DDD	72-54-8	1.69E-02	4.76E-06	8.20E-05	2.73E-03	2.59E-03	3.42E-05	2.81E-06	
P/PCB	4,4'-DDE	72-55-9	1.44E-02	5.87E-06	4.31E-04	2.31E-03	1.89E-03	2.81E-05	1.21E-05	
P/PCB	4,4'-DDT	50-29-3	1.37E-02	4.95E-06	1.66E-04	2.21E-03	2.00E-03	2.92E-05	4.84E-06	2.1E+05
P/PCB	Dieldrin	60-57-1	1.25E-02	4.74E-06	3.10E-04	2.01E-03	1.70E-03	2.62E-05	8.11E-06	3.1E+04
P/PCB	Endosulfan I	959-98-8			2.06E-03					
P/PCB	Endosulfan II	33213-65-9			3.90E-04					
P/PCB	Endosulfan sulfate	1031-07-8			4.19E-02					
P/PCB	Endrin	72-20-8	1.25E-02	4.74E-06	1.54E-04	2.02E-03	1.85E-03	2.77E-05	4.27E-06	2.3E+04
P/PCB	Endrin aldehyde	7421-93-4			7.89E-06					
P/PCB	Endrin ketone	53494-70-5								
P/PCB	Heptachlor	76-44-8	1.12E-02	5.69E-06	2.24E-02	1.79E-03	4.50E-04	9.07E-06	2.03E-04	2.5E+03
P/PCB	Heptachlor epoxide	1024-57-3	1.32E-02	4.23E-06	1.95E-04	2.12E-03	1.86E-03	2.79E-05	5.43E-06	9.2E+03
P/PCB	Methoxychlor	72-43-5	1.56E-02	4.46E-06	3.24E-04	2.51E-03	2.03E-03	2.94E-05	9.54E-06	1.0E+06
P/PCB	Toxaphene	8001-35-2	1.16E-02	4.34E-06	1.23E-04	1.87E-03	1.76E-03	2.68E-05	3.30E-06	1.5E+05
INORG	Aluminum	7429-90-5								
INORG	Antimony	7440-36-0								
INORG	Arsenic	7440-38-2								
INORG	Barium	7440-39-3								
INORG	Beryllium	7440-41-7								
INORG	Cadmium	7440-43-9								
INORG	Calcium	7440-70-2								
INORG	Chromium (total)	7440-47-3								
INORG	Chromium III	16065-83-1								
INORG	Chromium VI	18540-29-9								
INORG	Cobalt	7440-48-4								
INORG	Copper	7440-50-8								
INORG	Cyanide (total)	57-12-5								
INORG	Iron	7439-89-6								
INORG	Lead	7439-92-1								

Table C-7: Calculation of Site-Specific Vapor Intrusion Criteria for On-Site Groundwater
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	C_{bldg} (L-water/m^3)	Criteria (mg/l)
INORG	Magnesium	7439-95-4								
INORG	Manganese	7439-96-5								
INORG	Mercury	7439-97-6	3.07E-02	6.30E-06	1.45E-01	4.92E-03	1.76E-04	3.80E-06	5.52E-04	4.5E+01
INORG	Nickel	7440-02-0								
INORG	Potassium	7440-09-7								
INORG	Selenium	7782-49-2								
INORG	Silver	7440-22-4								
INORG	Sodium	7440-23-5								
INORG	Thallium	7440-28-0								
INORG	Vanadium	7440-62-2								
INORG	Zinc	7440-66-6								
Notes:	**Crack Soil and Building Characteristics**									
	Bulk density	kg/L	ρ_b	1.66						
	Total porosity	L/L-soil	θ	**0.375**						
	Water-filled porosity	L/L-soil	θ_w	**0.054**						
	Air-filled porosity	L/L-soil	θ_a	0.321						
	Residual saturation	L/L-soil	θ_r	**0.053**						
	Hydraulic conductivity	cm/s	**K**	**7.4E-03**						
	Dynamic viscosity of water	g/cm-s	μ	0.01307						
	Density of water	g/cm^3	ρ_w	1.0						
	Gravitational acceleration	cm/s^2	**g**	980.7						
	Intrinsic permeability	cm^2	**k**	9.9E-08						
	Effective total saturation	unitless	S_{te}	0.005						
	van Genuchten N	unitless	**N**	**3.177**						
	van Genuchten M	unitless	**M**	0.685						
	Relative air permeability	unitless	k_{rg}	0.997						
	Permeability to vapor	cm^2	k_v	9.83E-08						
	Distance from building foundation to source	m	L_T	**3.36**						
	Bldg foundation thickness	m	L_{crack}	0.15						
	Bldg foundation length	m		**19.29**						
	Bldg foundation width	m		**19.29**						
	Bldg occupied height	m		**2.44**						
	Bldg occupied volume	m^3		907.68						
	Bldg depth below ground	m		**0.15**						
	Bldg area for vapor intrusion	m^2	A_B	383.6						
	Ratio of A_{crack} to A_B		η	1E-04						
	Area of cracks	m^2	A_{crack}	3.86E-02						
	Air exchange rate	$hour^{-1}$	**ac/h**	**2.0**						
	Building ventilation rate	m^3/s	Q_{bldg}	5.04E-01						
	Pressure difference between outdoors-indoors	$kg/m\text{-}s^2$	ΔP	1.0						
	Air viscosity	kg/m-s	μ	1.8E-05						
	Crack length (bldg perimeter)	m	X_{crack}	77.149206						
	Crack depth below ground	m	Z_{crack}	0.15						
	Crack radius	m	r_{crack}	**5E-04**						
	Soil gas flow rate into bldg	m^3/s	Q_{soil}	4.14E-05						

Table C-8: Soil Moisture Profile below Building with Basement Vernay Laboratories Inc., Yellow Springs, Ohio		
z (m)	θ_T	θ_w
0.000	0.375	0.375
0.009	0.375	0.375
0.018	0.375	0.375
0.027	0.375	0.375
0.036	0.375	0.375
0.045	0.375	0.374
0.054	0.375	0.374
0.063	0.375	0.373
0.073	0.375	0.372
0.082	0.375	0.371
0.091	0.375	0.369
0.100	0.375	0.367
0.109	0.375	0.365
0.118	0.375	0.362
0.127	0.375	0.359
0.136	0.375	0.355
0.145	0.375	0.351
0.154	0.375	0.347
0.163	0.375	0.342
0.172	0.375	0.336
0.181	0.375	0.331
0.190	0.375	0.325
0.200	0.375	0.318
0.209	0.375	0.312
0.218	0.375	0.305
0.227	0.375	0.298
0.236	0.375	0.291
0.245	0.375	0.284
0.254	0.375	0.277
0.263	0.375	0.269
0.272	0.375	0.262
0.281	0.375	0.255
0.290	0.375	0.248
0.299	0.375	0.241
0.308	0.375	0.235
0.317	0.375	0.228
0.327	0.375	0.222
0.336	0.375	0.216
0.345	0.375	0.210
0.354	0.375	0.204
0.363	0.375	0.199
0.372	0.375	0.193
0.381	0.375	0.188
0.390	0.375	0.183
0.399	0.375	0.178
0.408	0.375	0.174
0.417	0.375	0.170
0.426	0.375	0.165
0.435	0.375	0.161
0.444	0.375	0.158
0.454	0.375	0.154
0.463	0.375	0.150
0.472	0.375	0.147
0.481	0.375	0.144
0.490	0.375	0.141

Table C-8: Soil Moisture Profile below Building with Basement Vernay Laboratories Inc., Yellow Springs, Ohio		
z (m)	θ_T	θ_w
0.499	0.375	0.138
0.508	0.375	0.135
0.517	0.375	0.132
0.526	0.375	0.130
0.535	0.375	0.127
0.544	0.375	0.125
0.553	0.375	0.123
0.562	0.375	0.120
0.571	0.375	0.118
0.581	0.375	0.116
0.590	0.375	0.114
0.599	0.375	0.113
0.608	0.375	0.111
0.617	0.375	0.109
0.626	0.375	0.108
0.635	0.375	0.106
0.644	0.375	0.104
0.653	0.375	0.103
0.662	0.375	0.102
0.671	0.375	0.100
0.680	0.375	0.099
0.689	0.375	0.098
0.698	0.375	0.097
0.708	0.375	0.095
0.717	0.375	0.094
0.726	0.375	0.093
0.735	0.375	0.092
0.744	0.375	0.091
0.753	0.375	0.090
0.762	0.375	0.089
0.771	0.375	0.089
0.780	0.375	0.088
0.789	0.375	0.087
0.798	0.375	0.086
0.807	0.375	0.085
0.816	0.375	0.085
0.825	0.375	0.084
0.835	0.375	0.083
0.844	0.375	0.082
0.853	0.375	0.082
0.862	0.375	0.081
0.871	0.375	0.081
0.880	0.375	0.080
0.889	0.375	0.079
0.898	0.375	0.079
Note:		
Based on geotechnical data for sand:		
θT	0.375	
θρ	0.053	
α	0.035	
N	3.177	

Table C-9: Calculation of Effective Diffusion Coefficient for a Building with Basement Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{eff}^T (cm^2/s)
VOC	Acetone	67-64-1	1.24E-01	1.14E-05	7.95E-04	4.49E-03
VOC	Benzene	71-43-2	8.80E-02	9.80E-06	1.14E-01	9.91E-05
VOC	Bromochloromethane	74-97-5			2.94E-02	
VOC	Bromodichloromethane	75-27-4	2.98E-02	1.06E-05	3.28E-02	2.31E-04
VOC	Bromoform	75-25-2	1.49E-02	1.03E-05	1.10E-02	3.81E-04
VOC	Bromomethane	74-83-9	7.28E-02	1.21E-05	1.28E-01	1.04E-04
VOC	2-Butanone	78-93-3	9.49E-02	9.80E-06	1.14E-03	3.00E-03
VOC	Carbon Disulfide	75-15-0	1.04E-01	1.00E-05	6.20E-01	2.41E-05
VOC	Carbon Tetrachloride	56-23-5	7.80E-02	8.80E-06	6.25E-01	2.06E-05
VOC	Chlorobenzene	108-90-7	7.30E-02	8.70E-06	7.60E-02	1.22E-04
VOC	Chloroethane	75-00-3	1.10E-01		1.80E-01	
VOC	Chloroform	67-66-3	1.04E-01	1.00E-05	7.50E-02	1.47E-04
VOC	Chloromethane	74-87-3	1.26E-01	6.50E-06	1.80E-01	4.96E-05
VOC	Cumene	98-82-8			2.37E+01	
VOC	Cyclohexane	110-82-7	1.10E-01	9.14E-06	3.98E+00	4.33E-06
VOC	1,2-Dibromo-3-chloropropane	96-12-8	8.00E-02	8.00E-06	3.00E-03	1.37E-03
VOC	Dibromochloromethane	124-48-1	1.96E-02	1.05E-05	1.61E-02	3.35E-04
VOC	1,2-Dibromoethane	106-93-4	8.00E-02	8.00E-06	1.52E-02	4.24E-04
VOC	1,2-Dichlorobenzene	95-50-1	6.90E-02	7.90E-06	3.90E-02	1.93E-04
VOC	1,3-Dichlorobenzene	541-73-1			6.33E-02	
VOC	1,4-Dichlorobenzene	106-46-7	6.90E-02	7.90E-06	4.98E-02	1.58E-04
VOC	Dichlorodifluoromethane	75-71-8	8.00E-02	8.00E-06	7.01E+00	2.25E-06
VOC	1,1-Dichloroethane	75-34-3	7.42E-02	1.05E-05	1.15E-01	1.01E-04
VOC	1,2-Dichloroethane	107-06-2	1.04E-01	9.90E-06	2.01E-02	4.27E-04
VOC	1,1-Dichloroethene	75-35-4	9.00E-02	1.04E-05	5.35E-01	2.78E-05
VOC	1,2-Dichloroethene (total)	540-59-0	7.07E-02	1.19E-05	1.93E-01	7.25E-05
VOC	cis-1,2-Dichloroethene	156-59-2	7.36E-02	1.13E-05	8.35E-02	1.40E-04
VOC	trans-1,2-Dichloroethene	156-60-5	7.07E-02	1.19E-05	1.93E-01	7.25E-05
VOC	1,2-Dichloropropane	78-87-5	7.82E-02	8.73E-06	5.75E-02	1.56E-04
VOC	1,3-Dichloropropene (total)	542-75-6	6.26E-02	1.00E-05	3.63E-01	3.57E-05
VOC	cis-1,3-Dichloropropene	0061-01-5	8.00E-02	8.00E-06	7.25E-02	1.20E-04
VOC	trans-1,3-Dichloropropene	0061-02-6	8.00E-02	8.00E-06	3.27E-02	2.31E-04
VOC	Ethyl Benzene	100-41-4	7.50E-02	7.80E-06	1.62E-01	5.93E-05
VOC	2-Hexanone	591-78-6	8.62E-02	8.76E-02	3.58E-02	3.19E-02
VOC	Methyl Acetate	79-20-9				
VOC	Methyl tert-butyl ether	1634-04-4	1.03E-01	1.05E-05	2.76E-02	3.47E-04
VOC	4-Methyl-2-pentanone	108-10-1	7.50E-02	7.80E-06	2.82E-03	1.37E-03
VOC	Methylcyclohexane	108-87-2	9.86E-02	8.52E-06		
VOC	Methylene Chloride	75-09-2	1.01E-01	1.17E-05	4.49E-02	2.54E-04
VOC	Styrene	100-42-5	7.10E-02	8.00E-06	5.65E-02	1.45E-04
VOC	1,1,2,2-Tetrachloroethane	79-34-5	7.10E-02	7.90E-06	7.05E-03	7.24E-04
VOC	Tetrachloroethene	127-18-4	7.20E-02	8.20E-06	3.77E-01	2.97E-05
VOC	Toluene	108-88-3	8.70E-02	8.60E-06	1.36E-01	7.63E-05
VOC	1,2,4-Trichlorobenzene	120-82-1	3.00E-02	8.23E-06	2.91E-02	2.09E-04
VOC	1,1,1-Trichloroethane	71-55-6	7.80E-02	8.80E-06	3.53E-01	3.39E-05
VOC	1,1,2-Trichloroethane	79-00-5	7.80E-02	8.80E-06	1.87E-02	3.86E-04
VOC	Trichloroethene	79-01-6	7.90E-02	9.10E-06	2.11E-01	5.43E-05
VOC	Trichlorofluoromethane	75-69-4	8.33E-02	9.70E-06	1.98E+00	8.21E-06
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	7.80E-02	8.20E-06	9.83E+00	1.70E-06
VOC	Vinyl Chloride	75-01-4	1.06E-01	1.23E-05	5.55E-01	3.18E-05
VOC	Xylenes (total)	1330-20-7	7.80E-02	8.75E-06	1.38E-01	7.51E-05
SVOC	Acenaphthene	83-32-9	4.21E-02	7.69E-06	3.18E-03	1.02E-03
SVOC	Acenaphthylene	208-96-8	4.42E-02	7.44E-06	2.31E-03	1.23E-03
SVOC	Acetophenone	98-86-2	8.00E-02	8.00E-06	2.19E-04	5.64E-03
SVOC	Anthracene	120-12-7	3.24E-02	7.74E-06	1.34E-03	1.48E-03
SVOC	Atrazine	1912-24-9				
SVOC	Benzaldehyde	100-52-7				
SVOC	Benzo(a)anthracene	56-55-3	5.10E-02	9.00E-06	6.85E-05	6.96E-03
SVOC	Benzo(a)pyrene	50-32-8	4.30E-02	9.00E-06	2.32E-05	9.38E-03
SVOC	Benzo(b)fluoranthene	205-99-2	2.26E-02	5.56E-06	2.28E-03	7.90E-04

Table C-9: Calculation of Effective Diffusion Coefficient for a Building with Basement Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{eff}^T (cm^2/s)
SVOC	Benzo(g,h,i)perylene	191-24-2	2.03E-02	5.20E-06	2.88E-06	1.53E-02
SVOC	Benzo(k)fluoranthene	207-08-9	2.26E-02	5.56E-06	1.70E-05	6.02E-03
SVOC	Biphenyl	92-52-4	4.04E-02	8.15E-05	6.13E-03	2.46E-03
SVOC	bis(2-Chloroethoxy)methane	111-91-1	3.73E-02	6.89E-05	3.47E-06	1.25E-01
SVOC	bis(2-Chloroethyl) ether	111-44-4	6.92E-02	7.53E-06	3.69E-04	4.02E-03
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	3.51E-02	3.66E-06	2.09E-06	1.80E-02
SVOC	4-Bromophenyl-phenyl ether	101-55-3			2.39E-03	
SVOC	Butylbenzylphthalate	85-68-7	1.74E-02	4.83E-06	2.59E-05	4.08E-03
SVOC	Caprolactam	105-60-2	6.54E-02	8.99E-06		
SVOC	Carbazole	86-74-8	3.90E-02	7.03E-06	3.13E-07	1.41E-01
SVOC	4-Chloro-3-methylphenol	59-50-7			8.15E-06	
SVOC	4-Chloroaniline	106-47-8	4.83E-02	1.01E-05	6.80E-06	1.87E-02
SVOC	2-Chloronaphthalene	91-58-7			6.42E-03	
SVOC	2-Chlorophenol	95-57-8	5.01E-02	9.46E-06	8.00E-03	6.78E-04
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3			4.50E-03	
SVOC	Chrysene	218-01-9	2.48E-02	6.21E-06	1.94E-03	9.54E-04
SVOC	Dibenz(a,h)anthracene	53-70-3	2.02E-02	5.18E-06	3.02E-07	1.06E-01
SVOC	Dibenzofuran	132-64-9	2.70E-02	5.93E-06	2.57E-04	2.45E-03
SVOC	3,3'-Dichlorobenzidine	91-94-1	1.94E-02	6.74E-06	8.20E-08	4.85E-01
SVOC	2,4-Dichlorophenol	120-83-2	3.46E-02	8.77E-06	6.50E-05	5.48E-03
SVOC	Diethylphthalate	84-66-2	2.56E-02	6.35E-06	9.25E-06	9.19E-03
SVOC	2,4-Dimethylphenol	105-67-9	5.84E-02	8.69E-06	4.10E-05	9.02E-03
SVOC	Dimethylphthalate	131-11-3	5.68E-02	6.30E-06	2.15E-06	2.97E-02
SVOC	Di-n-butylphthalate	84-74-2	4.38E-02	7.86E-06	1.93E-08	2.40E+00
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	3.13E-02	6.35E-05	8.73E-06	5.03E-02
SVOC	2,4-Dinitrophenol	51-28-5	2.73E-02	9.06E-06	9.10E-06	1.16E-02
SVOC	2,4-Dinitrotoluene	121-14-2	2.03E-01	7.06E-06	1.90E-06	6.03E-02
SVOC	2,6-Dinitrotoluene	606-20-2	3.27E-02	7.26E-06	1.53E-05	8.72E-03
SVOC	Di-n-octylphthalate	117-84-0	1.51E-02	3.58E-06	1.37E-03	6.77E-04
SVOC	Fluoranthene	206-44-0	3.02E-02	6.35E-06	3.30E-04	2.44E-03
SVOC	Fluorene	86-73-7	3.63E-02	7.88E-06	1.31E-03	1.59E-03
SVOC	Hexachlorobenzene	118-74-1	5.42E-02	5.91E-06	2.71E-02	1.96E-04
SVOC	Hexachlorobutadiene	87-68-3	5.61E-02	6.16E-06	1.67E-01	4.52E-05
SVOC	Hexachlorocyclopentadiene	77-47-4	1.61E-02	7.21E-06	5.55E-01	1.54E-05
SVOC	Hexachloroethane	67-72-1	2.50E-03	6.80E-06	7.95E-02	4.34E-05
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	1.90E-02	5.66E-06	3.28E-05	4.15E-03
SVOC	Isophorone	78-59-1	6.23E-02	6.76E-06	1.36E-04	5.51E-03
SVOC	2-Methylnaphthalene	91-57-6	9.86E-02	7.75E-06	1.06E-02	5.73E-04
SVOC	2-Methylphenol	95-48-7	7.40E-02	8.30E-06	2.46E-05	1.24E-02
SVOC	4-Methylphenol	106-44-5	7.40E-02	1.00E-05	1.62E-05	1.56E-02
SVOC	Naphthalene	91-20-3	5.90E-02	7.50E-06	9.90E-03	5.18E-04
SVOC	2-Nitroaniline	88-74-4	7.30E-02		1.99E-03	
SVOC	3-Nitroaniline	99-09-2			2.94E-06	
SVOC	4-Nitroaniline	100-01-6			4.23E-08	
SVOC	Nitrobenzene	98-95-3	7.60E-02	8.60E-06	4.92E-04	3.92E-03
SVOC	2-Nitrophenol	88-75-5			1.94E-04	
SVOC	4-Nitrophenol	100-02-7			8.48E-09	
SVOC	N-Nitrosodiphenylamine	86-30-6	3.12E-02	6.35E-06	1.03E-04	3.88E-03
SVOC	N-Nitroso-di-n-propylamine	621-64-7	5.45E-02	8.17E-06	4.62E-05	8.09E-03
SVOC	N-Nitrosomorpholine	59-89-2				
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	6.02E-02		2.39E-03	
SVOC	Pentachlorophenol	87-86-5	5.60E-02	6.10E-06	5.00E-07	8.52E-02
SVOC	Phenanthrene	85-01-8			4.76E-04	
SVOC	Phenol	108-95-2	8.20E-02	9.10E-06	8.15E-06	2.13E-02
SVOC	Pyrene	129-00-0	2.72E-02	7.24E-06	2.26E-04	2.79E-03
SVOC	2,4,5-Trichlorophenol	95-95-4	2.91E-02	7.03E-06	8.90E-05	4.05E-03
SVOC	2,4,6-Trichlorophenol	88-06-2	3.18E-02	6.25E-06	1.60E-04	3.32E-03
P/PCB	PCBs (total)	1336-36-3	8.00E-02	1.00E-05	5.31E-02	1.87E-04
P/PCB	Aroclor-1016	2674-11-2	2.05E-02		5.93E-03	
P/PCB	Aroclor-1221	1104-28-2			7.15E-02	

Table C-9: Calculation of Effective Diffusion Coefficient for a Building with Basement Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{eff}^T (cm^2/s)
P/PCB	Aroclor-1232	1141-16-5				
P/PCB	Aroclor-1242	53469-21-9			1.17E-02	
P/PCB	Aroclor-1248	12672-29-6			7.17E-02	
P/PCB	Aroclor-1254	11097-69-1			1.71E-01	
P/PCB	Aroclor-1260	11096-82-5	1.27E-02		1.46E-01	
P/PCB	Aldrin	309-00-2	1.32E-02	4.86E-06	3.49E-03	4.55E-04
P/PCB	alpha-BHC	319-84-6	1.42E-02	7.34E-06	2.18E-04	1.88E-03
P/PCB	beta-BHC	319-85-7	1.42E-02	7.34E-06	1.53E-05	5.79E-03
P/PCB	delta-BHC	319-86-8	1.76E-02		8.77E-06	
P/PCB	gamma-BHC	58-89-9	1.42E-02	7.34E-06	2.87E-04	1.70E-03
P/PCB	Chlordane	57-74-9	1.18E-02	4.37E-06	9.95E-04	7.61E-04
P/PCB	alpha-Chlordane	5103-71-9				
P/PCB	gamma-Chlordane	5103-74-2				
P/PCB	4,4'-DDD	72-54-8	1.69E-02	4.76E-06	8.20E-05	2.56E-03
P/PCB	4,4'-DDE	72-55-9	1.44E-02	5.87E-06	4.31E-04	1.36E-03
P/PCB	4,4'-DDT	50-29-3	1.37E-02	4.95E-06	1.66E-04	1.76E-03
P/PCB	Dieldrin	60-57-1	1.25E-02	4.74E-06	3.10E-04	1.30E-03
P/PCB	Endosulfan I	959-98-8			2.06E-03	
P/PCB	Endosulfan II	33213-65-9			3.90E-04	
P/PCB	Endosulfan sulfate	1031-07-8			4.19E-02	
P/PCB	Endrin	72-20-8	1.25E-02	4.74E-06	1.54E-04	1.68E-03
P/PCB	Endrin aldehyde	7421-93-4			7.89E-06	
P/PCB	Endrin ketone	53494-70-5				
P/PCB	Heptachlor	76-44-8	1.12E-02	5.69E-06	2.24E-02	1.48E-04
P/PCB	Heptachlor epoxide	1024-57-3	1.32E-02	4.23E-06	1.95E-04	1.53E-03
P/PCB	Methoxychlor	72-43-5	1.56E-02	4.46E-06	3.24E-04	1.44E-03
P/PCB	Toxaphene	8001-35-2	1.16E-02	4.34E-06	1.23E-04	1.68E-03
INORG	Aluminum	7429-90-5				
INORG	Antimony	7440-36-0				
INORG	Arsenic	7440-38-2				
INORG	Barium	7440-39-3				
INORG	Beryllium	7440-41-7				
INORG	Cadmium	7440-43-9				
INORG	Calcium	7440-70-2				
INORG	Chromium (total)	7440-47-3				
INORG	Chromium III	6065-83-1				
INORG	Chromium VI	8540-29-9				
INORG	Cobalt	7440-48-4				
INORG	Copper	7440-50-8				
INORG	Cyanide (total)	57-12-5				
INORG	Iron	7439-89-6				
INORG	Lead	7439-92-1				
INORG	Magnesium	7439-95-4				
INORG	Manganese	7439-96-5				
INORG	Mercury	7439-97-6	3.07E-02	6.30E-06	1.45E-01	4.71E-05
INORG	Nickel	7440-02-0				
INORG	Potassium	7440-09-7				
INORG	Selenium	7782-49-2				
INORG	Silver	7440-22-4				
INORG	Sodium	7440-23-5				
INORG	Thallium	7440-28-0				
INORG	Vanadium	7440-62-2				
INORG	Zinc	7440-66-6				

Table C-10: Calculation of Site-Specific Vapor Intrusion Criteria for Off-Site Groundwater
Vernay Laboratories Inc., Yellow Springs, Ohio

										Indoor Air Limits		
Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	C_{bldg} (L-water/m^3)	10^{-5} Risk (mg/m^3)	HQ of 1 (mg/m^3)	Criteria (mg/l)
VOC	Acetone	67-64-1	1.24E-01	1.14E-05	7.95E-04	1.53E-02	4.49E-03	8.56E-05	6.80E-05			3.5E+07
VOC	Benzene	71-43-2	8.80E-02	9.80E-06	1.14E-01	1.08E-02	9.91E-05	1.28E-05	1.46E-03	2.1E+00	2.1E+01	4.8E+04
VOC	Bromochloromethane	74-97-5			2.94E-02							
VOC	Bromodichloromethane	75-27-4	2.98E-02	1.06E-05	3.28E-02	3.67E-03	2.31E-04	2.54E-05	8.35E-04			5.2E+03
VOC	Bromoform	75-25-2	1.49E-02	1.03E-05	1.10E-02	1.84E-03	3.81E-04	3.60E-05	3.94E-04	5.6E+01		8.1E+03
VOC	Bromomethane	74-83-9	7.28E-02	1.21E-05	1.28E-01	8.97E-03	1.04E-04	1.34E-05	1.71E-03		3.0E+00	
VOC	2-Butanone	78-93-3	9.49E-02	9.80E-06	1.14E-03	1.17E-02	3.00E-03	8.05E-05	9.19E-05		5.7E+04	1.1E+07
VOC	Carbon Disulfide	75-15-0	1.04E-01	1.00E-05	6.20E-01	1.28E-02	2.41E-05	3.46E-06	2.14E-03		3.4E+02	
VOC	Carbon Tetrachloride	56-23-5	7.80E-02	8.80E-06	6.25E-01	9.61E-03	2.06E-05	2.97E-06	1.86E-03	8.7E-01		2.7E+03
VOC	Chlorobenzene	108-90-7	7.30E-02	8.70E-06	7.60E-02	9.00E-03	1.22E-04	1.53E-05	1.17E-03		5.4E+01	3.3E+03
VOC	Chloroethane	75-00-3	1.10E-01		1.80E-01							
VOC	Chloroform	67-66-3	1.04E-01	1.00E-05	7.50E-02	1.28E-02	1.47E-04	1.79E-05	1.34E-03	7.9E-01	3.9E+01	
VOC	Chloromethane	74-87-3	1.26E-01	6.50E-06	1.80E-01	1.55E-02	4.96E-05	6.87E-06	1.24E-03		7.6E+01	
VOC	Cumene	98-82-8			2.37E+01							
VOC	Cyclohexane	110-82-7	1.10E-01	9.14E-06	3.98E+00	1.36E-02	4.33E-06	6.41E-07	2.56E-03		2.4E+03	1.2E+04
VOC	1,2-Dibromo-3-chloropropane	96-12-8	8.00E-02	8.00E-06	3.00E-03	9.86E-03	1.37E-03	6.62E-05	1.99E-04		1.0E+00	3.2E+05
VOC	Dibromochloromethane	124-48-1	1.96E-02	1.05E-05	1.61E-02	2.42E-03	3.35E-04	3.31E-05	5.31E-04			1.7E+05
VOC	1,2-Dibromoethane	106-93-4	8.00E-02	8.00E-06	1.52E-02	9.86E-03	4.24E-04	3.84E-05	5.84E-04	1.9E-01		5.1E+03
VOC	1,2-Dichlorobenzene	95-50-1	6.90E-02	7.90E-06	3.90E-02	8.50E-03	1.93E-04	2.22E-05	8.66E-04		2.4E+02	4.0E+05
VOC	1,3-Dichlorobenzene	541-73-1			6.33E-02							
VOC	1,4-Dichlorobenzene	106-46-7	6.90E-02	7.90E-06	4.98E-02	8.50E-03	1.58E-04	1.90E-05	9.46E-04		8.8E+02	5.2E+04
VOC	Dichlorodifluoromethane	75-71-8	8.00E-02	8.00E-06	7.01E+00	9.86E-03	2.25E-06	3.34E-07	2.34E-03		8.9E+01	4.4E+04
VOC	1,1-Dichloroethane	75-34-3	7.42E-02	1.05E-05	1.15E-01	9.14E-03	1.01E-04	1.31E-05	1.50E-03		3.5E+02	
VOC	1,2-Dichloroethane	107-06-2	1.04E-01	9.90E-06	2.01E-02	1.28E-02	4.27E-04	3.86E-05	7.74E-04	1.2E+00	6.7E+00	
VOC	1,1-Dichloroethene	75-35-4	9.00E-02	1.04E-05	5.35E-01	1.11E-02	2.78E-05	3.97E-06	2.12E-03		9.8E+01	1.2E+05
VOC	1,2-Dichloroethene (total)	540-59-0	7.07E-02	1.19E-05	1.93E-01	8.71E-03	7.25E-05	9.72E-06	1.87E-03			5.6E+05
VOC	cis-1,2-Dichloroethene	156-59-2	7.36E-02	1.13E-05	8.35E-02	9.07E-03	1.40E-04	1.72E-05	1.44E-03			
VOC	trans-1,2-Dichloroethene	156-60-5	7.07E-02	1.19E-05	1.93E-01	8.71E-03	7.25E-05	9.72E-06	1.87E-03			
VOC	1,2-Dichloropropane	78-87-5	7.82E-02	8.73E-06	5.75E-02	9.64E-03	1.56E-04	1.88E-05	1.08E-03		3.9E+00	
VOC	1,3-Dichloropropene (total)	542-75-6	6.26E-02	1.00E-05	3.63E-01	7.71E-03	3.57E-05	5.05E-06	1.83E-03	3.3E+00	1.1E+01	
VOC	cis-1,3-Dichloropropene	10061-01-5	8.00E-02	8.00E-06	7.25E-02	9.86E-03	1.20E-04	1.51E-05	1.10E-03	5.5E+00	1.9E+01	
VOC	trans-1,3-Dichloropropene	10061-02-6	8.00E-02	8.00E-06	3.27E-02	9.86E-03	2.31E-04	2.55E-05	8.34E-04			
VOC	Ethyl Benzene	100-41-4	7.50E-02	7.80E-06	1.62E-01	9.24E-03	5.93E-05	8.10E-06	1.31E-03		8.0E+02	1.1E+05
VOC	2-Hexanone	591-78-6	8.62E-02	8.76E-02	3.58E-02	1.43E-02	3.19E-02	9.62E-05	3.44E-03		1.5E+00	
VOC	Methyl Acetate	79-20-9										
VOC	Methyl tert-butyl ether	1634-04-4	1.03E-01	1.05E-05	2.76E-02	1.27E-02	3.47E-04	3.38E-05	9.33E-04		3.4E+03	5.3E+06
VOC	4-Methyl-2-pentanone	108-10-1	7.50E-02	7.80E-06	2.82E-03	9.25E-03	1.37E-03	6.63E-05	1.87E-04		1.7E+04	2.1E+06
VOC	Methylcyclohexane	108-87-2	9.86E-02	8.52E-06								
VOC	Methylene Chloride	75-09-2	1.01E-01	1.17E-05	4.49E-02	1.24E-02	2.54E-04	2.73E-05	1.23E-03	4.2E+01	2.5E+03	1.6E+04
VOC	Styrene	100-42-5	7.10E-02	8.00E-06	5.65E-02	8.75E-03	1.45E-04	1.77E-05	9.99E-04		1.0E+03	7.9E+05
VOC	1,1,2,2-Tetrachloroethane	79-34-5	7.10E-02	7.90E-06	7.05E-03	8.75E-03	7.24E-04	5.14E-05	3.62E-04	1.2E+00		2.2E+06
VOC	Tetrachloroethene	127-18-4	7.20E-02	8.20E-06	3.77E-01	8.87E-03	2.97E-05	4.24E-06	1.60E-03	5.0E+00	2.6E+02	5.0E+05
VOC	Toluene	108-88-3	8.70E-02	8.60E-06	1.36E-01	1.07E-02	7.63E-05	1.02E-05	1.38E-03		3.0E+02	2.5E+05
VOC	1,2,4-Trichlorobenzene	120-82-1	3.00E-02	8.23E-06	2.91E-02	3.70E-03	2.09E-04	2.36E-05	6.88E-04		3.0E+02	
VOC	1,1,1-Trichloroethane	71-55-6	7.80E-02	8.80E-06	3.53E-01	9.61E-03	3.39E-05	4.79E-06	1.69E-03		1.4E+03	
VOC	1,1,2-Trichloroethane	79-00-5	7.80E-02	8.80E-06	1.87E-02	9.61E-03	3.86E-04	3.63E-05	6.78E-04	2.2E+00		
VOC	Trichloroethene	79-01-6	7.90E-02	9.10E-06	2.11E-01	9.73E-03	5.43E-05	7.46E-06	1.58E-03	9.1E+00		2.9E+03
VOC	Trichlorofluoromethane	75-69-4	8.33E-02	9.70E-06	1.98E+00	1.03E-02	8.21E-06	1.21E-06	2.39E-03		3.0E+02	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	7.80E-02	8.20E-06	9.83E+00	9.61E-03	1.70E-06	2.52E-07	2.48E-03		1.3E+04	
VOC	Vinyl Chloride	75-01-4	1.06E-01	1.23E-05	5.55E-01	1.31E-02	3.18E-05	4.52E-06	2.51E-03	1.1E+00	4.2E+01	1.4E+05
VOC	Xylenes (total)	1330-20-7	7.80E-02	8.75E-06	1.38E-01	9.61E-03	7.51E-05	1.00E-05	1.39E-03		7.5E+01	3.1E+05
SVOC	Acenaphthene	83-32-9	4.21E-02	7.69E-06	3.18E-03	5.19E-03	1.02E-03	5.96E-05	1.89E-04			4.7E+06
SVOC	Acenaphthylene	208-96-8	4.42E-02	7.44E-06	2.31E-03	5.45E-03	1.23E-03	6.40E-05	1.48E-04			
SVOC	Acetophenone	98-86-2	8.00E-02	8.00E-06	2.19E-04	9.91E-03	5.64E-03	8.79E-05	1.92E-05			2.1E+07
SVOC	Anthracene	120-12-7	3.24E-02	7.74E-06	1.34E-03	4.00E-03	1.48E-03	6.79E-05	9.06E-05			3.1E+05
SVOC	Atrazine	1912-24-9										
SVOC	Benzaldehyde	100-52-7										

Table C-10: Calculation of Site-Specific Vapor Intrusion Criteria for Off-Site Groundwater
Vernay Laboratories Inc., Yellow Springs, Ohio

										Indoor Air Limits		
Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	C_{bldg} (L-water/m^3)	10^{-5} Risk (mg/m^3)	HQ of 1 (mg/m^3)	Criteria (mg/l)
SVOC	Benzo(a)anthracene	56-55-3	5.10E-02	9.00E-06	6.85E-05	6.48E-03	6.96E-03	8.97E-05	6.14E-06			9.9E+07
SVOC	Benzo(a)pyrene	50-32-8	4.30E-02	9.00E-06	2.32E-05	5.88E-03	9.38E-03	9.17E-05	2.12E-06			8.5E+07
SVOC	Benzo(b)fluoranthene	205-99-2	2.26E-02	5.56E-06	2.28E-03	2.79E-03	7.90E-04	5.35E-05	1.22E-04			3.4E+06
SVOC	Benzo(g,h,i)perylene	191-24-2	2.03E-02	5.20E-06	2.88E-06	5.19E-03	1.53E-02	9.41E-05	2.71E-07			7.4E+09
SVOC	Benzo(k)fluoranthene	207-08-9	2.26E-02	5.56E-06	1.70E-05	3.27E-03	6.02E-03	8.85E-05	1.50E-06			5.8E+07
SVOC	Biphenyl	92-52-4	4.04E-02	8.15E-05	6.13E-03	5.00E-03	2.46E-03	7.74E-05	4.75E-04			8.6E+05
SVOC	bis(2-Chloroethoxy)methane	111-91-1	3.73E-02	6.89E-05	3.47E-06	3.41E-02	1.25E-01	9.76E-05	3.39E-07			
SVOC	bis(2-Chloroethyl) ether	111-44-4	6.92E-02	7.53E-06	3.69E-04	8.56E-03	4.02E-03	8.43E-05	3.11E-05	2.4E+00		
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	3.51E-02	3.66E-06	2.09E-06	6.93E-03	1.80E-02	9.47E-05	1.98E-07			
SVOC	4-Bromophenyl-phenyl ether	101-55-3			2.39E-03							
SVOC	Butylbenzylphthalate	85-68-7	1.74E-02	4.83E-06	2.59E-05	2.42E-03	4.08E-03	8.45E-05	2.18E-06			
SVOC	Caprolactam	105-60-2	6.54E-02	8.99E-06								
SVOC	Carbazole	86-74-8	3.90E-02	7.03E-06	3.13E-07	3.83E-02	1.41E-01	9.77E-05	3.06E-08			2.2E+10
SVOC	4-Chloro-3-methylphenol	59-50-7			8.15E-06							
SVOC	4-Chloroaniline	106-47-8	4.83E-02	1.01E-05	6.80E-06	8.16E-03	1.87E-02	9.48E-05	6.45E-07			
SVOC	2-Chloronaphthalene	91-58-7			6.42E-03							
SVOC	2-Chlorophenol	95-57-8	5.01E-02	9.46E-06	8.00E-03	6.18E-03	6.78E-04	4.98E-05	3.98E-04			4.8E+06
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3			4.50E-03							
SVOC	Chrysene	218-01-9	2.48E-02	6.21E-06	1.94E-03	3.06E-03	9.54E-04	5.80E-05	1.13E-04			4.8E+06
SVOC	Dibenz(a,h)anthracene	53-70-3	2.02E-02	5.18E-06	3.02E-07	2.81E-02	1.06E-01	9.75E-05	2.94E-08			1.9E+11
SVOC	Dibenzofuran	132-64-9	2.70E-02	5.93E-06	2.57E-04	3.36E-03	2.45E-03	7.73E-05	1.99E-05			1.5E+07
SVOC	3,3'-Dichlorobenzidine	91-94-1	1.94E-02	6.74E-06	8.20E-08	1.25E-01	4.85E-01	9.80E-05	8.04E-09			9.5E+11
SVOC	2,4-Dichlorophenol	120-83-2	3.46E-02	8.77E-06	6.50E-05	4.46E-03	5.48E-03	8.76E-05	5.70E-06			
SVOC	Diethylphthalate	84-66-2	2.56E-02	6.35E-06	9.25E-06	4.18E-03	9.19E-03	9.16E-05	8.47E-07			
SVOC	2,4-Dimethylphenol	105-67-9	5.84E-02	8.69E-06	4.10E-05	7.51E-03	9.02E-03	9.15E-05	3.75E-06			9.4E+06
SVOC	Dimethylphthalate	131-11-3	5.68E-02	6.30E-06	2.15E-06	1.14E-02	2.97E-02	9.60E-05	2.06E-07			1.2E+07
SVOC	Di-n-butylphthalate	84-74-2	4.38E-02	7.86E-06	1.93E-08	6.14E-01	2.40E+00	1.19E-04	2.30E-09			1.9E+11
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	3.13E-02	6.35E-05	8.73E-06	1.47E-02	5.03E-02	9.69E-05	8.45E-07			
SVOC	2,4-Dinitrophenol	51-28-5	2.73E-02	9.06E-06	9.10E-06	4.85E-03	1.16E-02	9.29E-05	8.45E-07			
SVOC	2,4-Dinitrotoluene	121-14-2	2.03E-01	7.06E-06	1.90E-06	3.06E-02	6.03E-02	9.71E-05	1.84E-07			2.7E+08
SVOC	2,6-Dinitrotoluene	606-20-2	3.27E-02	7.26E-06	1.53E-05	4.74E-03	8.72E-03	9.13E-05	1.40E-06			
SVOC	Di-n-octylphthalate	117-84-0	1.51E-02	3.58E-06	1.37E-03	1.86E-03	6.77E-04	4.97E-05	6.81E-05			
SVOC	Fluoranthene	206-44-0	3.02E-02	6.35E-06	3.30E-04	3.75E-03	2.44E-03	7.73E-05	2.55E-05			7.4E+05
SVOC	Fluorene	86-73-7	3.63E-02	7.88E-06	1.31E-03	4.48E-03	1.59E-03	6.94E-05	9.06E-05			
SVOC	Hexachlorobenzene	118-74-1	5.42E-02	5.91E-06	2.71E-02	6.68E-03	1.96E-04	2.25E-05	6.07E-04	8.7E-02		
SVOC	Hexachlorobutadiene	87-68-3	5.61E-02	6.16E-06	1.67E-01	6.91E-03	4.52E-05	6.29E-06	1.05E-03	1.1E+00		4.8E+03
SVOC	Hexachlorocyclopentadiene	77-47-4	1.61E-02	7.21E-06	5.55E-01	1.98E-03	1.54E-05	2.24E-06	1.25E-03		1.7E-01	
SVOC	Hexachloroethane	67-72-1	2.50E-03	6.80E-06	7.95E-02	3.08E-04	4.34E-05	6.07E-06	4.83E-04	1.3E+01		
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	1.90E-02	5.66E-06	3.28E-05	2.60E-03	4.15E-03	8.47E-05	2.78E-06			
SVOC	Isophorone	78-59-1	6.23E-02	6.76E-06	1.36E-04	7.75E-03	5.51E-03	8.77E-05	1.19E-05			
SVOC	2-Methylnaphthalene	91-57-6	9.86E-02	7.75E-06	1.06E-02	1.22E-02	5.73E-04	4.57E-05	4.83E-04		6.5E+00	
SVOC	2-Methylphenol	95-48-7	7.40E-02	8.30E-06	2.46E-05	9.62E-03	1.24E-02	9.32E-05	2.29E-06			
SVOC	4-Methylphenol	106-44-5	7.40E-02	1.00E-05	1.62E-05	1.00E-02	1.56E-02	9.42E-05	1.52E-06			
SVOC	Naphthalene	91-20-3	5.90E-02	7.50E-06	9.90E-03	7.27E-03	5.18E-04	4.32E-05	4.27E-04		7.3E+00	
SVOC	2-Nitroaniline	88-74-4	7.30E-02		1.99E-03							
SVOC	3-Nitroaniline	99-09-2			2.94E-06							
SVOC	4-Nitroaniline	100-01-6			4.23E-08							
SVOC	Nitrobenzene	98-95-3	7.60E-02	8.60E-06	4.92E-04	9.39E-03	3.92E-03	8.40E-05	4.13E-05		5.0E+01	1.2E+05
SVOC	2-Nitrophenol	88-75-5			1.94E-04							
SVOC	4-Nitrophenol	100-02-7			8.48E-09							
SVOC	N-Nitrosodiphenylamine	86-30-6	3.12E-02	6.35E-06	1.03E-04	3.94E-03	3.88E-03	8.39E-05	8.60E-06			
SVOC	N-Nitroso-di-n-propylamine	621-64-7	5.45E-02	8.17E-06	4.62E-05	6.98E-03	8.09E-03	9.08E-05	4.19E-06			1.2E+06
SVOC	N-Nitrosomorpholine	59-89-2										
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	6.02E-02		2.39E-03							
SVOC	Pentachlorophenol	87-86-5	5.60E-02	6.10E-06	5.00E-07	2.51E-02	8.52E-02	9.74E-05	4.87E-08			
SVOC	Phenanthrene	85-01-8			4.76E-04							
SVOC	Phenol	108-95-2	8.20E-02	9.10E-06	8.15E-06	1.18E-02	2.13E-02	9.52E-05	7.76E-07			

Table C-10: Calculation of Site-Specific Vapor Intrusion Criteria for Off-Site Groundwater
Vernay Laboratories Inc., Yellow Springs, Ohio

										Indoor Air Limits		
Chem Group	Chemical	CASRN	D_{air} (cm^2/s)	D_{water} (cm^2/s)	H (unitless)	D_{crack} (cm^2/s)	D_{eff}^T (cm^2/s)	α_1	C_{bldg} (L-water/m^3)	10^{-5} Risk (mg/m^3)	HQ of 1 (mg/m^3)	Criteria (mg/l)
SVOC	Pyrene	129-00-0	2.72E-02	7.24E-06	2.26E-04	3.40E-03	2.79E-03	7.94E-05	1.79E-05			
SVOC	2,4,5-Trichlorophenol	95-95-4	2.91E-02	7.03E-06	8.90E-05	3.70E-03	4.05E-03	8.44E-05	7.51E-06			
SVOC	2,4,6-Trichlorophenol	88-06-2	3.18E-02	6.25E-06	1.60E-04	3.98E-03	3.32E-03	8.19E-05	1.31E-05	6.0E+02		
P/PCB	PCBs (total)	1336-36-3	8.00E-02	1.00E-05	5.31E-02	9.86E-03	1.87E-04	2.17E-05	1.15E-03			
P/PCB	Aroclor-1016	12674-11-2	2.05E-02		5.93E-03							
P/PCB	Aroclor-1221	11104-28-2			7.15E-02							
P/PCB	Aroclor-1232	11141-16-5										
P/PCB	Aroclor-1242	53469-21-9			1.17E-02							
P/PCB	Aroclor-1248	12672-29-6			7.17E-02							
P/PCB	Aroclor-1254	11097-69-1			1.71E-01							
P/PCB	Aroclor-1260	11096-82-5	1.27E-02		1.46E-01							
P/PCB	Aldrin	309-00-2	1.32E-02	4.86E-06	3.49E-03	1.63E-03	4.55E-04	4.01E-05	1.40E-04	3.6E-02		
P/PCB	alpha-BHC	319-84-6	1.42E-02	7.34E-06	2.18E-04	1.80E-03	1.88E-03	7.27E-05	1.58E-05	8.5E-01		
P/PCB	beta-BHC	319-85-7	1.42E-02	7.34E-06	1.53E-05	2.47E-03	5.79E-03	8.81E-05	1.34E-06	3.4E+01		
P/PCB	delta-BHC	319-86-8	1.76E-02		8.77E-06							
P/PCB	gamma-BHC	58-89-9	1.42E-02	7.34E-06	2.87E-04	1.79E-03	1.70E-03	7.08E-05	2.03E-05			
P/PCB	Chlordane	57-74-9	1.18E-02	4.37E-06	9.95E-04	1.46E-03	7.61E-04	5.26E-05	5.23E-05	4.7E+00	1.4E+01	9.6E+04
P/PCB	alpha-Chlordane	5103-71-9										
P/PCB	gamma-Chlordane	5103-74-2										
P/PCB	4,4'-DDD	72-54-8	1.69E-02	4.76E-06	8.20E-05	2.17E-03	2.56E-03	7.80E-05	6.40E-06			1.6E+05
P/PCB	4,4'-DDE	72-55-9	1.44E-02	5.87E-06	4.31E-04	1.79E-03	1.36E-03	6.61E-05	2.85E-05			
P/PCB	4,4'-DDT	50-29-3	1.37E-02	4.95E-06	1.66E-04	1.73E-03	1.76E-03	7.14E-05	1.19E-05	2.1E+01		
P/PCB	Dieldrin	60-57-1	1.25E-02	4.74E-06	3.10E-04	1.56E-03	1.30E-03	6.52E-05	2.02E-05	2.6E-01		
P/PCB	Endosulfan I	959-98-8			2.06E-03							
P/PCB	Endosulfan II	33213-65-9			3.90E-04							
P/PCB	Endosulfan sulfate	1031-07-8			4.19E-02							
P/PCB	Endrin	72-20-8	1.25E-02	4.74E-06	1.54E-04	1.59E-03	1.68E-03	7.05E-05	1.09E-05			4.6E+03
P/PCB	Endrin aldehyde	7421-93-4			7.89E-06							
P/PCB	Endrin ketone	53494-70-5										
P/PCB	Heptachlor	76-44-8	1.12E-02	5.69E-06	2.24E-02	1.38E-03	1.48E-04	1.80E-05	4.01E-04	4.7E-02		
P/PCB	Heptachlor epoxide	1024-57-3	1.32E-02	4.23E-06	1.95E-04	1.66E-03	1.53E-03	6.86E-05	1.34E-05	7.0E-01		
P/PCB	Methoxychlor	72-43-5	1.56E-02	4.46E-06	3.24E-04	1.94E-03	1.44E-03	6.73E-05	2.18E-05			9.2E+01
P/PCB	Toxaphene	8001-35-2	1.16E-02	4.34E-06	1.23E-04	1.48E-03	1.68E-03	7.05E-05	8.67E-06	8.8E+00		2.5E+04
INORG	Aluminum	7429-90-5										
INORG	Antimony	7440-36-0										
INORG	Arsenic	7440-38-2										
INORG	Barium	7440-39-3										
INORG	Beryllium	7440-41-7										
INORG	Cadmium	7440-43-9										
INORG	Calcium	7440-70-2										
INORG	Chromium (total)	7440-47-3										
INORG	Chromium III	16065-83-1										
INORG	Chromium VI	18540-29-9										
INORG	Cobalt	7440-48-4										
INORG	Copper	7440-50-8										
INORG	Cyanide (total)	57-12-5										
INORG	Iron	7439-89-6										
INORG	Lead	7439-92-1										
INORG	Magnesium	7439-95-4										
INORG	Manganese	7439-96-5										
INORG	Mercury	7439-97-6	3.07E-02	6.30E-06	1.45E-01	3.78E-03	4.71E-05	6.55E-06	9.50E-04		3.3E-01	
INORG	Nickel	7440-02-0										
INORG	Potassium	7440-09-7										
INORG	Selenium	7782-49-2										
INORG	Silver	7440-22-4										
INORG	Sodium	7440-23-5										
INORG	Thallium	7440-28-0										

Table C-10: Calculation of Site-Specific Vapor Intrusion Criteria for Off-Site Groundwater
Vernay Laboratories Inc., Yellow Springs, Ohio

										Indoor Air Limits		
Chem Group	**Chemical**	**CASRN**	**D_{air}** (cm^2/s)	**D_{water}** (cm^2/s)	**H** (unitless)	**D_{crack}** (cm^2/s)	**D_{eff}^T** (cm^2/s)	**α_1**	**C_{bldg}** (L-water/m^3)	**10^{-5} Risk** (mg/m^3)	**HQ of 1** (mg/m^3)	**Criteria** (mg/l)
INORG	Vanadium	7440-62-2										
INORG	Zinc	7440-66-6										
Notes:	**Crack Soil and Building Characteristics**											
	Bulk density	kg/L	**ρ_b**	1.66								
	Total porosity	L/L-soil	**θ**	**0.375**								
	Water-filled porosity	L/L-soil	**θ_w**	**0.079**								
	Air-filled porosity	L/L-soil	**θ_a**	0.296								
	Residual saturation	L/L-soil	**θ_r**	**0.053**								
	Hydraulic conductivity	cm/s	**K**	**7.4E-03**								
	Dynamic viscosity of water	g/cm-s	**μ**	0.01307								
	Density of water	g/cm^3	**ρ_w**	1.0								
	Gravitational acceleration	cm/s^2	**g**	980.7								
	Intrinsic permeability	cm^2	**k**	9.9E-08								
	Effective total saturation	unitless	**S_{te}**	0.080								
	van Genuchten N	unitless	**N**	**3.177**								
	van Genuchten M	unitless	**M**	0.685								
	Relative air permeability	unitless	**k_{rg}**	0.926								
	Permeability to vapor	cm^2	**k_v**	9.14E-08								
	Distance from building foundation to source	m	**L_T**	**0.90**								
	Bldg foundation thickness	m	**L_{crack}**	0.15								
	Bldg foundation length	m		**10.58**								
	Bldg foundation width	m		**10.58**								
	Bldg occupied height	m		**4.88**								
	Bldg occupied volume	m^3		546.56								
	Bldg depth below ground	m		**2.15**								
	Bldg area for vapor intrusion	m^2	**A_B**	203.0								
	Ratio of A_{crack} to A_B		**η**	1E-04								
	Area of cracks	m^2	**A_{crack}**	2.12E-02								
	Air exchange rate	$hour^{-1}$	**ac/h**	**1.0**								
	Building ventilation rate	m^3/s	**Q_{bldg}**	1.52E-01								
	Pressure difference between outdoors-indoors	$kg/m\text{-}s^2$	**ΔP**	1.0								
	Air viscosity	kg/m-s	**μ**	1.8E-05								
	Crack length (bldg perimeter)	m	**X_{crack}**	42.332021								
	Crack depth below ground	m	**Z_{crack}**	2.15								
	Crack radius	m	**r_{crack}**	**5E-04**								
	Soil gas flow rate into bldg	m^3/s	**Q_{soil}**	1.49E-05								

APPENDIX D

Indoor Air Sampling
Statement of Work 9A (Payne Firm, 2004)

STATEMENT OF WORK #9A
First Quarter 2004 Monitoring Event

VERNAY LABORATORIES, INC.
PLANT 2/3 FACILITY
YELLOW SPRINGS, OHIO

Project No. 0292.11.28

EPA ID No. OHD004243002

US EPA Docket No. RCRA-05-2002-0016
(Administrative Order on Consent)

February 24, 2004

Prepared For

VERNAY LABORATORIES, INC.
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Prepared By

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STATEMENT OF WORK #9A
First Quarter 2004 Monitoring Event

VERNAY LABORATORIES, INC.
PLANT 2/3 FACILITY
YELLOW SPRINGS, OHIO

Project No. 0292.11.09

February 24, 2004

Kevin D. Kallini, P.G.
Field Coordinator/QA Officer

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STATEMENT OF WORK #9A

The Payne Firm, Inc.
Environmental Consultants

11231 Cornell Park Drive
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513-489-2255 Fax: 513-489-2533

DATE: February 24, 2004

SUBJECT: 1st Quarter 2004 Monitoring Program

PROJECT NO.: 292.11.28

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1. OBJECTIVES

This Statement of Work (SOW) identifies the ninth task that will be undertaken as part of a September 27, 2002 RCRA Corrective Action Order (Order) agreed between Vernay Laboratories, Inc. located at 875 Dayton Street, Yellow Springs, Ohio (Facility) and the United States Environmental Protection Agency (US EPA).

This SOW involves the quarterly ground water monitoring as required by Section VI.13. of the Order. The main objective of the quarterly monitoring program is to collect the sufficient data needed to make the appropriate determinations required by the RCRA Ground Water and Human Health Environmental Indicators, to support the baseline risk assessment, and the evaluation of corrective measures including the existing ground water extraction interim measure. This SOW was prepared following the project Quality Assurance Project Plan (QAPP), Payne Firm SOPs, and US EPA guidance document "Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers," (May, 2002).

2. MONITORING NETWORK/SAMPLE LOCATIONS

A. Ground Water

Twenty monitoring wells (MW01-01 through MW01-14, MW01-02CD through MW01-05CD, MW01-02SE, MW01-04SE) are located at the Facility, and thirty two monitoring wells (MW02-01 through MW02-18, MW02-03CD, MW02-03SE, MW02-04CD, MW02-05CD, MW02-06CD, MW02-08CD, MW02-08SE, MW02-10CD, MW02-11SE, MW02-14CD through MW02-18CD) are located east and south of the Facility on Wright Street, Omar Circle, Suncrest Drive, Green Street, WS and WN College Street, Dayton Street, and on private property located at 825 Dayton Street. Monitoring wells MW01-01 through MW01-14 (excluding MW01-12 and MW01-13) and MW02-01 through MW02-18 are screened within the upper portion of the Cedarville Aquifer. Monitoring wells MW01-02CD through MW01-05CD, MW02-03CD, MW02-04CD, MW02-05CD, MW02-06CD, MW02-08CD, MW02-10CD and MW02-14CD through MW02-18CD are screened into the middle portion of the Cedarville Aquifer. Monitoring well MW01-02SE, MW01-04SE, MW02-03SE, MW02-

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08SE, and MW02-11SE are screened into the lower portion of the Cedarville Aquifer. Monitoring wells MW01-12, MW01-13, and MW02-12 are screened into sanitary sewer or storm sewer backfill materials.

For this quarterly sampling event, all twenty Facility monitoring wells and all thirty two monitoring wells located off of the Facility will be sampled. In addition, a ground water sample will be collected at RW01-05 where elevated concentrations of VOCs have been detected during previous monitoring events. RW01-05 is also screened in the upper portion of the Cedarville Aquifer. Therefore, a total of 53 monitoring wells will be sampled during this quarterly monitoring event. The attached Figure 1 shows the locations of the Facility and off-property monitoring well locations.

B. Surface Water

Two surface water samples will be collected during this monitoring event. The surface water samples will be collected from the storm sewer at sample location ST02-03, and at the outfall to the unnamed creek at ST02-05. The attached Figure 2 shows the locations of the surface water sampling locations.

C. Air

Air samples will be collected from within Plant 2 and Plant 3 on the Facility. In Plant 2, air samples will be collected within the hydraulic tank pit and the underground utility tunnel. In Plant 3, air samples will also be collected within the hydraulic tank pit and the underground utility tunnel. At each location, two air samples will be collected from different depths in the subsurface structure. Air sample locations are shown on the attached Figure 3 and Figure 4.

3. SAMPLING FREQUENCY

As stated in Section VI.13. of the Order, ground water sampling will be conducted on a quarterly basis. The number of monitoring wells sampled during each quarterly ground water monitoring event will be reevaluated during each monitoring event.

4. SAMPLING METHODOLOGY

A. Ground Water

The field activities associated with ground water monitoring will follow the project QAPP and the Payne Firm's Standard Operating Procedures (SOPs) for Well Purging (SOP 6-3), Ground Water Sampling (SOP 6-4), and Decontamination of Water Sampling Equipment (SOP 6-1). The Payne Firm's SOPs are consistent with the May 2002 US EPA guidance document "Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers." The methodology will consist of the following primary elements:

- Prior to sampling a monitoring well, appropriate measurements such as the static water level, total well depth, volume of water in the well, and ground water elevation will be made.
- A submersible pump (QED Well Wizard® Bladder Pump) with dedicated Teflon tubing will be slowly lowered into the well to a point within the well screen interval.
- Each well will be purged following the low flow purging methods described in SOP 6-3. During well purging, water quality parameters (temperature, pH, specific conductance, oxidation-reduction potential [ORP], dissolved oxygen, and turbidity) will be recorded from an in line flow-through cell every 3 to 5 minutes after a minimum of one tubing volume of water has been removed. Purging may cease when measurements for all parameters have stabilized for three consecutive

measurements. Stabilization criteria for the water quality parameters is as follows (USEPA 2002):

i. pH: +/- 0.1
ii. specific conductance: +/- 3% S/cm
iii. dissolved oxygen: +/- 0.3 milligrams per liter
iv. oxidation-reduction potential: +/- 10 millivolts
v. turbidity: +/- 10% (when turbidity is > 10 NTUs).

The flow rate during purging will initially be low (0.2 to 0.5 liter per minute); the flow rate can be increased as long as the drawdown in the well does not exceed 0.33 feet.

- Once sufficient ground water is purged, ground water will be transferred to laboratory supplied containers for analysis of chemicals of concern (VOCs). Appropriate sample preservation will be added to the ground water samples, according to the particular analysis to be conducted (see Section 5). Samples will be collected directly from the discharge port of the pump tubing prior to passing through the flow-through cell.
- The ground water samples will be appropriately packaged and shipped to Severn Trent Laboratories in North Canton, Ohio.
- Ground water sampling information will be recorded on a ground water sampling form and/or in the project field logbook.

B. Surface Water

Surface water samples collected from the unnamed creek (ST02-05) will be collected directly into the sample container. The sample will be collected under the water surface by pointing the sample container upstream, avoiding any disturbance to the stream substrate.

A sample will be collected from the storm sewer at location ST02-03 using a dip sampler. The surface water sample will be collected by carefully lowering the dip sampler into the storm sewer manhole to collect the sample. Once the dip sampler container is full, it will be carefully brought to the surface and gently poured into the appropriate sample containers.

C. Air

Air samples will be collected at the locations shown on Figures 3 and 4. At each location, two air samples will be collected into a Summa Passivated Canister (Summa Canister): one sample collected approximately one foot from the bottom of the structure, and a second sample collected approximately four feet from the bottom of the structure. The sample time interval for the samples will be 4 hours, which will be regulated by a laboratory present flow regulator attached to each Summa Canister. At the completion of sampling, each sample will be labeled and returned to the laboratory under proper chain-of-custody procedures.

5. SAMPLING CONTAINERS, IDENTIFICATION, ANALYSIS AND PRESERVATION

The ground water samples will be labeled as **MW01-01/[date]**, where:

MW01-01/[date], MW01=On-property monitoring well (MW02=Off-property monitoring well);
MW01-01/[date], 01=Well identification;
MW01-01/[date], [date]=Date of sample collection.

Ground water samples will be collected into three 40-milliliter (mL) vials, and will be analyzed for VOCs by

U.S. EPA Method SW-846 8260 (TCL/TAL list). Each sample container will be provided by the analytical laboratory, and will be preserved with hydrochloric acid. Each sample will be cooled to 4º Celsius after collection.

Surface water samples will be labeled as ST02-03/[date], where:

ST02-03/[date], MW01=Off-property surface water sample;
ST02-03/[date], 01=Sample station identification;
ST02-03/[date], [date]=Date of sample collection.

Surface water samples will be collected into three 40-milliliter (mL) vials, and will be analyzed for VOCs by U.S. EPA Method SW-846 8260 (TCL/TAL list). Each sample container will be provided by the analytical laboratory, and will be preserved with hydrochloric acid. For the samples collected directly from the unnamed creek, care will be taken so that the preservative will not be diluted during sample collection. Each sample will be cooled to 4º Celsius after collection.

Air samples will be labeled as AIR-0107/[date], where:

AIR01-07/[date], AIR01=On-property air sample;
AIR01-07/[date], 07=Sample station identification;
AIR01-07/[date], [date]=Date of sample collection.

Air samples will be collected into a 6-liter Summa Canister, and will be analyzed for VOCs by U.S. EPA Method TO-14 (USEPA, 1988).

8. SAMPLE HANDLING AND SHIPMENT

All samples will be labeled immediately after collection. The information on the sample label will include the project name, sample identification, sample date and time, and the analyses requested. Samples will be packaged and shipped to the project laboratory.

9. FIELD DOCUMENTATION

9.1 Field Logbook

A field logbook and a field ground water sampling form will be used to record facts and circumstances of the sampling event. Information recorded in the logbook/field form will include the following:

- Name of sampling personnel;
- Sample location;
- Time and date;
- Weather conditions;
- Sample type (i.e. grab, composite, etc.); and
- Pertinent sample data.

9.2 Chain-of-Custody

Chain-of-custody documentation will accompany each sample shipment. The chain-of-custody record will record the project name, type of sample collected, date of sample collection, name(s) of the person(s) responsible for sample collection, date of custody transfer, signature of the person relinquishing and accepting sample custody, and other pertinent information.

10. EQUIPMENT DECONTAMINATION

The ground water sampling pump will be decontaminated prior to use at each monitoring well location. Decontamination procedures include:

- Disconnect internal pump parts, including Teflon bladder and pump fittings.
- Scrub the exterior of the pump and associated internal pump fittings and Teflon bladder in a non-phosphate detergent solution; (Bucket #1);
- Rinse with distilled water (Bucket #2);
- Allow to air dry.

Dedicated tubing will be used at each monitoring well location; therefore, it will not be necessary to decontaminate pump tubing between monitoring well sampling locations.

Decontamination solutions will be contained and new solutions used periodically during each day of sampling. All decontamination solutions will be contained and properly disposed.

11. QUALITY ASSURANCE

Sample collection, quality assurance/quality control procedures, and employment of data quality objectives will be conducted by the Payne Firm in accordance with the Payne Firm's SOPs and project-related QAPP. During the monitoring event, the following QA/QC samples will be collected at a minimum:

- One trip blank sample will be shipped with each sample cooler containing samples for VOC analysis. The trip blank samples will be identified as: TB01-[date]. The trip blank sample will be analyzed for VOCs.
- Three duplicate samples will be collected. The duplicate samples will be collected from monitoring well MW01-04CD, MW02-03CD, and MW02-13. The duplicate samples will be identified as: DUP01/[date] (for duplicate of MW01-04CD), DUP02/[date] (for duplicate of MW02-03CD, and DUP03/[date] (for duplicate of MW02-13), and will be analyzed for VOCs.
- Three equipment rinsate samples will be collected. The rinsate samples will be collected after the ground water sample pump has been properly decontaminated at the end of the day. The sample will be collected by pouring laboratory grade water over the sample pump, and collecting the rinsate off of the pump into the appropriate sample containers. The laboratory grade water will be provided by the project laboratory. The rinsate sample will be labeled as: RIN01/[date], RIN02/(date) and RIN03/[date].
- Three matrix spike/matrix spike duplicate (MS/MSD) samples will be collected during the sampling event. MS/MSD samples will be collected at MW01-04CD, MW02-03CD, and MW02-13. The lab will be provided triple the volume for each with MS/MSD indicated on the chain of custody.
- Three field blank samples will be collected during the sampling event by filling laboratory grade water directly into the appropriate sample containers. One field blank will be collected on the Facility, and two will be collected off of the Facility property. The field blank sample will be labeled as FB01/[date] for the sample collected on the Facility property, and FB02/[date] and FB03/[date] for the samples collected

off of the Facility property.

12. SAMPLING TEAM

Project Manager-David C. Contant, L.G.
Field Coordinator/Quality Assurance Officer-Kevin D. Kallini, P.G.
Field Samplers-Payne Firm field personnel

DRAFT

LEGEND **DRAFT**

- Cedarville Aquifer Extraction Well
- Upper Cedarville Aquifer Monitoring Well
- Middle Cedarville Aquifer Monitoring Well (CD)
- Lower Cedarville Aquifer Monitoring Well (SE)

200 100 0 200
Feet

N

MW02-12
MW01-13
MW02-17
MW02-17CD
CW01-02
MW01-12
MW01-09
MW01-05CD
MW01-01
DAYTON STREET
MW01-02CD
MW01-02
MW01-02SE
MW01-07
MW01-05
PLANT 3
MW01-11
RW01-05
MW01-10
CW01-01
MW01-06
MW01-08
MW01-14
MW01-04CD
MW01-04SE
MW01-03CD
MW01-04
MW01-03
MW02-11
MW02-11SE
MW02-08CD
MW02-08SE
MW02-08
MW02-07
WRIGHT STREET
LIMESTONE STREET
MW02-15
MW02-15CD
GREEN STREET
MW02-09
SUNCREST DRIVE
MW02-10
MW02-10CD
MW02-06
MW02-06CD
MW02-05
MW02-05CD
MW02-16
MW02-16CD
W N COLLEGE STREET
MW02-01
OMAR CIRCLE
MW02-02
MW02-03CD
MW02-03SE
MW02-03
MW02-04
MW02-04CD
E ENON
OMAR CIRCLE
MW02-18CD
MW02-18
MW02-13
BARBARA STREET
W C COLLEGE STREET
GREEN STREET
W S COLLEGE STREET
MW02-14
MW02-14CD

F:\Data\PEI-MGT\Vernay\GIS\1st Qtr 2004\SOW9_MWLocations.mxd

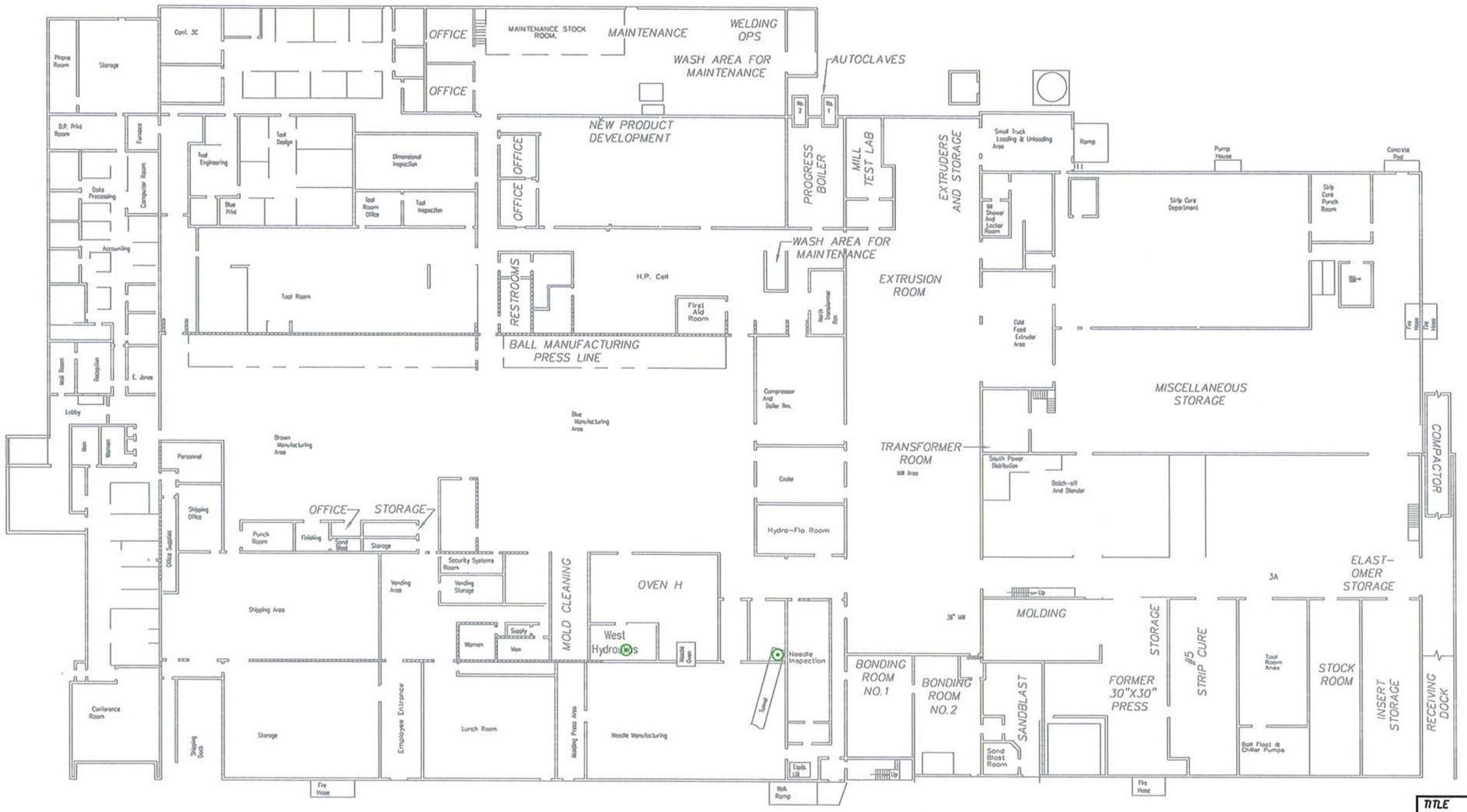
The Payne Firm, Inc.	Environmental Consultants Cincinnati, Ohio
DATE	2/23/04
APPROVED BY	KDK
FIGURE NO.	1
DRAWN BY	ALH
PROJECT NO.	292.11.28
CLIENT	VERNAY LABORATORIES, INC.
TITLE	SAMPLING LOCATIONS (1ST QUARTER 2004)

REFERENCE Greene County Auditors, Orthophotograph (1998); State Plane Coordinates from Woolpert Surveying, LLP, Dayton, Ohio (NAD83/NAVD88)

The Payne Firm, Inc.
Environmental Consultants
Cincinnati, Ohio

CLIENT	VERNAY LABORATORIES, INC.	FIGURE NO.	2
TITLE	SURFACE WATER SAMPLING LOCATIONS (1ST QUARTER 2004)	DRAWN BY	ALH
		PROJECT NO.	292.11.28
		DATE	2/12/04
		APPROVED BY	KDK

REFERENCE Greene County Auditors, Orthophotograph (1998); State Plane Coordinates from Woolpert Surveying, LLP, Dayton, Ohio (NAD83/NAVD88)



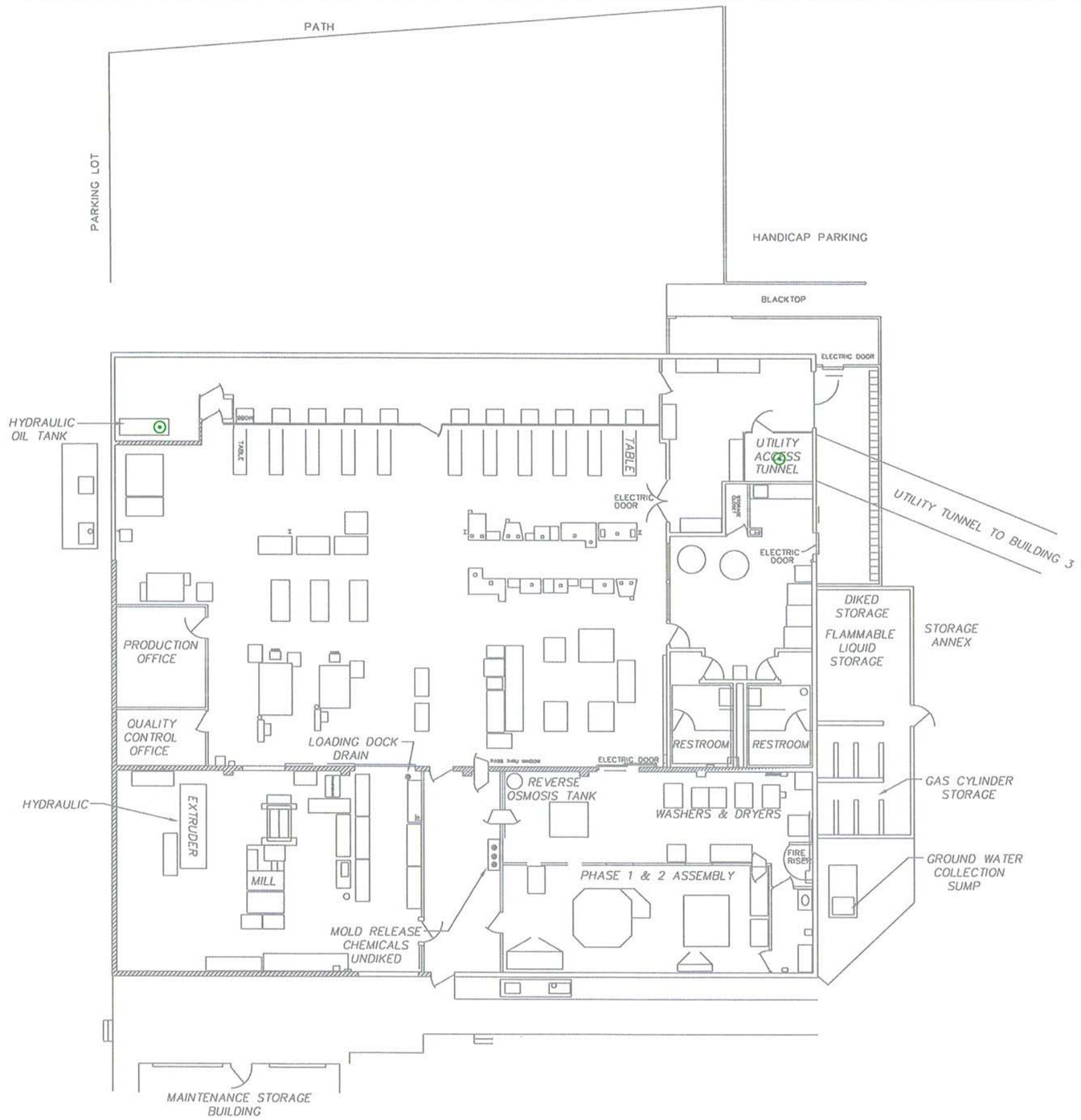
LEGEND

⊙ AIR SAMPLE LOCATION

APPROXIMATE SCALE: 1 INCH = 40 FEET

TITLE	PLANT 3 AIR SAMPLE LOCATIONS
DATE 02/12/04	FIGURE 3
DRAWN BY MRD	APPROVED BY DCC
CLIENT	VERNAY LABORATORIES, INC.
PROJECT NO.	0292.11.28

The Payne Firm, Inc.
Environmental Consultants
Cincinnati, Ohio 45242



NORTH

LEGEND

⊙ AIR SAMPLE LOCATION

APPROXIMATE SCALE: 1 INCH = 18 FEET

TITLE	***PLANT 2 AIR SAMPLE LOCATIONS***
DATE ***02/12/04***	FIGURE ***4***
DRAWN BY ***MRD***	APPROVED BY ***DCC***
CLIENT	***VERNAY LABORATORIES, INC.***
PROJECT NO.	***0292.11.28***

The Payne Firm, Inc.
Environmental Consultants
Cincinnati, Ohio 45242

Vernay Laboratories, Inc.
Plant 2/3 Facility
Yellow Springs, Ohio
Project No. 0292.11.28

Table 1: First Quarter 2004 Ground Water Monitoring Event Information

On-Property Monitoring Wells							
Well ID	**Sample ID**	**Analytical Method**	**Sample Container**	**Preservative**	**QA/QC Samples**	**QA/QC Sample ID**	**QA/QC Sample Analysis**
MW01-01	MW01-01/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-02	MW01-02/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-02CD	MW01-02CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-02SE	MW01-02SE/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-03	MW01-03/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-03CD	MW01-03CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-04	MW01-04/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-04CD	MW01-04CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	Field Duplicate, MS/MSD	DUP01/[date], MW01-04CD/[date]/MSMSD	VOC-8260
MW01-04SE	MW01-04SE/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-05	MW01-05/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-05CD	MW01-05CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-06	MW01-06/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-07	MW01-07/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-08	MW01-08/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-09	MW01-09/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-10	MW01-10/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-11	MW01-11/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-12	MW01-12/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-13	MW01-13/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW01-14	MW01-14/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
RW01-05	RW01-05/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA

Well ID	Sample ID	Analytical Method	Sample Container	Preservative	QA/QC Samples	QA/QC Sample ID	QA/QC Sample Analysis
Off-Property Monitoring Wells							
MW02-01	MW02-01/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-02	MW02-02/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-03	MW02-03/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-03CD	MW02-03CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	Field Duplicate, MS/MSD	DUP02/[date], MW02-03CD/[date]/MSMSD	VOC-8260
MW02-03SE	MW02-03SE/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-04	MW02-04/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-04CD	MW02-04CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-05	MW02-05/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-05CD	MW02-05CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-06	MW02-06/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-06CD	MW02-06CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-07	MW02-07/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-08	MW02-08/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-08CD	MW02-08CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-08SE	MW02-08SE/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-09	MW02-09/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-10	MW02-10/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-10CD	MW02-10CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-11	MW02-11/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-11SE	MW02-11SE/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-12	MW02-12/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-13	MW02-13/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	Field Duplicate, MS/MSD	DUP03/[date], MW02-13/[date]/MSMSD	VOC-8260
MW02-14	MW02-14/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-14CD	MW02-14CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-15	MW02-15/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-15CD	MW02-15CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-16	MW02-16/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-16CD	MW02-16CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-17	MW02-17/[date}	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-17CD	MW02-17CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-18	MW02-18/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA
MW02-18CD	MW02-18CD/[date]	VOC-8260	3-40 ml. vials	ice, HCl (vials)	NA	NA	NA

Other QA/QC Samples			
Sample Type	**Sample ID**	**Analysis**	**Comments**
Trip Blank	TB01/[date], TB02/[date], etc.	VOCs-8260	Sent with every shipment of VOC samples
Field Blank	FB01/[date], FB02/[date], FB03/[date]	VOCs-8260	Total of 3 Field Blank Samples; one collected on property, two collected off property
Equipment Rinsate	RIN01/[date], RIN02/[date], RIN03/[date]	VOCs-8260	Total of 3 Equipment Rinsate samples collected at the end of the day of sampling.

The Payne Firm, Inc.

Vernay Laboratories, Inc.

Plant 2/3 Facility

Yellow Springs, Ohio

Project No. 0292.11.28

Data Objective Summary Form (SOW #9A: First Quarter 2004 Monitoring Event)

Activity:	Monitoring Event (Q1-2004)
Sample Media:	Ground Water/Surface Water/Air
Sample Type:	Grab (ground water/surface water); composite (air)
Number of Samples	53 ground water
	2 surface water
	8 air
QA/QC Samples:	3 Field Duplicate
	3 MS/MSD
	1 Trip Blank with every cooler for VOC analysis
	3 Field Blank
	3 Equipment Rinsate
Sampling Procedures:	See applicable SOPs attached to QAPP
Analytical Methods:	SW-846 8260 (surface water/ground water); TO-14 (air)
Appropriate Analytical Support Levels:	ASL-IV

APPENDIX E

Vernay Health & Safety Policy for On-Facility Excavations

Vernay Environmental System
Excavation Policy

1. Purpose

The purpose of this policy is to prevent personnel exposure to subsurface contaminants during excavation at Vernay Laboratories, Inc. Dayton Street, Plant 2/Plant 3 facility in Yellow Springs, Ohio.

2. Scope

This policy is applicable to any excavation activity that will be performed on property belonging to Vernay Laboratories, Inc. at its Dayton Street, Plant 2/Plant 3 facility. Occupational Safety and Health Standards for General Industry and for the Construction Industry can be found in 29 CFR 1910 and 29 CFR 1926, respectively. Personnel planning to perform excavation activities should consult the OSHA Standards for the applicable regulatory requirements for excavation and associated tasks. Additional Vernay Work Instructions relevant to the tasks associated with excavation may be available and should be consulted to determine any Company policies and best management practices required by Vernay.

3. Definitions

Excavation is defined as any man-made cut, cavity, trench, or depression in a floor slab, parking lot, or in an earth surface, formed by removal of concrete, asphalt, dirt and or rock.

4. Responsibility

The Environmental Affairs and Safety Manager (EASM) and the Maintenance and Facilities Manager have responsibilities for the activities in this policy as detailed below.

5. Instructions

5.1 Notification

Prior to performing any excavation activity, permission must be obtained from the EASM (or in his absence from the facility, the Facilities and Maintenance Manager). Notification of all planned or emergency work involving any excavation will be made by completing and submitting an **Excavation Permit** to the EASM. A blank **Excavation Permit** form may be obtained from the InfoBase.

Excavation work must be done in accordance with a written site-specific Health and Safety Plan. Work in excavation areas must be performed by competent personnel currently trained pursuant to OSHA's Standards for excavation (29 CFR 1926, Subpart P) and hazardous materials (29 CFR 1910, Subpart H), at a minimum.

All excavation activities, regardless of where performed, must be executed in accordance with the applicable regulatory requirements and Company policies and practices. The requirements identified below apply to all excavation activities.
The Project Leader, as identified on the **Excavation Permit**, and excavation personnel are responsible for complying with all applicable regulatory standards and Company policies and practices. Additionally, the Project Leader is responsible for the following:

- Display the approved Excavation Permit in the excavation work area at all times until the excavation activities are complete.

- Manage excavated materials in accordance with instructions from the EASM (or in his absence from the facility, the Facilities and Maintenance Manager).

- Obtain approval from the EASM (or in his absence from the facility, the Facilities and Maintenance Manager) prior to making any changes in excavation scope, location, or duration.

- Stop excavation and contact the EASM (or in his absence from the facility, the Facilities and Maintenance Manager) immediately for further instructions if excavated material appears to have odors and/or visible staining.

- Notify the EASM (or in his absence from the facility, the Facilities and Maintenance Manager) once the excavation has been backfilled and surrender the excavation permit.

5.2 Monitoring

Hazardous atmospheric conditions may be present in excavations. The Project Leader is responsible for ensuring appropriate atmospheric monitoring, in accordance with the applicable OSHA Standards and Company policies and practices, to prevent exposure to harmful atmospheric conditions.

Hazardous atmospheric conditions may include oxygen deficiency, accumulation of toxic gases, and accumulation of flammable gases. The atmospheres in excavations greater than 4 feet in depth shall be tested prior to entry. The Project Leader is responsible to ensure that adequate precautions, such as providing ventilation and or proper respiratory protection, in accordance with OSHA Standards, are taken to prevent personnel exposure to hazardous atmospheric conditions. Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. Emergency rescue equipment shall be attended when in use.

The Project Leader is also responsible for ensuring that testing is conducted as often as necessary to ensure that the atmospheric conditions of the excavation remain safe.

5.3 Disposal

Environmental Affairs and Safety Manager will perform the waste determination of the excavated material and will arrange for proper disposal.

Vernay Environmental System
Excavation Permit

Instructions: Submit the completed Excavation Permit to the Environmental Affairs and Safety Manager (or in his absence from the facility, the Facilities and Maintenance Manager). No excavation activities shall be permitted at **Vernay Laboratories, Inc., Dayton Street, Plant 2 / Plant 3 facility** without prior approval from the Environmental Affairs and Safety Manager (or in his absence from the facility, the Facilities and Maintenance Manager).

Date of Request:	

Estimated Starting Date:		**Estimated Completion Date:**	

Project Title:		**Project Number:**	

Site Location, Building #, and Column Location:	

Requesting Employee Name: (print)					
Phone #:		**Cellular #:**		**Pager #:**	

Excavation Project Leader:					
Phone #:		**Cellular #:**		**Pager #:**	

☐ **Project Description**. A checkmark in this box indicates the Environmental Affairs and Safety Manager (or in his absence from the facility, the Facilities and Maintenance Manager) has received the required information. Requestor must attach brief description of the work to be performed, including a sketch of the area to be excavated with the excavation area outlined and the approximate dimensions (length, width and depth) provided.

☐ **HASP Reviewed**. A checkmark in this box indicates Environmental Affairs and Safety Manager (or in his absence from the facility, the Facilities and Maintenance Manager) has reviewed the Health and Safety Plan (HASP).

Issued
Environmental Affairs and Safety Manager
(Facilities and Maintenance Manager, if EASM is absent)

Acknowledgement
Project Leader (Competent Person)

Print		**Print**	
Sign		**Sign**	
Date		**Date**	

To be completed by Environmental Affairs and Safety Manager
(Facilities and Maintenance Manager, if EASM is absent)

PERMIT EXPIRES Date: _____	**EXTENDED TO**	**EXTENDED TO**
	Date:	**Date:**
	Signature:	**Signature:**

Excavation Completed/Permit Surrendered	**Date:**	
	Signature:	

Ref: EMP-4.6-VL Rev. 07/01/04

APPENDIX F

Methodology for Evaluating Current Human Health Risk Associated with Potential Unnamed Creek Exposures

APPENDIX F

Methodology for Evaluating Current Human Health Risk Associated with Potential Unnamed Creek Exposures

The methodology used to evaluate the significance of potential current human health risk associated with hypothetical exposures to site-related constituents detected in surface water and sediment[5] in the unnamed creek to the north of the Vernay facility are outlined below. The selection of the exposure concentrations and exposure factors used in the evaluation of human health risk associated with these exposure scenarios is also presented.

Background

A review of the data for surface water in the unnamed creek collected during the Phase I RFI indicates that tetrachloroethene exceed generic human health risk-based screening criteria selected to identify potentially significant concentrations in each media sampled.[6] In order to further evaluate the significance of the potential human health risk associated with exposures to tetrachloroethene, a preliminary assessment was performed to estimate the cancer risk and the noncancer health effects for the potentially exposed human receptors identified under current conditions.

Description of Exposure Setting

The exposure setting is evaluated with respect to: (1) general physical characteristics of the facility and its surrounding; and (2) the characteristics of the potentially exposed populations at and near the site. The following are descriptions of the general characteristics, as described in the Current Conditions Report prepared by the Payne Firm (2002), of the area that is being evaluated in this assessment:

Unnamed Creek

Surface water drainage at the Facility flows to several on-property storm sewer drains, which are connected to a 54-inch Village of Yellow Springs storm sewer located below Dayton Street. The Facility's connection to the 54-inch Village of Yellow Springs storm sewer is located near the northeast corner of the Facility. No surface bodies of water are located on the Facility.

---

[5] Sediment was included in the evaluation even though sediment "contamination" was not identified.

[6] For sediments, risk-based screening criteria based on Region 9 PRGs for industrial soil were used. For surface water drinking water screening criteria and criteria for evaluating direct contact during short-term maintenance activities were used.

The Village of Yellow Springs storm sewer located beneath Dayton Street discharges into a small unnamed creek on the north side of Dayton Street approximately 0.3 miles east of the Facility. Sediment and surface water sampling locations in the unnamed creek are presented in Figure 6e. The unnamed creek travels approximately one mile where it discharges into the Yellow Spring Creek near the intersection of Yellow Springs Creek and Polecat Road. Yellow Springs Creek is a tributary of the Little Miami River located approximately 2.5 miles south of the Property. The Little Miami River is the principle river that drains Greene County.

Potential Receptors and Exposure Pathways

Based on the understanding of the physical characteristics of the site and its surroundings, the following population has been identified as the receptor having a potential to be exposed (via direct contact and incidental ingestion) to site-related constituents detected in surface water and sediment:

- Off-Facility Recreators

The following exposure pathways are quantitatively evaluated for the receptor identified above:

Potential Exposures to *Sediment*

- incidental ingestion of sediment
- dermal contact with sediment

Potential Exposures to *Surface Water*

- incidental ingestion of surface water
- dermal contact with surface water
- inhalation of vapor from surface water

Quantification of Potential Exposures

The exposures identified for quantitative evaluation are quantified in terms of a dose, as follows:

$$Dose = Concentration \cdot Intake$$

The dose for evaluating cancer risk is averaged over a lifetime and is called the lifetime average daily dose (LADD). For evaluating long-term (or chronic) noncancer effects, the dose is averaged over the period of exposure and is called the average daily dose (ADD).

The concentration term in the dose equation refers to a conservative estimate of the chemical concentration in an environmental medium to which a known or hypothetical receptor population is exposed over a hypothetical period of exposure. The intake term refers to the intake rate of an environmental medium, which is a function of the magnitude, frequency, and the duration of exposure.

Exposure Concentration

The exposure concentrations used in the assessment are provided in Table F-1.

Sediment

The maximum concentration of constituents detected in the unnamed creek sediment was used to represent the exposure point concentrations.

Surface Water

The maximum concentration of constituents detected in the unnamed creek surface water was used to represent the exposure point concentrations.

Exposure Factors

The high-end exposures to receptors identified for quantitative risk evaluation are summarized in Table F-2.

Table F-1: Exposure Concentrations in Sediment and Surface Water Vernay Laboratories Inc., Yellow Springs, Ohio				
			Sediment Conc. (mg/kg)	Surface Water Conc. (mg/L)
Chemical Group	Detected Constituent	CASRN	Max Detected	Max Detected
VOC	Acetone	67-64-1	6.30E-02	3.70E-02
VOC	Benzene	71-43-2		
VOC	Bromochloromethane	74-97-5		
VOC	Bromodichloromethane	75-27-4		
VOC	Bromoform	75-25-2		
VOC	Bromomethane	74-83-9		
VOC	Butanone 2	78-93-3		
VOC	Carbon Disulfide	75-15-0		2.20E-04
VOC	Carbon Tetrachloride	56-23-5		
VOC	Chlorobenzene	108-90-7		
VOC	Chloroethane	75-00-3		
VOC	Chloroform	67-66-3		
VOC	Chloromethane	74-87-3		
VOC	Cumene	98-82-8		
VOC	Cyclohexane	110-82-7		
VOC	1,2-Dibromo-3-chloropropane	96-12-8		
VOC	Dibromochloromethane	124-48-1		
VOC	1,2-Dibromoethane	106-93-4		
VOC	1,2-Dichlorobenzene	95-50-1		
VOC	1,3-Dichlorobenzene	541-73-1		
VOC	1,4-Dichlorobenzene	106-46-7		
VOC	Dichlorodifluoromethane	75-71-8		
VOC	1,1-Dichloroethane	75-34-3		
VOC	1,2-Dichloroethane	107-06-2		
VOC	1,1-Dichloroethene	75-35-4		
VOC	1,2-Dichloroethene (total)	540-59-0	2.70E-01	1.20E-03
VOC	cis-1,2-Dichloroethene	156-59-2	2.70E-01	1.20E-03
VOC	trans-1,2-Dichloroethene	156-60-5		
VOC	1,2-Dichloropropane	78-87-5		
VOC	1,3-Dichloropropene (total)	542-75-6		
VOC	cis-1,3-Dichloropropene	10061-01-5		
VOC	trans-1,3-Dichloropropene	10061-02-6		
VOC	Ethyl Benzene	100-41-4		
VOC	2-Hexanone	591-78-6		
VOC	Methyl Acetate	79-20-9		
VOC	Methyl tert-butyl ether	1634-04-4		
VOC	4-Methyl-2-pentanone	108-10-1		
VOC	Methylcyclohexane	108-87-2		
VOC	Methylene Chloride	75-09-2		5.20E-04
VOC	Styrene	100-42-5		
VOC	1,1,2,2-Tetrachloroethane	79-34-5		
VOC	Tetrachloroethene	127-18-4	6.60E-02	7.50E-02
VOC	Toluene	108-88-3	6.50E-02	
VOC	1,2,4-Trichlorobenzene	120-82-1		
VOC	1,1,1-Trichloroethane	71-55-6		
VOC	1,1,2-Trichloroethane	79-00-5		
VOC	Trichloroethene	79-01-6	2.30E-02	1.40E-03
VOC	Trichlorofluoromethane	75-69-4		
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		
VOC	Vinyl Chloride	75-01-4	3.20E-02	
VOC	Xylenes (total)	1330-20-7		
SVOC	Acenaphthene	83-32-9		

Table F-1: Exposure Concentrations in Sediment and Surface Water Vernay Laboratories Inc., Yellow Springs, Ohio				
			Sediment Conc. (mg/kg)	Surface Water Conc. (mg/L)
Chemical Group	Detected Constituent	CASRN	Max Detected	Max Detected
SVOC	Acenaphthylene	208-96-8		
SVOC	Acetophenone	98-86-2		
SVOC	Anthracene	120-12-7		
SVOC	Atrazine	1912-24-9		
SVOC	Benzaldehyde	100-52-7		
SVOC	Benzo(a)anthracene	56-55-3		
SVOC	Benzo(a)pyrene	50-32-8		
SVOC	Benzo(b)fluoranthene	205-99-2		
SVOC	Benzo(g,h,i)perylene	191-24-2		
SVOC	Benzo(k)fluoranthene	207-08-9		
SVOC	Biphenyl	92-52-4		
SVOC	bis(2-Chloroethoxy)methane	111-91-1		
SVOC	bis(2-Chloroethyl) ether	111-44-4		
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7		
SVOC	4-Bromophenyl-phenyl ether	101-55-3		
SVOC	Butylbenzylphthalate	85-68-7		
SVOC	Caprolactam	105-60-2		
SVOC	Carbazole	86-74-8		
SVOC	4-Chloro-3-methylphenol	59-50-7		
SVOC	4-Chloroaniline	106-47-8		
SVOC	2-Chloronaphthalene	91-58-7		
SVOC	2-Chlorophenol	95-57-8		
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3		
SVOC	Chrysene	218-01-9		
SVOC	Dibenz(a,h)anthracene	53-70-3		
SVOC	Dibenzofuran	132-64-9		
SVOC	3,3'-Dichlorobenzidine	91-94-1		
SVOC	2,4-Dichlorophenol	120-83-2		
SVOC	Diethylphthalate	84-66-2		
SVOC	2,4-Dimethylphenol	105-67-9		
SVOC	Dimethylphthalate	131-11-3		
SVOC	Di-n-butylphthalate	84-74-2		
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		
SVOC	2,4-Dinitrophenol	51-28-5		
SVOC	2,4-Dinitrotoluene	121-14-2		
SVOC	2,6-Dinitrotoluene	606-20-2		
SVOC	Di-n-octylphthalate	117-84-0		
SVOC	Fluoranthene	206-44-0		
SVOC	Fluorene	86-73-7		
SVOC	Hexachlorobenzene	118-74-1		
SVOC	Hexachlorobutadiene	87-68-3		
SVOC	Hexachlorocyclopentadiene	77-47-4		
SVOC	Hexachloroethane	67-72-1		
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5		
SVOC	Isophorone	78-59-1		
SVOC	2-Methylnaphthalene	91-57-6		
SVOC	2-Methylphenol	95-48-7		
SVOC	4-Methylphenol	106-44-5		
SVOC	Naphthalene	91-20-3		
SVOC	2-Nitroaniline	88-74-4		
SVOC	3-Nitroaniline	99-09-2		
SVOC	4-Nitroaniline	100-01-6		

Table F-1: Exposure Concentrations in Sediment and Surface Water Vernay Laboratories Inc., Yellow Springs, Ohio				
			Sediment Conc. (mg/kg)	Surface Water Conc. (mg/L)
Chemical Group	Detected Constituent	CASRN	Max Detected	Max Detected
SVOC	Nitrobenzene	98-95-3		
SVOC	2-Nitrophenol	88-75-5		
SVOC	4-Nitrophenol	100-02-7		
SVOC	N-Nitrosodiphenylamine	86-30-6		
SVOC	N-Nitroso-di-n-propylamine	621-64-7		
SVOC	N-Nitrosomorpholine	59-89-2		
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1		
SVOC	Pentachlorophenol	87-86-5		
SVOC	Phenanthrene	85-01-8		
SVOC	Phenol	108-95-2		
SVOC	Pyrene	129-00-0		
SVOC	2,4,5-Trichlorophenol	95-95-4		
SVOC	2,4,6-Trichlorophenol	88-06-2		
P/PCB	PCBs (total)	1336-36-3		
P/PCB	Aroclor-1016	12674-11-2		
P/PCB	Aroclor-1221	11104-28-2		
P/PCB	Aroclor-1232	11141-16-5		
P/PCB	Aroclor-1242	53469-21-9		
P/PCB	Aroclor-1248	12672-29-6		
P/PCB	Aroclor-1254	11097-69-1		
P/PCB	Aroclor-1260	11096-82-5		
P/PCB	Aldrin	309-00-2		
P/PCB	alpha-BHC	319-84-6		
P/PCB	beta-BHC	319-85-7		
P/PCB	delta-BHC	319-86-8		
P/PCB	gamma-BHC	58-89-9		
P/PCB	Chlordane	57-74-9		
P/PCB	alpha-Chlordane	5103-71-9		
P/PCB	gamma-Chlordane	5103-74-2		
P/PCB	4,4'-DDD	72-54-8		
P/PCB	4,4'-DDE	72-55-9		
P/PCB	4,4'-DDT	50-29-3		
P/PCB	Dieldrin	60-57-1		
P/PCB	Endosulfan I	959-98-8		
P/PCB	Endosulfan II	33213-65-9		
P/PCB	Endosulfan sulfate	1031-07-8		
P/PCB	Endrin	72-20-8		
P/PCB	Endrin aldehyde	7421-93-4		
P/PCB	Endrin ketone	53494-70-5		
P/PCB	Heptachlor	76-44-8		
P/PCB	Heptachlor epoxide	1024-57-3		
P/PCB	Methoxychlor	72-43-5		
P/PCB	Toxaphene	8001-35-2		
INORG	Aluminum	7429-90-5		
INORG	Antimony	7440-36-0		
INORG	Arsenic	7440-38-2		
INORG	Barium	7440-39-3		
INORG	Beryllium	7440-41-7		
INORG	Cadmium	7440-43-9		
INORG	Calcium	7440-70-2		
INORG	Chromium (total)	7440-47-3		
INORG	Chromium III	16065-83-1		

Table F-1: Exposure Concentrations in Sediment and Surface Water Vernay Laboratories Inc., Yellow Springs, Ohio				
			Sediment Conc. (mg/kg)	Surface Water Conc. (mg/L)
Chemical Group	Detected Constituent	CASRN	Max Detected	Max Detected
INORG	Cobalt	7440-48-4		
INORG	Copper	7440-50-8		
INORG	Cyanide (total)	57-12-5		
INORG	Iron	7439-89-6		
INORG	Lead	7439-92-1		
INORG	Magnesium	7439-95-4		
INORG	Manganese	7439-96-5		
INORG	Mercury	7439-97-6		
INORG	Nickel	7440-02-0		
INORG	Potassium	7440-09-7		
INORG	Selenium	7782-49-2		
INORG	Silver	7440-22-4		
INORG	Sodium	7440-23-5		
INORG	Thallium	7440-28-0		
INORG	Vanadium	7440-62-2		
INORG	Zinc	7440-66-6		

Table F-2: High-End Exposure Factors Vernay Laboratories Inc., Yellow Springs, Ohio		
		Off-site Recreators (age 9 to 18)
Sediment Ingestion		
Ingestion Rate (mg/d)	IR	50
Conversion Factor (kg/mg)	CF	1E-06
Fraction Contacted (unitless)	FC	1.0
Exposure Frequency (d/yr)	EF	26
Exposure Duration (yr)	ED	10
Body Weight (kg-bw)	BW	51
Averaging Time, carc (d)	AT_c	25,550
Averaging Time, noncarc (d)	AT_{nc}	3,650
Intake, carc (kg-soil/kg-bw per d)		9.98E-09
Intake, noncarc (kg-soil/kg-bw per d)		6.98E-08
Sediment Dermal Contact		
Adherence Factor (mg/cm^2)	AD	0.2
Skin Surface Area (cm^2/d)	SA	3,950
Conversion Factor (kg/mg)	CF	1E-06
Fraction Contacted (unitless)	FC	1.0
Exposure Frequency (d/yr)	EF	26
Exposure Duration (yr)	ED	10
Body Weight (kg-bw)	BW	51
Averaging Time, carc (d)	AT_c	25,550
Averaging Time, noncarc (d)	AT_{nc}	3,650
Intake, carc (kg-soil/kg-bw per d)		1.58E-07
Intake, noncarc (kg-soil/kg-bw per d)		1.10E-06
Ambient Air Inhalation - Vapor from Surface Water		
Breathing Rate (m^3-air/d)	BR	20
Fraction Contacted (unitless)	FC	1.0
Exposure Time (h exposed/h in a day)	ET	1.00
Exposure Frequency (d/yr)	EF	26
Exposure Duration (yr)	ED	10
Body Weight (kg-bw)	BW	51
Averaging Time, carc (d)	AT_c	25,550
Averaging Time, noncarc (d)	AT_{nc}	3,650
IP, carc (unitless)		1.02E-02
IP, noncarc (unitless)		7.12E-02
Incidental Ingestion of Surface Water		
Drinking Rate (L-water/hr)	DR	0.005
Exposure Time (hr/d)	ET	1
Exposure Frequency (d/yr)	EF	26
Exposure Duration (yr)	ED	10
Body Weight (kg-bw)	BW	51
Averaging Time, carc (d)	AT_c	25,550
Averaging Time, noncarc (d)	AT_{nc}	3,650
Intake, cancer (L-water/kg/day)		9.98E-07
Intake, noncancer (L-water/kg/day)		6.98E-06
Dermal Contact of Surface Water		
Skin Surface Area (cm^2)	SA	3,950
Permeability (cm/hr)	K_p	Chemical-specific

Table F-2: High-End Exposure Factors
Vernay Laboratories Inc., Yellow Springs, Ohio

		Off-site Recreators (age 9 to 18)
Conversion Factor (L/cm^3)	CF	1E-03
Exposure Time (hr/d)	ET	1
Exposure Frequency (d/yr)	EF	26
Expoure Duration (y)	ED	10
Body Weight (kg-bw)	BW	51
Averaging Time, canc (d)	AT_c	25,550
Averaging Time, noncanc (d)	AT_{nc}	3,650
Intake, cancer (L-water/kg per d)		7.88E-04
Intake, noncancer (L-water/kg per d)		5.52E-03
Notes:		
These exposure factors are "standard default" exposure factors recommended by USEPA (Human Health Evaluation Manual, Supplemental Guidance: "Standard default exposure factors." OSWER Directive 9285.6-03, 1991) for estimating high-end exposures, except for		
Off-site recreating		
Based on wading in streams/ponds.		
Recreators have been considered with appropriate selections of body weight and skin surface area. Exposure frequency and duration are based on two events/week for 3 months when the air temperature is above 70 F for 10 years (Columbus data, NOAA)		

APPENDIX G

Non-Potable Ground Water Criteria

APPENDIX G

Derivation of Off-Facility Non-Potable Residential Ground Water Use Criteria

Potential non-potable ground water use exposures of off-Facility residents to constituents detected in Cedarville Aquifer ground water are evaluated using conservative risk-based screening criteria. The derivation of these criteria for assessing residential exposures via direct contact and inhalation associated with use of ground water in a residential "kiddie" pool is presented in this Appendix.

The criteria are based on inhalation exposure to vapor, dermal contact, and incidental ingestion of ground water in a kiddie pool. Conservative exposure factors for a resident were applied (see Table G-1). Air concentrations resulting from the volatilization of constituents were determined using the model presented below.

The vapor emission rate from the kiddie pool at a specific time (t) is calculated by the following equation (USEPA 1995a, Equation 11):

$$N = (1 - \exp[-k \cdot A \cdot t / V]) \cdot V \cdot C_0 / t$$

where:

N:	Emission rate for a tank filled with water (g/s)
k:	Overall mass transfer coefficient (m/s)
t:	Time (seconds)
A:	Surface area of the pool (m^3)
V:	Volume of water in the pool (m^3)
C_o:	Initial concentration in water (g/m^3)

The average emission rate over the exposure period from t = 0 to t_{max} is directly proportional to the average concentration in the water during the same time, and is calculated by integrating the concentration in the kiddie pool during the averaging period:

$$C_{avg} / C_0 = \frac{V}{k \cdot A \cdot t}[(1 - \exp[-k \cdot A \cdot t / V])$$

where:

C_{avg}:	Average concentration in water over the period (g/m^3)
t:	Averaging period (seconds)

The concentration in air is calculated by multiplying the average emission flux over the exposure period by the dispersion factor using the following equation:

$$C_{Air} = \frac{N \cdot {C_{avg}}/{C_0} \cdot C/Q}{A}$$

where:

C/Q: Maximum normalized air concentration (g/m^3 per g/m^2-s)

A: Surface area of the pool (m^2)

The normalized air concentration (C/Q) is estimated using EPA's SCREEN3 air dispersion model (USEPA 1995b) using a pool size of 6 ft by 6 ft as a source area. The estimated normalized air concentration is the ground level maximum annual average concentration, calculated by multiplying the hourly maximum normalized air concentration (based on worst-case meteorological conditions as selected by the model) by a conversion factor of 0.08 (USEPA 1995b).

The model parameters and the values used in the evaluation are summarized in Table G-2.

The criterion associated with potential exposure to a carcinogenic chemical, via dermal contact, is estimated based on the target cancer risk of 10^{-5} and the dermal cancer slope factor (SF) for the chemical. The criterion associated with potential exposure to a carcinogenic chemical, via inhalation, is estimated based on the target cancer risk of 10^{-5} and the unit risk factor (URF) for the chemical. The criterion associated with potential exposure to a carcinogenic chemical, via incidental ingestion, is estimated based on the target cancer risk of 10^{-5} and the oral cancer slope factor (SF) for the chemical. The URFs and RfCs for chemicals evaluated are presented in Table G-3.

The risk-based criteria for potential exposure to a carcinogenic chemical, via multiple exposure routes, is estimated as follows:

$$RBC_{Carc} = \frac{1}{{1}/{RBC_{route\,1}} + \cdots {1}/{RBC_{route\,N}}}$$

The criterion associated with potential exposure to a noncarcinogenic chemical, via dermal contact, is estimated based on the target hazard quotient (HQ) of 1 and the dermal reference dose (RfD) for the chemical. The criterion associated with potential exposure to a noncarcinogenic chemical, via incidental ingestion, is estimated based on the target hazard quotient (HQ) of 1 and the oral reference dose (RfD) for the chemical. The criterion associated with potential exposure

to a noncarcinogenic chemical, via inhalation, is estimated based on the target hazard quotient (HQ) of 1 and the reference concentration (RfC) for the chemical. The RfDs and RfCs for chemicals evaluated are presented on Table G-3.

The risk-based criteria for potential exposure to a noncarcinogenic chemical, via multiple exposure routes, is estimated as follows:

$$RBC_{NCarc} = \frac{1}{1/RBC_{route\,1} + \cdots 1/RBC_{route\,N}}$$

The screening criteria for assessing residential exposures via direct contact and inhalation associated with use of ground water in a "kiddie" pool are calculated by taking the minimum of the cancer and the noncancer risk-based criteria.

The calculation of the cancer and non-cancer risk based criteria are shown on Tables G-4a and G-4b of this Appendix. The resulting risk based criteria are shown on Table G-5 of this Appendix.

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Table G-1: High-End Exposure Factors
Vernay Laboratories Inc., Yellow Springs, Ohio

		Residents			
		Offsite			
		Child	Age 1-6	Age 7-31	Adult
Incidental Ingestion in Wading Pool					
Drinking Rate (L-water/hr)	DR	0.05	0.05	0.05	0.05
Exposure Time (hr/d)	ET	2	2	2	2
Exposure Frequency (d/yr)	EF	32	32	32	32
Exposure Duration (yr)	ED	6	6	24	30
Body Weight (kg-bw)	BW	15	15	70	70
Averaging Time, carc (d)	AT_c	25,550	25,550	25,550	25,550
Averaging Time, noncarc (d)	AT_{nc}	2,190	10,950	10,950	10,950
Dermal Contact in Wading Pool					
Event Time (hours)	t	2	2	2	2
Skin Surface Area (cm^2)	SA	6,880	6,880	18,150	18,150
Permeability (cm/hr)	K_p	Chemical-specific			
Events per Day	EV	1	1	1	1
Exposure Frequency (d/yr)	EF	32	32	32	32
Expoure Duration (y)	ED	6	6	24	30
Body Weight (kg-bw)	BW	15	15	70	70
Averaging Time, canc (d)	AT_c	25,550	25,550	25,550	25,550
Averaging Time, noncanc (d)	AT_{nc}	2,190	10,950	10,950	10,950
Ambient Air Inhalation - Vapor in Wading Pool					
Fraction Contacted (unitless)	FC	1.0	1.0	1.0	1.0
Exposure Time (h exposed/h in a day)	ET	0.08	0.08	0.08	0.08
Exposure Frequency (d/yr)	EF	32	32	32	32
Exposure Duration (yr)	ED	6	6	24	30
Averaging Time, carc (d)	AT_c	25,550	25,550	25,550	25,550
Averaging Time, noncarc (d)	AT_{nc}	2,190	10,950	10,950	10,950

Table G-2: Vapor Flux (mg/m^2-s per mg/L) from Residential Kiddie Pool
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	H (unitless)	D_{air} (cm^2/s)	D_{water} (cm^2/s)	Sc_L (unitless)	Sc_G (unitless)	k_L (m/s)	k_G (m/s)	K_L (m/s)	C_{avg}/C_0 (unitless)	J_L (L/m^2-s)
VOC	Acetone	67-64-1	1.59E-03	1.24E-01	1.14E-05	7.83E+02	1.22E+00	6.95E-06	1.24E-02	5.15E-06	4.41E-01	2.27E-03
VOC	Benzene	71-43-2	2.28E-01	8.80E-02	9.80E-06	9.11E+02	1.71E+00	6.52E-06	9.89E-03	6.50E-06	3.72E-01	2.42E-03
VOC	Bromochloromethane	74-97-5	5.89E-02									
VOC	Bromodichloromethane	75-27-4	6.56E-02	2.98E-02	1.06E-05	8.42E+02	5.06E+00	6.74E-06	4.79E-03	6.60E-06	3.68E-01	2.43E-03
VOC	Bromoform	75-25-2	2.19E-02	1.49E-02	1.03E-05	8.67E+02	1.01E+01	6.66E-06	3.01E-03	6.05E-06	3.93E-01	2.38E-03
VOC	Bromomethane	74-83-9	2.56E-01	7.28E-02	1.21E-05	7.38E+02	2.07E+00	7.13E-06	8.71E-03	7.11E-06	3.47E-01	2.47E-03
VOC	2-Butanone	78-93-3	2.28E-03	9.49E-02	9.80E-06	9.11E+02	1.59E+00	6.52E-06	1.04E-02	5.12E-06	4.42E-01	2.26E-03
VOC	Carbon Disulfide	75-15-0	1.24E+00	1.04E-01	1.00E-05	8.93E+02	1.45E+00	6.58E-06	1.11E-02	6.57E-06	3.69E-01	2.43E-03
VOC	Carbon Tetrachloride	56-23-5	1.25E+00	7.80E-02	8.80E-06	1.01E+03	1.93E+00	6.23E-06	9.12E-03	6.23E-06	3.84E-01	2.39E-03
VOC	Chlorobenzene	108-90-7	1.52E-01	7.30E-02	8.70E-06	1.03E+03	2.07E+00	6.20E-06	8.72E-03	6.17E-06	3.87E-01	2.39E-03
VOC	Chloroethane	75-00-3	3.60E-01	1.10E-01			1.37E+00		1.15E-02			
VOC	Chloroform	67-66-3	1.50E-01	1.04E-01	1.00E-05	8.93E+02	1.45E+00	6.58E-06	1.11E-02	6.55E-06	3.70E-01	2.42E-03
VOC	Chloromethane	74-87-3	3.60E-01	1.26E-01	6.50E-06	1.37E+03	1.20E+00	5.50E-06	1.26E-02	5.49E-06	4.21E-01	2.31E-03
VOC	Cumene	98-82-8	4.74E+01									
VOC	Cyclohexane	110-82-7	7.97E+00	1.10E-01	9.14E-06	9.77E+02	1.37E+00	6.33E-06	1.15E-02	6.33E-06	3.80E-01	2.40E-03
VOC	1,2-Dibromo-3-chloropropane	96-12-8	6.01E-03	8.00E-02	8.00E-06	1.12E+03	1.89E+00	5.99E-06	9.28E-03	5.41E-06	4.26E-01	2.30E-03
VOC	Dibromochloromethane	124-48-1	3.21E-02	1.96E-02	1.05E-05	8.50E+02	7.70E+00	6.71E-06	3.61E-03	6.35E-06	3.79E-01	2.41E-03
VOC	1,2-Dibromoethane	106-93-4	3.04E-02	8.00E-02	8.00E-06	1.12E+03	1.89E+00	5.99E-06	9.28E-03	5.86E-06	4.02E-01	2.36E-03
VOC	1,2-Dichlorobenzene	95-50-1	7.79E-02	6.90E-02	7.90E-06	1.13E+03	2.19E+00	5.96E-06	8.40E-03	5.90E-06	4.00E-01	2.36E-03
VOC	1,3-Dichlorobenzene	541-73-1	1.27E-01									
VOC	1,4-Dichlorobenzene	106-46-7	9.96E-02	6.90E-02	7.90E-06	1.13E+03	2.19E+00	5.96E-06	8.40E-03	5.91E-06	4.00E-01	2.36E-03
VOC	Dichlorodifluoromethane	75-71-8	1.40E+01	8.00E-02	8.00E-06	1.12E+03	1.89E+00	5.99E-06	9.28E-03	5.99E-06	3.96E-01	2.37E-03
VOC	1,1-Dichloroethane	75-34-3	2.30E-01	7.42E-02	1.05E-05	8.50E+02	2.03E+00	6.71E-06	8.82E-03	6.69E-06	3.64E-01	2.43E-03
VOC	1,2-Dichloroethane	107-06-2	4.01E-02	1.04E-01	9.90E-06	9.02E+02	1.45E+00	6.55E-06	1.11E-02	6.45E-06	3.74E-01	2.42E-03
VOC	1,1-Dichloroethene	75-35-4	1.07E+00	9.00E-02	1.04E-05	8.59E+02	1.68E+00	6.69E-06	1.00E-02	6.68E-06	3.64E-01	2.43E-03
VOC	1,2-Dichloroethene (total)	540-59-0	3.85E-01	7.07E-02	1.19E-05	7.50E+02	2.13E+00	7.08E-06	8.54E-03	7.07E-06	3.48E-01	2.46E-03
VOC	cis-1,2-Dichloroethene	156-59-2	1.67E-01	7.36E-02	1.13E-05	7.90E+02	2.05E+00	6.93E-06	8.77E-03	6.90E-06	3.55E-01	2.45E-03
VOC	trans-1,2-Dichloroethene	156-60-5	3.85E-01	7.07E-02	1.19E-05	7.50E+02	2.13E+00	7.08E-06	8.54E-03	7.07E-06	3.48E-01	2.46E-03
VOC	1,2-Dichloropropane	78-87-5	1.15E-01	7.82E-02	8.73E-06	1.02E+03	1.93E+00	6.21E-06	9.14E-03	6.17E-06	3.87E-01	2.39E-03
VOC	1,3-Dichloropropene (total)	542-75-6	7.26E-01	6.26E-02	1.00E-05	8.93E+02	2.41E+00	6.58E-06	7.87E-03	6.57E-06	3.69E-01	2.42E-03
VOC	cis-1,3-Dichloropropene	10061-01-5	1.45E-01	8.00E-02	8.00E-06	1.12E+03	1.89E+00	5.99E-06	9.28E-03	5.96E-06	3.97E-01	2.37E-03
VOC	trans-1,3-Dichloropropene	10061-02-6	6.54E-02	8.00E-02	8.00E-06	1.12E+03	1.89E+00	5.99E-06	9.28E-03	5.93E-06	3.99E-01	2.36E-03
VOC	Ethyl Benzene	100-41-4	3.23E-01	7.50E-02	7.80E-06	1.14E+03	2.01E+00	5.93E-06	8.88E-03	5.91E-06	4.00E-01	2.36E-03
VOC	2-Hexanone	591-78-6	7.15E-02	8.62E-02	8.76E-02	1.02E-01	1.75E+00	5.23E-04	9.75E-03	2.99E-04	8.85E-03	2.65E-03
VOC	Methyl Acetate	79-20-9										
VOC	Methyl tert-butyl ether	1634-04-4	5.52E-02	1.03E-01	1.05E-05	8.50E+02	1.46E+00	6.71E-06	1.10E-02	6.64E-06	3.66E-01	2.43E-03
VOC	4-Methyl-2-pentanone	108-10-1	5.64E-03	7.50E-02	7.80E-06	1.14E+03	2.01E+00	5.93E-06	8.88E-03	5.30E-06	4.32E-01	2.29E-03
VOC	Methylcyclohexane	108-87-2		9.86E-02	8.52E-06	1.05E+03	1.53E+00	6.15E-06	1.07E-02		#DIV/0!	#DIV/0!
VOC	Methylene Chloride	75-09-2	8.98E-02	1.01E-01	1.17E-05	7.63E+02	1.49E+00	7.03E-06	1.08E-02	6.98E-06	3.52E-01	2.46E-03
VOC	Styrene	100-42-5	1.13E-01	7.10E-02	8.00E-06	1.12E+03	2.12E+00	5.99E-06	8.56E-03	5.95E-06	3.98E-01	2.37E-03
VOC	1,1,2,2-Tetrachloroethane	79-34-5	1.41E-02	7.10E-02	7.90E-06	1.13E+03	2.12E+00	5.96E-06	8.56E-03	5.68E-06	4.12E-01	2.34E-03
VOC	Tetrachloroethene	127-18-4	7.54E-01	7.20E-02	8.20E-06	1.09E+03	2.09E+00	6.05E-06	8.64E-03	6.04E-06	3.93E-01	2.38E-03
VOC	Toluene	108-88-3	2.72E-01	8.70E-02	8.60E-06	1.04E+03	1.73E+00	6.17E-06	9.81E-03	6.16E-06	3.88E-01	2.39E-03
VOC	1,2,4-Trichlorobenzene	120-82-1	5.82E-02	3.00E-02	8.23E-06	1.09E+03	5.03E+00	6.06E-06	4.81E-03	5.93E-06	3.99E-01	2.36E-03
VOC	1,1,1-Trichloroethane	71-55-6	7.05E-01	7.80E-02	8.80E-06	1.01E+03	1.93E+00	6.23E-06	9.12E-03	6.23E-06	3.85E-01	2.39E-03
VOC	1,1,2-Trichloroethane	79-00-5	3.74E-02	7.80E-02	8.80E-06	1.01E+03	1.93E+00	6.23E-06	9.12E-03	6.12E-06	3.90E-01	2.38E-03
VOC	Trichloroethene	79-01-6	4.22E-01	7.90E-02	9.10E-06	9.81E+02	1.91E+00	6.32E-06	9.20E-03	6.31E-06	3.81E-01	2.40E-03
VOC	Trichlorofluoromethane	75-69-4	3.96E+00	8.33E-02	9.70E-06	9.21E+02	1.81E+00	6.49E-06	9.53E-03	6.49E-06	3.73E-01	2.42E-03
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.97E+01	7.80E-02	8.20E-06	1.09E+03	1.93E+00	6.05E-06	9.12E-03	6.05E-06	3.93E-01	2.38E-03
VOC	Vinyl Chloride	75-01-4	1.11E+00	1.06E-01	1.23E-05	7.26E+02	1.42E+00	7.18E-06	1.12E-02	7.18E-06	3.44E-01	2.47E-03
VOC	Xylenes (total)	1330-20-7	2.76E-01	7.80E-02	8.75E-06	1.02E+03	1.93E+00	6.22E-06	9.12E-03	6.20E-06	3.86E-01	2.39E-03
SVOC	Acenaphthene	83-32-9	6.36E-03	4.21E-02	7.69E-06	1.16E+03	3.58E+00	5.89E-06	6.03E-03	5.11E-06	4.43E-01	2.26E-03
SVOC	Acenaphthylene	208-96-8	4.62E-03	4.42E-02	7.44E-06	1.20E+03	3.41E+00	5.81E-06	6.23E-03	4.83E-06	4.59E-01	2.22E-03
SVOC	Acetophenone	98-86-2	4.37E-04	8.00E-02	8.00E-06	1.12E+03	1.89E+00	5.99E-06	9.28E-03	2.42E-06	6.55E-01	1.59E-03
SVOC	Anthracene	120-12-7	2.67E-03	3.24E-02	7.74E-06	1.15E+03	4.66E+00	5.91E-06	5.06E-03	4.11E-06	5.08E-01	2.09E-03

Table G-2: Vapor Flux (mg/m^2-s per mg/L) from Residential Kiddie Pool
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	H (unitless)	D_{air} (cm^2/s)	D_{water} (cm^2/s)	Sc_L (unitless)	Sc_G (unitless)	k_L (m/s)	k_G (m/s)	K_L (m/s)	C_{avg}/C_0 (unitless)	J_L (L/m^2-s)
SVOC	Atrazine	1912-24-9										
SVOC	Benzaldehyde	100-52-7										
SVOC	Benzo(a)anthracene	56-55-3	1.37E-04	5.10E-02	9.00E-06	9.92E+02	2.96E+00	6.29E-06	6.86E-03	8.18E-07	8.60E-01	7.03E-04
SVOC	Benzo(a)pyrene	50-32-8	4.63E-05	4.30E-02	9.00E-06	9.92E+02	3.51E+00	6.29E-06	6.12E-03	2.71E-07	9.50E-01	2.58E-04
SVOC	Benzo(b)fluoranthene	205-99-2	4.55E-03	2.26E-02	5.56E-06	1.61E+03	6.67E+00	5.16E-06	3.98E-03	4.01E-06	5.15E-01	2.07E-03
SVOC	Benzo(g,h,i)perylene	191-24-2	5.76E-06	2.03E-02	5.20E-06	1.72E+03	7.43E+00	5.02E-06	3.70E-03	2.12E-08	9.96E-01	2.12E-05
SVOC	Benzo(k)fluoranthene	207-08-9	3.40E-05	2.26E-02	5.56E-06	1.61E+03	6.67E+00	5.16E-06	3.98E-03	1.32E-07	9.76E-01	1.29E-04
SVOC	Biphenyl	92-52-4	1.23E-02	4.04E-02	8.15E-05	1.10E+02	3.73E+00	1.69E-05	5.87E-03	1.37E-05	1.92E-01	2.63E-03
SVOC	bis(2-Chloroethoxy)methane	111-91-1	6.95E-06	3.73E-02	6.89E-05	1.30E+02	4.04E+00	1.56E-05	5.56E-03	3.86E-08	9.93E-01	3.83E-05
SVOC	bis(2-Chloroethyl) ether	111-44-4	7.38E-04	6.92E-02	7.53E-06	1.19E+03	2.18E+00	5.84E-06	8.42E-03	3.01E-06	5.97E-01	1.80E-03
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	4.18E-06	3.51E-02	3.66E-06	2.44E+03	4.30E+00	4.37E-06	5.34E-03	2.22E-08	9.96E-01	2.21E-05
SVOC	4-Bromophenyl-phenyl ether	101-55-3	4.78E-03									
SVOC	Butylbenzylphthalate	85-68-7	5.17E-05	1.74E-02	4.83E-06	1.85E+03	8.67E+00	4.88E-06	3.34E-03	1.67E-07	9.69E-01	1.62E-04
SVOC	Caprolactam	105-60-2		6.54E-02	8.99E-06	9.93E+02	2.31E+00	6.29E-06	8.10E-03		#DIV/0!	#DIV/0!
SVOC	Carbazole	86-74-8	6.26E-07	3.90E-02	7.03E-06	1.27E+03	3.87E+00	5.68E-06	5.73E-03	3.59E-09	9.99E-01	3.58E-06
SVOC	4-Chloro-3-methylphenol	59-50-7	1.63E-05									
SVOC	4-Chloroaniline	106-47-8	1.36E-05	4.83E-02	1.01E-05	8.84E+02	3.12E+00	6.60E-06	6.61E-03	8.88E-08	9.83E-01	8.73E-05
SVOC	2-Chloronaphthalene	91-58-7	1.28E-02									
SVOC	2-Chlorophenol	95-57-8	1.60E-02	5.01E-02	9.46E-06	9.44E+02	3.01E+00	6.42E-06	6.78E-03	6.06E-06	3.92E-01	2.38E-03
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3	8.99E-03									
SVOC	Chrysene	218-01-9	3.88E-03	2.48E-02	6.21E-06	1.44E+03	6.08E+00	5.39E-06	4.23E-03	4.06E-06	5.11E-01	2.08E-03
SVOC	Dibenz(a,h)anthracene	53-70-3	6.03E-07	2.02E-02	5.18E-06	1.72E+03	7.47E+00	5.01E-06	3.69E-03	2.22E-09	1.00E+00	2.22E-06
SVOC	Dibenzofuran	132-64-9	5.15E-04	2.70E-02	5.93E-06	1.51E+03	5.59E+00	5.29E-06	4.48E-03	1.61E-06	7.50E-01	1.20E-03
SVOC	3,3'-Dichlorobenzidine	91-94-1	1.64E-07	1.94E-02	6.74E-06	1.32E+03	7.77E+00	5.58E-06	3.59E-03	5.89E-10	1.00E+00	5.89E-07
SVOC	2,4-Dichlorophenol	120-83-2	1.30E-04	3.46E-02	8.77E-06	1.02E+03	4.36E+00	6.22E-06	5.29E-03	6.19E-07	8.92E-01	5.52E-04
SVOC	Diethylphthalate	84-66-2	1.85E-05	2.56E-02	6.35E-06	1.41E+03	5.89E+00	5.44E-06	4.32E-03	7.88E-08	9.85E-01	7.77E-05
SVOC	2,4-Dimethylphenol	105-67-9	8.20E-05	5.84E-02	8.69E-06	1.03E+03	2.58E+00	6.20E-06	7.51E-03	5.60E-07	9.01E-01	5.05E-04
SVOC	Dimethylphthalate	131-11-3	4.29E-06	5.68E-02	6.30E-06	1.42E+03	2.66E+00	5.43E-06	7.37E-03	3.15E-08	9.94E-01	3.13E-05
SVOC	Di-n-butylphthalate	84-74-2	3.85E-08	4.38E-02	7.86E-06	1.14E+03	3.44E+00	5.94E-06	6.20E-03	2.39E-10	1.00E+00	2.38E-07
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	1.75E-05	3.13E-02	6.35E-05	1.41E+02	4.82E+00	1.51E-05	4.95E-03	8.58E-08	9.84E-01	8.45E-05
SVOC	2,4-Dinitrophenol	51-28-5	1.82E-05	2.73E-02	9.06E-06	9.86E+02	5.53E+00	6.31E-06	4.51E-03	8.11E-08	9.85E-01	7.99E-05
SVOC	2,4-Dinitrotoluene	121-14-2	3.80E-06	2.03E-01	7.06E-06	1.26E+03	7.43E-01	5.69E-06	1.73E-02	6.50E-08	9.88E-01	6.42E-05
SVOC	2,6-Dinitrotoluene	606-20-2	3.06E-05	3.27E-02	7.26E-06	1.23E+03	4.61E+00	5.75E-06	5.09E-03	1.52E-07	9.72E-01	1.47E-04
SVOC	Di-n-octylphthalate	117-84-0	2.74E-03	1.51E-02	3.58E-06	2.49E+03	9.99E+00	4.34E-06	3.04E-03	2.85E-06	6.12E-01	1.74E-03
SVOC	Fluoranthene	206-44-0	6.60E-04	3.02E-02	6.35E-06	1.41E+03	4.99E+00	5.44E-06	4.83E-03	2.01E-06	7.01E-01	1.41E-03
SVOC	Fluorene	86-73-7	2.61E-03	3.63E-02	7.88E-06	1.13E+03	4.16E+00	5.95E-06	5.46E-03	4.20E-06	5.01E-01	2.10E-03
SVOC	Hexachlorobenzene	118-74-1	5.41E-02	5.42E-02	5.91E-06	1.51E+03	2.78E+00	5.29E-06	7.15E-03	5.22E-06	4.37E-01	2.28E-03
SVOC	Hexachlorobutadiene	87-68-3	3.34E-01	5.61E-02	6.16E-06	1.45E+03	2.69E+00	5.38E-06	7.31E-03	5.37E-06	4.28E-01	2.30E-03
SVOC	Hexachlorocyclopentadiene	77-47-4	1.11E+00	1.61E-02	7.21E-06	1.24E+03	9.37E+00	5.74E-06	3.17E-03	5.73E-06	4.09E-01	2.34E-03
SVOC	Hexachloroethane	67-72-1	1.59E-01	2.50E-03	6.80E-06	1.31E+03	6.03E+01	5.60E-06	9.10E-04	5.39E-06	4.27E-01	2.30E-03
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	6.56E-05	1.90E-02	5.66E-06	1.58E+03	7.94E+00	5.20E-06	3.54E-03	2.22E-07	9.59E-01	2.13E-04
SVOC	Isophorone	78-59-1	2.72E-04	6.23E-02	6.76E-06	1.32E+03	2.42E+00	5.59E-06	7.84E-03	1.54E-06	7.58E-01	1.17E-03
SVOC	2-Methylnaphthalene	91-57-6	2.12E-02	9.86E-02	7.75E-06	1.15E+03	1.53E+00	5.91E-06	1.07E-02	5.76E-06	4.07E-01	2.35E-03
SVOC	2-Methylphenol	95-48-7	4.92E-05	7.40E-02	8.30E-06	1.08E+03	2.04E+00	6.08E-06	8.80E-03	4.04E-07	9.27E-01	3.75E-04
SVOC	4-Methylphenol	106-44-5	3.24E-05	7.40E-02	1.00E-05	8.93E+02	2.04E+00	6.58E-06	8.80E-03	2.73E-07	9.50E-01	2.60E-04
SVOC	Naphthalene	91-20-3	1.98E-02	5.90E-02	7.50E-06	1.19E+03	2.56E+00	5.83E-06	7.56E-03	5.61E-06	4.15E-01	2.33E-03
SVOC	2-Nitroaniline	88-74-4	3.97E-03	7.30E-02			2.07E+00		8.72E-03			
SVOC	3-Nitroaniline	99-09-2	5.89E-06									
SVOC	4-Nitroaniline	100-01-6	8.46E-08									
SVOC	Nitrobenzene	98-95-3	9.84E-04	7.60E-02	8.60E-06	1.04E+03	1.98E+00	6.17E-06	8.96E-03	3.63E-06	5.44E-01	1.98E-03
SVOC	2-Nitrophenol	88-75-5	3.87E-04									
SVOC	4-Nitrophenol	100-02-7	1.70E-08									
SVOC	N-Nitrosodiphenylamine	86-30-6	2.05E-04	3.12E-02	6.35E-06	1.41E+03	4.83E+00	5.44E-06	4.94E-03	8.53E-07	8.55E-01	7.29E-04
SVOC	N-Nitroso-di-n-propylamine	621-64-7	9.23E-05	5.45E-02	8.17E-06	1.09E+03	2.77E+00	6.04E-06	7.17E-03	5.97E-07	8.95E-01	5.34E-04
SVOC	N-Nitrosomorpholine	59-89-2										

Table G-2: Vapor Flux (mg/m^2-s per mg/L) from Residential Kiddie Pool
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	H (unitless)	D_{air} (cm^2/s)	D_{water} (cm^2/s)	Sc_L (unitless)	Sc_G (unitless)	k_L (m/s)	k_G (m/s)	K_L (m/s)	C_{avg}/C_0 (unitless)	J_L (L/m^2-s)
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	4.78E-03	6.02E-02			2.51E+00		7.67E-03			
SVOC	Pentachlorophenol	87-86-5	1.00E-06	5.60E-02	6.10E-06	1.46E+03	2.69E+00	5.36E-06	7.30E-03	7.29E-09	9.99E-01	7.28E-06
SVOC	Phenanthrene	85-01-8	9.52E-04									
SVOC	Phenol	108-95-2	1.63E-05	8.20E-02	9.10E-06	9.81E+02	1.84E+00	6.32E-06	9.43E-03	1.50E-07	9.72E-01	1.46E-04
SVOC	Pyrene	129-00-0	4.51E-04	2.72E-02	7.24E-06	1.23E+03	5.55E+00	5.75E-06	4.50E-03	1.50E-06	7.63E-01	1.15E-03
SVOC	2,4,5-Trichlorophenol	95-95-4	1.78E-04	2.91E-02	7.03E-06	1.27E+03	5.18E+00	5.68E-06	4.71E-03	7.31E-07	8.74E-01	6.38E-04
SVOC	2,4,6-Trichlorophenol	88-06-2	3.19E-04	3.18E-02	6.25E-06	1.43E+03	4.74E+00	5.41E-06	5.00E-03	1.23E-06	8.00E-01	9.85E-04
P/PCB	PCBs (total)	1336-36-3	1.06E-01	8.00E-02	1.00E-05	8.93E+02	1.89E+00	6.58E-06	9.28E-03	6.53E-06	3.71E-01	2.42E-03
P/PCB	Aroclor-1016	12674-11-2	1.19E-02	2.05E-02			7.36E+00		3.73E-03			
P/PCB	Aroclor-1221	11104-28-2	1.43E-01									
P/PCB	Aroclor-1232	11141-16-5										
P/PCB	Aroclor-1242	53469-21-9	2.34E-02									
P/PCB	Aroclor-1248	12672-29-6	1.43E-01									
P/PCB	Aroclor-1254	11097-69-1	3.42E-01									
P/PCB	Aroclor-1260	11096-82-5	2.91E-01	1.27E-02			1.19E+01		2.70E-03			
P/PCB	Aldrin	309-00-2	6.97E-03	1.32E-02	4.86E-06	1.84E+03	1.14E+01	4.89E-06	2.77E-03	3.90E-06	5.23E-01	2.04E-03
P/PCB	alpha-BHC	319-84-6	4.35E-04	1.42E-02	7.34E-06	1.22E+03	1.06E+01	5.78E-06	2.91E-03	1.04E-06	8.27E-01	8.59E-04
P/PCB	beta-BHC	319-85-7	3.05E-05	1.42E-02	7.34E-06	1.22E+03	1.06E+01	5.78E-06	2.91E-03	8.75E-08	9.84E-01	8.61E-05
P/PCB	delta-BHC	319-86-8	1.75E-05	1.76E-02			8.57E+00		3.36E-03			
P/PCB	gamma-BHC	58-89-9	5.74E-04	1.42E-02	7.34E-06	1.22E+03	1.06E+01	5.78E-06	2.91E-03	1.30E-06	7.91E-01	1.03E-03
P/PCB	Chlordane	57-74-9	1.99E-03	1.18E-02	4.37E-06	2.04E+03	1.28E+01	4.69E-06	2.57E-03	2.45E-06	6.52E-01	1.60E-03
P/PCB	alpha-Chlordane	5103-71-9										
P/PCB	gamma-Chlordane	5103-74-2										
P/PCB	4,4'-DDD	72-54-8	1.64E-04	1.69E-02	4.76E-06	1.88E+03	8.93E+00	4.85E-06	3.27E-03	4.83E-07	9.14E-01	4.42E-04
P/PCB	4,4'-DDE	72-55-9	8.61E-04	1.44E-02	5.87E-06	1.52E+03	1.05E+01	5.27E-06	2.94E-03	1.71E-06	7.36E-01	1.26E-03
P/PCB	4,4'-DDT	50-29-3	3.32E-04	1.37E-02	4.95E-06	1.80E+03	1.10E+01	4.92E-06	2.84E-03	7.92E-07	8.64E-01	6.85E-04
P/PCB	Dieldrin	60-57-1	6.19E-04	1.25E-02	4.74E-06	1.88E+03	1.21E+01	4.84E-06	2.67E-03	1.23E-06	7.99E-01	9.86E-04
P/PCB	Endosulfan I	959-98-8	4.13E-03									
P/PCB	Endosulfan II	33213-65-9	7.81E-04									
P/PCB	Endosulfan sulfate	1031-07-8	8.38E-02									
P/PCB	Endrin	72-20-8	3.08E-04	1.25E-02	4.74E-06	1.88E+03	1.21E+01	4.84E-06	2.67E-03	7.04E-07	8.78E-01	6.18E-04
P/PCB	Endrin aldehyde	7421-93-4	1.58E-05									
P/PCB	Endrin ketone	53494-70-5										
P/PCB	Heptachlor	76-44-8	4.47E-02	1.12E-02	5.69E-06	1.57E+03	1.35E+01	5.21E-06	2.48E-03	4.97E-06	4.51E-01	2.24E-03
P/PCB	Heptachlor epoxide	1024-57-3	3.90E-04	1.32E-02	4.23E-06	2.11E+03	1.14E+01	4.63E-06	2.77E-03	8.77E-07	8.51E-01	7.46E-04
P/PCB	Methoxychlor	72-43-5	6.48E-04	1.56E-02	4.46E-06	2.00E+03	9.67E+00	4.72E-06	3.10E-03	1.41E-06	7.75E-01	1.09E-03
P/PCB	Toxaphene	8001-35-2	2.46E-04	1.16E-02	4.34E-06	2.06E+03	1.30E+01	4.67E-06	2.54E-03	5.52E-07	9.03E-01	4.98E-04
INORG	Aluminum	7429-90-5										
INORG	Antimony	7440-36-0										
INORG	Arsenic	7440-38-2										
INORG	Barium	7440-39-3										
INORG	Beryllium	7440-41-7										
INORG	Cadmium	7440-43-9										
INORG	Calcium	7440-70-2										
INORG	Chromium (total)	7440-47-3										
INORG	Chromium III	16065-83-1										
INORG	Chromium VI	18540-29-9										
INORG	Cobalt	7440-48-4										
INORG	Copper	7440-50-8										
INORG	Cyanide (total)	57-12-5										
INORG	Iron	7439-89-6										
INORG	Lead	7439-92-1										
INORG	Magnesium	7439-95-4										
INORG	Manganese	7439-96-5										
INORG	Mercury	7439-97-6	2.90E-01	3.07E-02	6.30E-06	1.42E+03	4.91E+00	5.43E-06	4.88E-03	5.41E-06	4.26E-01	2.30E-03

Table G-2: Vapor Flux (mg/m^2-s per mg/L) from Residential Kiddie Pool
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	H (unitless)	D_{air} (cm^2/s)	D_{water} (cm^2/s)	Sc_L (unitless)	Sc_G (unitless)	k_L (m/s)	k_G (m/s)	K_L (m/s)	C_{avg}/C_0 (unitless)	J_L (L/m^2-s)
INORG	Nickel	7440-02-0										
INORG	Potassium	7440-09-7										
INORG	Selenium	7782-49-2										
INORG	Silver	7440-22-4										
INORG	Sodium	7440-23-5										
INORG	Thallium	7440-28-0										
INORG	Vanadium	7440-62-2										
INORG	Zinc	7440-66-6										
Notes:												
	Water density	ρ_w	1.00E+00	g/cm^3								
	Water viscosity	ν_w	8.93E-03	g/cm-s								
	Air density	ρ_a	1.20E-03	g/cm^3								
	Air viscosity	ν_a	1.81E-04	g/cm-s								
	Wind speed	u_{10}	4.42	m/s								
	Friction velocity	u	0.13	m/s								
	Pool effective diameter	d_e	2.1	m								
	Pool water surface area	A	3.3	m^2								
	Pool water depth	d	0.23	m								
	Pool water volume	V	0.76	m^3								
	Fetch-to-depth ratio	F/D	9.0									
	Averaging period	t	1.0	day								

Table G-3: Toxicity Values
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)			RfC (mg/m^3)			Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
			Value	Ref	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Value
VOC	Acetone	67-64-1	ID	1							9.0E-01	1						9.0E-01
VOC	Benzene	71-43-2	A	1	5.5E-02	1	68	7.8E-03	1	60	4.0E-03	1		3.0E-02	1		5.5E-02	4.0E-03
VOC	Bromochloromethane	74-97-5																
VOC	Bromodichloromethane	75-27-4	B2	1	6.2E-02	1					2.0E-02	1					6.2E-02	2.0E-02
VOC	Bromoform	75-25-2	B2	1	7.9E-03	1		1.1E-03	1		2.0E-02	1			2	90	7.9E-03	2.0E-02
VOC	Bromomethane	74-83-9	D	1							1.4E-03	1		5.0E-03	1			1.4E-03
VOC	2-Butanone	78-93-3	ID	1							6.0E-01	1		5.0E+00	1			6.0E-01
VOC	Carbon Disulfide	75-15-0									1.0E-01	1		7.0E-01	1			1.0E-01
VOC	Carbon Tetrachloride	56-23-5	B2	1	1.3E-01	1		1.5E-02	1		7.0E-04	1					1.3E-01	7.0E-04
VOC	Chlorobenzene	108-90-7	D	1							2.0E-02	1		6.0E-02	103			2.0E-02
VOC	Chloroethane	75-00-3			2.9E-03	3					4.0E-01	3		1.0E+01	1		2.9E-03	4.0E-01
VOC	Chloroform	67-66-3	B2	1				2.3E-02	1		1.0E-02	1		5.0E-02	117			1.0E-02
VOC	Chloromethane	74-87-3	D	1										9.0E-02	1			
VOC	Cumene	98-82-8	D	1							1.0E-01	1		4.0E-01	1			1.0E-01
VOC	Cyclohexane	110-82-7	ID	1										6.0E+00	1			
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	2	1.4E+00	2								2.0E-04	1		1.4E+00	
VOC	Dibromochloromethane	124-48-1	C	1	8.4E-02	1					2.0E-02	1					8.4E-02	2.0E-02
VOC	1,2-Dibromoethane	106-93-4	B2	1	8.5E+01	1		2.2E-01	1								8.5E+01	
VOC	1,2-Dichlorobenzene	95-50-1	D	1							9.0E-02	1		2.0E-01	2	3		9.0E-02
VOC	1,3-Dichlorobenzene	541-73-1	D	1							9.0E-02	1	10					9.0E-02
VOC	1,4-Dichlorobenzene	106-46-7	C	2	2.4E-02	2	6				3.0E-02	3		8.0E-01	1		2.4E-02	3.0E-02
VOC	Dichlorodifluoromethane	75-71-8									2.0E-01	1		2.0E-01	2			2.0E-01
VOC	1,1-Dichloroethane	75-34-3	C	1							1.0E-01	2	26,6	5.0E-01	2	3		1.0E-01
VOC	1,2-Dichloroethane	107-06-2	B2	1	9.1E-02	1		2.6E-02	1		3.0E-02	3		5.0E-03	102	92	9.1E-02	3.0E-02
VOC	1,1-Dichloroethene	75-35-4	C	1							5.0E-02	1		2.0E-01	1			5.0E-02
VOC	1,2-Dichloroethene (total)	540-59-0									9.0E-03	2						9.0E-03
VOC	cis-1,2-Dichloroethene	156-59-2	D	1							1.0E-02	2	6					1.0E-02
VOC	trans-1,2-Dichloroethene	156-60-5									2.0E-02	1						2.0E-02
VOC	1,2-Dichloropropane	78-87-5	B2	2	6.8E-02	2	6							4.0E-03	1		6.8E-02	
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1	1.0E-01	1	77	4.0E-03	1		3.0E-02	1		2.0E-02	1		1.0E-01	3.0E-02
VOC	cis-1,3-Dichloropropene	10061-01-5			1.0E-01	1	77,11	4.0E-03	1	11	3.0E-02	1	11	2.0E-02	1	11	1.0E-01	3.0E-02
VOC	trans-1,3-Dichloropropene	10061-02-6																
VOC	Ethyl Benzene	100-41-4	D	1							1.0E-01	1		1.0E+00	1			1.0E-01
VOC	2-Hexanone	591-78-6									4.0E-02	40		5.0E-03	108			4.0E-02
VOC	Methyl Acetate	79-20-9									1.0E+00	2						1.0E+00
VOC	Methyl tert-butyl ether	1634-04-4			3.3E-03	4								3.0E+00	1		3.3E-03	
VOC	4-Methyl-2-pentanone	108-10-1	ID	1								1	90	3.0E+00	1			
VOC	Methylcyclohexane	108-87-2												3.0E+00	2			
VOC	Methylene Chloride	75-09-2	B2	1	7.5E-03	1		4.7E-04	1		6.0E-02	1		3.0E+00	2		7.5E-03	6.0E-02
VOC	Styrene	100-42-5									2.0E-01	1	6	1.0E+00	1			2.0E-01
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1	2.0E-01	1		5.8E-02	1		6.0E-02	101			88	90	2.0E-01	6.0E-02
VOC	Tetrachloroethene	127-18-4	C-B2	77	5.2E-02	77		3.1E-03	77		1.0E-02	1		4.0E-01	109	94	5.2E-02	1.0E-02
VOC	Toluene	108-88-3	D	1							2.0E-01	1		4.0E-01	1			2.0E-01
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1							1.0E-02	1		2.0E-01	2			1.0E-02
VOC	1,1,1-Trichloroethane	71-55-6	D	1							2.8E-01	72		2.2E+00	73			2.8E-01
VOC	1,1,2-Trichloroethane	79-00-5	C	1	5.7E-02	1		1.6E-02	1		4.0E-03	1					5.7E-02	4.0E-03
VOC	Trichloroethene	79-01-6	C-B2	49	1.1E-02	49		1.7E-03	49		6.0E-03	46	6, 97				1.1E-02	6.0E-03
VOC	Trichlorofluoromethane	75-69-4									3.0E-01	1		7.0E-01	2	3		3.0E-01
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1									3.0E+01	1		3.0E+01	2			3.0E+01
VOC	Vinyl Chloride	75-01-4	A	1	1.4E+00	1	78	8.8E-03	1	79	3.0E-03	1		1.0E-01	1		1.4E+00	3.0E-03
VOC	Xylenes (total)	1330-20-7	ID	1							2.0E-01	1		1.0E-01	1			2.0E-01
SVOC	Acenaphthene	83-32-9									6.0E-02	1						6.0E-02
SVOC	Acenaphthylene	208-96-8	D	1							3.0E-02	1	20					3.0E-02
SVOC	Acetophenone	98-86-2	D	1							1.0E-01	1						1.0E-01
SVOC	Anthracene	120-12-7	D	1							3.0E-01	1			2	90		3.0E-01
SVOC	Atrazine	1912-24-9	C	2	2.2E-01	2					3.5E-02	1					2.2E-01	3.5E-02
SVOC	Benzaldehyde	100-52-7									1.0E-01	1						1.0E-01

Table G-3: Toxicity Values
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)			RfC (mg/m^3)			Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
			Value	Ref	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Value
SVOC	Benzo(a)anthracene	56-55-3	B2	1	7.3E-01	10	5										7.3E-01	
SVOC	Benzo(a)pyrene	50-32-8	B2	1	7.3E+00	1											7.3E+00	
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1	7.3E-01	10	5										7.3E-01	
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1							3.0E-02	1	20					3.0E-02
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1	7.3E-02	10	5										7.3E-02	
SVOC	Biphenyl	92-52-4	D	1							5.0E-02	1						5.0E-02
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	1														
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1	1.1E+00	1		3.3E-01	1								1.1E+00	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1	1.4E-02	1					2.0E-02	1					1.4E-02	2.0E-02
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	1														
SVOC	Butylbenzylphthalate	85-68-7	C	1							2.0E-01	1						2.0E-01
SVOC	Caprolactam	105-60-2									5.0E-01	1						5.0E-01
SVOC	Carbazole	86-74-8	B2	2	2.0E-02	2											2.0E-02	
SVOC	4-Chloro-3-methylphenol	59-50-7																
SVOC	4-Chloroaniline	106-47-8									4.0E-03	1						4.0E-03
SVOC	2-Chloronaphthalene	91-58-7									8.0E-02	1						8.0E-02
SVOC	2-Chlorophenol	95-57-8									5.0E-03	1						5.0E-03
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3																
SVOC	Chrysene	218-01-9	B2	1	7.3E-03	10	5										7.3E-03	
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1	7.3E+00	10	5										7.3E+00	
SVOC	Dibenzofuran	132-64-9	D	1							2.0E-03	3						2.0E-03
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1	4.5E-01	1											4.5E-01	
SVOC	2,4-Dichlorophenol	120-83-2									3.0E-03	1						3.0E-03
SVOC	Diethylphthalate	84-66-2	D	1							8.0E-01	1						8.0E-01
SVOC	2,4-Dimethylphenol	105-67-9									2.0E-02	1						2.0E-02
SVOC	Dimethylphthalate	131-11-3	D	1								2	90		2	90		
SVOC	Di-n-butylphthalate	84-74-2	D	1							1.0E-01	1	6		1	90		1.0E-01
SVOC	4,6-Dinitro-2-methylphenol	534-52-1									1.0E-04	3						1.0E-04
SVOC	2,4-Dinitrophenol	51-28-5									2.0E-03	1			2	90		2.0E-03
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1	6.8E-01	1	28				2.0E-03	1			2	90	6.8E-01	2.0E-03
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1	6.8E-01	1	28				1.0E-03	2	6				6.8E-01	1.0E-03
SVOC	Di-n-octylphthalate	117-84-0									2.0E-02	2						2.0E-02
SVOC	Fluoranthene	206-44-0	D	1							4.0E-02	1						4.0E-02
SVOC	Fluorene	86-73-7	D	1							4.0E-02	1						4.0E-02
SVOC	Hexachlorobenzene	118-74-1	B2	1	1.6E+00	1		4.6E-01	1		8.0E-04	1			1	90	1.6E+00	8.0E-04
SVOC	Hexachlorobutadiene	87-68-3	C	1	7.8E-02	1		2.2E-02	1		2.0E-04	2	6				7.8E-02	2.0E-04
SVOC	Hexachlorocyclopentadiene	77-47-4	E	1							6.0E-03	1		2.0E-04	1			6.0E-03
SVOC	Hexachloroethane	67-72-1	C	1	1.4E-02	1		4.0E-03	1		1.0E-03	1					1.4E-02	1.0E-03
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1	7.3E-01	10	5										7.3E-01	
SVOC	Isophorone	78-59-1	C	1	9.5E-04	1					2.0E-01	1			2	90	9.5E-04	2.0E-01
SVOC	2-Methylnaphthalene	91-57-6	ID	1							4.0E-03	1		3.0E-03	1	61		4.0E-03
SVOC	2-Methylphenol	95-48-7	C	1							5.0E-02	1			1	90		5.0E-02
SVOC	4-Methylphenol	106-44-5	C	1							5.0E-03	2	6		42	90,92		5.0E-03
SVOC	Naphthalene	91-20-3	C	1							2.0E-02	1		3.0E-03	1			2.0E-02
SVOC	2-Nitroaniline	88-74-4												2.0E-04	2			
SVOC	3-Nitroaniline	99-09-2	C	112	2.1E-02	112					3.0E-04	110		1.0E-03	111		2.1E-02	3.0E-04
SVOC	4-Nitroaniline	100-01-6	C	115	2.1E-02	115					3.0E-03	113		4.0E-03	114		2.1E-02	3.0E-03
SVOC	Nitrobenzene	98-95-3	D	1							5.0E-04	1	6	2.0E-03	2	3		5.0E-04
SVOC	2-Nitrophenol	88-75-5																
SVOC	4-Nitrophenol	100-02-7									8.0E-03	3						8.0E-03
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1	4.9E-03	1					2.0E-02	104			89	90	4.9E-03	2.0E-02
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1	7.0E+00	1											7.0E+00	
SVOC	N-Nitrosomorpholine	59-89-2																
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	2	7.0E-02	2		1.0E-02	2		4.0E-02	1					7.0E-02	4.0E-02
SVOC	Pentachlorophenol	87-86-5	B2	1	1.2E-01	1					3.0E-02	1					1.2E-01	3.0E-02
SVOC	Phenanthrene	85-01-8	D	1							3.0E-02	1	20					3.0E-02
SVOC	Phenol	108-95-2	ID	1							3.0E-01	1			1	90,98		3.0E-01

Table G-3: Toxicity Values
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)			RfC (mg/m^3)			Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
			Value	Ref	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Value
SVOC	Pyrene	129-00-0	D	1							3.0E-02	1						3.0E-02
SVOC	2,4,5-Trichlorophenol	95-95-4									1.0E-01	1			2	90		1.0E-01
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1	1.1E-02	1		3.1E-03	1		1.0E-04	4			2	90	1.1E-02	1.0E-04
P/PCB	PCBs (total)	1336-36-3	B2	1	2.0E+00	1	30,32				2.0E-05	1	72				2.0E+00	2.0E-05
P/PCB	Aroclor-1016	12674-11-2	B2	1	7.0E-02	1	30,34				7.0E-05	1					7.0E-02	7.0E-05
P/PCB	Aroclor-1221	11104-28-2	B2	1	2.0E+00	1	30,32										2.0E+00	
P/PCB	Aroclor-1232	11141-16-5	B2	1	2.0E+00	1	30,32										2.0E+00	
P/PCB	Aroclor-1242	53469-21-9	B2	1	2.0E+00	1	30,32										2.0E+00	
P/PCB	Aroclor-1248	12672-29-6	B2	1	2.0E+00	1	30,32										2.0E+00	
P/PCB	Aroclor-1254	11097-69-1	B2	1	2.0E+00	1	30,32				2.0E-05	1					2.0E+00	2.0E-05
P/PCB	Aroclor-1260	11096-82-5	B2	1	2.0E+00	1	30,32										2.0E+00	
P/PCB	Aldrin	309-00-2	B2	1	1.7E+01	1		4.9E+00	1		3.0E-05	1					1.7E+01	3.0E-05
P/PCB	alpha-BHC	319-84-6	B2	1	6.3E+00	1		1.8E+00	1		5.0E-04	4					6.3E+00	5.0E-04
P/PCB	beta-BHC	319-85-7	C	1	1.8E+00	1		5.3E-01	1		2.0E-04	4					1.8E+00	2.0E-04
P/PCB	delta-BHC	319-86-8	D	1								38	90		38	90		
P/PCB	gamma-BHC	58-89-9	B2-C	2	1.3E+00	2	6				3.0E-04	1					1.3E+00	3.0E-04
P/PCB	Chlordane	57-74-9	B2	1	3.5E-01	1		1.0E-01	1		5.0E-04	1		7.0E-04	1		3.5E-01	5.0E-04
P/PCB	alpha-Chlordane	5103-71-9			3.5E-01	1	12				5.0E-04	1	12				3.5E-01	5.0E-04
P/PCB	gamma-Chlordane	5103-74-2			3.5E-01	1	12				5.0E-04	1	12				3.5E-01	5.0E-04
P/PCB	4,4'-DDD	72-54-8	B2	1	2.4E-01	1					3.0E-03	120					2.4E-01	3.0E-03
P/PCB	4,4'-DDE	72-55-9	B2	1	3.4E-01	1					7.0E-04	120					3.4E-01	7.0E-04
P/PCB	4,4'-DDT	50-29-3	B2	1	3.4E-01	1		9.7E-02	1		5.0E-04	1					3.4E-01	5.0E-04
P/PCB	Dieldrin	60-57-1	B2	1	1.6E+01	1		4.6E+00	1		5.0E-05	1					1.6E+01	5.0E-05
P/PCB	Endosulfan I	959-98-8									6.0E-03	1	13					6.0E-03
P/PCB	Endosulfan II	33213-65-9									6.0E-03	107						6.0E-03
P/PCB	Endosulfan sulfate	1031-07-8									6.0E-03	1	13					6.0E-03
P/PCB	Endrin	72-20-8	D	1							3.0E-04	1						3.0E-04
P/PCB	Endrin aldehyde	7421-93-4									3.0E-04	1	48					3.0E-04
P/PCB	Endrin ketone	53494-70-5																
P/PCB	Heptachlor	76-44-8	B2	1	4.5E+00	1		1.3E+00	1		5.0E-04	1					4.5E+00	5.0E-04
P/PCB	Heptachlor epoxide	1024-57-3	B2	1	9.1E+00	1		2.6E+00	1		1.3E-05	1					9.1E+00	1.3E-05
P/PCB	Methoxychlor	72-43-5	D	1							5.0E-03	1			2	90		5.0E-03
P/PCB	Toxaphene	8001-35-2	B2	1	1.1E+00	1		3.2E-01	1								1.1E+00	
INORG	Aluminum	7429-90-5	D	90		90	90		90	90	1.0E+00	85		5.0E-03	84			1.0E+00
INORG	Antimony	7440-36-0									4.0E-04	1						4.0E-04
INORG	Arsenic	7440-38-2	A	1	1.5E+00	1		4.3E+00	1		3.0E-04	1					1.5E+00	3.0E-04
INORG	Barium	7440-39-3	D	1							7.0E-02	1			1	90		7.0E-02
INORG	Beryllium	7440-41-7	B1	1				2.4E+00	1		2.0E-03	1		2.0E-05	1			2.0E-03
INORG	Cadmium	7440-43-9	B1	1				1.8E+00	1		1.0E-03	1	95					1.0E-03
INORG	Calcium	7440-70-2																
INORG	Chromium (total)	7440-47-3						1.2E+01	1	8	3.0E-03	1	8	1.0E-04	1	59,8		3.0E-03
INORG	Chromium III	16065-83-1	D	1							1.5E+00	1						1.5E+00
INORG	Chromium VI	18540-29-9	A	1				1.2E+01	1		3.0E-03	1		1.0E-04	1	59		3.0E-03
INORG	Cobalt	7440-48-4	B1	106				2.8E+00	106		2.0E-02	105		2.0E-05	86			2.0E-02
INORG	Copper	7440-50-8	D	1							4.0E-02	50	49					4.0E-02
INORG	Cyanide (total)	57-12-5	D	1							2.0E-02	1						2.0E-02
INORG	Iron	7439-89-6	D	91		91	90		91	90	3.0E-01	87			92	90		3.0E-01
INORG	Lead	7439-92-1	B2	1														
INORG	Magnesium	7439-95-4									9.7E+00	63	92					9.7E+00
INORG	Manganese	7439-96-5	D	1							1.4E-01	1	36	5.0E-05	1			1.4E-01
INORG	Mercury	7439-97-6	D	1							3.0E-04	1	51	3.0E-04	1			3.0E-04
INORG	Nickel	7440-02-0	A	1				2.4E-01	1		2.0E-02	1						2.0E-02
INORG	Potassium	7440-09-7																
INORG	Selenium	7782-49-2	D	1							5.0E-03	1						5.0E-03
INORG	Silver	7440-22-4	D	1							5.0E-03	1		1.0E-05	83			5.0E-03
INORG	Sodium	7440-23-5																
INORG	Thallium	7440-28-0									7.0E-05	52	49					7.0E-05

Table G-3: Toxicity Values
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)			RfC (mg/m^3)			Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
			Value	Ref	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Value
INORG	Vanadium	7440-62-2									7.0E-03	2	6					7.0E-03
INORG	Zinc	7440-66-6	D	1							3.0E-01	1						3.0E-01

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Table G-3: Toxicity Values
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)			RfC (mg/m^3)			Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
			Value	Ref	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Value
107	USEPA. NCEA. 1994. Risk Assessment Issue paper for: Derivation of a Provisional RfD for Endosulfan II [CASRN 33213-65-9]. July 1.																	
108	USEPA. NCEA. 1993. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 2-Hexanone (Methyl-n-butyl ketone) [CASRN 591-78-6]. June 24.																	
109	USEPA. NCEA. 1997. Risk Assessment Issue Paper for: Derivation of a Provisional RfC for Tetrachloroethylene (perchloroethylene, PERC) [CASRN 127-18-4]. June 20.																	
110	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 3-Nitroaniline [CASRN 99-09-2] by analogy to 4-Nitroaniline [CASRN 100-01-6]. June 11.																	
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123	NCEA. 2003. Personal Communication -- phone call with Teresa Shannon. September 22.																	
Notes:																		
2	USEPA adopted chronic value as subchronic value.																	
3	HEAST Alternate Method.																	
5	Based on analogy to Benzo(a)pyrene [CASRN 50-32-8] using USEPA relative potency described in the indicated reference.																	
6	Under review, according to IRIS.																	
8	ENVIRON used Chromium VI [CASRN 18540-29-9] value from IRIS (reference 1) as a surrogate.																	
10	ENVIRON used 1,2-Dichlorobenzene [CASRN 95-50-1] values from IRIS (chronic RfDo) (reference 1) and HEAST (chronic RfDi) (reference 2) as surrogates.																	
11	ENVIRON used 1,3-Dichloropropene (total) [CASRN 542-75-6] value from the indicated reference as a surrogate].																	
12	ENVIRON used Chlordane [CASRN 57-74-9] value from IRIS (reference 1) or HEAST (reference 2) as a surrogate.																	
13	ENVIRON used Endosulfan [CASRN 115-29-7] value from IRIS (reference 1) or HEAST (reference 2) as a surrogate.																	
20	ENVIRON used Pyrene [CASRN 129-00-0] value from IRIS (reference 1) as a surrogate.																	
26	USEPA obtained value by route-to-route extrapolation.																	
28	USEPA used 2,4-,2,6-Dinitrotolunene mixture value from IRIS (reference 1) as a surrogate.																	
30	Upper-bound slope factor.																	
32	High risk & persistence tier.Use for: food chain exposure;sediment/soil ingestion;dust/aerosol inhalation;dermal exposure, if an absorption factor has been applied;																	
	presence of dioxin-like,tumor-promoting/persistent congeners;all early life exposures.																	
34	Lowest risk & persistence tier. Criteria for use: congener or isomer analyses verify that congeners with more than 4 chlorines comprise less than 1/2 % of total PCBs.																	
36	IRIS recommends applying a modifying factor of 3 when using this RfD in assessing exposures to drinking water or soil.																	
44	ENVIRON derived CRFC from CRFDI value presented in the indicated reference, using standard USEPA methodology presented in HEAST.																	
45	ENVIRON derived URFI from CSFI value presented in the indicated reference, using standard USEPA methodology presented in HEAST.																	
48	ENVIRON used Endrin [CASRN 72-20-8] value from IRIS (reference 1) as a surrogate.																	
49	ENVIRON derived CRFDO from adverse health effect level value presented in the indicated reference.																	
50	Personal communication with NCEA indicated the supporting paper had been retired.																	
51	ENVIRON used Mercuric Chloride [CASRN 7487-94-7] value from the indicated reference as a surrogate.																	
53	ENVIRON used Polychlorinated Biphenyl [CASRN 1336-36-3] value from IRIS (Reference 1) as a surrogate.																	
55	Under EPA review. Number subject to change.																	
56	This toxicity value already incorporates the absorption factor of 75% that is recommended in the cited reference.																	
59	Chromium VI Particulates.																	
60	IRIS provides a range of 2.2E-6 to 7.8E-6 (ug/m3)-1 as the Inhalation Unit Risk Factor (URF) for Benzene.																	
61	ENVIRON used Naphthalene [CASRN 91-20-3] value from indicated reference as a surrogate.																	
68	IRIS provides a range of 1.5E-2 to 5.5E-2 (mg/kg/d)-1 as the Oral Slope Factor (CSFO) for Benzene.																	
69	Personal communication with NCEA indicated the retired paper should be used until a new value is published in IRIS.																	
72	ENVIRON used Aroclor 1254 [CASRN 11097-69-1] value from the indicated reference as a surrogate for Polychlorinated biphenyls [CASRN 1336-36-3].																	
77	IRIS provides an alternate slope factor of 5E-2; however, EPA does not recommend its use, due to the higher uncertainty in the delivered dose in the supporting study.																	
78	IRIS recommends an Oral Cancer Slope Factor(CSFO) for Vinyl Chloride of 7.2E-1 (mg/kg/d)-1																	
	to account for continuous lifetime exposure during adulthood; a twofold increase to 1.4 (mg/kg/d)-1 is recommended to account for continuous exposure from birth.																	
79	IRIS recommends an Inhalation Unit Risk(URFI) for Vinyl Chloride of 4.4E-6 (ug/m3)-1																	
	to account for continuous lifetime exposure during adulthood; a twofold increase to 8.8E-6 (ug/m3)-1 is recommended to account for continuous exposure from birth.																	
90	Inadequate data exist to derive a toxicity value, according to the indicated reference.																	

Table G-3: Toxicity Values
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Cancer Group		SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)			RfC (mg/m^3)			Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
			Value	Ref	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Ref	Notes	Value	Value
91	This criterion is applicable to insoluable forms of the compound occurring as dust or fumes.																	
92	NCEA directed ENVIRON to use outdated value.																	
93	Personal communication with NCEA indicated the HEAST LOAEL of 1000 mg and the sRfD of 7E-1mg/kg-day both appear to be incorrect and recommended using the IRIS RfD of 3E-1 as the sRfD.																	
94	Two provisonal RfC values are presented in the indicated reference (4E-1 and 6E-1 mg/m3).																	
	Personal communication with NCEA indicated that either RfC is acceptable and the RfC should be chosen on a case-by-case basis.																	
95	Diet Criterion.																	
97	ENVIRON used withdrawn source.																	
98	Route-to-route extrapolation is not appropriate, according to the indicated reference.																	
99	ENVIRON used 3-Methylphenol [CASRN 108-39-4] values from the indicated reference as a surrogate.																	
100	Personal communication with NCEA confirmed the value published by Regions 3 and 9.																	
102	A dose equivalency factor of 4.5 was applied to the Chronic RfC to derive the Subchronic RfC.																	

Table G-4a: Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Receptor:	Resident								
				Pathway	Incidental Ingestion in Wading Pool		Dermal Contact in Wading Pool			Vapor Inhalation in Wading Pool			Target Risk:
					Intake:		Intake:	1.12E+01		Intake:	3.1E-03		1.00E-05
Analyte Group	Chemical	CASRN	Carc Group	C_{gw} (mg/L)	SF_{oral} $(mg/kg/d)^{-1}$	RBC (mg/L)	DA $(L/cm^2\text{-event})$	SF_{derm} $(mg/kg/d)^{-1}$	RBC (mg/L)	C_{air} (mg/m^3)	URF $(mg/m^3)^{-1}$	RBC (mg/L)	RBC (mg/L)
VOC	Acetone	67-64-1	ID	1.0E+00						6.35E-03			
VOC	Benzene	71-43-2	A	1.0E+00	5.5E-02	5.3E+00	3.6E-05	5.5E-02	1.2E+00	6.77E-03	7.8E-03	1.6E+02	9.7E-01
VOC	Bromochloromethane	74-97-5		1.0E+00									
VOC	Bromodichloromethane	75-27-4	B2	1.0E+00	6.2E-02	4.7E+00	1.7E-05	6.2E-02	2.2E+00	6.80E-03			1.5E+00
VOC	Bromoform	75-25-2	B2	1.0E+00	7.9E-03	3.5E+01	1.4E-05	7.9E-03	2.1E+01	6.66E-03	1.1E-03	1.1E+03	1.3E+01
VOC	Bromomethane	74-83-9	D	1.0E+00			7.5E-06			6.90E-03			
VOC	2-Butanone	78-93-3	ID	1.0E+00						6.34E-03			
VOC	Carbon Disulfide	75-15-0		1.0E+00			3.1E-05			6.79E-03			
VOC	Carbon Tetrachloride	56-23-5	B2	1.0E+00	1.3E-01	2.2E+00	4.9E-05	1.3E-01	3.7E-01	6.70E-03	1.5E-02	8.3E+01	3.1E-01
VOC	Chlorobenzene	108-90-7	D	1.0E+00			8.0E-05			6.69E-03			
VOC	Chloroethane	75-00-3		1.0E+00	2.9E-03	3.7E+01		2.9E-03					3.7E+01
VOC	Chloroform	67-66-3	B2	1.0E+00			1.9E-05			6.79E-03	2.3E-02	5.5E+01	5.5E+01
VOC	Chloromethane	74-87-3	D	1.0E+00			7.9E-06			6.48E-03			
VOC	Cumene	98-82-8	D	1.0E+00									
VOC	Cyclohexane	110-82-7	ID	1.0E+00						6.73E-03			
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	1.0E+00	1.4E+00	1.8E-01		1.4E+00		6.45E-03			1.8E-01
VOC	Dibromochloromethane	124-48-1	C	1.0E+00	8.4E-02	3.4E+00	1.4E-05	8.4E-02	2.0E+00	6.74E-03			1.2E+00
VOC	1,2-Dibromoethane	106-93-4	B2	1.0E+00	8.5E+01	3.1E-03	8.5E-06	8.5E+01	3.1E-03	6.60E-03	2.2E-01	5.5E+00	1.5E-03
VOC	1,2-Dichlorobenzene	95-50-1	D	1.0E+00			1.5E-04			6.61E-03			
VOC	1,3-Dichlorobenzene	541-73-1	D	1.0E+00									
VOC	1,4-Dichlorobenzene	106-46-7	C	1.0E+00	2.4E-02	1.1E+01	1.4E-04	2.4E-02	6.5E-01	6.62E-03			6.1E-01
VOC	Dichlorodifluoromethane	75-71-8		1.0E+00			2.6E-05			6.64E-03			
VOC	1,1-Dichloroethane	75-34-3	C	1.0E+00			1.8E-05			6.82E-03			
VOC	1,2-Dichloroethane	107-06-2	B2	1.0E+00	9.1E-02	3.2E+00	1.1E-05	9.1E-02	2.3E+00	6.76E-03	2.6E-02	4.9E+01	1.3E+00
VOC	1,1-Dichloroethene	75-35-4	C	1.0E+00			3.0E-05			6.82E-03			
VOC	1,2-Dichloroethene (total)	540-59-0		1.0E+00						6.90E-03			
VOC	cis-1,2-Dichloroethene	156-59-2	D	1.0E+00						6.86E-03			
VOC	trans-1,2-Dichloroethene	156-60-5		1.0E+00						6.90E-03			
VOC	1,2-Dichloropropane	78-87-5	B2	1.0E+00	6.8E-02	4.1E+00	2.1E-05	6.8E-02	1.6E+00	6.69E-03			1.2E+00
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1.0E+00	1.0E-01	2.9E+00	2.3E-05	1.0E-01	1.1E+00	6.79E-03	4.0E-03	3.2E+02	7.8E-01
VOC	cis-1,3-Dichloropropene	10061-01-5		1.0E+00	1.0E-01	2.7E+00		1.0E-01		6.63E-03	4.0E-03	3.0E+02	2.7E+00
VOC	trans-1,3-Dichloropropene	10061-02-6		1.0E+00						6.62E-03			
VOC	Ethyl Benzene	100-41-4	D	1.0E+00						6.62E-03			
VOC	2-Hexanone	591-78-6		1.0E+00						7.41E-03			
VOC	Methyl Acetate	79-20-9		1.0E+00									
VOC	Methyl tert-butyl ether	1634-04-4		1.0E+00	3.3E-03	8.9E+01		3.3E-03		6.81E-03			8.9E+01
VOC	4-Methyl-2-pentanone	108-10-1	ID	1.0E+00						6.41E-03			
VOC	Methylcyclohexane	108-87-2		1.0E+00									
VOC	Methylene Chloride	75-09-2	B2	1.0E+00	7.5E-03	4.1E+01	9.3E-06	7.5E-03	3.6E+01	6.88E-03	4.7E-04	2.8E+03	1.9E+01
VOC	Styrene	100-42-5		1.0E+00			9.6E-05			6.63E-03			
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1.0E+00	2.0E-01	1.3E+00	2.6E-05	2.0E-01	4.2E-01	6.54E-03	5.8E-02	2.0E+01	3.1E-01
VOC	Tetrachloroethene	127-18-4	C-B2	1.0E+00	5.2E-02	5.3E+00	4.0E-05	5.2E-02	1.1E+00	6.65E-03	3.1E-03	4.0E+02	9.0E-01
VOC	Toluene	108-88-3	D	1.0E+00						6.69E-03			
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1.0E+00			2.7E-04			6.62E-03			
VOC	1,1,1-Trichloroethane	71-55-6	D	1.0E+00			3.8E-05			6.70E-03			
VOC	1,1,2-Trichloroethane	79-00-5	C	1.0E+00	5.7E-02	4.8E+00	2.0E-05	5.7E-02	2.0E+00	6.68E-03	1.6E-02	7.7E+01	1.4E+00
VOC	Trichloroethene	79-01-6	C-B2	1.0E+00	1.1E-02	2.6E+01	5.5E-05	1.1E-02	3.9E+00	6.73E-03	1.7E-03	7.3E+02	3.3E+00
VOC	Trichlorofluoromethane	75-69-4		1.0E+00			4.0E-05			6.77E-03			
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		1.0E+00						6.66E-03			
VOC	Vinyl Chloride	75-01-4	A	1.0E+00	1.4E+00	2.2E-01	1.7E-05	1.4E+00	1.1E-01	6.92E-03	8.8E-03	1.5E+02	7.3E-02

Table G-4a: Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Receptor:	Resident								
				Pathway	Incidental Ingestion in Wading Pool		Dermal Contact in Wading Pool			Vapor Inhalation in Wading Pool			Target Risk:
					Intake:		Intake:	1.12E+01		Intake:	3.1E-03		1.00E-05
Analyte Group	Chemical	CASRN	Carc Group	C_{gw} (mg/L)	SF_{oral} $(mg/kg/d)^{-1}$	RBC (mg/L)	DA $(L/cm^2\text{-event})$	SF_{derm} $(mg/kg/d)^{-1}$	RBC (mg/L)	C_{air} (mg/m^3)	URF $(mg/m^3)^{-1}$	RBC (mg/L)	RBC (mg/L)
VOC	Xylenes (total)	1330-20-7	ID	1.0E+00						6.70E-03			
SVOC	Acenaphthene	83-32-9		1.0E+00						6.33E-03			
SVOC	Acenaphthylene	208-96-8	D	1.0E+00						6.22E-03			
SVOC	Acetophenone	98-86-2	D	1.0E+00						4.44E-03			
SVOC	Anthracene	120-12-7	D	1.0E+00						5.84E-03			
SVOC	Atrazine	1912-24-9	C	1.0E+00	2.2E-01	4.8E-01		2.2E-01					4.8E-01
SVOC	Benzaldehyde	100-52-7		1.0E+00									
SVOC	Benzo(a)anthracene	56-55-3	B2	1.0E+00	7.3E-01	1.7E-01	2.7E-03	7.3E-01	5.3E-04	1.97E-03			5.3E-04
SVOC	Benzo(a)pyrene	50-32-8	B2	1.0E+00	7.3E+00	1.5E-02	4.3E-03	7.3E+00	3.0E-05	7.22E-04			3.0E-05
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1.0E+00	7.3E-01	2.9E-01	4.9E-03	7.3E-01	4.8E-04	5.78E-03			4.8E-04
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1.0E+00						5.92E-05			
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1.0E+00	7.3E-02	1.5E+00		7.3E-02		3.60E-04			1.5E+00
SVOC	Biphenyl	92-52-4	D	1.0E+00						7.37E-03			
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	1.0E+00						1.07E-04			
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1.0E+00	1.1E+00	1.6E-01	5.2E-06	1.1E+00	2.6E-01	5.03E-03	3.3E-01	3.2E+00	9.7E-02
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1.0E+00	1.4E-02	7.7E+00	8.5E-03	1.4E-02	7.5E-03	6.19E-05			7.5E-03
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	1.0E+00									
SVOC	Butylbenzylphthalate	85-68-7	C	1.0E+00						4.52E-04			
SVOC	Caprolactam	105-60-2		1.0E+00									
SVOC	Carbazole	86-74-8	B2	1.0E+00	2.0E-02	5.4E+00		2.0E-02		1.00E-05			5.4E+00
SVOC	4-Chloro-3-methylphenol	59-50-7		1.0E+00									
SVOC	4-Chloroaniline	106-47-8		1.0E+00						2.44E-04			
SVOC	2-Chloronaphthalene	91-58-7		1.0E+00									
SVOC	2-Chlorophenol	95-57-8		1.0E+00			2.4E-05			6.66E-03			
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3		1.0E+00									
SVOC	Chrysene	218-01-9	B2	1.0E+00	7.3E-03	2.9E+01	2.7E-03	7.3E-03	9.0E-02	5.81E-03			8.9E-02
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1.0E+00	7.3E+00	1.5E-02	4.6E-03	7.3E+00	2.7E-05	6.22E-06			2.7E-05
SVOC	Dibenzofuran	132-64-9	D	1.0E+00						3.37E-03			
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1.0E+00	4.5E-01	2.4E-01	8.1E-05	4.5E-01	2.4E-02	1.65E-06			2.2E-02
SVOC	2,4-Dichlorophenol	120-83-2		1.0E+00			7.6E-05			1.55E-03			
SVOC	Diethylphthalate	84-66-2	D	1.0E+00			2.2E-05			2.17E-04			
SVOC	2,4-Dimethylphenol	105-67-9		1.0E+00			3.5E-05			1.41E-03			
SVOC	Dimethylphthalate	131-11-3	D	1.0E+00			6.2E-06			8.76E-05			
SVOC	Di-n-butylphthalate	84-74-2	D	1.0E+00			3.3E-04			6.68E-07			
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		1.0E+00						2.36E-04			
SVOC	2,4-Dinitrophenol	51-28-5		1.0E+00			6.4E-06			2.24E-04			
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1.0E+00	6.8E-01	1.6E-01	1.3E-05	6.8E-01	1.0E-01	1.80E-04			6.2E-02
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1.0E+00	6.8E-01	1.6E-01	1.1E-05	6.8E-01	1.3E-01	4.13E-04			7.1E-02
SVOC	Di-n-octylphthalate	117-84-0		1.0E+00						4.89E-03			
SVOC	Fluoranthene	206-44-0	D	1.0E+00			1.3E-03			3.94E-03			
SVOC	Fluorene	86-73-7	D	1.0E+00						5.89E-03			
SVOC	Hexachlorobenzene	118-74-1	B2	1.0E+00	1.6E+00	1.5E-01	2.2E-03	1.6E+00	5.7E-04	6.38E-03	4.6E-01	2.5E+00	5.7E-04
SVOC	Hexachlorobutadiene	87-68-3	C	1.0E+00	7.8E-02	3.2E+00	5.1E-04	7.8E-02	5.3E-02	6.43E-03	2.2E-02	5.3E+01	5.2E-02
SVOC	Hexachlorocyclopentadiene	77-47-4	E	1.0E+00						6.56E-03			
SVOC	Hexachloroethane	67-72-1	C	1.0E+00	1.4E-02	1.8E+01	1.9E-04	1.4E-02	7.8E-01	6.44E-03	4.0E-03	2.9E+02	7.5E-01
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1.0E+00	7.3E-01	1.5E-01	4.5E-03	7.3E-01	2.8E-04	5.97E-04			2.8E-04
SVOC	Isophorone	78-59-1	C	1.0E+00	9.5E-04	1.5E+02	1.1E-05	9.5E-04	1.1E+02	3.28E-03			6.3E+01
SVOC	2-Methylnaphthalene	91-57-6	ID	1.0E+00						6.57E-03			
SVOC	2-Methylphenol	95-48-7	C	1.0E+00			2.3E-05			1.05E-03			
SVOC	4-Methylphenol	106-44-5	C	1.0E+00			2.1E-05			7.27E-04			

Table G-4a: Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Receptor:	Resident								
				Pathway	Incidental Ingestion in Wading Pool		Dermal Contact in Wading Pool			Vapor Inhalation in Wading Pool			Target Risk:
					Intake:		Intake:	1.12E+01		Intake:	3.1E-03		1.00E-05
Analyte Group	Chemical	CASRN	Carc Group	C_{gw} (mg/L)	SF_{oral} $(mg/kg/d)^{-1}$	RBC (mg/L)	DA $(L/cm^2\text{-event})$	SF_{derm} $(mg/kg/d)^{-1}$	RBC (mg/L)	C_{air} (mg/m^3)	URF $(mg/m^3)^{-1}$	RBC (mg/L)	RBC (mg/L)
SVOC	Naphthalene	91-20-3	C	1.0E+00			1.5E-04			6.52E-03			
SVOC	2-Nitroaniline	88-74-4		1.0E+00									
SVOC	3-Nitroaniline	99-09-2	C	1.0E+00	2.1E-02	5.1E+00		2.1E-02					5.1E+00
SVOC	4-Nitroaniline	100-01-6	C	1.0E+00	2.1E-02	5.1E+00		2.1E-02					5.1E+00
SVOC	Nitrobenzene	98-95-3	D	1.0E+00						5.53E-03			
SVOC	2-Nitrophenol	88-75-5		1.0E+00									
SVOC	4-Nitrophenol	100-02-7		1.0E+00									
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1.0E+00	4.9E-03	2.6E+01	6.7E-05	4.9E-03	3.2E+00	2.04E-03			2.8E+00
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1.0E+00	7.0E+00	1.7E-02	7.7E-06	7.0E+00	1.8E-02	1.50E-03			8.9E-03
SVOC	N-Nitrosomorpholine	59-89-2		1.0E+00									
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	1.0E+00	7.0E-02	1.5E+00		7.0E-02			1.0E-02		1.5E+00
SVOC	Pentachlorophenol	87-86-5	B2	1.0E+00	1.2E-01	9.0E-01	7.3E-04	1.2E-01	1.0E-02	2.04E-05			1.0E-02
SVOC	Phenanthrene	85-01-8	D	1.0E+00									
SVOC	Phenol	108-95-2	ID	1.0E+00			1.2E-05			4.08E-04			
SVOC	Pyrene	129-00-0	D	1.0E+00						3.21E-03			
SVOC	2,4,5-Trichlorophenol	95-95-4		1.0E+00						1.79E-03			
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1.0E+00	1.1E-02	1.2E+01	1.6E-04	1.1E-02	6.5E-01	2.76E-03	3.1E-03	4.7E+02	6.2E-01
P/PCB	PCBs (total)	1336-36-3	B2	1.0E+00	2.0E+00	1.4E-01	2.1E-03	2.0E+00	5.7E-04	6.78E-03			5.7E-04
P/PCB	Aroclor-1016	12674-11-2	B2	1.0E+00	7.0E-02	1.5E+00		7.0E-02					1.5E+00
P/PCB	Aroclor-1221	11104-28-2	B2	1.0E+00	2.0E+00	5.4E-02		2.0E+00					5.4E-02
P/PCB	Aroclor-1232	11141-16-5	B2	1.0E+00	2.0E+00	5.4E-02		2.0E+00					5.4E-02
P/PCB	Aroclor-1242	53469-21-9	B2	1.0E+00	2.0E+00	5.4E-02		2.0E+00					5.4E-02
P/PCB	Aroclor-1248	12672-29-6	B2	1.0E+00	2.0E+00	5.4E-02		2.0E+00					5.4E-02
P/PCB	Aroclor-1254	11097-69-1	B2	1.0E+00	2.0E+00	5.4E-02		2.0E+00					5.4E-02
P/PCB	Aroclor-1260	11096-82-5	B2	1.0E+00	2.0E+00	5.4E-02		2.0E+00					5.4E-02
P/PCB	Aldrin	309-00-2	B2	1.0E+00	1.7E+01	1.2E-02	3.8E-03	1.7E+01	2.7E-05	5.71E-03	4.9E+00	2.2E-01	2.7E-05
P/PCB	alpha-BHC	319-84-6	B2	1.0E+00	6.3E+00	2.1E-02		6.3E+00		2.41E-03	1.8E+00	8.9E-01	2.0E-02
P/PCB	beta-BHC	319-85-7	C	1.0E+00	1.8E+00	6.1E-02		1.8E+00		2.41E-04	5.3E-01	2.5E+01	6.1E-02
P/PCB	delta-BHC	319-86-8	D	1.0E+00									
P/PCB	gamma-BHC	58-89-9	B2-C	1.0E+00	1.3E+00	1.0E-01	8.1E-05	1.3E+00	1.1E-02	2.87E-03			9.7E-03
P/PCB	Chlordane	57-74-9	B2	1.0E+00	3.5E-01	4.7E-01	1.5E-03	3.5E-01	2.6E-03	4.47E-03	1.0E-01	1.1E+01	2.6E-03
P/PCB	alpha-Chlordane	5103-71-9		1.0E+00	3.5E-01	3.1E-01		3.5E-01					3.1E-01
P/PCB	gamma-Chlordane	5103-74-2		1.0E+00	3.5E-01	3.1E-01		3.5E-01					3.1E-01
P/PCB	4,4'-DDD	72-54-8	B2	1.0E+00	2.4E-01	4.9E-01	2.2E-03	2.4E-01	1.8E-03	1.24E-03			1.8E-03
P/PCB	4,4'-DDE	72-55-9	B2	1.0E+00	3.4E-01	4.3E-01	6.0E-03	3.4E-01	5.9E-04	3.53E-03			5.9E-04
P/PCB	4,4'-DDT	50-29-3	B2	1.0E+00	3.4E-01	3.7E-01	2.9E-03	3.4E-01	1.0E-03	1.92E-03	9.7E-02	2.0E+01	1.0E-03
P/PCB	Dieldrin	60-57-1	B2	1.0E+00	1.6E+01	8.4E-03	4.8E-04	1.6E+01	1.5E-04	2.76E-03	4.6E+00	3.1E-01	1.4E-04
P/PCB	Endosulfan I	959-98-8		1.0E+00									
P/PCB	Endosulfan II	33213-65-9		1.0E+00									
P/PCB	Endosulfan sulfate	1031-07-8		1.0E+00									
P/PCB	Endrin	72-20-8	D	1.0E+00			2.9E-04			1.73E-03			
P/PCB	Endrin aldehyde	7421-93-4		1.0E+00									
P/PCB	Endrin ketone	53494-70-5		1.0E+00									
P/PCB	Heptachlor	76-44-8	B2	1.0E+00	4.5E+00	5.3E-02	1.9E-03	4.5E+00	2.3E-04	6.28E-03	1.3E+00	8.7E-01	2.2E-04
P/PCB	Heptachlor epoxide	1024-57-3	B2	1.0E+00	9.1E+00	1.4E-02		9.1E+00		2.09E-03	2.6E+00	6.9E-01	1.4E-02
P/PCB	Methoxychlor	72-43-5	D	1.0E+00						3.06E-03			
P/PCB	Toxaphene	8001-35-2	B2	1.0E+00	1.1E+00	1.1E-01	4.8E-04	1.1E+00	1.9E-03	1.39E-03	3.2E-01	7.9E+00	1.8E-03
INORG	Aluminum	7429-90-5	D	1.0E+00			2.0E-06						
INORG	Antimony	7440-36-0		1.0E+00			2.0E-06						
INORG	Arsenic	7440-38-2	A	1.0E+00	1.5E+00	7.2E-02	2.0E-06	1.5E+00	3.0E-01		4.3E+00		5.8E-02

Table G-4a: Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Receptor:	Resident									
				Pathway	Incidental Ingestion in Wading Pool		Dermal Contact in Wading Pool			Vapor Inhalation in Wading Pool			Target Risk:	
					Intake:		Intake:	1.12E+01		Intake:	3.1E-03		1.00E-05	
Analyte Group	**Chemical**	**CASRN**	**Carc Group**	C_{gw} (mg/L)	SF_{oral} $(mg/kg/d)^{-1}$	**RBC** (mg/L)	**DA** $(L/cm^2\text{-event})$	SF_{derm} $(mg/kg/d)^{-1}$	**RBC** (mg/L)	C_{air} (mg/m^3)	**URF** $(mg/m^3)^{-1}$	**RBC** (mg/L)	**RBC (mg/L)**	
INORG	Barium	7440-39-3	D	1.0E+00			2.0E-06							
INORG	Beryllium	7440-41-7	B1	1.0E+00			2.0E-06				2.4E+00			
INORG	Cadmium	7440-43-9	B1	1.0E+00			2.0E-06				1.8E+00			
INORG	Calcium	7440-70-2		1.0E+00										
INORG	Chromium (total)	7440-47-3		1.0E+00			2.0E-06				1.2E+01			
INORG	Chromium III	16065-83-1	D	1.0E+00			2.0E-06							
INORG	Chromium VI	18540-29-9	A	1.0E+00			4.0E-06				1.2E+01			
INORG	Cobalt	7440-48-4	B1	1.0E+00			8.0E-07				2.8E+00			
INORG	Copper	7440-50-8	D	1.0E+00			2.0E-06							
INORG	Cyanide (total)	57-12-5	D	1.0E+00			2.0E-06							
INORG	Iron	7439-89-6	D	1.0E+00			2.0E-06							
INORG	Lead	7439-92-1	B2	1.0E+00			2.0E-06							
INORG	Magnesium	7439-95-4		1.0E+00			2.0E-06							
INORG	Manganese	7439-96-5	D	1.0E+00			2.0E-06							
INORG	Mercury	7439-97-6	D	1.0E+00			2.0E-06			6.45E-03				
INORG	Nickel	7440-02-0	A	1.0E+00			4.0E-07				2.4E-01			
INORG	Potassium	7440-09-7		1.0E+00			4.0E-06							
INORG	Selenium	7782-49-2	D	1.0E+00			2.0E-06							
INORG	Silver	7440-22-4	D	1.0E+00			1.2E-06							
INORG	Sodium	7440-23-5		1.0E+00			2.0E-06							
INORG	Thallium	7440-28-0		1.0E+00			2.0E-06							
INORG	Vanadium	7440-62-2		1.0E+00			2.0E-06							
INORG	Zinc	7440-66-6	D	1.0E+00			1.2E-06							

Table G-4b: Non-Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Pathway	Incidental Ingestion in Wading Pool			Dermal Contact in Wading Pool				Vapor Inhalation in Wading Pool				
					Intake:	2.2E-04		Intake:	2.62E+01			Intake:	7.3E-03			Target HI
Analyte Group	Chemical	CASRN	Carc Group	C_{gw} (mg/L)	RfD_{oral} (mg/kg/d)	HQ	RBC (mg/L)	DA (L/cm^2-event)	RfD_{derm} (mg/kg/d)	HQ	RBC (mg/L)	C_{air} (mg/m^3)	RfC (mg/m^3)	HQ	RBC (mg/L)	RBC (mg/L)
VOC	Acetone	67-64-1	ID	1.0E+00	9.0E-01	1.1E-04	9.4E+03		9.0E-01			6.3E-03				9.4E+03
VOC	Benzene	71-43-2	A	1.0E+00	4.0E-03	2.0E-02	5.0E+01	3.6E-05	4.0E-03	1.4E-06	7.1E+05	6.8E-03	3.0E-02	6.1E-04	1.6E+03	4.8E+01
VOC	Bromochloromethane	74-97-5		1.0E+00												
VOC	Bromodichloromethane	75-27-4	B2	1.0E+00	2.0E-02	4.0E-03	2.5E+02	1.7E-05	2.0E-02	3.3E-06	3.0E+05	6.8E-03				2.5E+02
VOC	Bromoform	75-25-2	B2	1.0E+00	2.0E-02	4.3E-03	2.3E+02	1.4E-05	2.0E-02	2.9E-06	3.5E+05	6.7E-03				2.3E+02
VOC	Bromomethane	74-83-9	D	1.0E+00	1.4E-03	5.4E-02	1.9E+01	7.5E-06	1.4E-03	9.6E-08	1.0E+07	6.9E-03	5.0E-03	3.5E-03	2.9E+02	1.7E+01
VOC	2-Butanone	78-93-3	ID	1.0E+00	6.0E-01	1.6E-04	6.2E+03		6.0E-01			6.3E-03	5.0E+00	4.1E-06	2.4E+05	6.1E+03
VOC	Carbon Disulfide	75-15-0		1.0E+00	1.0E-01	8.0E-04	1.2E+03	3.1E-05	1.0E-01	3.0E-05	3.3E+04	6.8E-03	7.0E-01	2.6E-05	3.8E+04	1.2E+03
VOC	Carbon Tetrachloride	56-23-5	B2	1.0E+00	7.0E-04	1.2E-01	8.4E+00	4.9E-05	7.0E-04	3.4E-07	2.9E+06	6.7E-03				8.4E+00
VOC	Chlorobenzene	108-90-7	D	1.0E+00	2.0E-02	4.2E-03	2.4E+02	8.0E-05	2.0E-02	1.6E-05	6.2E+04	6.7E-03	6.0E-02	3.2E-04	3.2E+03	2.2E+02
VOC	Chloroethane	75-00-3		1.0E+00	4.0E-01	5.4E-04	1.8E+03		4.0E-01				1.0E+01			1.8E+03
VOC	Chloroform	67-66-3	B2	1.0E+00	1.0E-02	8.0E-03	1.2E+02	1.9E-05	1.0E-02	1.8E-06	5.6E+05	6.8E-03	5.0E-02	3.7E-04	2.7E+03	1.2E+02
VOC	Chloromethane	74-87-3	D	1.0E+00				7.9E-06				6.5E-03	9.0E-02	2.2E-04	4.5E+03	4.5E+03
VOC	Cumene	98-82-8	D	1.0E+00	1.0E-01	2.2E-03	4.6E+02		1.0E-01				4.0E-01			4.6E+02
VOC	Cyclohexane	110-82-7	ID	1.0E+00								6.7E-03	6.0E+00	3.1E-06	3.2E+05	3.2E+05
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	1.0E+00								6.4E-03	2.0E-04	1.0E-01	1.0E+01	1.0E+01
VOC	Dibromochloromethane	124-48-1	C	1.0E+00	2.0E-02	4.1E-03	2.4E+02	1.4E-05	2.0E-02	2.8E-06	3.5E+05	6.7E-03				2.4E+02
VOC	1,2-Dibromoethane	106-93-4	B2	1.0E+00				8.5E-06				6.6E-03				
VOC	1,2-Dichlorobenzene	95-50-1	D	1.0E+00	9.0E-02	9.7E-04	1.0E+03	1.5E-04	9.0E-02	1.4E-04	7.2E+03	6.6E-03	2.0E-01	9.7E-05	1.0E+04	8.3E+02
VOC	1,3-Dichlorobenzene	541-73-1	D	1.0E+00	9.0E-02	2.4E-03	4.1E+02		9.0E-02							4.1E+02
VOC	1,4-Dichlorobenzene	106-46-7	C	1.0E+00	3.0E-02	2.9E-03	3.5E+02	1.4E-04	3.0E-02	4.5E-05	2.2E+04	6.6E-03	8.0E-01	2.4E-05	4.1E+04	3.4E+02
VOC	Dichlorodifluoromethane	75-71-8		1.0E+00	2.0E-01	4.3E-04	2.3E+03	2.6E-05	2.0E-01	5.4E-05	1.9E+04	6.6E-03	2.0E-01	9.6E-05	1.0E+04	1.7E+03
VOC	1,1-Dichloroethane	75-34-3	C	1.0E+00	1.0E-01	7.9E-04	1.3E+03	1.8E-05	1.0E-01	1.8E-05	5.7E+04	6.8E-03	5.0E-01	3.6E-05	2.8E+04	1.2E+03
VOC	1,2-Dichloroethane	107-06-2	B2	1.0E+00	3.0E-02	2.7E-03	3.7E+02	1.1E-05	3.0E-02	3.4E-06	3.0E+05	6.8E-03	5.0E-03	3.7E-03	2.7E+02	1.6E+02
VOC	1,1-Dichloroethene	75-35-4	C	1.0E+00	5.0E-02	1.6E-03	6.3E+02	3.0E-05	5.0E-02	1.4E-05	6.9E+04	6.8E-03	2.0E-01	9.1E-05	1.1E+04	5.9E+02
VOC	1,2-Dichloroethene (total)	540-59-0		1.0E+00	9.0E-03	8.4E-03	1.2E+02		9.0E-03			6.9E-03				1.2E+02
VOC	cis-1,2-Dichloroethene	156-59-2	D	1.0E+00	1.0E-02	7.7E-03	1.3E+02		1.0E-02			6.9E-03				1.3E+02
VOC	trans-1,2-Dichloroethene	156-60-5		1.0E+00	2.0E-02	3.8E-03	2.6E+02		2.0E-02			6.9E-03				2.6E+02
VOC	1,2-Dichloropropane	78-87-5	B2	1.0E+00				2.1E-05				6.7E-03	4.0E-03	4.7E-03	2.1E+02	2.1E+02
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1.0E+00	3.0E-02	2.7E-03	3.7E+02	2.3E-05	3.0E-02	6.5E-06	1.5E+05	6.8E-03	2.0E-02	9.2E-04	1.1E+03	2.8E+02
VOC	cis-1,3-Dichloropropene	10061-01-5		1.0E+00	3.0E-02	2.9E-03	3.5E+02		3.0E-02			6.6E-03	2.0E-02	9.6E-04	1.0E+03	2.6E+02
VOC	trans-1,3-Dichloropropene	10061-02-6		1.0E+00								6.6E-03				
VOC	Ethyl Benzene	100-41-4	D	1.0E+00	1.0E-01	8.7E-04	1.2E+03		1.0E-01			6.6E-03	1.0E+00	1.9E-05	5.2E+04	1.1E+03
VOC	2-Hexanone	591-78-6		1.0E+00	4.0E-02	4.8E-05	2.1E+04		4.0E-02			7.4E-03	5.0E-03	9.6E-05	1.0E+04	7.0E+03
VOC	Methyl Acetate	79-20-9		1.0E+00	1.0E+00	2.2E-04	4.6E+03		1.0E+00							4.6E+03
VOC	Methyl tert-butyl ether	1634-04-4		1.0E+00								6.8E-03	3.0E+00	6.1E-06	1.6E+05	1.6E+05
VOC	4-Methyl-2-pentanone	108-10-1	ID	1.0E+00								6.4E-03	3.0E+00	6.7E-06	1.5E+05	1.5E+05
VOC	Methylcyclohexane	108-87-2		1.0E+00									3.0E+00			
VOC	Methylene Chloride	75-09-2	B2	1.0E+00	6.0E-02	1.3E-03	7.9E+02	9.3E-06	6.0E-02	5.2E-06	1.9E+05	6.9E-03	3.0E+00	5.9E-06	1.7E+05	7.8E+02
VOC	Styrene	100-42-5		1.0E+00	2.0E-01	4.3E-04	2.3E+03	9.6E-05	2.0E-01	2.0E-04	5.0E+03	6.6E-03	1.0E+00	1.9E-05	5.2E+04	1.5E+03
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1.0E+00	6.0E-02	1.5E-03	6.7E+02	2.6E-05	6.0E-02	1.7E-05	5.9E+04	6.5E-03				6.6E+02
VOC	Tetrachloroethene	127-18-4	C-B2	1.0E+00	1.0E-02	8.5E-03	1.2E+02	4.0E-05	1.0E-02	4.1E-06	2.4E+05	6.7E-03	4.0E-01	4.8E-05	2.1E+04	1.2E+02
VOC	Toluene	108-88-3	D	1.0E+00	2.0E-01	4.2E-04	2.4E+03		2.0E-01			6.7E-03	4.0E-01	4.7E-05	2.1E+04	2.1E+03
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1.0E+00	1.0E-02	8.7E-03	1.2E+02	2.7E-04	1.0E-02	2.8E-05	3.5E+04	6.6E-03	2.0E-01	9.6E-05	1.0E+04	1.1E+02
VOC	1,1,1-Trichloroethane	71-55-6	D	1.0E+00	2.8E-01	3.0E-04	3.4E+03	3.8E-05	2.8E-01	1.1E-04	9.2E+03	6.7E-03	2.2E+00	8.6E-06	1.2E+05	2.4E+03
VOC	1,1,2-Trichloroethane	79-00-5	C	1.0E+00	4.0E-03	2.1E-02	4.7E+01	2.0E-05	4.0E-03	8.1E-07	1.2E+06	6.7E-03				4.7E+01
VOC	Trichloroethene	79-01-6	C-B2	1.0E+00	6.0E-03	1.4E-02	7.3E+01	5.5E-05	6.0E-03	3.3E-06	3.0E+05	6.7E-03				7.3E+01
VOC	Trichlorofluoromethane	75-69-4		1.0E+00	3.0E-01	2.7E-04	3.7E+03	4.0E-05	3.0E-01	1.2E-04	8.4E+03	6.8E-03	7.0E-01	2.6E-05	3.8E+04	2.4E+03
VOC	1,1,2-Trichloro-1,2,2-trifluoroeth	76-13-1		1.0E+00	3.0E+01	2.8E-06	3.5E+05		3.0E+01			6.7E-03	3.0E+01	6.4E-07	1.6E+06	2.9E+05
VOC	Vinyl Chloride	75-01-4	A	1.0E+00	3.0E-03	2.5E-02	4.0E+01	1.7E-05	3.0E-03	4.6E-07	2.2E+06	6.9E-03	1.0E-01	1.7E-04	5.8E+03	4.0E+01
VOC	Xylenes (total)	1330-20-7	ID	1.0E+00	2.0E-01	4.2E-04	2.4E+03		2.0E-01			6.7E-03	1.0E-01	1.9E-04	5.3E+03	1.6E+03

Table G-4b: Non-Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Pathway	Incidental Ingestion in Wading Pool			Dermal Contact in Wading Pool				Vapor Inhalation in Wading Pool				
					Intake:	2.2E-04		Intake:	2.62E+01			Intake:	7.3E-03			Target HI
Analyte Group	Chemical	CASRN	Carc Group	C_{gw} (mg/L)	RfD_{oral} (mg/kg/d)	HQ	RBC (mg/L)	DA (L/cm^2-event)	RfD_{derm} (mg/kg/d)	HQ	RBC (mg/L)	C_{air} (mg/m^3)	RfC (mg/m^3)	HQ	RBC (mg/L)	RBC (mg/L)
SVOC	Acenaphthene	83-32-9		1.0E+00	6.0E-02	1.6E-03	6.2E+02		6.0E-02			6.3E-03				6.2E+02
SVOC	Acenaphthylene	208-96-8	D	1.0E+00	3.0E-02	3.3E-03	3.0E+02		3.0E-02			6.2E-03				3.0E+02
SVOC	Acetophenone	98-86-2	D	1.0E+00	1.0E-01	1.4E-03	7.0E+02		1.0E-01			4.4E-03				7.0E+02
SVOC	Anthracene	120-12-7	D	1.0E+00	3.0E-01	3.7E-04	2.7E+03		3.0E-01			5.8E-03				2.7E+03
SVOC	Atrazine	1912-24-9	C	1.0E+00	3.5E-02	6.2E-03	1.6E+02		3.5E-02							1.6E+02
SVOC	Benzaldehyde	100-52-7		1.0E+00	1.0E-01	2.2E-03	4.6E+02		1.0E-01							4.6E+02
SVOC	Benzo(a)anthracene	56-55-3	B2	1.0E+00				2.7E-03				2.0E-03				
SVOC	Benzo(a)pyrene	50-32-8	B2	1.0E+00				4.3E-03				7.2E-04				
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1.0E+00				4.9E-03				5.8E-03				
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1.0E+00	3.0E-02	7.2E-03	1.4E+02		3.0E-02			5.9E-05				1.4E+02
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1.0E+00								3.6E-04				
SVOC	Biphenyl	92-52-4	D	1.0E+00	5.0E-02	8.3E-04	1.2E+03		5.0E-02			7.4E-03				1.2E+03
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	1.0E+00								1.1E-04				
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1.0E+00				5.2E-06				5.0E-03				
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1.0E+00	2.0E-02	1.1E-02	9.3E+01	8.5E-03	2.0E-02	4.5E-03	2.2E+02	6.2E-05				6.6E+01
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	1.0E+00												
SVOC	Butylbenzylphthalate	85-68-7	C	1.0E+00	2.0E-01	1.1E-03	9.5E+02		2.0E-01			4.5E-04				9.5E+02
SVOC	Caprolactam	105-60-2		1.0E+00	5.0E-01	4.3E-04	2.3E+03		5.0E-01							2.3E+03
SVOC	Carbazole	86-74-8	B2	1.0E+00								1.0E-05				
SVOC	4-Chloro-3-methylphenol	59-50-7		1.0E+00												
SVOC	4-Chloroaniline	106-47-8		1.0E+00	4.0E-03	5.3E-02	1.9E+01		4.0E-03			2.4E-04				1.9E+01
SVOC	2-Chloronaphthalene	91-58-7		1.0E+00	8.0E-02	2.7E-03	3.7E+02		8.0E-02							3.7E+02
SVOC	2-Chlorophenol	95-57-8		1.0E+00	5.0E-03	1.7E-02	5.9E+01	2.4E-05	5.0E-03	1.2E-06	8.0E+05	6.7E-03				5.9E+01
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3		1.0E+00												
SVOC	Chrysene	218-01-9	B2	1.0E+00				2.7E-03				5.8E-03				
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1.0E+00				4.6E-03				6.2E-06				
SVOC	Dibenzofuran	132-64-9	D	1.0E+00	2.0E-03	8.1E-02	1.2E+01		2.0E-03			3.4E-03				1.2E+01
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1.0E+00				8.1E-05				1.6E-06				
SVOC	2,4-Dichlorophenol	120-83-2		1.0E+00	3.0E-03	6.5E-02	1.5E+01	7.6E-05	3.0E-03	5.3E-06	1.9E+05	1.5E-03				1.5E+01
SVOC	Diethylphthalate	84-66-2	D	1.0E+00	8.0E-01	2.7E-04	3.7E+03	2.2E-05	8.0E-01	4.5E-04	2.2E+03	2.2E-04				1.4E+03
SVOC	2,4-Dimethylphenol	105-67-9		1.0E+00	2.0E-02	9.8E-03	1.0E+02	3.5E-05	2.0E-02	1.7E-05	6.0E+04	1.4E-03				1.0E+02
SVOC	Dimethylphthalate	131-11-3	D	1.0E+00				6.2E-06				8.8E-05				
SVOC	Di-n-butylphthalate	84-74-2	D	1.0E+00	1.0E-01	2.2E-03	4.6E+02	3.3E-04	1.0E-01	8.7E-04	1.1E+03	6.7E-07				3.3E+02
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		1.0E+00	1.0E-04	2.1E+00	4.7E-01		1.0E-04			2.4E-04				4.7E-01
SVOC	2,4-Dinitrophenol	51-28-5		1.0E+00	2.0E-03	1.1E-01	9.4E+00	6.4E-06	2.0E-03	3.3E-07	3.0E+06	2.2E-04				9.4E+00
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1.0E+00	2.0E-03	1.1E-01	9.3E+00	1.3E-05	2.0E-03	6.7E-07	1.5E+06	1.8E-04				9.3E+00
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1.0E+00	1.0E-03	2.1E-01	4.7E+00	1.1E-05	1.0E-03	2.7E-07	3.7E+06	4.1E-04				4.7E+00
SVOC	Di-n-octylphthalate	117-84-0		1.0E+00	2.0E-02	6.6E-03	1.5E+02		2.0E-02			4.9E-03				1.5E+02
SVOC	Fluoranthene	206-44-0	D	1.0E+00	4.0E-02	3.8E-03	2.6E+02	1.3E-03	4.0E-02	9.5E-04	1.1E+03	3.9E-03				2.1E+02
SVOC	Fluorene	86-73-7	D	1.0E+00	4.0E-02	2.7E-03	3.7E+02		4.0E-02			5.9E-03				3.7E+02
SVOC	Hexachlorobenzene	118-74-1	B2	1.0E+00	8.0E-04	1.2E-01	8.4E+00	2.2E-03	8.0E-04	2.0E-05	4.9E+04	6.4E-03				8.4E+00
SVOC	Hexachlorobutadiene	87-68-3	C	1.0E+00	2.0E-04	4.6E-01	2.2E+00	5.1E-04	2.0E-04	1.1E-06	8.8E+05	6.4E-03				2.2E+00
SVOC	Hexachlorocyclopentadiene	77-47-4	E	1.0E+00	6.0E-03	1.5E-02	6.8E+01		6.0E-03			6.6E-03	2.0E-04	9.8E-02	1.0E+01	8.9E+00
SVOC	Hexachloroethane	67-72-1	C	1.0E+00	1.0E-03	9.3E-02	1.1E+01	1.9E-04	1.0E-03	2.1E-06	4.7E+05	6.4E-03				1.1E+01
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1.0E+00				4.5E-03				6.0E-04				
SVOC	Isophorone	78-59-1	C	1.0E+00	2.0E-01	8.2E-04	1.2E+03	1.1E-05	2.0E-01	4.5E-05	2.2E+04	3.3E-03				1.2E+03
SVOC	2-Methylnaphthalene	91-57-6	ID	1.0E+00	4.0E-03	2.2E-02	4.5E+01		4.0E-03			6.6E-03	3.0E-03	6.5E-03	1.5E+02	3.5E+01
SVOC	2-Methylphenol	95-48-7	C	1.0E+00	5.0E-02	4.0E-03	2.5E+02	2.3E-05	5.0E-02	2.8E-05	3.6E+04	1.0E-03				2.5E+02
SVOC	4-Methylphenol	106-44-5	C	1.0E+00	5.0E-03	4.1E-02	2.4E+01	2.1E-05	5.0E-03	2.7E-06	3.7E+05	7.3E-04				2.4E+01
SVOC	Naphthalene	91-20-3	C	1.0E+00	2.0E-02	4.5E-03	2.2E+02	1.5E-04	2.0E-02	3.2E-05	3.1E+04	6.5E-03	3.0E-03	6.6E-03	1.5E+02	9.0E+01
SVOC	2-Nitroaniline	88-74-4		1.0E+00									2.0E-04			

Table G-4b: Non-Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Pathway	Incidental Ingestion in Wading Pool			Dermal Contact in Wading Pool				Vapor Inhalation in Wading Pool				
					Intake:	2.2E-04		Intake:	2.62E+01			Intake:	7.3E-03			Target HI
Analyte Group	Chemical	CASRN	Carc Group	C_{gw} (mg/L)	RfD_{oral} (mg/kg/d)	HQ	RBC (mg/L)	DA (L/cm^2-event)	RfD_{derm} (mg/kg/d)	HQ	RBC (mg/L)	C_{air} (mg/m^3)	RfC (mg/m^3)	HQ	RBC (mg/L)	RBC (mg/L)
SVOC	3-Nitroaniline	99-09-2	C	1.0E+00	3.0E-04	7.2E-01	1.4E+00		3.0E-04				1.0E-03			1.4E+00
SVOC	4-Nitroaniline	100-01-6	C	1.0E+00	3.0E-03	7.2E-02	1.4E+01		3.0E-03				4.0E-03			1.4E+01
SVOC	Nitrobenzene	98-95-3	D	1.0E+00	5.0E-04	2.4E-01	4.2E+00		5.0E-04			5.5E-03	2.0E-03	1.1E-02	9.1E+01	4.0E+00
SVOC	2-Nitrophenol	88-75-5		1.0E+00												
SVOC	4-Nitrophenol	100-02-7		1.0E+00	8.0E-03	2.7E-02	3.7E+01		8.0E-03							3.7E+01
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1.0E+00	2.0E-02	9.3E-03	1.1E+02	6.7E-05	2.0E-02	3.0E-05	3.3E+04	2.0E-03				1.1E+02
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1.0E+00				7.7E-06				1.5E-03				
SVOC	N-Nitrosomorpholine	59-89-2		1.0E+00												
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	1.0E+00	4.0E-02	5.4E-03	1.8E+02		4.0E-02							1.8E+02
SVOC	Pentachlorophenol	87-86-5	B2	1.0E+00	3.0E-02	7.2E-03	1.4E+02	7.3E-04	3.0E-02	5.7E-04	1.7E+03	2.0E-05				1.3E+02
SVOC	Phenanthrene	85-01-8	D	1.0E+00	3.0E-02	7.2E-03	1.4E+02		3.0E-02							1.4E+02
SVOC	Phenol	108-95-2	ID	1.0E+00	3.0E-01	7.0E-04	1.4E+03	1.2E-05	3.0E-01	9.1E-05	1.1E+04	4.1E-04				1.3E+03
SVOC	Pyrene	129-00-0	D	1.0E+00	3.0E-02	5.5E-03	1.8E+02		3.0E-02			3.2E-03				1.8E+02
SVOC	2,4,5-Trichlorophenol	95-95-4		1.0E+00	1.0E-01	1.9E-03	5.3E+02		1.0E-01			1.8E-03				5.3E+02
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1.0E+00	1.0E-04	1.7E+00	5.8E-01	1.6E-04	1.0E-04	3.3E-07	3.1E+06	2.8E-03				5.8E-01
P/PCB	PCBs (total)	1336-36-3	B2	1.0E+00	2.0E-05	4.0E+00	2.5E-01	2.1E-03	2.0E-05	4.1E-07	2.5E+06	6.8E-03				2.5E-01
P/PCB	Aroclor-1016	12674-11-2	B2	1.0E+00	7.0E-05	3.1E+00	3.2E-01		7.0E-05							3.2E-01
P/PCB	Aroclor-1221	11104-28-2	B2	1.0E+00												
P/PCB	Aroclor-1232	11141-16-5	B2	1.0E+00												
P/PCB	Aroclor-1242	53469-21-9	B2	1.0E+00												
P/PCB	Aroclor-1248	12672-29-6	B2	1.0E+00												
P/PCB	Aroclor-1254	11097-69-1	B2	1.0E+00	2.0E-05	1.1E+01	9.2E-02		2.0E-05							9.2E-02
P/PCB	Aroclor-1260	11096-82-5	B2	1.0E+00												
P/PCB	Aldrin	309-00-2	B2	1.0E+00	3.0E-05	3.8E+00	2.6E-01	3.8E-03	3.0E-05	1.5E-06	6.5E+05	5.7E-03				2.6E-01
P/PCB	alpha-BHC	319-84-6	B2	1.0E+00	5.0E-04	3.6E-01	2.8E+00		5.0E-04			2.4E-03				2.8E+00
P/PCB	beta-BHC	319-85-7	C	1.0E+00	2.0E-04	1.1E+00	9.4E-01		2.0E-04			2.4E-04				9.4E-01
P/PCB	delta-BHC	319-86-8	D	1.0E+00												
P/PCB	gamma-BHC	58-89-9	B2-C	1.0E+00	3.0E-04	5.7E-01	1.7E+00	8.1E-05	3.0E-04	5.0E-07	2.0E+06	2.9E-03				1.7E+00
P/PCB	Chlordane	57-74-9	B2	1.0E+00	5.0E-04	2.8E-01	3.5E+00	1.5E-03	5.0E-04	1.3E-05	7.8E+04	4.5E-03	7.0E-04	3.0E-02	3.3E+01	3.2E+00
P/PCB	alpha-Chlordane	5103-71-9		1.0E+00	5.0E-04	4.3E-01	2.3E+00		5.0E-04							2.3E+00
P/PCB	gamma-Chlordane	5103-74-2		1.0E+00	5.0E-04	4.3E-01	2.3E+00		5.0E-04							2.3E+00
P/PCB	4,4'-DDD	72-54-8	B2	1.0E+00	3.0E-03	6.6E-02	1.5E+01	2.2E-03	3.0E-03	1.6E-04	6.3E+03	1.2E-03				1.5E+01
P/PCB	4,4'-DDE	72-55-9	B2	1.0E+00	7.0E-04	2.3E-01	4.4E+00	6.0E-03	7.0E-04	8.1E-05	1.2E+04	3.5E-03				4.4E+00
P/PCB	4,4'-DDT	50-29-3	B2	1.0E+00	5.0E-04	3.8E-01	2.7E+00	2.9E-03	5.0E-04	3.3E-05	3.0E+04	1.9E-03				2.7E+00
P/PCB	Dieldrin	60-57-1	B2	1.0E+00	5.0E-05	3.5E+00	2.9E-01	4.8E-04	5.0E-05	5.0E-07	2.0E+06	2.8E-03				2.9E-01
P/PCB	Endosulfan I	959-98-8		1.0E+00	6.0E-03	3.6E-02	2.8E+01		6.0E-03							2.8E+01
P/PCB	Endosulfan II	33213-65-9		1.0E+00	6.0E-03	3.6E-02	2.8E+01		6.0E-03							2.8E+01
P/PCB	Endosulfan sulfate	1031-07-8		1.0E+00	6.0E-03	3.6E-02	2.8E+01		6.0E-03							2.8E+01
P/PCB	Endrin	72-20-8	D	1.0E+00	3.0E-04	6.4E-01	1.6E+00	2.9E-04	3.0E-04	2.0E-06	4.9E+05	1.7E-03				1.6E+00
P/PCB	Endrin aldehyde	7421-93-4		1.0E+00	3.0E-04	7.2E-01	1.4E+00		3.0E-04							1.4E+00
P/PCB	Endrin ketone	53494-70-5		1.0E+00												
P/PCB	Heptachlor	76-44-8	B2	1.0E+00	5.0E-04	2.0E-01	5.1E+00	1.9E-03	5.0E-04	1.2E-05	8.7E+04	6.3E-03				5.1E+00
P/PCB	Heptachlor epoxide	1024-57-3	B2	1.0E+00	1.3E-05	1.4E+01	7.0E-02		1.3E-05			2.1E-03				7.0E-02
P/PCB	Methoxychlor	72-43-5	D	1.0E+00	5.0E-03	3.4E-02	3.0E+01		5.0E-03			3.1E-03				3.0E+01
P/PCB	Toxaphene	8001-35-2	B2	1.0E+00				4.8E-04				1.4E-03				
INORG	Aluminum	7429-90-5	D	1.0E+00	1.0E+00	2.2E-04	4.6E+03	2.0E-06	1.0E+00	5.2E-05	1.9E+04		5.0E-03			3.7E+03
INORG	Antimony	7440-36-0		1.0E+00	4.0E-04	5.4E-01	1.8E+00	2.0E-06	4.0E-04	1.3E-01	7.6E+00					1.5E+00
INORG	Arsenic	7440-38-2	A	1.0E+00	3.0E-04	7.2E-01	1.4E+00	2.0E-06	3.0E-04	1.7E-01	5.7E+00					1.1E+00
INORG	Barium	7440-39-3	D	1.0E+00	7.0E-02	3.1E-03	3.2E+02	2.0E-06	7.0E-02	7.5E-04	1.3E+03					2.6E+02
INORG	Beryllium	7440-41-7	B1	1.0E+00	2.0E-03	1.1E-01	9.2E+00	2.0E-06	2.0E-03	2.6E-02	3.8E+01		2.0E-05			7.4E+00
INORG	Cadmium	7440-43-9	B1	1.0E+00	1.0E-03	2.2E-01	4.6E+00	2.0E-06	1.0E-03	5.2E-02	1.9E+01					3.7E+00

Table G-4b: Non-Cancer Risk-Based Criteria Calculations - Hypothetical Residential Non-Potable Exposure Scenarios (Kiddie Pool)
Vernay Laboratories Inc., Yellow Springs, Ohio

				Pathway	Incidental Ingestion in Wading Pool			Dermal Contact in Wading Pool				Vapor Inhalation in Wading Pool				
					Intake:	2.2E-04		Intake:	2.62E+01			Intake:	7.3E-03			Target HI
Analyte Group	Chemical	CASRN	Carc Group	C_{gw} (mg/L)	RfD_{oral} (mg/kg/d)	HQ	RBC (mg/L)	DA (L/cm^2-event)	RfD_{derm} (mg/kg/d)	HQ	RBC (mg/L)	C_{air} (mg/m^3)	RfC (mg/m^3)	HQ	RBC (mg/L)	RBC (mg/L)
INORG	Calcium	7440-70-2		1.0E+00												
INORG	Chromium (total)	7440-47-3		1.0E+00	3.0E-03	7.2E-02	1.4E+01	2.0E-06	3.0E-03	1.7E-02	5.7E+01		1.0E-04			1.1E+01
INORG	Chromium III	16065-83-1	D	1.0E+00	1.5E+00	1.4E-04	6.9E+03	2.0E-06	1.5E+00	3.5E-05	2.9E+04					5.6E+03
INORG	Chromium VI	18540-29-9	A	1.0E+00	3.0E-03	7.2E-02	1.4E+01	4.0E-06	3.0E-03	3.5E-02	2.9E+01		1.0E-04			9.3E+00
INORG	Cobalt	7440-48-4	B1	1.0E+00	2.0E-02	1.1E-02	9.2E+01	8.0E-07	2.0E-02	1.0E-03	9.5E+02		2.0E-05			8.4E+01
INORG	Copper	7440-50-8	D	1.0E+00	4.0E-02	5.4E-03	1.8E+02	2.0E-06	4.0E-02	1.3E-03	7.6E+02					1.5E+02
INORG	Cyanide (total)	57-12-5	D	1.0E+00	2.0E-02	1.1E-02	9.2E+01	2.0E-06	2.0E-02	2.6E-03	3.8E+02					7.4E+01
INORG	Iron	7439-89-6	D	1.0E+00	3.0E-01	7.2E-04	1.4E+03	2.0E-06	3.0E-01	1.7E-04	5.7E+03					1.1E+03
INORG	Lead	7439-92-1	B2	1.0E+00				2.0E-06								
INORG	Magnesium	7439-95-4		1.0E+00	9.7E+00	2.2E-05	4.5E+04	2.0E-06	9.7E+00	5.4E-06	1.8E+05					3.6E+04
INORG	Manganese	7439-96-5	D	1.0E+00	1.4E-01	1.6E-03	6.4E+02	2.0E-06	1.4E-01	3.7E-04	2.7E+03		5.0E-05			5.2E+02
INORG	Mercury	7439-97-6	D	1.0E+00	3.0E-04	3.1E-01	3.2E+00	2.0E-06	3.0E-04	6.7E-09	1.5E+08	6.4E-03	3.0E-04	6.7E-02	1.5E+01	2.7E+00
INORG	Nickel	7440-02-0	A	1.0E+00	2.0E-02	1.1E-02	9.2E+01	4.0E-07	2.0E-02	5.2E-04	1.9E+03					8.8E+01
INORG	Potassium	7440-09-7		1.0E+00				4.0E-06								
INORG	Selenium	7782-49-2	D	1.0E+00	5.0E-03	4.3E-02	2.3E+01	2.0E-06	5.0E-03	1.0E-02	9.5E+01					1.9E+01
INORG	Silver	7440-22-4	D	1.0E+00	5.0E-03	4.3E-02	2.3E+01	1.2E-06	5.0E-03	6.3E-03	1.6E+02		1.0E-05			2.0E+01
INORG	Sodium	7440-23-5		1.0E+00				2.0E-06								
INORG	Thallium	7440-28-0		1.0E+00	7.0E-05	3.1E+00	3.2E-01	2.0E-06	7.0E-05	7.5E-01	1.3E+00					2.6E-01
INORG	Vanadium	7440-62-2		1.0E+00	7.0E-03	3.1E-02	3.2E+01	2.0E-06	7.0E-03	7.5E-03	1.3E+02					2.6E+01
INORG	Zinc	7440-66-6	D	1.0E+00	3.0E-01	7.2E-04	1.4E+03	1.2E-06	3.0E-01	1.0E-04	9.5E+03					1.2E+03

Table G-5: Risk-Based Criteria for Nonpotable Groundwater Use
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Off Facility Kiddie Pool Groundwater Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Non-Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Criteria (mg/L)
VOC	Acetone	67-64-1		9.4E+03	9.4E+03
VOC	Benzene	71-43-2	9.7E-01	4.8E+01	9.7E-01
VOC	Bromochloromethane	74-97-5			
VOC	Bromodichloromethane	75-27-4	1.5E+00	2.5E+02	1.5E+00
VOC	Bromoform	75-25-2	1.3E+01	2.3E+02	1.3E+01
VOC	Bromomethane	74-83-9		1.7E+01	1.7E+01
VOC	2-Butanone	78-93-3		6.1E+03	6.1E+03
VOC	Carbon Disulfide	75-15-0		1.2E+03	1.2E+03
VOC	Carbon Tetrachloride	56-23-5	3.1E-01	8.4E+00	3.1E-01
VOC	Chlorobenzene	108-90-7		2.2E+02	2.2E+02
VOC	Chloroethane	75-00-3	3.7E+01	1.8E+03	3.7E+01
VOC	Chloroform	67-66-3	5.5E+01	1.2E+02	5.5E+01
VOC	Chloromethane	74-87-3		4.5E+03	4.5E+03
VOC	Cumene	98-82-8		4.6E+02	4.6E+02
VOC	Cyclohexane	110-82-7		3.2E+05	3.2E+05
VOC	1,2-Dibromo-3-chloropropane	96-12-8	1.8E-01	1.0E+01	1.8E-01
VOC	Dibromochloromethane	124-48-1	1.2E+00	2.4E+02	1.2E+00
VOC	1,2-Dibromoethane	106-93-4	1.5E-03		1.5E-03
VOC	1,2-Dichlorobenzene	95-50-1		8.3E+02	8.3E+02
VOC	1,3-Dichlorobenzene	541-73-1		4.1E+02	4.1E+02
VOC	1,4-Dichlorobenzene	106-46-7	6.1E-01	3.4E+02	6.1E-01
VOC	Dichlorodifluoromethane	75-71-8		1.7E+03	1.7E+03
VOC	1,1-Dichloroethane	75-34-3		1.2E+03	1.2E+03
VOC	1,2-Dichloroethane	107-06-2	1.3E+00	1.6E+02	1.3E+00
VOC	1,1-Dichloroethene	75-35-4		5.9E+02	5.9E+02
VOC	1,2-Dichloroethene (total)	540-59-0		1.2E+02	1.2E+02
VOC	cis-1,2-Dichloroethene	156-59-2		1.3E+02	1.3E+02
VOC	trans-1,2-Dichloroethene	156-60-5		2.6E+02	2.6E+02
VOC	1,2-Dichloropropane	78-87-5	1.2E+00	2.1E+02	1.2E+00
VOC	1,3-Dichloropropene (total)	542-75-6	7.8E-01	2.8E+02	7.8E-01
VOC	cis-1,3-Dichloropropene	10061-01-5	2.7E+00	2.6E+02	2.7E+00
VOC	trans-1,3-Dichloropropene	10061-02-6			
VOC	Ethyl Benzene	100-41-4		1.1E+03	1.1E+03
VOC	2-Hexanone	591-78-6		7.0E+03	7.0E+03
VOC	Methyl Acetate	79-20-9		4.6E+03	4.6E+03
VOC	Methyl tert-butyl ether	1634-04-4	8.9E+01	1.6E+05	8.9E+01
VOC	4-Methyl-2-pentanone	108-10-1		1.5E+05	1.5E+05
VOC	Methylcyclohexane	108-87-2			
VOC	Methylene Chloride	75-09-2	1.9E+01	7.8E+02	1.9E+01
VOC	Styrene	100-42-5		1.5E+03	1.5E+03
VOC	1,1,2,2-Tetrachloroethane	79-34-5	3.1E-01	6.6E+02	3.1E-01
VOC	Tetrachloroethene	127-18-4	9.0E-01	1.2E+02	9.0E-01
VOC	Toluene	108-88-3		2.1E+03	2.1E+03
VOC	1,2,4-Trichlorobenzene	120-82-1		1.1E+02	1.1E+02
VOC	1,1,1-Trichloroethane	71-55-6		2.4E+03	2.4E+03
VOC	1,1,2-Trichloroethane	79-00-5	1.4E+00	4.7E+01	1.4E+00
VOC	Trichloroethene	79-01-6	3.3E+00	7.3E+01	3.3E+00
VOC	Trichlorofluoromethane	75-69-4		2.4E+03	2.4E+03
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		2.9E+05	2.9E+05
VOC	Vinyl Chloride	75-01-4	7.3E-02	4.0E+01	7.3E-02
VOC	Xylenes (total)	1330-20-7		1.6E+03	1.6E+03
SVOC	Acenaphthene	83-32-9		6.2E+02	6.2E+02
SVOC	Acenaphthylene	208-96-8		3.0E+02	3.0E+02
SVOC	Acetophenone	98-86-2		7.0E+02	7.0E+02
SVOC	Anthracene	120-12-7		2.7E+03	2.7E+03

Table G-5: Risk-Based Criteria for Nonpotable Groundwater Use
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Off Facility Kiddie Pool Groundwater Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Non-Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Criteria (mg/L)
SVOC	Atrazine	1912-24-9	4.8E-01	1.6E+02	4.8E-01
SVOC	Benzaldehyde	100-52-7		4.6E+02	4.6E+02
SVOC	Benzo(a)anthracene	56-55-3	5.3E-04		5.3E-04
SVOC	Benzo(a)pyrene	50-32-8	3.0E-05		3.0E-05
SVOC	Benzo(b)fluoranthene	205-99-2	4.8E-04		4.8E-04
SVOC	Benzo(g,h,i)perylene	191-24-2		1.4E+02	1.4E+02
SVOC	Benzo(k)fluoranthene	207-08-9	1.5E+00		1.5E+00
SVOC	Biphenyl	92-52-4		1.2E+03	1.2E+03
SVOC	bis(2-Chloroethoxy)methane	111-91-1			
SVOC	bis(2-Chloroethyl) ether	111-44-4	9.7E-02		9.7E-02
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	7.5E-03	6.6E+01	7.5E-03
SVOC	4-Bromophenyl-phenyl ether	101-55-3			
SVOC	Butylbenzylphthalate	85-68-7		9.5E+02	9.5E+02
SVOC	Caprolactam	105-60-2		2.3E+03	2.3E+03
SVOC	Carbazole	86-74-8	5.4E+00		5.4E+00
SVOC	4-Chloro-3-methylphenol	59-50-7			
SVOC	4-Chloroaniline	106-47-8		1.9E+01	1.9E+01
SVOC	2-Chloronaphthalene	91-58-7		3.7E+02	3.7E+02
SVOC	2-Chlorophenol	95-57-8		5.9E+01	5.9E+01
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3			
SVOC	Chrysene	218-01-9	8.9E-02		8.9E-02
SVOC	Dibenz(a,h)anthracene	53-70-3	2.7E-05		2.7E-05
SVOC	Dibenzofuran	132-64-9		1.2E+01	1.2E+01
SVOC	3,3'-Dichlorobenzidine	91-94-1	2.2E-02		2.2E-02
SVOC	2,4-Dichlorophenol	120-83-2		1.5E+01	1.5E+01
SVOC	Diethylphthalate	84-66-2		1.4E+03	1.4E+03
SVOC	2,4-Dimethylphenol	105-67-9		1.0E+02	1.0E+02
SVOC	Dimethylphthalate	131-11-3			
SVOC	Di-n-butylphthalate	84-74-2		3.3E+02	3.3E+02
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		4.7E-01	4.7E-01
SVOC	2,4-Dinitrophenol	51-28-5		9.4E+00	9.4E+00
SVOC	2,4-Dinitrotoluene	121-14-2	6.2E-02	9.3E+00	6.2E-02
SVOC	2,6-Dinitrotoluene	606-20-2	7.1E-02	4.7E+00	7.1E-02
SVOC	Di-n-octylphthalate	117-84-0		1.5E+02	1.5E+02
SVOC	Fluoranthene	206-44-0		2.1E+02	2.1E+02
SVOC	Fluorene	86-73-7		3.7E+02	3.7E+02
SVOC	Hexachlorobenzene	118-74-1	5.7E-04	8.4E+00	5.7E-04
SVOC	Hexachlorobutadiene	87-68-3	5.2E-02	2.2E+00	5.2E-02
SVOC	Hexachlorocyclopentadiene	77-47-4		8.9E+00	8.9E+00
SVOC	Hexachloroethane	67-72-1	7.5E-01	1.1E+01	7.5E-01
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	2.8E-04		2.8E-04
SVOC	Isophorone	78-59-1	6.3E+01	1.2E+03	6.3E+01
SVOC	2-Methylnaphthalene	91-57-6		3.5E+01	3.5E+01
SVOC	2-Methylphenol	95-48-7		2.5E+02	2.5E+02
SVOC	4-Methylphenol	106-44-5		2.4E+01	2.4E+01
SVOC	Naphthalene	91-20-3		9.0E+01	9.0E+01
SVOC	2-Nitroaniline	88-74-4			
SVOC	3-Nitroaniline	99-09-2	5.1E+00	1.4E+00	1.4E+00
SVOC	4-Nitroaniline	100-01-6	5.1E+00	1.4E+01	5.1E+00
SVOC	Nitrobenzene	98-95-3		4.0E+00	4.0E+00
SVOC	2-Nitrophenol	88-75-5			
SVOC	4-Nitrophenol	100-02-7		3.7E+01	3.7E+01
SVOC	N-Nitrosodiphenylamine	86-30-6	2.8E+00	1.1E+02	2.8E+00
SVOC	N-Nitroso-di-n-propylamine	621-64-7	8.9E-03		8.9E-03
SVOC	N-Nitrosomorpholine	59-89-2			

Table G-5: Risk-Based Criteria for Nonpotable Groundwater Use
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Off Facility Kiddie Pool Groundwater Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Non-Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Criteria (mg/L)
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	1.5E+00	1.8E+02	1.5E+00
SVOC	Pentachlorophenol	87-86-5	1.0E-02	1.3E+02	1.0E-02
SVOC	Phenanthrene	85-01-8		1.4E+02	1.4E+02
SVOC	Phenol	108-95-2		1.3E+03	1.3E+03
SVOC	Pyrene	129-00-0		1.8E+02	1.8E+02
SVOC	2,4,5-Trichlorophenol	95-95-4		5.3E+02	5.3E+02
SVOC	2,4,6-Trichlorophenol	88-06-2	6.2E-01	5.8E-01	5.8E-01
P/PCB	PCBs (total)	1336-36-3	5.7E-04	2.5E-01	5.7E-04
P/PCB	Aroclor-1016	12674-11-2	1.5E+00	3.2E-01	3.2E-01
P/PCB	Aroclor-1221	11104-28-2	5.4E-02		5.4E-02
P/PCB	Aroclor-1232	11141-16-5	5.4E-02		5.4E-02
P/PCB	Aroclor-1242	53469-21-9	5.4E-02		5.4E-02
P/PCB	Aroclor-1248	12672-29-6	5.4E-02		5.4E-02
P/PCB	Aroclor-1254	11097-69-1	5.4E-02	9.2E-02	5.4E-02
P/PCB	Aroclor-1260	11096-82-5	5.4E-02		5.4E-02
P/PCB	Aldrin	309-00-2	2.7E-05	2.6E-01	2.7E-05
P/PCB	alpha-BHC	319-84-6	2.0E-02	2.8E+00	2.0E-02
P/PCB	beta-BHC	319-85-7	6.1E-02	9.4E-01	6.1E-02
P/PCB	delta-BHC	319-86-8			
P/PCB	gamma-BHC	58-89-9	9.7E-03	1.7E+00	9.7E-03
P/PCB	Chlordane	57-74-9	2.6E-03	3.2E+00	2.6E-03
P/PCB	alpha-Chlordane	5103-71-9	3.1E-01	2.3E+00	3.1E-01
P/PCB	gamma-Chlordane	5103-74-2	3.1E-01	2.3E+00	3.1E-01
P/PCB	4,4'-DDD	72-54-8	1.8E-03	1.5E+01	1.8E-03
P/PCB	4,4'-DDE	72-55-9	5.9E-04	4.4E+00	5.9E-04
P/PCB	4,4'-DDT	50-29-3	1.0E-03	2.7E+00	1.0E-03
P/PCB	Dieldrin	60-57-1	1.4E-04	2.9E-01	1.4E-04
P/PCB	Endosulfan I	959-98-8		2.8E+01	2.8E+01
P/PCB	Endosulfan II	33213-65-9		2.8E+01	2.8E+01
P/PCB	Endosulfan sulfate	1031-07-8		2.8E+01	2.8E+01
P/PCB	Endrin	72-20-8		1.6E+00	1.6E+00
P/PCB	Endrin aldehyde	7421-93-4		1.4E+00	1.4E+00
P/PCB	Endrin ketone	53494-70-5			
P/PCB	Heptachlor	76-44-8	2.2E-04	5.1E+00	2.2E-04
P/PCB	Heptachlor epoxide	1024-57-3	1.4E-02	7.0E-02	1.4E-02
P/PCB	Methoxychlor	72-43-5		3.0E+01	3.0E+01
P/PCB	Toxaphene	8001-35-2	1.8E-03		1.8E-03
INORG	Aluminum	7429-90-5		3.7E+03	3.7E+03
INORG	Antimony	7440-36-0		1.5E+00	1.5E+00
INORG	Arsenic	7440-38-2	5.8E-02	1.1E+00	5.8E-02
INORG	Barium	7440-39-3		2.6E+02	2.6E+02
INORG	Beryllium	7440-41-7		7.4E+00	7.4E+00
INORG	Cadmium	7440-43-9		3.7E+00	3.7E+00
INORG	Calcium	7440-70-2			
INORG	Chromium (total)	7440-47-3		1.1E+01	1.1E+01
INORG	Chromium III	16065-83-1		5.6E+03	5.6E+03
INORG	Chromium VI	18540-29-9		9.3E+00	9.3E+00
INORG	Cobalt	7440-48-4		8.4E+01	8.4E+01
INORG	Copper	7440-50-8		1.5E+02	1.5E+02
INORG	Cyanide (total)	57-12-5		7.4E+01	7.4E+01
INORG	Iron	7439-89-6		1.1E+03	1.1E+03
INORG	Lead	7439-92-1			
INORG	Magnesium	7439-95-4		3.6E+04	3.6E+04
INORG	Manganese	7439-96-5		5.2E+02	5.2E+02
INORG	Mercury	7439-97-6		2.7E+00	2.7E+00

Table G-5: Risk-Based Criteria for Nonpotable Groundwater Use
Vernay Laboratories Inc., Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Off Facility Kiddie Pool Groundwater Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Non-Cancer (mg/L)	Off-Facility Kiddie Pool Groundwater Criteria (mg/L)
INORG	Nickel	7440-02-0		8.8E+01	8.8E+01
INORG	Potassium	7440-09-7			
INORG	Selenium	7782-49-2		1.9E+01	1.9E+01
INORG	Silver	7440-22-4		2.0E+01	2.0E+01
INORG	Sodium	7440-23-5			
INORG	Thallium	7440-28-0		2.6E-01	2.6E-01
INORG	Vanadium	7440-62-2		2.6E+01	2.6E+01
INORG	Zinc	7440-66-6		1.2E+03	1.2E+03
Notes:					
1	Criteria are calculated with a target cancer risk level of 1E-5 and an HQ of 1.				

APPENDIX H

Methodology for Evaluating Current Human Health Risk Associated with Potential Utility Excavation Worker Direct Contact with Subsurface Water

APPENDIX H

Methodology for Evaluating Current Human Health Risk Associated with Potential Utility Excavation Worker Direct Contact with Subsurface Water

Potential exposures of utility excavation workers to constituents detected in subsurface water are evaluated using conservative risk-based screening criteria. The derivation of these criteria for assessing utility excavation worker exposures via incidental ingestion, dermal contact and inhalation of vapors during excavations that extend to saturated sand seams in the Unconsolidated Unit, sewer backfill water, and storm sewer water is presented in this Appendix.

The cancer risk and HQ estimates for the ingestion and dermal routes are calculated as follows:

$$RBC = \frac{TR}{LADD^* \cdot SF}$$

$$RBC = \frac{THQ \cdot RfD}{ADD^*}$$

The target risk and HQ are 10^{-5} and 1, respectively. The *LADD** and *ADD** are calculated using the exposure factors presented in Table H-1.

The risk-based criteria for the inhalation route are calculated as follows:

$$RBC = \frac{TR \cdot AT}{URF \cdot ET \cdot EF \cdot ED}\left(J \cdot C / Q\right)^{-1}$$

$$RBC = \frac{THQ \cdot RfC \cdot AT}{ET \cdot EF \cdot ED}\left(J \cdot C / Q\right)^{-1}$$

where the product *J·C/Q* is an air concentration that is normalized to unit concentration in ground water. The *J* term is a normalized vapor flux, and the *C/Q* term is a normalized air concentration.

The normalized vapor flux J of a chemical is estimated using an overall mass transfer coefficient that is recommended by USEPA (1995c):

$$K_L = \left(\frac{1}{k_l} + \frac{1}{H\,k_g} \right)^{-1} \left(\frac{m}{10^2\,cm} \right) \left(\frac{10^3\,L}{m^3} \right)$$

where H is the Henry's law constant, and k_l and k_g are the liquid-phase and gas-phase mass transfer coefficients (in cm/s) given by the following:

$$k_l = \left(\frac{MW_o}{MW} \right)^{0.5} \left(\frac{T}{298°K} \right) k_{l,o}$$

$$k_g = \left(\frac{MW_w}{MW} \right)^{0.335} \left(\frac{T}{298°K} \right)^{1.005} k_{g,w}$$

where MW, MW_o, and MW_w are the molecular weights of the chemical, oxygen, and water, T is the water's absolute temperature, $k_{l,o}$ is the liquid-phase mass transfer coefficient for oxygen (0.002 cm/s), and $k_{g,w}$ is the gas-phase mass transfer coefficient for water vapor (0.833 cm/s).

The C/Q term is a normalized air concentration estimated using SCREEN3 (USEPA 1995b) for a 15-foot by 15-foot excavation pit. The SCREEN3 area-source algorithm is used with worst-case meteorological conditions selected by the model to estimate a maximum 1-hour air concentration at ground level. The maximum 1-hour air concentration is converted to a maximum 24-hour air concentration using a conservative factor of 0.4, because workers are conservatively assumed to have inhalation exposure over the entire work day while working around the excavation area. This air concentration is expected to be higher than actual air concentrations to which workers would be exposed during excavation activities.

The model parameters and the values used in the evaluation are summarized in Table H-2.

The criterion associated with potential exposure to a carcinogenic chemical, via dermal contact, is estimated based on the target cancer risk of 10^{-5} and the dermal cancer slope factor (SF) for the chemical. The criterion associated with potential exposure to a carcinogenic chemical, via inhalation, is estimated based on the target cancer risk of 10^{-5} and the unit risk factor (URF) for the chemical. The criterion associated with potential exposure to a carcinogenic chemical, via incidental ingestion, is estimated based on the target cancer risk of 10^{-5} and the oral

cancer slope factor (SF) for the chemical. The URFs and RfCs for chemicals evaluated are presented in Table H-3.

The criterion associated with potential exposure to a noncarcinogenic chemical, via dermal contact, is estimated based on the target hazard quotient (HQ) of 1 and the dermal reference dose (RfD) for the chemical. The criterion associated with potential exposure to a noncarcinogenic chemical, via incidental ingestion, is estimated based on the target hazard quotient (HQ) of 1 and the oral reference dose (RfD) for the chemical. The criterion associated with potential exposure to a noncarcinogenic chemical, via inhalation, is estimated based on the target hazard quotient (HQ) of 1 and the reference concentration (RfC) for the chemical. The RfDs and RfCs for chemicals evaluated are presented on Table H-3.

The risk-based criteria for each route of exposure are then combined to give criteria that are based on the combination of all three routes, as follows:

$$RBC = \left(\sum_i RBC_i^{-1} \right)^{-1}$$

The cancer risk and HQ are estimated using these RBC in the following equations:

$$Risk = \frac{C}{RBC} \cdot TR$$

$$HQ = \frac{C}{RBC} \cdot THQ$$

The calculation of the cancer and non-cancer risk based criteria for each exposure route are shown on Tables H-4a and H-4b of this Appendix. The resulting combined risk based criteria are shown on Table H-5 of this Appendix.

Table H-1: High-End Exposure Factors
Vernay Laboratories, Inc. Yellow Springs, Ohio

		Excavation Workers
Ambient Air Inhalation - Vapor from Ground Water		
Fraction Contacted (unitless)	FC	1.0
Exposure Time (h exposed/h in a day)	ET	1.00
Exposure Frequency (d/yr)	EF	5
Exposure Duration (yr)	ED	10
Averaging Time, carc (d)	AT_c	25,550
Averaging Time, noncarc (d)	AT_{nc}	3,650
Incidental Groundwater Ingestion		
Drinking Rate (L/hr per event)	DR	0.005
Exposure Time (h)	ET	8
Exposure Frequency (d/yr)	EF	5
Expoure Duration (yr)	ED	10
Body Weight (kg-bw)	BW	70
Averaging Time, canc (d)	AT_c	25,550
Averaging Time, noncanc (d)	AT_{nc}	3,650
Groundwater Dermal Contact		
Event Time (hr)	t	2
Skin Surface Area (cm^2)	SA	3,300
Events per Day (event/d)	EV	4
Exposure Frequency (d/yr)	EF	5
Expoure Duration (yr)	ED	10
Body Weight (kg)	BW	70
Averaging Time, cancer (days)	AT_c	25550
Averaging Time, noncancer (days)	AT_{nc}	3650

Table H-2: Vapor Flux (mg/m^2-s per mg/L) from Exposed Groundwater in Excavation to Ambient Air
Vernay Laboratories, Inc. Yellow Springs, Ohio

Analyte Group	Substance	CASRN	H (unitless)	MW g/mol	k_G cm/s	k_L cm/s	K_L cm/s	J_L (L/m^2-s)
VOC	Acetone	67-64-1	1.6E-03	5.8E+01	5.38E-01	1.42E-03	5.34E-04	5.34E-03
VOC	Benzene	71-43-2	2.3E-01	7.8E+01	4.87E-01	1.22E-03	1.21E-03	1.21E-02
VOC	Bromochloromethane	74-97-5	5.9E-02	1.3E+02	4.11E-01	9.51E-04	9.15E-04	9.15E-03
VOC	Bromodichloromethane	75-27-4	6.6E-02	1.6E+02	3.80E-01	8.45E-04	8.18E-04	8.18E-03
VOC	Bromoform	75-25-2	2.2E-02	2.5E+02	3.29E-01	6.81E-04	6.22E-04	6.22E-03
VOC	Bromomethane	74-83-9	2.6E-01	9.5E+01	4.56E-01	1.11E-03	1.10E-03	1.10E-02
VOC	2-Butanone	78-93-3	2.3E-03	7.2E+01	5.00E-01	1.27E-03	6.03E-04	6.03E-03
VOC	Carbon Disulfide	75-15-0	1.2E+00	7.6E+01	4.91E-01	1.24E-03	1.24E-03	1.24E-02
VOC	Carbon Tetrachloride	56-23-5	1.3E+00	1.5E+02	3.88E-01	8.72E-04	8.71E-04	8.71E-03
VOC	Chlorobenzene	108-90-7	1.5E-01	1.1E+02	4.31E-01	1.02E-03	1.00E-03	1.00E-02
VOC	Chloroethane	75-00-3	3.6E-01	6.5E+01	5.19E-01	1.35E-03	1.34E-03	1.34E-02
VOC	Chloroform	67-66-3	1.5E-01	1.2E+02	4.23E-01	9.90E-04	9.75E-04	9.75E-03
VOC	Chloromethane	74-87-3	3.6E-01	5.0E+01	5.64E-01	1.52E-03	1.51E-03	1.51E-02
VOC	Cumene	98-82-8	4.7E+01	1.2E+02	4.22E-01	9.87E-04	9.87E-04	9.87E-03
VOC	Cyclohexane	110-82-7	8.0E+00	8.4E+01	4.75E-01	1.18E-03	1.18E-03	1.18E-02
VOC	1,2-Dibromo-3-chloropropane	96-12-8	6.0E-03	2.4E+02	3.36E-01	7.04E-04	5.22E-04	5.22E-03
VOC	Dibromochloromethane	124-48-1	3.2E-02	2.1E+02	3.51E-01	7.50E-04	7.03E-04	7.03E-03
VOC	1,2-Dibromoethane	106-93-4	3.0E-02	1.9E+02	3.63E-01	7.89E-04	7.37E-04	7.37E-03
VOC	1,2-Dichlorobenzene	95-50-1	7.8E-02	1.5E+02	3.94E-01	8.92E-04	8.67E-04	8.67E-03
VOC	1,3-Dichlorobenzene	541-73-1	1.3E-01	1.5E+02	3.94E-01	8.92E-04	8.77E-04	8.77E-03
VOC	1,4-Dichlorobenzene	106-46-7	1.0E-01	1.5E+02	3.94E-01	8.92E-04	8.73E-04	8.73E-03
VOC	Dichlorodifluoromethane	75-71-8	1.4E+01	1.2E+02	4.21E-01	9.84E-04	9.84E-04	9.84E-03
VOC	1,1-Dichloroethane	75-34-3	2.3E-01	9.9E+01	4.50E-01	1.09E-03	1.08E-03	1.08E-02
VOC	1,2-Dichloroethane	107-06-2	4.0E-02	9.9E+01	4.50E-01	1.09E-03	1.03E-03	1.03E-02
VOC	1,1-Dichloroethene	75-35-4	1.1E+00	9.7E+01	4.53E-01	1.10E-03	1.10E-03	1.10E-02
VOC	1,2-Dichloroethene (total)	540-59-0	3.9E-01	9.7E+01	4.53E-01	1.10E-03	1.09E-03	1.09E-02
VOC	cis-1,2-Dichloroethene	156-59-2	1.7E-01	9.7E+01	4.53E-01	1.10E-03	1.08E-03	1.08E-02
VOC	trans-1,2-Dichloroethene	156-60-5	3.9E-01	9.7E+01	4.53E-01	1.10E-03	1.09E-03	1.09E-02
VOC	1,2-Dichloropropane	78-87-5	1.2E-01	1.1E+02	4.30E-01	1.02E-03	9.97E-04	9.97E-03
VOC	1,3-Dichloropropene (total)	542-75-6	7.3E-01	1.1E+02	4.33E-01	1.03E-03	1.02E-03	1.02E-02
VOC	cis-1,3-Dichloropropene	10061-01-5	1.5E-01	1.1E+02	4.33E-01	1.03E-03	1.01E-03	1.01E-02
VOC	trans-1,3-Dichloropropene	10061-02-6	6.5E-02	1.1E+02	4.33E-01	1.03E-03	9.91E-04	9.91E-03
VOC	Ethyl Benzene	100-41-4	3.2E-01	1.1E+02	4.40E-01	1.05E-03	1.04E-03	1.04E-02
VOC	2-Hexanone	591-78-6	7.2E-02	1.0E+02	4.48E-01	1.08E-03	1.05E-03	1.05E-02
VOC	Methyl Acetate	79-20-9		7.4E+01	4.96E-01	1.26E-03		
VOC	Methyl tert-butyl ether	1634-04-4	5.5E-02	8.8E+01	4.68E-01	1.15E-03	1.10E-03	1.10E-02
VOC	4-Methyl-2-pentanone	108-10-1	5.6E-03	1.0E+02	4.48E-01	1.08E-03	7.57E-04	7.57E-03
VOC	Methylcyclohexane	108-87-2		9.8E+01	4.51E-01	1.09E-03		
VOC	Methylene Chloride	75-09-2	9.0E-02	8.5E+01	4.74E-01	1.17E-03	1.14E-03	1.14E-02
VOC	Styrene	100-42-5	1.1E-01	1.0E+02	4.42E-01	1.06E-03	1.04E-03	1.04E-02
VOC	1,1,2,2-Tetrachloroethane	79-34-5	1.4E-02	1.7E+02	3.77E-01	8.35E-04	7.22E-04	7.22E-03
VOC	Tetrachloroethene	127-18-4	7.5E-01	1.7E+02	3.79E-01	8.40E-04	8.38E-04	8.38E-03
VOC	Toluene	108-88-3	2.7E-01	9.2E+01	4.61E-01	1.13E-03	1.12E-03	1.12E-02
VOC	1,2,4-Trichlorobenzene	120-82-1	5.8E-02	1.8E+02	3.67E-01	8.03E-04	7.74E-04	7.74E-03
VOC	1,1,1-Trichloroethane	71-55-6	7.1E-01	1.3E+02	4.07E-01	9.37E-04	9.34E-04	9.34E-03
VOC	1,1,2-Trichloroethane	79-00-5	3.7E-02	1.3E+02	4.07E-01	9.37E-04	8.83E-04	8.83E-03
VOC	Trichloroethene	79-01-6	4.2E-01	1.3E+02	4.09E-01	9.44E-04	9.39E-04	9.39E-03
VOC	Trichlorofluoromethane	75-69-4	4.0E+00	1.4E+02	4.03E-01	9.23E-04	9.23E-04	9.23E-03
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	2.0E+01	1.9E+02	3.63E-01	7.90E-04	7.90E-04	7.90E-03
VOC	Vinyl Chloride	75-01-4	1.1E+00	6.3E+01	5.25E-01	1.37E-03	1.37E-03	1.37E-02
VOC	Xylenes (total)	1330-20-7	2.8E-01	1.1E+02	4.40E-01	1.05E-03	1.04E-03	1.04E-02
SVOC	Acenaphthene	83-32-9	6.4E-03	1.5E+02	3.88E-01	8.71E-04	6.44E-04	6.44E-03
SVOC	Acenaphthylene	208-96-8	4.6E-03	1.5E+02	3.90E-01	8.77E-04	5.90E-04	5.90E-03
SVOC	Acetophenone	98-86-2	4.4E-04	1.2E+02	4.22E-01	9.87E-04	1.55E-04	1.55E-03
SVOC	Anthracene	120-12-7	2.7E-03	1.8E+02	3.70E-01	8.10E-04	4.45E-04	4.45E-03

Table H-2: Vapor Flux (mg/m^2-s per mg/L) from Exposed Groundwater in Excavation to Ambient Air
Vernay Laboratories, Inc. Yellow Springs, Ohio

Analyte Group	Substance	CASRN	H (unitless)	MW g/mol	k_G cm/s	k_L cm/s	K_L cm/s	J_L (L/m^2-s)
SVOC	Atrazine	1912-24-9		2.2E+02	3.47E-01	7.37E-04		
SVOC	Benzaldehyde	100-52-7						
SVOC	Benzo(a)anthracene	56-55-3	1.4E-04	2.3E+02	3.40E-01	7.16E-04	4.37E-05	4.37E-04
SVOC	Benzo(a)pyrene	50-32-8	4.6E-05	2.5E+02	3.29E-01	6.81E-04	1.49E-05	1.49E-04
SVOC	Benzo(b)fluoranthene	205-99-2	4.6E-03	2.5E+02	3.29E-01	6.81E-04	4.68E-04	4.68E-03
SVOC	Benzo(g,h,i)perylene	191-24-2	5.8E-06	2.8E+02	3.19E-01	6.51E-04	1.83E-06	1.83E-05
SVOC	Benzo(k)fluoranthene	207-08-9	3.4E-05	2.5E+02	3.29E-01	6.81E-04	1.10E-05	1.10E-04
SVOC	Biphenyl	92-52-4	1.2E-02	1.5E+02	3.88E-01	8.71E-04	7.36E-04	7.36E-03
SVOC	bis(2-Chloroethoxy)methane	111-91-1	6.9E-06	1.7E+02	3.73E-01	8.23E-04	2.58E-06	2.58E-05
SVOC	bis(2-Chloroethyl) ether	111-44-4	7.4E-04	1.4E+02	3.98E-01	9.05E-04	2.22E-04	2.22E-03
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	4.2E-06	3.9E+02	2.84E-01	5.48E-04	1.18E-06	1.18E-05
SVOC	4-Bromophenyl-phenyl ether	101-55-3	4.8E-03	2.5E+02	3.30E-01	6.86E-04	4.78E-04	4.78E-03
SVOC	Butylbenzylphthalate	85-68-7	5.2E-05	3.1E+02	3.06E-01	6.12E-04	1.54E-05	1.54E-04
SVOC	Caprolactam	105-60-2						
SVOC	Carbazole	86-74-8	6.3E-07	1.7E+02	3.77E-01	8.37E-04	2.36E-07	2.36E-06
SVOC	4-Chloro-3-methylphenol	59-50-7	1.6E-05	1.4E+02	3.98E-01	9.06E-04	6.45E-06	6.45E-05
SVOC	4-Chloroaniline	106-47-8	1.4E-05	1.3E+02	4.13E-01	9.58E-04	5.59E-06	5.59E-05
SVOC	2-Chloronaphthalene	91-58-7	1.3E-02	1.6E+02	3.81E-01	8.48E-04	7.23E-04	7.23E-03
SVOC	2-Chlorophenol	95-57-8	1.6E-02	1.3E+02	4.12E-01	9.54E-04	8.34E-04	8.34E-03
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3	9.0E-03	2.0E+02	3.53E-01	7.56E-04	6.11E-04	6.11E-03
SVOC	Chrysene	218-01-9	3.9E-03	2.3E+02	3.40E-01	7.16E-04	4.64E-04	4.64E-03
SVOC	Dibenz(a,h)anthracene	53-70-3	6.0E-07	2.8E+02	3.18E-01	6.49E-04	1.92E-07	1.92E-06
SVOC	Dibenzofuran	132-64-9	5.1E-04	1.7E+02	3.77E-01	8.34E-04	1.57E-04	1.57E-03
SVOC	3,3'-Dichlorobenzidine	91-94-1	1.6E-07	2.5E+02	3.29E-01	6.80E-04	5.39E-08	5.39E-07
SVOC	2,4-Dichlorophenol	120-83-2	1.3E-04	1.6E+02	3.81E-01	8.48E-04	4.68E-05	4.68E-04
SVOC	Diethylphthalate	84-66-2	1.9E-05	2.2E+02	3.43E-01	7.26E-04	6.29E-06	6.29E-05
SVOC	2,4-Dimethylphenol	105-67-9	8.2E-05	1.2E+02	4.19E-01	9.79E-04	3.32E-05	3.32E-04
SVOC	Dimethylphthalate	131-11-3	4.3E-06	1.9E+02	3.59E-01	7.76E-04	1.54E-06	1.54E-05
SVOC	Di-n-butylphthalate	84-74-2	3.9E-08	2.8E+02	3.18E-01	6.49E-04	1.23E-08	1.23E-07
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	1.7E-05	2.0E+02	3.57E-01	7.69E-04	6.17E-06	6.17E-05
SVOC	2,4-Dinitrophenol	51-28-5	1.8E-05	1.8E+02	3.66E-01	7.97E-04	6.60E-06	6.60E-05
SVOC	2,4-Dinitrotoluene	121-14-2	3.8E-06	1.8E+02	3.67E-01	8.02E-04	1.39E-06	1.39E-05
SVOC	2,6-Dinitrotoluene	606-20-2	3.1E-05	1.8E+02	3.67E-01	8.02E-04	1.11E-05	1.11E-04
SVOC	Di-n-octylphthalate	117-84-0	2.7E-03	3.9E+02	2.84E-01	5.48E-04	3.21E-04	3.21E-03
SVOC	Fluoranthene	206-44-0	6.6E-04	2.0E+02	3.54E-01	7.61E-04	1.79E-04	1.79E-03
SVOC	Fluorene	86-73-7	2.6E-03	1.7E+02	3.78E-01	8.39E-04	4.54E-04	4.54E-03
SVOC	Hexachlorobenzene	118-74-1	5.4E-02	2.8E+02	3.16E-01	6.41E-04	6.18E-04	6.18E-03
SVOC	Hexachlorobutadiene	87-68-3	3.3E-01	2.6E+02	3.25E-01	6.70E-04	6.66E-04	6.66E-03
SVOC	Hexachlorocyclopentadiene	77-47-4	1.1E+00	2.7E+02	3.20E-01	6.55E-04	6.54E-04	6.54E-03
SVOC	Hexachloroethane	67-72-1	1.6E-01	2.4E+02	3.36E-01	7.03E-04	6.94E-04	6.94E-03
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	6.6E-05	2.8E+02	3.19E-01	6.51E-04	2.03E-05	2.03E-04
SVOC	Isophorone	78-59-1	2.7E-04	1.4E+02	4.02E-01	9.20E-04	9.78E-05	9.78E-04
SVOC	2-Methylnaphthalene	91-57-6	2.1E-02	1.4E+02	3.99E-01	9.07E-04	8.19E-04	8.19E-03
SVOC	2-Methylphenol	95-48-7	4.9E-05	1.1E+02	4.37E-01	1.04E-03	2.11E-05	2.11E-04
SVOC	4-Methylphenol	106-44-5	3.2E-05	1.1E+02	4.37E-01	1.04E-03	1.40E-05	1.40E-04
SVOC	Naphthalene	91-20-3	2.0E-02	1.3E+02	4.13E-01	9.56E-04	8.56E-04	8.56E-03
SVOC	2-Nitroaniline	88-74-4	4.0E-03	1.4E+02	4.02E-01	9.21E-04	5.84E-04	5.84E-03
SVOC	3-Nitroaniline	99-09-2	5.9E-06	1.4E+02	4.02E-01	9.21E-04	2.36E-06	2.36E-05
SVOC	4-Nitroaniline	100-01-6	8.5E-08	1.4E+02	4.02E-01	9.21E-04	3.40E-08	3.40E-07
SVOC	Nitrobenzene	98-95-3	9.8E-04	1.2E+02	4.18E-01	9.75E-04	2.89E-04	2.89E-03
SVOC	2-Nitrophenol	88-75-5	3.9E-04	1.4E+02	4.01E-01	9.17E-04	1.33E-04	1.33E-03
SVOC	4-Nitrophenol	100-02-7	1.7E-08	1.4E+02	4.01E-01	9.17E-04	6.81E-09	6.81E-08
SVOC	N-Nitrosodiphenylamine	86-30-6	2.1E-04	2.0E+02	3.57E-01	7.69E-04	6.67E-05	6.67E-04
SVOC	N-Nitroso-di-n-propylamine	621-64-7	9.2E-05	1.3E+02	4.10E-01	9.48E-04	3.64E-05	3.64E-04
SVOC	N-Nitrosomorpholine	59-89-2		1.2E+02	4.27E-01	1.00E-03		

Table H-2: Vapor Flux (mg/m^2-s per mg/L) from Exposed Groundwater in Excavation to Ambient Air
Vernay Laboratories, Inc. Yellow Springs, Ohio

Analyte Group	Substance	CASRN	H (unitless)	MW g/mol	k_G cm/s	k_L cm/s	K_L cm/s	J_L (L/m^2-s)
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	4.8E-03	1.7E+02	3.75E-01	8.27E-04	5.66E-04	5.66E-03
SVOC	Pentachlorophenol	87-86-5	1.0E-06	2.7E+02	3.23E-01	6.63E-04	3.23E-07	3.23E-06
SVOC	Phenanthrene	85-01-8	9.5E-04	1.8E+02	3.70E-01	8.10E-04	2.45E-04	2.45E-03
SVOC	Phenol	108-95-2	1.6E-05	9.4E+01	4.58E-01	1.12E-03	7.41E-06	7.41E-05
SVOC	Pyrene	129-00-0	4.5E-04	2.0E+02	3.54E-01	7.61E-04	1.32E-04	1.32E-03
SVOC	2,4,5-Trichlorophenol	95-95-4	1.8E-04	2.0E+02	3.57E-01	7.70E-04	5.87E-05	5.87E-04
SVOC	2,4,6-Trichlorophenol	88-06-2	3.2E-04	2.0E+02	3.57E-01	7.70E-04	9.92E-05	9.92E-04
P/PCB	PCBs (total)	1336-36-3	1.1E-01	3.3E+02	3.01E-01	5.97E-04	5.86E-04	5.86E-03
P/PCB	Aroclor-1016	12674-11-2	1.2E-02	2.6E+02	3.26E-01	6.74E-04	5.74E-04	5.74E-03
P/PCB	Aroclor-1221	11104-28-2	1.4E-01	2.0E+02	3.55E-01	7.64E-04	7.52E-04	7.52E-03
P/PCB	Aroclor-1232	11141-16-5		2.3E+02	3.38E-01	7.10E-04		
P/PCB	Aroclor-1242	53469-21-9	2.3E-02	2.7E+02	3.23E-01	6.63E-04	6.09E-04	6.09E-03
P/PCB	Aroclor-1248	12672-29-6	1.4E-01	3.0E+02	3.11E-01	6.25E-04	6.17E-04	6.17E-03
P/PCB	Aroclor-1254	11097-69-1	3.4E-01	3.3E+02	3.01E-01	5.97E-04	5.94E-04	5.94E-03
P/PCB	Aroclor-1260	11096-82-5	2.9E-01	3.8E+02	2.87E-01	5.57E-04	5.53E-04	5.53E-03
P/PCB	Aldrin	309-00-2	7.0E-03	3.6E+02	2.91E-01	5.66E-04	4.43E-04	4.43E-03
P/PCB	alpha-BHC	319-84-6	4.4E-04	2.9E+02	3.14E-01	6.34E-04	1.12E-04	1.12E-03
P/PCB	beta-BHC	319-85-7	3.1E-05	2.9E+02	3.14E-01	6.34E-04	9.42E-06	9.42E-05
P/PCB	delta-BHC	319-86-8	1.8E-05	2.9E+02	3.14E-01	6.34E-04	5.45E-06	5.45E-05
P/PCB	gamma-BHC	58-89-9	5.7E-04	2.9E+02	3.14E-01	6.34E-04	1.40E-04	1.40E-03
P/PCB	Chlordane	57-74-9	2.0E-03	4.1E+02	2.80E-01	5.35E-04	2.73E-04	2.73E-03
P/PCB	alpha-Chlordane	5103-71-9		4.1E+02	2.80E-01	5.34E-04		
P/PCB	gamma-Chlordane	5103-74-2		4.1E+02	2.80E-01	5.34E-04		
P/PCB	4,4'-DDD	72-54-8	1.6E-04	3.2E+02	3.04E-01	6.05E-04	4.60E-05	4.60E-04
P/PCB	4,4'-DDE	72-55-9	8.6E-04	3.2E+02	3.04E-01	6.07E-04	1.83E-04	1.83E-03
P/PCB	4,4'-DDT	50-29-3	3.3E-04	3.5E+02	2.93E-01	5.75E-04	8.33E-05	8.33E-04
P/PCB	Dieldrin	60-57-1	6.2E-04	3.8E+02	2.86E-01	5.54E-04	1.34E-04	1.34E-03
P/PCB	Endosulfan I	959-98-8	4.1E-03	4.1E+02	2.80E-01	5.36E-04	3.66E-04	3.66E-03
P/PCB	Endosulfan II	33213-65-9	7.8E-04	4.1E+02	2.80E-01	5.36E-04	1.55E-04	1.55E-03
P/PCB	Endosulfan sulfate	1031-07-8	8.4E-02	4.2E+02	2.77E-01	5.26E-04	5.14E-04	5.14E-03
P/PCB	Endrin	72-20-8	3.1E-04	3.8E+02	2.86E-01	5.54E-04	7.61E-05	7.61E-04
P/PCB	Endrin aldehyde	7421-93-4	1.6E-05	3.8E+02	2.86E-01	5.54E-04	4.48E-06	4.48E-05
P/PCB	Endrin ketone	53494-70-5						
P/PCB	Heptachlor	76-44-8	4.5E-02	3.7E+02	2.88E-01	5.60E-04	5.37E-04	5.37E-03
P/PCB	Heptachlor epoxide	1024-57-3	3.9E-04	3.9E+02	2.84E-01	5.48E-04	9.23E-05	9.23E-04
P/PCB	Methoxychlor	72-43-5	6.5E-04	3.5E+02	2.96E-01	5.82E-04	1.44E-04	1.44E-03
P/PCB	Toxaphene	8001-35-2	2.5E-04	4.1E+02	2.79E-01	5.32E-04	6.08E-05	6.08E-04
INORG	Aluminum	7429-90-5		2.7E+01	6.95E-01	2.08E-03		
INORG	Antimony	7440-36-0		1.2E+02	4.20E-01	9.81E-04		
INORG	Arsenic	7440-38-2		7.5E+01	4.94E-01	1.25E-03		
INORG	Barium	7440-39-3		1.4E+02	4.03E-01	9.23E-04		
INORG	Beryllium	7440-41-7		9.0E+00	1.00E+00	3.60E-03		
INORG	Cadmium	7440-43-9		1.1E+02	4.31E-01	1.02E-03		
INORG	Calcium	7440-70-2		4.0E+01	6.09E-01	1.71E-03		
INORG	Chromium (total)	7440-47-3		5.2E+01	5.58E-01	1.50E-03		
INORG	Chromium III	16065-83-1		5.2E+01	5.58E-01	1.50E-03		
INORG	Chromium VI	18540-29-9		5.2E+01	5.58E-01	1.50E-03		
INORG	Cobalt	7440-48-4		5.9E+01	5.35E-01	1.41E-03		
INORG	Copper	7440-50-8		6.4E+01	5.22E-01	1.36E-03		
INORG	Cyanide (total)	57-12-5		2.6E+01	7.04E-01	2.12E-03		
INORG	Iron	7439-89-6		5.6E+01	5.45E-01	1.45E-03		
INORG	Lead	7439-92-1		2.1E+02	3.51E-01	7.52E-04		
INORG	Magnesium	7439-95-4		2.4E+01	7.20E-01	2.19E-03		
INORG	Manganese	7439-96-5		5.5E+01	5.48E-01	1.46E-03		
INORG	Mercury	7439-97-6	2.9E-01	2.0E+02	3.55E-01	7.63E-04	7.58E-04	7.58E-03

Table H-2: Vapor Flux (mg/m^2-s per mg/L) from Exposed Groundwater in Excavation to Ambient Air
Vernay Laboratories, Inc. Yellow Springs, Ohio

Analyte Group	Substance	CASRN	H (unitless)	MW g/mol	k_G cm/s	k_L cm/s	K_L cm/s	J_L (L/m^2-s)
INORG	Nickel	7440-02-0		5.9E+01	5.36E-01	1.41E-03		
INORG	Potassium	7440-09-7		3.9E+01	6.14E-01	1.73E-03		
INORG	Selenium	7782-49-2		7.9E+01	4.85E-01	1.22E-03		
INORG	Silver	7440-22-4		1.1E+02	4.37E-01	1.04E-03		
INORG	Sodium	7440-23-5		2.3E+01	7.34E-01	2.26E-03		
INORG	Thallium	7440-28-0		2.0E+02	3.53E-01	7.57E-04		
INORG	Vanadium	7440-62-2		5.1E+01	5.62E-01	1.52E-03		
INORG	Zinc	7440-66-6		6.5E+01	5.17E-01	1.34E-03		
	molecular weight of oxygen	g/mol	**MW_{02}**	32				
	molecular weight of water	g/mol	**MW_{H20}**	18				
	absolute temperature	K	**T**	285				
	liquid-phase mass transfer coefficient for oxygen	cm/s	**$k_{L,02}$**	0.002				
	gas-phase mass transfer coefficient for water vapor at 25 C	cm/s	**$K_{G,H20}$**	0.833				

Table H-3: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Carc Class	SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)				RfC (mg/m^3)				Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
				Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	Value
VOC	Acetone	67-64-1	ID							9.0E-01	1,000	1							9.0E-01
VOC	Benzene	71-43-2	A	5.5E-02	1	68	7.8E-03	1	60	4.0E-03	300	1		3.0E-02	300	1			5.5E-02	4.0E-03
VOC	Bromochloromethane	74-97-5																		
VOC	Bromodichloromethane	75-27-4	B2	6.2E-02	1					2.0E-02	1,000	1							6.2E-02	2.0E-02
VOC	Bromoform	75-25-2	B2	7.9E-03	1		1.1E-03	1		2.0E-02	1,000	1				2	90		7.9E-03	2.0E-02
VOC	Bromomethane	74-83-9	D							1.4E-03	1,000	1		5.0E-03	100	1				1.4E-03
VOC	2-Butanone	78-93-3	ID							6.0E-01	1,000	1		5.0E+00	300	1				6.0E-01
VOC	Carbon Disulfide	75-15-0								1.0E-01	100	1		7.0E-01	30	1				1.0E-01
VOC	Carbon Tetrachloride	56-23-5	B2	1.3E-01	1		1.5E-02	1		7.0E-04	1,000	1							1.3E-01	7.0E-04
VOC	Chlorobenzene	108-90-7	D							2.0E-02	1,000	1		6.0E-02	1,000	103				2.0E-02
VOC	Chloroethane	75-00-3		2.9E-03	3					4.0E-01		3		1.0E+01	300	1			2.9E-03	4.0E-01
VOC	Chloroform	67-66-3	B2				2.3E-02	1		1.0E-02	1,000	1		5.0E-02	100	117				1.0E-02
VOC	Chloromethane	74-87-3	D											9.0E-02	1,000	1				
VOC	Cumene	98-82-8	D							1.0E-01	1,000	1		4.0E-01	1,000	1				1.0E-01
VOC	Cyclohexane	110-82-7	ID											6.0E+00	300	1				
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	1.4E+00	2									2.0E-04	1,000	1			1.4E+00	
VOC	Dibromochloromethane	124-48-1	C	8.4E-02	1					2.0E-02	1,000	1							8.4E-02	2.0E-02
VOC	1,2-Dibromoethane	106-93-4	B2	8.5E+01	1		2.2E-01	1											8.5E+01	
VOC	1,2-Dichlorobenzene	95-50-1	D							9.0E-02	1,000	1		2.0E-01	1,000	2	3			9.0E-02
VOC	1,3-Dichlorobenzene	541-73-1	D							9.0E-02	1,000	1	10							9.0E-02
VOC	1,4-Dichlorobenzene	106-46-7	C	2.4E-02	2	6				3.0E-02		3		8.0E-01	100	1			2.4E-02	3.0E-02
VOC	Dichlorodifluoromethane	75-71-8								2.0E-01	100	1		2.0E-01	10,000	2				2.0E-01
VOC	1,1-Dichloroethane	75-34-3	C							1.0E-01	1,000	2	26,6	5.0E-01	1,000	2	3			1.0E-01
VOC	1,2-Dichloroethane	107-06-2	B2	9.1E-02	1		2.6E-02	1		3.0E-02		3		5.0E-03	3,000	102	92		9.1E-02	3.0E-02
VOC	1,1-Dichloroethene	75-35-4	C							5.0E-02	100	1		2.0E-01	30	1				5.0E-02
VOC	1,2-Dichloroethene (total)	540-59-0								9.0E-03	1,000	2								9.0E-03
VOC	cis-1,2-Dichloroethene	156-59-2	D							1.0E-02	3,000	2	6							1.0E-02
VOC	trans-1,2-Dichloroethene	156-60-5								2.0E-02	1,000	1								2.0E-02
VOC	1,2-Dichloropropane	78-87-5	B2	6.8E-02	2	6								4.0E-03	300	1			6.8E-02	
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1.0E-01	1	77	4.0E-03	1		3.0E-02	100	1		2.0E-02	30	1			1.0E-01	3.0E-02
VOC	cis-1,3-Dichloropropene	10061-01-5		1.0E-01	1	77,11	4.0E-03	1	11	3.0E-02	100	1	11	2.0E-02	30	1	11		1.0E-01	3.0E-02
VOC	trans-1,3-Dichloropropene	10061-02-6																		
VOC	Ethyl Benzene	100-41-4	D							1.0E-01	1,000	1		1.0E+00	300	1				1.0E-01
VOC	2-Hexanone	591-78-6								4.0E-02	10,000	40		5.0E-03	10,000	108				4.0E-02
VOC	Methyl Acetate	79-20-9								1.0E+00	1,000	2								1.0E+00
VOC	Methyl tert-butyl ether	1634-04-4		3.3E-03	4									3.0E+00	100	1			3.3E-03	
VOC	4-Methyl-2-pentanone	108-10-1	ID									1	90	3.0E+00	300	1				
VOC	Methylcyclohexane	108-87-2												3.0E+00	100	2				
VOC	Methylene Chloride	75-09-2	B2	7.5E-03	1		4.7E-04	1		6.0E-02	100	1		3.0E+00	100	2			7.5E-03	6.0E-02
VOC	Styrene	100-42-5								2.0E-01	1,000	1	6	1.0E+00	30	1				2.0E-01
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	2.0E-01	1		5.8E-02	1		6.0E-02	300	101				88	90		2.0E-01	6.0E-02
VOC	Tetrachloroethene	127-18-4	C-B2	5.2E-02	77		3.1E-03	77		1.0E-02	1,000	1		4.0E-01	300	109	94		5.2E-02	1.0E-02
VOC	Toluene	108-88-3	D							2.0E-01	1,000	1		4.0E-01	300	1				2.0E-01
VOC	1,2,4-Trichlorobenzene	120-82-1	D							1.0E-02	1,000	1		2.0E-01	1,000	2				1.0E-02
VOC	1,1,1-Trichloroethane	71-55-6	D							2.8E-01	90	72		2.2E+00	90	73				2.8E-01
VOC	1,1,2-Trichloroethane	79-00-5	C	5.7E-02	1		1.6E-02	1		4.0E-03	1,000	1							5.7E-02	4.0E-03
VOC	Trichloroethene	79-01-6	C-B2	1.1E-02	49		1.7E-03	49		6.0E-03	3,000	46	6, 97						1.1E-02	6.0E-03
VOC	Trichlorofluoromethane	75-69-4								3.0E-01	1,000	1		7.0E-01	10,000	2	3			3.0E-01
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1								3.0E+01	10	1		3.0E+01	100	2				3.0E+01
VOC	Vinyl Chloride	75-01-4	A	1.4E+00	1	78	8.8E-03	1	79	3.0E-03	30	1		1.0E-01	30	1			1.4E+00	3.0E-03
VOC	Xylenes (total)	1330-20-7	ID							2.0E-01	1,000	1		1.0E-01	300	1				2.0E-01
SVOC	Acenaphthene	83-32-9								6.0E-02	3,000	1								6.0E-02

Table H-3: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Carc Class	SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)				RfC (mg/m^3)				Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
				Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	Value
SVOC	Acenaphthylene	208-96-8	D							3.0E-02	3,000	1	20						3.0E-02
SVOC	Acetophenone	98-86-2	D							1.0E-01	3,000	1							1.0E-01
SVOC	Anthracene	120-12-7	D							3.0E-01	3,000	1				2	90		3.0E-01
SVOC	Atrazine	1912-24-9	C	2.2E-01	2					3.5E-02	100	1						2.2E-01	3.5E-02
SVOC	Benzaldehyde	100-52-7								1.0E-01	1,000	1							1.0E-01
SVOC	Benzo(a)anthracene	56-55-3	B2	7.3E-01	10	5												7.3E-01	
SVOC	Benzo(a)pyrene	50-32-8	B2	7.3E+00	1													7.3E+00	
SVOC	Benzo(b)fluoranthene	205-99-2	B2	7.3E-01	10	5												7.3E-01	
SVOC	Benzo(g,h,i)perylene	191-24-2	D							3.0E-02	3,000	1	20						3.0E-02
SVOC	Benzo(k)fluoranthene	207-08-9	B2	7.3E-02	10	5												7.3E-02	
SVOC	Biphenyl	92-52-4	D							5.0E-02	1,000	1							5.0E-02
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D																
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1.1E+00	1		3.3E-01	1										1.1E+00	
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1.4E-02	1					2.0E-02	1,000	1						1.4E-02	2.0E-02
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D																
SVOC	Butylbenzylphthalate	85-68-7	C							2.0E-01	1,000	1							2.0E-01
SVOC	Caprolactam	105-60-2								5.0E-01	100	1							5.0E-01
SVOC	Carbazole	86-74-8	B2	2.0E-02	2													2.0E-02	
SVOC	4-Chloro-3-methylphenol	59-50-7																	
SVOC	4-Chloroaniline	106-47-8								4.0E-03	3,000	1							4.0E-03
SVOC	2-Chloronaphthalene	91-58-7								8.0E-02	3,000	1							8.0E-02
SVOC	2-Chlorophenol	95-57-8								5.0E-03	1,000	1							5.0E-03
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3																	
SVOC	Chrysene	218-01-9	B2	7.3E-03	10	5												7.3E-03	
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	7.3E+00	10	5												7.3E+00	
SVOC	Dibenzofuran	132-64-9	D							2.0E-03		3							2.0E-03
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	4.5E-01	1													4.5E-01	
SVOC	2,4-Dichlorophenol	120-83-2								3.0E-03	100	1							3.0E-03
SVOC	Diethylphthalate	84-66-2	D							8.0E-01	1,000	1							8.0E-01
SVOC	2,4-Dimethylphenol	105-67-9								2.0E-02	3,000	1							2.0E-02
SVOC	Dimethylphthalate	131-11-3	D								100	2	90			2	90		
SVOC	Di-n-butylphthalate	84-74-2	D							1.0E-01	1,000	1	6			1	90		1.0E-01
SVOC	4,6-Dinitro-2-methylphenol	534-52-1								1.0E-04		3							1.0E-04
SVOC	2,4-Dinitrophenol	51-28-5								2.0E-03	1,000	1				2	90		2.0E-03
SVOC	2,4-Dinitrotoluene	121-14-2	B2	6.8E-01	1	28				2.0E-03	100	1				2	90	6.8E-01	2.0E-03
SVOC	2,6-Dinitrotoluene	606-20-2	B2	6.8E-01	1	28				1.0E-03	3,000	2	6					6.8E-01	1.0E-03
SVOC	Di-n-octylphthalate	117-84-0								2.0E-02	1,000	2							2.0E-02
SVOC	Fluoranthene	206-44-0	D							4.0E-02	3,000	1							4.0E-02
SVOC	Fluorene	86-73-7	D							4.0E-02	3,000	1							4.0E-02
SVOC	Hexachlorobenzene	118-74-1	B2	1.6E+00	1		4.6E-01	1		8.0E-04	100	1				1	90	1.6E+00	8.0E-04
SVOC	Hexachlorobutadiene	87-68-3	C	7.8E-02	1		2.2E-02	1		2.0E-04	1,000	2	6					7.8E-02	2.0E-04
SVOC	Hexachlorocyclopentadiene	77-47-4	E							6.0E-03	1,000	1		2.0E-04	100	1			6.0E-03
SVOC	Hexachloroethane	67-72-1	C	1.4E-02	1		4.0E-03	1		1.0E-03	1,000	1						1.4E-02	1.0E-03
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	7.3E-01	10	5												7.3E-01	
SVOC	Isophorone	78-59-1	C	9.5E-04	1					2.0E-01	1,000	1				2	90	9.5E-04	2.0E-01
SVOC	2-Methylnaphthalene	91-57-6	ID							4.0E-03	1,000	1		3.0E-03	3,000	1	61		4.0E-03
SVOC	2-Methylphenol	95-48-7	C							5.0E-02	1,000	1				1	90		5.0E-02
SVOC	4-Methylphenol	106-44-5	C							5.0E-03	1,000	2	6			42	90,92		5.0E-03
SVOC	Naphthalene	91-20-3	C							2.0E-02	3,000	1		3.0E-03	3,000	1			2.0E-02
SVOC	2-Nitroaniline	88-74-4												2.0E-04	10,000	2			
SVOC	3-Nitroaniline	99-09-2	C	2.1E-02	112					3.0E-04	1,000	110		1.0E-03	3,000	111		2.1E-02	3.0E-04
SVOC	4-Nitroaniline	100-01-6	C	2.1E-02	115					3.0E-03	100	113		4.0E-03	1,000	114		2.1E-02	3.0E-03

Table H-3: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Carc Class	SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)				RfC (mg/m^3)				Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
				Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	Value
SVOC	Nitrobenzene	98-95-3	D							5.0E-04	10,000	1	6	2.0E-03	10,000	2	3		5.0E-04
SVOC	2-Nitrophenol	88-75-5																	
SVOC	4-Nitrophenol	100-02-7								8.0E-03		3							8.0E-03
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	4.9E-03	1					2.0E-02	3,000	104				89	90	4.9E-03	2.0E-02
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	7.0E+00	1													7.0E+00	
SVOC	N-Nitrosomorpholine	59-89-2																	
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	7.0E-02	2		1.0E-02	2		4.0E-02		1						7.0E-02	4.0E-02
SVOC	Pentachlorophenol	87-86-5	B2	1.2E-01	1					3.0E-02	100	1						1.2E-01	3.0E-02
SVOC	Phenanthrene	85-01-8	D							3.0E-02	3,000	1	20						3.0E-02
SVOC	Phenol	108-95-2	ID							3.0E-01	300	1				1	90,98		3.0E-01
SVOC	Pyrene	129-00-0	D							3.0E-02	3,000	1							3.0E-02
SVOC	2,4,5-Trichlorophenol	95-95-4								1.0E-01	1,000	1				2	90		1.0E-01
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1.1E-02	1		3.1E-03	1		1.0E-04		4				2	90	1.1E-02	1.0E-04
P/PCB	PCBs (total)	1336-36-3	B2	2.0E+00	1	30,32				2.0E-05	300	1	72					2.0E+00	2.0E-05
P/PCB	Aroclor-1016	12674-11-2	B2	7.0E-02	1	30,34				7.0E-05	100	1						7.0E-02	7.0E-05
P/PCB	Aroclor-1221	11104-28-2	B2	2.0E+00	1	30,32												2.0E+00	
P/PCB	Aroclor-1232	11141-16-5	B2	2.0E+00	1	30,32												2.0E+00	
P/PCB	Aroclor-1242	53469-21-9	B2	2.0E+00	1	30,32												2.0E+00	
P/PCB	Aroclor-1248	12672-29-6	B2	2.0E+00	1	30,32												2.0E+00	
P/PCB	Aroclor-1254	11097-69-1	B2	2.0E+00	1	30,32				2.0E-05	300	1						2.0E+00	2.0E-05
P/PCB	Aroclor-1260	11096-82-5	B2	2.0E+00	1	30,32												2.0E+00	
P/PCB	Aldrin	309-00-2	B2	1.7E+01	1		4.9E+00	1		3.0E-05	1,000	1						1.7E+01	3.0E-05
P/PCB	alpha-BHC	319-84-6	B2	6.3E+00	1		1.8E+00	1		5.0E-04		4						6.3E+00	5.0E-04
P/PCB	beta-BHC	319-85-7	C	1.8E+00	1		5.3E-01	1		2.0E-04		4						1.8E+00	2.0E-04
P/PCB	delta-BHC	319-86-8	D									38	90			38	90		
P/PCB	gamma-BHC	58-89-9	B2-C	1.3E+00	2	6				3.0E-04	1,000	1						1.3E+00	3.0E-04
P/PCB	Chlordane	57-74-9	B2	3.5E-01	1		1.0E-01	1		5.0E-04	300	1		7.0E-04	1,000	1		3.5E-01	5.0E-04
P/PCB	alpha-Chlordane	5103-71-9		3.5E-01	1	12				5.0E-04	300	1	12					3.5E-01	5.0E-04
P/PCB	gamma-Chlordane	5103-74-2		3.5E-01	1	12				5.0E-04	300	1	12					3.5E-01	5.0E-04
P/PCB	4,4'-DDD	72-54-8	B2	2.4E-01	1					3.0E-03	10,000	120						2.4E-01	3.0E-03
P/PCB	4,4'-DDE	72-55-9	B2	3.4E-01	1					7.0E-04	10,000	120						3.4E-01	7.0E-04
P/PCB	4,4'-DDT	50-29-3	B2	3.4E-01	1		9.7E-02	1		5.0E-04	100	1						3.4E-01	5.0E-04
P/PCB	Dieldrin	60-57-1	B2	1.6E+01	1		4.6E+00	1		5.0E-05	100	1						1.6E+01	5.0E-05
P/PCB	Endosulfan I	959-98-8								6.0E-03	100	1	13						6.0E-03
P/PCB	Endosulfan II	33213-65-9								6.0E-03	100	107							6.0E-03
P/PCB	Endosulfan sulfate	1031-07-8								6.0E-03	100	1	13						6.0E-03
P/PCB	Endrin	72-20-8	D							3.0E-04	100	1							3.0E-04
P/PCB	Endrin aldehyde	7421-93-4								3.0E-04	100	1	48						3.0E-04
P/PCB	Endrin ketone	53494-70-5																	
P/PCB	Heptachlor	76-44-8	B2	4.5E+00	1		1.3E+00	1		5.0E-04	300	1						4.5E+00	5.0E-04
P/PCB	Heptachlor epoxide	1024-57-3	B2	9.1E+00	1		2.6E+00	1		1.3E-05	1,000	1						9.1E+00	1.3E-05
P/PCB	Methoxychlor	72-43-5	D							5.0E-03	1,000	1				2	90		5.0E-03
P/PCB	Toxaphene	8001-35-2	B2	1.1E+00	1		3.2E-01	1										1.1E+00	
INORG	Aluminum	7429-90-5	D		90	90		90	90	1.0E+00	100	85		5.0E-03	300	84			1.0E+00
INORG	Antimony	7440-36-0								4.0E-04	1,000	1							4.0E-04
INORG	Arsenic	7440-38-2	A	1.5E+00	1		4.3E+00	1		3.0E-04	3	1						1.5E+00	3.0E-04
INORG	Barium	7440-39-3	D							7.0E-02	3	1				1	90		7.0E-02
INORG	Beryllium	7440-41-7	B1				2.4E+00	1		2.0E-03	300	1		2.0E-05	10	1			2.0E-03
INORG	Cadmium	7440-43-9	B1				1.8E+00	1		1.0E-03	10	1	95						1.0E-03
INORG	Calcium	7440-70-2																	
INORG	Chromium (total)	7440-47-3					1.2E+01	1	8	3.0E-03	900	1	8	1.0E-04	300	1	59,8		3.0E-03
INORG	Chromium III	16065-83-1	D							1.5E+00	1,000	1							1.5E+00

Table H-3: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Carc Class	SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)				RfC (mg/m^3)				Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
				Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	Value
INORG	Chromium VI	18540-29-9	A				1.2E+01	1		3.0E-03	900	1		1.0E-04	300	1	59		3.0E-03
INORG	Cobalt	7440-48-4	B1				2.8E+00	106		2.0E-02	10	105		2.0E-05	100	86			2.0E-02
INORG	Copper	7440-50-8	D							4.0E-02	2	50	49						4.0E-02
INORG	Cyanide (total)	57-12-5	D							2.0E-02	500	1							2.0E-02
INORG	Iron	7439-89-6	D		91	90		91	90	3.0E-01	1	87				92	90		3.0E-01
INORG	Lead	7439-92-1	B2																
INORG	Magnesium	7439-95-4								9.7E+00		63	92						9.7E+00
INORG	Manganese	7439-96-5	D							1.4E-01	1	1	36	5.0E-05	1,000	1			1.4E-01
INORG	Mercury	7439-97-6	D							3.0E-04	1,000	1	51	3.0E-04	30	1			3.0E-04
INORG	Nickel	7440-02-0	A				2.4E-01	1		2.0E-02	300	1							2.0E-02
INORG	Potassium	7440-09-7																	
INORG	Selenium	7782-49-2	D							5.0E-03	3	1							5.0E-03
INORG	Silver	7440-22-4	D							5.0E-03	3	1		1.0E-05	1,000	83			5.0E-03
INORG	Sodium	7440-23-5																	
INORG	Thallium	7440-28-0								7.0E-05	3,000	52	49						7.0E-05
INORG	Vanadium	7440-62-2								7.0E-03	100	2	6						7.0E-03
INORG	Zinc	7440-66-6	D							3.0E-01	3	1							3.0E-01

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Table H-3: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Carc Class	SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)				RfC (mg/m^3)				Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
				Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	Value
85	USEPA. NCEA. 2001. Risk Assessment Issue Paper for : Derivation of a Provisional Oral RfD for Aluminum [CASRN 7429-90-5]. July 26.																		
86	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfC for Cobalt and Compounds [CASRN 7440-48-4]. January 15.																		
87	USEPA. NCEA. 2001. Risk Assessment Issue Paper for: Derivation of a Provisional RfD for Iron [CASRN 7439-89-6]. November 14.																		
88	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 1,1,2,2-Tetrachloroethane[CASRN 79-34-5]. January 15.																		
89	USEPA. NCEA. 2001. Risk Assessment Issue paper for: Derivation of a Provisional RfC for N-Nitrosodiphenylamine [CASRN 86-30-6]. March 16.																		
90	USEPA. NCEA. 2001. Evaluation of Carcinogenicity of Aluminum [CASRN 7429-90-5]. July 26.																		
91	USEPA. NCEA. 2001. Evaluation of Carcinogenicity of Iron [CASRN 7439-89-6] and Compounds. November 14.																		
92	USEPA. NCEA. 2001. Risk Assessment Issue Paper for: Derivation of a Provisional RfC for Iron [CASRN 7439-89-6] and Compounds. November 14.																		
93	USEPA. NCEA. 1996. Risk Assessment Issue paper for: Derivation of a Provisional Subchronic Inhalation RfD for Benzene [CASRN 71-43-2]. July 2.																		
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101	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 1,1,2,2-Tetrachloroethane[CASRN 79-34-5]. January 14.																		
102	USEPA. NCEA. 1993. Risk Assessment Issue paper for: Derivation of a Provisional Inhalation RfC for 1,2-Dichloroethane [CASRN 107-06-2]. April 5.																		
103	USEPA. NCEA. 1998. Risk Assessment Issue Paper for: Derivation of a Provisional Chronic RfC for Chlorobenzene [CASRN 108-90-7]. September 18.																		
104	USEPA. NCEA. 2001. Risk Assessment Issue paper for: Derivation of a Provisional RfD for N-Nitrosodiphenylamine [CASRN 86-30-6]. March 16.																		
105	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for Cobalt and Compounds [CASRN 7440-48-4]. January 15.																		
106	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional Carcinogenicity Assessment for Cobalt and Compounds [CASRN 7440-48-4]. January 15.																		
107	USEPA. NCEA. 1994. Risk Assessment Issue paper for: Derivation of a Provisional RfD for Endosulfan II [CASRN 33213-65-9]. July 1.																		
108	USEPA. NCEA. 1993. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 2-Hexanone (Methyl-n-butyl ketone) [CASRN 591-78-6]. June 24.																		
109	USEPA. NCEA. 1997. Risk Assessment Issue Paper for: Derivation of a Provisional RfC for Tetrachloroethylene (perchloroethylene, PERC) [CASRN 127-18-4]. June 20.																		
110	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 3-Nitroaniline [CASRN 99-09-2] by analogy to 4-Nitroaniline [CASRN 100-01-6]. June 11.																		
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	by analogy to 4-Nitroaniline [CASRN 100-01-6]. June 11.																		
113	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfD for 4-Nitroaniline [CASRN 100-01-6]. June 20.																		
114	USEPA. NCEA. 2002. Risk Assessment Issue paper for: Derivation of a Provisional RfC for 4-Nitroaniline [CASRN 100-01-6]. June 20.																		
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118	USEPA. NCEA. 2002. Provisional Toxicity Value Assessment for HWIR: RfD for 2-Methylnapthalene [CASRN 91-57-6]. August.																		
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123	NCEA. 2003. Personal Communication -- phone call with Teresa Shannon. September 22																		
Notes:																			
2	USEPA adopted chronic value as subchronic value.																		
3	HEAST Alternate Method.																		
5	Based on analogy to Benzo(a)pyrene [CASRN 50-32-8] using USEPA relative potency described in the indicated reference.																		
6	Under review, according to IRIS.																		
8	ENVIRON used Chromium VI [CASRN 18540-29-9] value from IRIS (reference 1) as a surrogate.																		
10	ENVIRON used 1,2-Dichlorobenzene [CASRN 95-50-1] values from IRIS (chronic RfDo) (reference 1) and HEAST (chronic RfDi) (reference 2) as surrogates.																		
11	ENVIRON used 1,3-Dichloropropene (total) [CASRN 542-75-6] value from the indicated reference as a surrogate].																		
12	ENVIRON used Chlordane [CASRN 57-74-9] value from IRIS (reference 1) or HEAST (reference 2) as a surrogate.																		
13	ENVIRON used Endosulfan [CASRN 115-29-7] value from IRIS (reference 1) or HEAST (reference 2) as a surrogate.																		
20	ENVIRON used Pyrene [CASRN 129-00-0] value from IRIS (reference 1) as a surrogate.																		
26	USEPA obtained value by route-to-route extrapolation.																		
28	USEPA used 2,4-,2,6-Dinitrotolunene mixture value from IRIS (reference 1) as a surrogate.																		

Table H-3: Toxicity Values
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Carc Class	SF_{oral} $(mg/kg/d)^{-1}$			URF $(mg/m^3)^{-1}$			RfD_{oral} (mg/kg/d)				RfC (mg/m^3)				Sf_{derm} $(mg/kg/d)^{-1}$	RfD_{derm} (mg/kg/d)
				Value	Ref	Notes	Value	Ref	Notes	Value	UF	Ref	Notes	Value	UF	Ref	Notes	Value	Value
30	Upper-bound slope factor.																		
32	High risk & persistence tier.Use for: food chain exposure;sediment/soil ingestion;dust/aerosol inhalation;dermal exposure, if an absorption factor has been applied;																		
	presence of dioxin-like,tumor-promoting/persistent congeners;all early life exposures.																		
34	Lowest risk & persistence tier. Criteria for use: congener or isomer analyses verify that congeners with more than 4 chlorines comprise less than 1/2 % of total PCBs.																		
36	IRIS recommends applying a modifying factor of 3 when using this RfD in assessing exposures to drinking water or soil.																		
44	ENVIRON derived CRFC from CRFDI value presented in the indicated reference, using standard USEPA methodology presented in HEAST.																		
45	ENVIRON derived URFI from CSFI value presented in the indicated reference, using standard USEPA methodology presented in HEAST.																		
48	ENVIRON used Endrin [CASRN 72-20-8] value from IRIS (reference 1) as a surrogate.																		
49	ENVIRON derived CRFDO from adverse health effect level value presented in the indicated reference.																		
50	Personal communication with NCEA indicated the supporting paper had been retired.																		
51	ENVIRON used Mercuric Chloride [CASRN 7487-94-7] value from the indicated reference as a surrogate.																		
53	ENVIRON used Polychlorinated Biphenyl [CASRN 1336-36-3] value from IRIS (Reference 1) as a surrogate.																		
55	Under EPA review. Number subject to change.																		
56	This toxicity value already incorporates the absorption factor of 75% that is recommended in the cited reference.																		
59	Chromium VI Particulates.																		
60	IRIS provides a range of 2.2E-6 to 7.8E-6 (ug/m3)-1 as the Inhalation Unit Risk Factor (URF) for Benzene.																		
61	ENVIRON used Naphthalene [CASRN 91-20-3] value from indicated reference as a surrogate.																		
68	IRIS provides a range of 1.5E-2 to 5.5E-2 (mg/kg/d)-1 as the Oral Slope Factor (CSFO) for Benzene.																		
69	Personal communication with NCEA indicated the retired paper should be used until a new value is published in IRIS.																		
72	ENVIRON used Aroclor 1254 [CASRN 11097-69-1] value from the indicated reference as a surrogate for Polychlorinated biphenyls [CASRN 1336-36-3].																		
77	IRIS provides an alternate slope factor of 5E-2; however, EPA does not recommend its use, due to the higher uncertainty in the delivered dose in the supporting study.																		
78	IRIS recommends an Oral Cancer Slope Factor(CSFO) for Vinyl Chloride of 7.2E-1 (mg/kg/d)-1 to account for continuous lifetime exposure during adulthood;																		
	a twofold increase to 1.4 (mg/kg/d)-1 is recommended to account for continuous exposure from birth.																		
79	IRIS recommends an Inhalation Unit Risk(URFI) for Vinyl Chloride of 4.4E-6 (ug/m3)-1 to account for continuous lifetime exposure during adulthood;																		
	a twofold increase to 8.8E-6 (ug/m3)-1 is recommended to account for continuous exposure from birth.																		
90	Inadequate data exist to derive a toxicity value, according to the indicated reference.																		
91	This criterion is applicable to insoluable forms of the compound occurring as dust or fumes.																		
92	NCEA directed ENVIRON to use outdated value.																		
93	Personal communication with NCEA indicated the HEAST LOAEL of 1000 mg and the sRfD of 7E-1mg/kg-day both appear to be incorrect and recommended using																		
	the IRIS RfD of 3E-1 as the sRfD.																		
94	Two provisonal RfC values are presented in the indicated reference (4E-1 and 6E-1 mg/m3). Personal communication with NCEA indicated that either RfC is acceptable and the RfC																		
	should be chosen on a case-by-case basis.																		
95	Diet Criterion.																		
97	ENVIRON used withdrawn source.																		
98	Route-to-route extrapolation is not appropriate, according to the indicated reference.																		
99	ENVIRON used 3-Methylphenol [CASRN 108-39-4] values from the indicated reference as a surrogate.																		
100	Personal communication with NCEA confirmed the value published by Regions 3 and 9.																		
102	A dose equivalency factor of 4.5 was applied to the Chronic RfC to derive the Subchronic RfC.																		

Table H-4a: Cancer Risk Calculation - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater		Dermal Contact with Groundwater			Inhalation of Vapor from Groundwater			Target Risk
				Intake:	1.1E-06		Intake:	3.7E-01		Intake:	2.0E-03		1.0E-05
Analyte Group	Chemical	CASRN	Carc Class	C_{gw} (mg/L)	SF_{oral} $(mg/kg/d)^{-1}$	RBC (mg/L)	DA (L/cm^2-event)	SF_{derm} $(mg/kg/d)^{-1}$	RBC (mg/L)	C_{air} (mg/m^3)	URF $(mg/m^3)^{-1}$	RBC (mg/L)	RBC (mg/L)
VOC	Acetone	67-64-1	ID	1.0E+00						8.5E-02			
VOC	Benzene	71-43-2	A	1.0E+00	5.5E-02	1.6E+02	3.6E-05	5.5E-02	1.4E+01	1.9E-01	7.8E-03	3.4E+00	2.7E+00
VOC	Bromochloromethane	74-97-5		1.0E+00						1.5E-01			
VOC	Bromodichloromethane	75-27-4	B2	1.7E+01	6.2E-02	1.4E+02	1.7E-05	6.2E-02	2.5E+01	2.2E+00			2.1E+01
VOC	Bromoform	75-25-2	B2	1.0E+00	7.9E-03	1.1E+03	1.4E-05	7.9E-03	2.5E+02	1.0E-01	1.1E-03	4.7E+01	3.8E+01
VOC	Bromomethane	74-83-9	D	1.0E+00			7.5E-06			1.8E-01			
VOC	2-Butanone	78-93-3	ID	1.0E+00						9.6E-02			
VOC	Carbon Disulfide	75-15-0		1.0E+00			3.1E-05			2.0E-01			
VOC	Carbon Tetrachloride	56-23-5	B2	1.0E+00	1.3E-01	6.9E+01	4.9E-05	1.3E-01	4.3E+00	1.4E-01	1.5E-02	2.4E+00	1.5E+00
VOC	Chlorobenzene	108-90-7	D	1.0E+00			8.0E-05			1.6E-01			
VOC	Chloroethane	75-00-3		1.0E+00	2.9E-03	3.1E+03		2.9E-03		2.1E-01			3.1E+03
VOC	Chloroform	67-66-3	B2	1.0E+00			1.9E-05			1.6E-01	2.3E-02	1.4E+00	1.4E+00
VOC	Chloromethane	74-87-3	D	1.0E+00			7.9E-06			2.4E-01			
VOC	Cumene	98-82-8	D	1.0E+00						1.6E-01			
VOC	Cyclohexane	110-82-7	ID	1.0E+00						1.9E-01			
VOC	1,2-Dibromo-3-chloropropa	96-12-8	B2	1.0E+00	1.4E+00	6.4E+00		1.4E+00		8.4E-02			6.4E+00
VOC	Dibromochloromethane	124-48-1	C	1.0E+00	8.4E-02	1.1E+02	1.4E-05	8.4E-02	2.3E+01	1.1E-01			1.9E+01
VOC	1,2-Dibromoethane	106-93-4	B2	1.0E+00	8.5E+01	1.1E-01	8.5E-06	8.5E+01	3.7E-02	1.2E-01	2.2E-01	2.0E-01	2.4E-02
VOC	1,2-Dichlorobenzene	95-50-1	D	1.0E+00			1.5E-04			1.4E-01			
VOC	1,3-Dichlorobenzene	541-73-1	D	1.0E+00						1.4E-01			
VOC	1,4-Dichlorobenzene	106-46-7	C	1.0E+00	2.4E-02	3.7E+02	1.4E-04	2.4E-02	7.9E+00	1.4E-01			7.8E+00
VOC	Dichlorodifluoromethane	75-71-8		1.0E+00			2.6E-05			1.6E-01			
VOC	1,1-Dichloroethane	75-34-3	C	1.0E+00			1.8E-05			1.7E-01			
VOC	1,2-Dichloroethane	107-06-2	B2	1.0E+00	9.1E-02	9.8E+01	1.1E-05	9.1E-02	2.6E+01	1.6E-01	2.6E-02	1.2E+00	1.1E+00
VOC	1,1-Dichloroethene	75-35-4	C	1.0E+00			3.0E-05			1.8E-01			
VOC	1,2-Dichloroethene (total)	540-59-0		1.0E+00						1.7E-01			
VOC	cis-1,2-Dichloroethene	156-59-2	D	1.0E+00						1.7E-01			
VOC	trans-1,2-Dichloroethene	156-60-5		1.0E+00						1.7E-01			
VOC	1,2-Dichloropropane	78-87-5	B2	1.0E+00	6.8E-02	1.3E+02	2.1E-05	6.8E-02	1.9E+01	1.6E-01			1.7E+01
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1.0E+00	1.0E-01	8.9E+01	2.3E-05	1.0E-01	1.2E+01	1.6E-01	4.0E-03	7.8E+00	4.5E+00
VOC	cis-1,3-Dichloropropene	10061-01-5		1.0E+00	1.0E-01	8.9E+01		1.0E-01		1.6E-01	4.0E-03	7.9E+00	7.3E+00
VOC	trans-1,3-Dichloropropene	10061-02-6		1.0E+00						1.6E-01			
VOC	Ethyl Benzene	100-41-4	D	1.0E+00						1.7E-01			
VOC	2-Hexanone	591-78-6		1.0E+00						1.7E-01			
VOC	Methyl Acetate	79-20-9		1.0E+00									
VOC	Methyl tert-butyl ether	1634-04-4		1.0E+00	3.3E-03	2.7E+03		3.3E-03		1.8E-01			2.7E+03
VOC	4-Methyl-2-pentanone	108-10-1	ID	1.0E+00						1.2E-01			
VOC	Methylcyclohexane	108-87-2		1.0E+00									
VOC	Methylene Chloride	75-09-2	B2	1.0E+00	7.5E-03	1.2E+03	9.3E-06	7.5E-03	3.9E+02	1.8E-01	4.7E-04	5.9E+01	4.9E+01
VOC	Styrene	100-42-5		1.0E+00			9.6E-05			1.7E-01			
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1.0E+00	2.0E-01	4.5E+01	2.6E-05	2.0E-01	5.2E+00	1.2E-01	5.8E-02	7.6E-01	6.6E-01
VOC	Tetrachloroethene	127-18-4	C-B2	1.0E+00	5.2E-02	1.7E+02	4.0E-05	5.2E-02	1.3E+01	1.3E-01	3.1E-03	1.2E+01	6.1E+00
VOC	Toluene	108-88-3	D	1.0E+00						1.8E-01			
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1.0E+00			2.7E-04			1.2E-01			
VOC	1,1,1-Trichloroethane	71-55-6	D	1.0E+00			3.8E-05			1.5E-01			
VOC	1,1,2-Trichloroethane	79-00-5	C	1.0E+00	5.7E-02	1.6E+02	2.0E-05	5.7E-02	2.4E+01	1.4E-01	1.6E-02	2.3E+00	2.0E+00
VOC	Trichloroethene	79-01-6	C-B2	1.0E+00	1.1E-02	8.1E+02	5.5E-05	1.1E-02	4.5E+01	1.5E-01	1.7E-03	2.0E+01	1.4E+01
VOC	Trichlorofluoromethane	75-69-4		1.0E+00			4.0E-05			1.5E-01			
VOC	1,1,2-Trichloro-1,2,2-trifluo	76-13-1		1.0E+00						1.3E-01			
VOC	Vinyl Chloride	75-01-4	A	1.0E+00	1.4E+00	6.4E+00	1.7E-05	1.4E+00	1.1E+00	2.2E-01	8.8E-03	2.7E+00	7.1E-01
VOC	Xylenes (total)	1330-20-7	ID	1.0E+00						1.7E-01			
SVOC	Acenaphthene	83-32-9		1.0E+00						1.0E-01			

Table H-4a: Cancer Risk Calculation - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater		Dermal Contact with Groundwater			Inhalation of Vapor from Groundwater			Target Risk
				Intake:	1.1E-06		Intake:	3.7E-01		Intake:	2.0E-03		1.0E-05
Analyte Group	Chemical	CASRN	Carc Class	C_{gw} (mg/L)	SF_{oral} $(mg/kg/d)^{-1}$	RBC (mg/L)	DA (L/cm^2-event)	SF_{derm} $(mg/kg/d)^{-1}$	RBC (mg/L)	C_{air} (mg/m^3)	URF $(mg/m^3)^{-1}$	RBC (mg/L)	RBC (mg/L)
SVOC	Acenaphthylene	208-96-8	D	1.0E+00						9.4E-02			
SVOC	Acetophenone	98-86-2	D	1.0E+00						2.5E-02			
SVOC	Anthracene	120-12-7	D	1.0E+00						7.1E-02			
SVOC	Atrazine	1912-24-9	C	1.0E+00	2.2E-01	4.0E+01		2.2E-01					4.0E+01
SVOC	Benzaldehyde	100-52-7		1.0E+00									
SVOC	Benzo(a)anthracene	56-55-3	B2	1.0E+00	7.3E-01	1.2E+01	2.7E-03	7.3E-01	1.4E-02	7.0E-03			1.4E-02
SVOC	Benzo(a)pyrene	50-32-8	B2	1.0E+00	7.3E+00	1.2E+00	4.3E-03	7.3E+00	8.7E-04	2.4E-03			8.7E-04
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1.0E+00	7.3E-01	1.2E+01	4.9E-03	7.3E-01	7.6E-03	7.5E-02			7.6E-03
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1.0E+00						2.9E-04			
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1.0E+00	7.3E-02	1.2E+02		7.3E-02		1.8E-03			1.2E+02
SVOC	Biphenyl	92-52-4	D	1.0E+00						1.2E-01			
SVOC	bis(2-Chloroethoxy)methar	111-91-1	D	1.0E+00						4.1E-04			
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1.0E+00	1.1E+00	8.1E+00	5.2E-06	1.1E+00	4.7E+00	3.5E-02	3.3E-01	4.4E-01	3.8E-01
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1.0E+00	1.4E-02	6.4E+02	8.5E-03	1.4E-02	2.3E-01	1.9E-04			2.3E-01
SVOC	4-Bromophenyl-phenyl eth	101-55-3	D	1.0E+00						7.7E-02			
SVOC	Butylbenzylphthalate	85-68-7	C	1.0E+00						2.5E-03			
SVOC	Caprolactam	105-60-2		1.0E+00									
SVOC	Carbazole	86-74-8	B2	1.0E+00	2.0E-02	4.5E+02		2.0E-02		3.8E-05			4.5E+02
SVOC	4-Chloro-3-methylphenol	59-50-7		1.0E+00						1.0E-03			
SVOC	4-Chloroaniline	106-47-8		1.0E+00						8.9E-04			
SVOC	2-Chloronaphthalene	91-58-7		1.0E+00						1.2E-01			
SVOC	2-Chlorophenol	95-57-8		1.0E+00			2.4E-05			1.3E-01			
SVOC	4-Chlorophenyl-phenyl eth	7005-72-3		1.0E+00						9.8E-02			
SVOC	Chrysene	218-01-9	B2	1.0E+00	7.3E-03	1.2E+03	2.7E-03	7.3E-03	1.4E+00	7.4E-02			1.4E+00
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1.0E+00	7.3E+00	1.2E+00	4.6E-03	7.3E+00	8.1E-04	3.1E-05			8.1E-04
SVOC	Dibenzofuran	132-64-9	D	1.0E+00						2.5E-02			
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1.0E+00	4.5E-01	2.0E+01	8.1E-05	4.5E-01	7.4E-01	8.6E-06			7.2E-01
SVOC	2,4-Dichlorophenol	120-83-2		1.0E+00			7.6E-05			7.5E-03			
SVOC	Diethylphthalate	84-66-2	D	1.0E+00			2.2E-05			1.0E-03			
SVOC	2,4-Dimethylphenol	105-67-9		1.0E+00			3.5E-05			5.3E-03			
SVOC	Dimethylphthalate	131-11-3	D	1.0E+00			6.2E-06			2.5E-04			
SVOC	Di-n-butylphthalate	84-74-2	D	1.0E+00			3.3E-04			2.0E-06			
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		1.0E+00						9.9E-04			
SVOC	2,4-Dinitrophenol	51-28-5		1.0E+00			6.4E-06			1.1E-03			
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1.0E+00	6.8E-01	1.3E+01	1.3E-05	6.8E-01	3.1E+00	2.2E-04			2.5E+00
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1.0E+00	6.8E-01	1.3E+01	1.1E-05	6.8E-01	3.7E+00	1.8E-03			2.9E+00
SVOC	Di-n-octylphthalate	117-84-0		1.0E+00						5.1E-02			
SVOC	Fluoranthene	206-44-0	D	1.0E+00			1.3E-03			2.9E-02			
SVOC	Fluorene	86-73-7	D	1.0E+00						7.3E-02			
SVOC	Hexachlorobenzene	118-74-1	B2	1.0E+00	1.6E+00	5.6E+00	2.2E-03	1.6E+00	7.6E-03	9.9E-02	4.6E-01	1.1E-01	7.1E-03
SVOC	Hexachlorobutadiene	87-68-3	C	1.0E+00	7.8E-02	1.1E+02	5.1E-04	7.8E-02	6.9E-01	1.1E-01	2.2E-02	2.2E+00	5.2E-01
SVOC	Hexachlorocyclopentadien	77-47-4	E	1.0E+00						1.0E-01			
SVOC	Hexachloroethane	67-72-1	C	1.0E+00	1.4E-02	6.4E+02	1.9E-04	1.4E-02	1.0E+01	1.1E-01	4.0E-03	1.1E+01	5.3E+00
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1.0E+00	7.3E-01	1.2E+01	4.5E-03	7.3E-01	8.2E-03	3.2E-03			8.2E-03
SVOC	Isophorone	78-59-1	C	1.0E+00	9.5E-04	9.4E+03	1.1E-05	9.5E-04	2.5E+03	1.6E-02			2.0E+03
SVOC	2-Methylnaphthalene	91-57-6	ID	1.0E+00						1.3E-01			
SVOC	2-Methylphenol	95-48-7	C	1.0E+00			2.3E-05			3.4E-03			
SVOC	4-Methylphenol	106-44-5	C	1.0E+00			2.1E-05			2.2E-03			
SVOC	Naphthalene	91-20-3	C	1.0E+00			1.5E-04			1.4E-01			
SVOC	2-Nitroaniline	88-74-4		1.0E+00						9.4E-02			
SVOC	3-Nitroaniline	99-09-2	C	1.0E+00	2.1E-02	4.3E+02		2.1E-02		3.8E-04			4.3E+02
SVOC	4-Nitroaniline	100-01-6	C	1.0E+00	2.1E-02	4.3E+02		2.1E-02		5.5E-06			4.3E+02

Table H-4a: Cancer Risk Calculation - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater		Dermal Contact with Groundwater			Inhalation of Vapor from Groundwater			Target Risk
				Intake:	1.1E-06		Intake:	3.7E-01		Intake:	2.0E-03		1.0E-05
Analyte Group	Chemical	CASRN	Carc Class	C_{gw} (mg/L)	SF_{oral} $(mg/kg/d)^{-1}$	RBC (mg/L)	DA (L/cm^2-event)	SF_{derm} $(mg/kg/d)^{-1}$	RBC (mg/L)	C_{air} (mg/m^3)	URF $(mg/m^3)^{-1}$	RBC (mg/L)	RBC (mg/L)
SVOC	Nitrobenzene	98-95-3	D	1.0E+00						4.6E-02			
SVOC	2-Nitrophenol	88-75-5		1.0E+00						2.1E-02			
SVOC	4-Nitrophenol	100-02-7		1.0E+00						1.1E-06			
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1.0E+00	4.9E-03	1.8E+03	6.7E-05	4.9E-03	8.3E+01	1.1E-02			7.9E+01
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1.0E+00	7.0E+00	1.3E+00	7.7E-06	7.0E+00	5.0E-01	5.8E-03			3.6E-01
SVOC	N-Nitrosomorpholine	59-89-2		1.0E+00									
SVOC	2,2'-oxybis(1-Chloropropan	108-60-1	C	1.0E+00	7.0E-02	1.3E+02		7.0E-02		9.1E-02	1.0E-02	5.6E+00	5.4E+00
SVOC	Pentachlorophenol	87-86-5	B2	1.0E+00	1.2E-01	7.5E+01	7.3E-04	1.2E-01	3.1E-01	5.2E-05			3.1E-01
SVOC	Phenanthrene	85-01-8	D	1.0E+00						3.9E-02			
SVOC	Phenol	108-95-2	ID	1.0E+00			1.2E-05			1.2E-03			
SVOC	Pyrene	129-00-0	D	1.0E+00						2.1E-02			
SVOC	2,4,5-Trichlorophenol	95-95-4		1.0E+00						9.4E-03			
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1.0E+00	1.1E-02	8.1E+02	1.6E-04	1.1E-02	1.6E+01	1.6E-02	3.1E-03	1.0E+02	1.4E+01
P/PCB	PCBs (total)	1336-36-3	B2	1.0E+00	2.0E+00	4.5E+00	2.1E-03	2.0E+00	6.5E-03	9.4E-02			6.5E-03
P/PCB	Aroclor-1016	12674-11-2	B2	1.0E+00	7.0E-02	1.3E+02		7.0E-02		9.2E-02			1.3E+02
P/PCB	Aroclor-1221	11104-28-2	B2	1.0E+00	2.0E+00	4.5E+00		2.0E+00		1.2E-01			4.5E+00
P/PCB	Aroclor-1232	11141-16-5	B2	1.0E+00	2.0E+00	4.5E+00		2.0E+00					4.5E+00
P/PCB	Aroclor-1242	53469-21-9	B2	1.0E+00	2.0E+00	4.5E+00		2.0E+00		9.8E-02			4.5E+00
P/PCB	Aroclor-1248	12672-29-6	B2	1.0E+00	2.0E+00	4.5E+00		2.0E+00		9.9E-02			4.5E+00
P/PCB	Aroclor-1254	11097-69-1	B2	1.0E+00	2.0E+00	4.5E+00		2.0E+00		9.5E-02			4.5E+00
P/PCB	Aroclor-1260	11096-82-5	B2	1.0E+00	2.0E+00	4.5E+00		2.0E+00		8.9E-02			4.5E+00
P/PCB	Aldrin	309-00-2	B2	1.0E+00	1.7E+01	5.3E-01	3.8E-03	1.7E+01	4.2E-04	7.1E-02	4.9E+00	1.5E-02	4.1E-04
P/PCB	alpha-BHC	319-84-6	B2	1.0E+00	6.3E+00	1.4E+00		6.3E+00		1.8E-02	1.8E+00	1.6E-01	1.4E-01
P/PCB	beta-BHC	319-85-7	C	1.0E+00	1.8E+00	5.0E+00		1.8E+00		1.5E-03	5.3E-01	6.4E+00	2.8E+00
P/PCB	delta-BHC	319-86-8	D	1.0E+00						8.7E-04			
P/PCB	gamma-BHC	58-89-9	B2-C	1.0E+00	1.3E+00	6.9E+00	8.1E-05	1.3E+00	2.6E-01	2.2E-02			2.5E-01
P/PCB	Chlordane	57-74-9	B2	1.0E+00	3.5E-01	2.6E+01	1.5E-03	3.5E-01	5.2E-02	4.4E-02	1.0E-01	1.2E+00	5.0E-02
P/PCB	alpha-Chlordane	5103-71-9		1.0E+00	3.5E-01	2.6E+01		3.5E-01					2.6E+01
P/PCB	gamma-Chlordane	5103-74-2		1.0E+00	3.5E-01	2.6E+01		3.5E-01					2.6E+01
P/PCB	4,4'-DDD	72-54-8	B2	1.0E+00	2.4E-01	3.7E+01	2.2E-03	2.4E-01	5.1E-02	7.4E-03			5.1E-02
P/PCB	4,4'-DDE	72-55-9	B2	1.0E+00	3.4E-01	2.6E+01	6.0E-03	3.4E-01	1.3E-02	2.9E-02			1.3E-02
P/PCB	4,4'-DDT	50-29-3	B2	1.0E+00	3.4E-01	2.6E+01	2.9E-03	3.4E-01	2.7E-02	1.3E-02	9.7E-02	4.0E+00	2.7E-02
P/PCB	Dieldrin	60-57-1	B2	1.0E+00	1.6E+01	5.6E-01	4.8E-04	1.6E+01	3.6E-03	2.2E-02	4.6E+00	5.2E-02	3.3E-03
P/PCB	Endosulfan I	959-98-8		1.0E+00						5.9E-02			
P/PCB	Endosulfan II	33213-65-9		1.0E+00						2.5E-02			
P/PCB	Endosulfan sulfate	1031-07-8		1.0E+00						8.2E-02			
P/PCB	Endrin	72-20-8	D	1.0E+00			2.9E-04			1.2E-02			
P/PCB	Endrin aldehyde	7421-93-4		1.0E+00						7.2E-04			
P/PCB	Endrin ketone	53494-70-5		1.0E+00									
P/PCB	Heptachlor	76-44-8	B2	1.0E+00	4.5E+00	2.0E+00	1.9E-03	4.5E+00	3.1E-03	8.6E-02	1.3E+00	4.6E-02	2.9E-03
P/PCB	Heptachlor epoxide	1024-57-3	B2	1.0E+00	9.1E+00	9.8E-01		9.1E+00		1.5E-02	2.6E+00	1.3E-01	1.2E-01
P/PCB	Methoxychlor	72-43-5	D	1.0E+00						2.3E-02			
P/PCB	Toxaphene	8001-35-2	B2	1.0E+00	1.1E+00	8.1E+00	4.8E-04	1.1E+00	5.1E-02	9.7E-03	3.2E-01	1.6E+00	4.9E-02
INORG	Aluminum	7429-90-5	D	1.0E+00			2.0E-06						
INORG	Antimony	7440-36-0		1.0E+00			2.0E-06						
INORG	Arsenic	7440-38-2	A	1.0E+00	1.5E+00	6.0E+00	2.0E-06	1.5E+00	9.0E+00		4.3E+00		3.6E+00
INORG	Barium	7440-39-3	D	1.0E+00			2.0E-06						
INORG	Beryllium	7440-41-7	B1	1.0E+00			2.0E-06				2.4E+00		
INORG	Cadmium	7440-43-9	B1	1.0E+00			2.0E-06				1.8E+00		
INORG	Calcium	7440-70-2		1.0E+00									
INORG	Chromium (total)	7440-47-3		1.0E+00			2.0E-06				1.2E+01		
INORG	Chromium III	16065-83-1	D	1.0E+00			2.0E-06						

Table H-4a: Cancer Risk Calculation - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater		Dermal Contact with Groundwater			Inhalation of Vapor from Groundwater			Target Risk
				Intake:	1.1E-06		Intake:	3.7E-01		Intake:	2.0E-03		1.0E-05
Analyte Group	**Chemical**	**CASRN**	**Carc Class**	**C_{gw}** (mg/L)	**SF_{oral}** $(mg/kg/d)^{-1}$	**RBC** (mg/L)	**DA** (L/cm^2-event)	**SF_{derm}** $(mg/kg/d)^{-1}$	**RBC** (mg/L)	**C_{air}** (mg/m^3)	**URF** $(mg/m^3)^{-1}$	**RBC** (mg/L)	**RBC** (mg/L)
INORG	Chromium VI	18540-29-9	A	1.0E+00			4.0E-06				1.2E+01		
INORG	Cobalt	7440-48-4	B1	1.0E+00			8.0E-07				2.8E+00		
INORG	Copper	7440-50-8	D	1.0E+00			2.0E-06						
INORG	Cyanide (total)	57-12-5	D	1.0E+00			2.0E-06						
INORG	Iron	7439-89-6	D	1.0E+00			2.0E-06						
INORG	Lead	7439-92-1	B2	1.0E+00			2.0E-06						
INORG	Magnesium	7439-95-4		1.0E+00			2.0E-06						
INORG	Manganese	7439-96-5	D	1.0E+00			2.0E-06						
INORG	Mercury	7439-97-6	D	1.0E+00			2.0E-06			1.2E-01			
INORG	Nickel	7440-02-0	A	1.0E+00			4.0E-07				2.4E-01		
INORG	Potassium	7440-09-7		1.0E+00			4.0E-06						
INORG	Selenium	7782-49-2	D	1.0E+00			2.0E-06						
INORG	Silver	7440-22-4	D	1.0E+00			1.2E-06						
INORG	Sodium	7440-23-5		1.0E+00			2.0E-06						
INORG	Thallium	7440-28-0		1.0E+00			2.0E-06						
INORG	Vanadium	7440-62-2		1.0E+00			2.0E-06						
INORG	Zinc	7440-66-6	D	1.0E+00			1.2E-06						
				Cummulative Risk		1.0E-05	**Cummulative Risk**		1.0E-05	**Cummulative Risk**		1.0E-05	

Table H-4b: Non-Cancer Risk Calculations - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater			Dermal Contact with Groundwater				Inhalation of Vapor from Groundwater				Target HI
					Intake:	7.8E-06		Intake:	2.6E+00			Intake:	1.4E-02			1.0E+00
Analyte Group	Constituent	CASRN	Carc Class	C_{gw} (mg/L)	RfD_{oral} (mg/kg/d)	HQ_{oral}	RBC (mg/L)	DA (L/cm^2-event)	RfD_{derm} $(mg/kg/d)^{-1}$	HQ_{derm}	RBC (mg/L)	C_{air} (mg/m^3)	RfC (mg/m^3	$HQ_{inh,ig}$	RBC (mg/L)	RBC (mg/L)
VOC	Acetone	67-64-1	ID	1.0E+00	9.0E-01	8.7E-06	1.1E+05		9.0E-01			8.5E-02				1.1E+05
VOC	Benzene	71-43-2	A	1.0E+00	4.0E-03	2.0E-03	5.1E+02	3.6E-05	4.0E-03	2.3E-02	4.3E+01	1.9E-01	3.0E-02	8.9E-02	1.1E+01	8.8E+00
VOC	Bromochloromethane	74-97-5		1.0E+00								1.5E-01				
VOC	Bromodichloromethane	75-27-4	B2	1.7E+01	2.0E-02	6.7E-03	2.6E+03	1.7E-05	2.0E-02	3.8E-02	4.5E+02	2.2E+00				3.8E+02
VOC	Bromoform	75-25-2	B2	1.0E+00	2.0E-02	3.9E-04	2.6E+03	1.4E-05	2.0E-02	1.8E-03	5.6E+02	1.0E-01				4.6E+02
VOC	Bromomethane	74-83-9	D	1.0E+00	1.4E-03	5.6E-03	1.8E+02	7.5E-06	1.4E-03	1.4E-02	7.2E+01	1.8E-01	5.0E-03	4.8E-01	2.1E+00	2.0E+00
VOC	2-Butanone	78-93-3	ID	1.0E+00	6.0E-01	1.3E-05	7.7E+04		6.0E-01			9.6E-02	5.0E+00	2.6E-04	3.8E+03	3.6E+03
VOC	Carbon Disulfide	75-15-0		1.0E+00	1.0E-01	7.8E-05	1.3E+04	3.1E-05	1.0E-01	8.0E-04	1.2E+03	2.0E-01	7.0E-01	3.9E-03	2.6E+02	2.1E+02
VOC	Carbon Tetrachloride	56-23-5	B2	1.0E+00	7.0E-04	1.1E-02	8.9E+01	4.9E-05	7.0E-04	1.8E-01	5.6E+00	1.4E-01				5.2E+00
VOC	Chlorobenzene	108-90-7	D	1.0E+00	2.0E-02	3.9E-04	2.6E+03	8.0E-05	2.0E-02	1.0E-02	9.7E+01	1.6E-01	6.0E-02	3.7E-02	2.7E+01	2.1E+01
VOC	Chloroethane	75-00-3		1.0E+00	4.0E-01	2.0E-05	5.1E+04		4.0E-01			2.1E-01	1.0E+01	2.9E-04	3.4E+03	3.2E+03
VOC	Chloroform	67-66-3	B2	1.0E+00	1.0E-02	7.8E-04	1.3E+03	1.9E-05	1.0E-02	4.8E-03	2.1E+02	1.6E-01	5.0E-02	4.3E-02	2.3E+01	2.1E+01
VOC	Chloromethane	74-87-3	D	1.0E+00				7.9E-06				2.4E-01	9.0E-02	3.7E-02	2.7E+01	2.7E+01
VOC	Cumene	98-82-8	D	1.0E+00	1.0E-01	7.8E-05	1.3E+04		1.0E-01			1.6E-01	4.0E-01	5.4E-03	1.8E+02	1.8E+02
VOC	Cyclohexane	110-82-7	ID	1.0E+00								1.9E-01	6.0E+00	4.3E-04	2.3E+03	2.3E+03
VOC	1,2-Dibromo-3-chloropropane	96-12-8	B2	1.0E+00								8.4E-02	2.0E-04	5.7E+00	1.7E-01	1.7E-01
VOC	Dibromochloromethane	124-48-1	C	1.0E+00	2.0E-02	3.9E-04	2.6E+03	1.4E-05	2.0E-02	1.8E-03	5.4E+02	1.1E-01				4.5E+02
VOC	1,2-Dibromoethane	106-93-4	B2	1.0E+00				8.5E-06				1.2E-01				
VOC	1,2-Dichlorobenzene	95-50-1	D	1.0E+00	9.0E-02	8.7E-05	1.1E+04	1.5E-04	9.0E-02	4.2E-03	2.4E+02	1.4E-01	2.0E-01	9.5E-03	1.1E+02	7.3E+01
VOC	1,3-Dichlorobenzene	541-73-1	D	1.0E+00	9.0E-02	8.7E-05	1.1E+04		9.0E-02			1.4E-01				1.1E+04
VOC	1,4-Dichlorobenzene	106-46-7	C	1.0E+00	3.0E-02	2.6E-04	3.8E+03	1.4E-04	3.0E-02	1.2E-02	8.1E+01	1.4E-01	8.0E-01	2.4E-03	4.2E+02	6.7E+01
VOC	Dichlorodifluoromethane	75-71-8		1.0E+00	2.0E-01	3.9E-05	2.6E+04	2.6E-05	2.0E-01	3.3E-04	3.0E+03	1.6E-01	2.0E-01	1.1E-02	9.3E+01	9.0E+01
VOC	1,1-Dichloroethane	75-34-3	C	1.0E+00	1.0E-01	7.8E-05	1.3E+04	1.8E-05	1.0E-01	4.7E-04	2.1E+03	1.7E-01	5.0E-01	4.7E-03	2.1E+02	1.9E+02
VOC	1,2-Dichloroethane	107-06-2	B2	1.0E+00	3.0E-02	2.6E-04	3.8E+03	1.1E-05	3.0E-02	9.8E-04	1.0E+03	1.6E-01	5.0E-03	4.5E-01	2.2E+00	2.2E+00
VOC	1,1-Dichloroethene	75-35-4	C	1.0E+00	5.0E-02	1.6E-04	6.4E+03	3.0E-05	5.0E-02	1.6E-03	6.4E+02	1.8E-01	2.0E-01	1.2E-02	8.3E+01	7.3E+01
VOC	1,2-Dichloroethene (total)	540-59-0		1.0E+00	9.0E-03	8.7E-04	1.1E+03		9.0E-03			1.7E-01				1.1E+03
VOC	cis-1,2-Dichloroethene	156-59-2	D	1.0E+00	1.0E-02	7.8E-04	1.3E+03		1.0E-02			1.7E-01				1.3E+03
VOC	trans-1,2-Dichloroethene	156-60-5		1.0E+00	2.0E-02	3.9E-04	2.6E+03		2.0E-02			1.7E-01				2.6E+03
VOC	1,2-Dichloropropane	78-87-5	B2	1.0E+00				2.1E-05				1.6E-01	4.0E-03	5.5E-01	1.8E+00	1.8E+00
VOC	1,3-Dichloropropene (total)	542-75-6	B2	1.0E+00	3.0E-02	2.6E-04	3.8E+03	2.3E-05	3.0E-02	1.9E-03	5.2E+02	1.6E-01	2.0E-02	1.1E-01	8.9E+00	8.7E+00
VOC	cis-1,3-Dichloropropene	10061-01-5		1.0E+00	3.0E-02	2.6E-04	3.8E+03		3.0E-02			1.6E-01	2.0E-02	1.1E-01	9.0E+00	9.0E+00
VOC	trans-1,3-Dichloropropene	10061-02-6		1.0E+00								1.6E-01				
VOC	Ethyl Benzene	100-41-4	D	1.0E+00	1.0E-01	7.8E-05	1.3E+04		1.0E-01			1.7E-01	1.0E+00	2.3E-03	4.4E+02	4.2E+02
VOC	2-Hexanone	591-78-6		1.0E+00	4.0E-02	2.0E-04	5.1E+03		4.0E-02			1.7E-01	5.0E-03	4.6E-01	2.2E+00	2.2E+00
VOC	Methyl Acetate	79-20-9		1.0E+00	1.0E+00	7.8E-06	1.3E+05		1.0E+00							1.3E+05
VOC	Methyl tert-butyl ether	1634-04-4		1.0E+00								1.8E-01	3.0E+00	8.1E-04	1.2E+03	1.2E+03
VOC	4-Methyl-2-pentanone	108-10-1	ID	1.0E+00								1.2E-01	3.0E+00	5.5E-04	1.8E+03	1.8E+03
VOC	Methylcyclohexane	108-87-2		1.0E+00									3.0E+00			
VOC	Methylene Chloride	75-09-2	B2	1.0E+00	6.0E-02	1.3E-04	7.7E+03	9.3E-06	6.0E-02	4.0E-04	2.5E+03	1.8E-01	3.0E+00	8.4E-04	1.2E+03	7.3E+02
VOC	Styrene	100-42-5		1.0E+00	2.0E-01	3.9E-05	2.6E+04	9.6E-05	2.0E-01	1.2E-03	8.0E+02	1.7E-01	1.0E+00	2.3E-03	4.4E+02	2.8E+02
VOC	1,1,2,2-Tetrachloroethane	79-34-5	C	1.0E+00	6.0E-02	1.3E-04	7.7E+03	2.6E-05	6.0E-02	1.1E-03	8.9E+02	1.2E-01				8.0E+02
VOC	Tetrachloroethene	127-18-4	C-B2	1.0E+00	1.0E-02	7.8E-04	1.3E+03	4.0E-05	1.0E-02	1.0E-02	9.7E+01	1.3E-01	4.0E-01	4.6E-03	2.2E+02	6.4E+01
VOC	Toluene	108-88-3	D	1.0E+00	2.0E-01	3.9E-05	2.6E+04		2.0E-01			1.8E-01	4.0E-01	6.1E-03	1.6E+02	1.6E+02
VOC	1,2,4-Trichlorobenzene	120-82-1	D	1.0E+00	1.0E-02	7.8E-04	1.3E+03	2.7E-04	1.0E-02	7.0E-02	1.4E+01	1.2E-01	2.0E-01	8.5E-03	1.2E+02	1.3E+01
VOC	1,1,1-Trichloroethane	71-55-6	D	1.0E+00	2.8E-01	2.8E-05	3.6E+04	3.8E-05	2.8E-01	3.5E-04	2.8E+03	1.5E-01	2.2E+00	9.3E-04	1.1E+03	7.6E+02
VOC	1,1,2-Trichloroethane	79-00-5	C	1.0E+00	4.0E-03	2.0E-03	5.1E+02	2.0E-05	4.0E-03	1.3E-02	7.8E+01	1.4E-01				6.8E+01
VOC	Trichloroethene	79-01-6	C-B2	1.0E+00	6.0E-03	1.3E-03	7.7E+02	5.5E-05	6.0E-03	2.4E-02	4.2E+01	1.5E-01				4.0E+01
VOC	Trichlorofluoromethane	75-69-4		1.0E+00	3.0E-01	2.6E-05	3.8E+04	4.0E-05	3.0E-01	3.5E-04	2.9E+03	1.5E-01	7.0E-01	2.9E-03	3.5E+02	3.1E+02
VOC	1,1,2-Trichloro-1,2,2-trifluoroeth	76-13-1		1.0E+00	3.0E+01	2.6E-07	3.8E+06		3.0E+01			1.3E-01	3.0E+01	5.8E-05	1.7E+04	1.7E+04

Table H-4b: Non-Cancer Risk Calculations - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater			Dermal Contact with Groundwater				Inhalation of Vapor from Groundwater				Target HI
					Intake:	7.8E-06		Intake:	2.6E+00			Intake:	1.4E-02			1.0E+00
Analyte Group	Constituent	CASRN	Carc Class	C_{gw} (mg/L)	RfD_{oral} (mg/kg/d)	HQ_{oral}	RBC (mg/L)	DA (L/cm^2-event)	RfD_{derm} $(mg/kg/d)^{-1}$	HQ_{derm}	RBC (mg/L)	C_{air} (mg/m^3)	RfC (mg/m^3	$HQ_{inh,ig}$	RBC (mg/L)	RBC (mg/L)
VOC	Vinyl Chloride	75-01-4	A	1.0E+00	3.0E-03	2.6E-03	3.8E+02	1.7E-05	3.0E-03	1.5E-02	6.8E+01	2.2E-01	1.0E-01	3.0E-02	3.3E+01	2.1E+01
VOC	Xylenes (total)	1330-20-7	ID	1.0E+00	2.0E-01	3.9E-05	2.6E+04		2.0E-01			1.7E-01	1.0E-01	2.3E-02	4.4E+01	4.4E+01
SVOC	Acenaphthene	83-32-9		1.0E+00	6.0E-02	1.3E-04	7.7E+03		6.0E-02			1.0E-01				7.7E+03
SVOC	Acenaphthylene	208-96-8	D	1.0E+00	3.0E-02	2.6E-04	3.8E+03		3.0E-02			9.4E-02				3.8E+03
SVOC	Acetophenone	98-86-2	D	1.0E+00	1.0E-01	7.8E-05	1.3E+04		1.0E-01			2.5E-02				1.3E+04
SVOC	Anthracene	120-12-7	D	1.0E+00	3.0E-01	2.6E-05	3.8E+04		3.0E-01			7.1E-02				3.8E+04
SVOC	Atrazine	1912-24-9	C	1.0E+00	3.5E-02	2.2E-04	4.5E+03		3.5E-02							4.5E+03
SVOC	Benzaldehyde	100-52-7		1.0E+00	1.0E-01	7.8E-05	1.3E+04		1.0E-01							1.3E+04
SVOC	Benzo(a)anthracene	56-55-3	B2	1.0E+00				2.7E-03				7.0E-03				
SVOC	Benzo(a)pyrene	50-32-8	B2	1.0E+00				4.3E-03				2.4E-03				
SVOC	Benzo(b)fluoranthene	205-99-2	B2	1.0E+00				4.9E-03				7.5E-02				
SVOC	Benzo(g,h,i)perylene	191-24-2	D	1.0E+00	3.0E-02	2.6E-04	3.8E+03		3.0E-02			2.9E-04				3.8E+03
SVOC	Benzo(k)fluoranthene	207-08-9	B2	1.0E+00								1.8E-03				
SVOC	Biphenyl	92-52-4	D	1.0E+00	5.0E-02	1.6E-04	6.4E+03		5.0E-02			1.2E-01				6.4E+03
SVOC	bis(2-Chloroethoxy)methane	111-91-1	D	1.0E+00								4.1E-04				
SVOC	bis(2-Chloroethyl) ether	111-44-4	B2	1.0E+00				5.2E-06				3.5E-02				
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	B2	1.0E+00	2.0E-02	3.9E-04	2.6E+03	8.5E-03	2.0E-02	1.1E+00	9.1E-01	1.9E-04				9.1E-01
SVOC	4-Bromophenyl-phenyl ether	101-55-3	D	1.0E+00								7.7E-02				
SVOC	Butylbenzylphthalate	85-68-7	C	1.0E+00	2.0E-01	3.9E-05	2.6E+04		2.0E-01			2.5E-03				2.6E+04
SVOC	Caprolactam	105-60-2		1.0E+00	5.0E-01	1.6E-05	6.4E+04		5.0E-01							6.4E+04
SVOC	Carbazole	86-74-8	B2	1.0E+00								3.8E-05				
SVOC	4-Chloro-3-methylphenol	59-50-7		1.0E+00								1.0E-03				
SVOC	4-Chloroaniline	106-47-8		1.0E+00	4.0E-03	2.0E-03	5.1E+02		4.0E-03			8.9E-04				5.1E+02
SVOC	2-Chloronaphthalene	91-58-7		1.0E+00	8.0E-02	9.8E-05	1.0E+04		8.0E-02			1.2E-01				1.0E+04
SVOC	2-Chlorophenol	95-57-8		1.0E+00	5.0E-03	1.6E-03	6.4E+02	2.4E-05	5.0E-03	1.3E-02	8.0E+01	1.3E-01				7.1E+01
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3		1.0E+00								9.8E-02				
SVOC	Chrysene	218-01-9	B2	1.0E+00				2.7E-03				7.4E-02				
SVOC	Dibenz(a,h)anthracene	53-70-3	B2	1.0E+00				4.6E-03				3.1E-05				
SVOC	Dibenzofuran	132-64-9	D	1.0E+00	2.0E-03	3.9E-03	2.6E+02		2.0E-03			2.5E-02				2.6E+02
SVOC	3,3'-Dichlorobenzidine	91-94-1	B2	1.0E+00				8.1E-05				8.6E-06				
SVOC	2,4-Dichlorophenol	120-83-2		1.0E+00	3.0E-03	2.6E-03	3.8E+02	7.6E-05	3.0E-03	6.5E-02	1.5E+01	7.5E-03				1.5E+01
SVOC	Diethylphthalate	84-66-2	D	1.0E+00	8.0E-01	9.8E-06	1.0E+05	2.2E-05	8.0E-01	7.0E-05	1.4E+04	1.0E-03				1.3E+04
SVOC	2,4-Dimethylphenol	105-67-9		1.0E+00	2.0E-02	3.9E-04	2.6E+03	3.5E-05	2.0E-02	4.6E-03	2.2E+02	5.3E-03				2.0E+02
SVOC	Dimethylphthalate	131-11-3	D	1.0E+00				6.2E-06				2.5E-04				
SVOC	Di-n-butylphthalate	84-74-2	D	1.0E+00	1.0E-01	7.8E-05	1.3E+04	3.3E-04	1.0E-01	8.6E-03	1.2E+02	2.0E-06				1.2E+02
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		1.0E+00	1.0E-04	7.8E-02	1.3E+01		1.0E-04			9.9E-04				1.3E+01
SVOC	2,4-Dinitrophenol	51-28-5		1.0E+00	2.0E-03	3.9E-03	2.6E+02	6.4E-06	2.0E-03	8.3E-03	1.2E+02	1.1E-03				8.2E+01
SVOC	2,4-Dinitrotoluene	121-14-2	B2	1.0E+00	2.0E-03	3.9E-03	2.6E+02	1.3E-05	2.0E-03	1.7E-02	6.0E+01	2.2E-04				4.8E+01
SVOC	2,6-Dinitrotoluene	606-20-2	B2	1.0E+00	1.0E-03	7.8E-03	1.3E+02	1.1E-05	1.0E-03	2.7E-02	3.6E+01	1.8E-03				2.8E+01
SVOC	Di-n-octylphthalate	117-84-0		1.0E+00	2.0E-02	3.9E-04	2.6E+03		2.0E-02			5.1E-02				2.6E+03
SVOC	Fluoranthene	206-44-0	D	1.0E+00	4.0E-02	2.0E-04	5.1E+03	1.3E-03	4.0E-02	8.4E-02	1.2E+01	2.9E-02				1.2E+01
SVOC	Fluorene	86-73-7	D	1.0E+00	4.0E-02	2.0E-04	5.1E+03		4.0E-02			7.3E-02				5.1E+03
SVOC	Hexachlorobenzene	118-74-1	B2	1.0E+00	8.0E-04	9.8E-03	1.0E+02	2.2E-03	8.0E-04	7.2E+00	1.4E-01	9.9E-02				1.4E-01
SVOC	Hexachlorobutadiene	87-68-3	C	1.0E+00	2.0E-04	3.9E-02	2.6E+01	5.1E-04	2.0E-04	6.5E+00	1.5E-01	1.1E-01				1.5E-01
SVOC	Hexachlorocyclopentadiene	77-47-4	E	1.0E+00	6.0E-03	1.3E-03	7.7E+02		6.0E-03			1.0E-01	2.0E-04	7.2E+00	1.4E-01	1.4E-01
SVOC	Hexachloroethane	67-72-1	C	1.0E+00	1.0E-03	7.8E-03	1.3E+02	1.9E-04	1.0E-03	4.9E-01	2.0E+00	1.1E-01				2.0E+00
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	B2	1.0E+00				4.5E-03				3.2E-03				
SVOC	Isophorone	78-59-1	C	1.0E+00	2.0E-01	3.9E-05	2.6E+04	1.1E-05	2.0E-01	1.5E-04	6.8E+03	1.6E-02				5.4E+03
SVOC	2-Methylnaphthalene	91-57-6	ID	1.0E+00	4.0E-03	2.0E-03	5.1E+02		4.0E-03			1.3E-01	3.0E-03	6.0E-01	1.7E+00	1.7E+00

Table H-4b: Non-Cancer Risk Calculations - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater			Dermal Contact with Groundwater				Inhalation of Vapor from Groundwater				Target HI
					Intake:	7.8E-06		Intake:	2.6E+00			Intake:	1.4E-02			1.0E+00
Analyte Group	Constituent	CASRN	Carc Class	C_{gw} (mg/L)	RfD_{oral} (mg/kg/d)	HQ_{oral}	RBC (mg/L)	DA (L/cm^2-event)	RfD_{derm} $(mg/kg/d)^{-1}$	HQ_{derm}	RBC (mg/L)	C_{air} (mg/m^3)	RfC (mg/m^3	$HQ_{inh,ig}$	RBC (mg/L)	RBC (mg/L)
SVOC	2-Methylphenol	95-48-7	C	1.0E+00	5.0E-02	1.6E-04	6.4E+03	2.3E-05	5.0E-02	1.2E-03	8.5E+02	3.4E-03				7.5E+02
SVOC	4-Methylphenol	106-44-5	C	1.0E+00	5.0E-03	1.6E-03	6.4E+02	2.1E-05	5.0E-03	1.1E-02	9.0E+01	2.2E-03				7.9E+01
SVOC	Naphthalene	91-20-3	C	1.0E+00	2.0E-02	3.9E-04	2.6E+03	1.5E-04	2.0E-02	1.9E-02	5.2E+01	1.4E-01	3.0E-03	6.3E-01	1.6E+00	1.6E+00
SVOC	2-Nitroaniline	88-74-4		1.0E+00								9.4E-02	2.0E-04	6.4E+00	1.6E-01	1.6E-01
SVOC	3-Nitroaniline	99-09-2	C	1.0E+00	3.0E-04	2.6E-02	3.8E+01		3.0E-04			3.8E-04	1.0E-03	5.2E-03	1.9E+02	3.2E+01
SVOC	4-Nitroaniline	100-01-6	C	1.0E+00	3.0E-03	2.6E-03	3.8E+02		3.0E-03			5.5E-06	4.0E-03	1.9E-05	5.4E+04	3.8E+02
SVOC	Nitrobenzene	98-95-3	D	1.0E+00	5.0E-04	1.6E-02	6.4E+01		5.0E-04			4.6E-02	2.0E-03	3.2E-01	3.2E+00	3.0E+00
SVOC	2-Nitrophenol	88-75-5		1.0E+00								2.1E-02				
SVOC	4-Nitrophenol	100-02-7		1.0E+00	8.0E-03	9.8E-04	1.0E+03		8.0E-03			1.1E-06				1.0E+03
SVOC	N-Nitrosodiphenylamine	86-30-6	B2	1.0E+00	2.0E-02	3.9E-04	2.6E+03	6.7E-05	2.0E-02	8.6E-03	1.2E+02	1.1E-02				1.1E+02
SVOC	N-Nitroso-di-n-propylamine	621-64-7	B2	1.0E+00				7.7E-06				5.8E-03				
SVOC	N-Nitrosomorpholine	59-89-2		1.0E+00												
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	C	1.0E+00	4.0E-02	2.0E-04	5.1E+03		4.0E-02			9.1E-02				5.1E+03
SVOC	Pentachlorophenol	87-86-5	B2	1.0E+00	3.0E-02	2.6E-04	3.8E+03	7.3E-04	3.0E-02	6.3E-02	1.6E+01	5.2E-05				1.6E+01
SVOC	Phenanthrene	85-01-8	D	1.0E+00	3.0E-02	2.6E-04	3.8E+03		3.0E-02			3.9E-02				3.8E+03
SVOC	Phenol	108-95-2	ID	1.0E+00	3.0E-01	2.6E-05	3.8E+04	1.2E-05	3.0E-01	1.0E-04	9.7E+03	1.2E-03				7.8E+03
SVOC	Pyrene	129-00-0	D	1.0E+00	3.0E-02	2.6E-04	3.8E+03		3.0E-02			2.1E-02				3.8E+03
SVOC	2,4,5-Trichlorophenol	95-95-4		1.0E+00	1.0E-01	7.8E-05	1.3E+04		1.0E-01			9.4E-03				1.3E+04
SVOC	2,4,6-Trichlorophenol	88-06-2	B2	1.0E+00	1.0E-04	7.8E-02	1.3E+01	1.6E-04	1.0E-04	4.0E+00	2.5E-01	1.6E-02				2.4E-01
P/PCB	PCBs (total)	1336-36-3	B2	1.0E+00	2.0E-05	3.9E-01	2.6E+00	2.1E-03	2.0E-05	2.7E+02	3.7E-03	9.4E-02				3.7E-03
P/PCB	Aroclor-1016	12674-11-2	B2	1.0E+00	7.0E-05	1.1E-01	8.9E+00		7.0E-05			9.2E-02				8.9E+00
P/PCB	Aroclor-1221	11104-28-2	B2	1.0E+00								1.2E-01				
P/PCB	Aroclor-1232	11141-16-5	B2	1.0E+00												
P/PCB	Aroclor-1242	53469-21-9	B2	1.0E+00								9.8E-02				
P/PCB	Aroclor-1248	12672-29-6	B2	1.0E+00								9.9E-02				
P/PCB	Aroclor-1254	11097-69-1	B2	1.0E+00	2.0E-05	3.9E-01	2.6E+00		2.0E-05			9.5E-02				2.6E+00
P/PCB	Aroclor-1260	11096-82-5	B2	1.0E+00								8.9E-02				
P/PCB	Aldrin	309-00-2	B2	1.0E+00	3.0E-05	2.6E-01	3.8E+00	3.8E-03	3.0E-05	3.2E+02	3.1E-03	7.1E-02				3.1E-03
P/PCB	alpha-BHC	319-84-6	B2	1.0E+00	5.0E-04	1.6E-02	6.4E+01		5.0E-04			1.8E-02				6.4E+01
P/PCB	beta-BHC	319-85-7	C	1.0E+00	2.0E-04	3.9E-02	2.6E+01		2.0E-04			1.5E-03				2.6E+01
P/PCB	delta-BHC	319-86-8	D	1.0E+00								8.7E-04				
P/PCB	gamma-BHC	58-89-9	B2-C	1.0E+00	3.0E-04	2.6E-02	3.8E+01	8.1E-05	3.0E-04	6.9E-01	1.4E+00	2.2E-02				1.4E+00
P/PCB	Chlordane	57-74-9	B2	1.0E+00	5.0E-04	1.6E-02	6.4E+01	1.5E-03	5.0E-04	7.7E+00	1.3E-01	4.4E-02	7.0E-04	8.5E-01	1.2E+00	1.2E-01
P/PCB	alpha-Chlordane	5103-71-9		1.0E+00	5.0E-04	1.6E-02	6.4E+01		5.0E-04							6.4E+01
P/PCB	gamma-Chlordane	5103-74-2		1.0E+00	5.0E-04	1.6E-02	6.4E+01		5.0E-04							6.4E+01
P/PCB	4,4'-DDD	72-54-8	B2	1.0E+00	3.0E-03	2.6E-03	3.8E+02	2.2E-03	3.0E-03	1.9E+00	5.2E-01	7.4E-03				5.2E-01
P/PCB	4,4'-DDE	72-55-9	B2	1.0E+00	7.0E-04	1.1E-02	8.9E+01	6.0E-03	7.0E-04	2.2E+01	4.5E-02	2.9E-02				4.5E-02
P/PCB	4,4'-DDT	50-29-3	B2	1.0E+00	5.0E-04	1.6E-02	6.4E+01	2.9E-03	5.0E-04	1.5E+01	6.6E-02	1.3E-02				6.6E-02
P/PCB	Dieldrin	60-57-1	B2	1.0E+00	5.0E-05	1.6E-01	6.4E+00	4.8E-04	5.0E-05	2.5E+01	4.1E-02	2.2E-02				4.0E-02
P/PCB	Endosulfan I	959-98-8		1.0E+00	6.0E-03	1.3E-03	7.7E+02		6.0E-03			5.9E-02				7.7E+02
P/PCB	Endosulfan II	33213-65-9		1.0E+00	6.0E-03	1.3E-03	7.7E+02		6.0E-03			2.5E-02				7.7E+02
P/PCB	Endosulfan sulfate	1031-07-8		1.0E+00	6.0E-03	1.3E-03	7.7E+02		6.0E-03			8.2E-02				7.7E+02
P/PCB	Endrin	72-20-8	D	1.0E+00	3.0E-04	2.6E-02	3.8E+01	2.9E-04	3.0E-04	2.5E+00	4.0E-01	1.2E-02				3.9E-01
P/PCB	Endrin aldehyde	7421-93-4		1.0E+00	3.0E-04	2.6E-02	3.8E+01		3.0E-04			7.2E-04				3.8E+01
P/PCB	Endrin ketone	53494-70-5		1.0E+00												
P/PCB	Heptachlor	76-44-8	B2	1.0E+00	5.0E-04	1.6E-02	6.4E+01	1.9E-03	5.0E-04	1.0E+01	9.9E-02	8.6E-02				9.9E-02
P/PCB	Heptachlor epoxide	1024-57-3	B2	1.0E+00	1.3E-05	6.0E-01	1.7E+00		1.3E-05			1.5E-02				1.7E+00
P/PCB	Methoxychlor	72-43-5	D	1.0E+00	5.0E-03	1.6E-03	6.4E+02		5.0E-03			2.3E-02				6.4E+02
P/PCB	Toxaphene	8001-35-2	B2	1.0E+00				4.8E-04				9.7E-03				

Table H-4b: Non-Cancer Risk Calculations - Hypothetical Excavation Workers Exposure Scenarios (Groundwater Contact)
Vernay Laboratories, Inc. Yellow Springs, Ohio

				Pathway:	Incidental Ingestion of Groundwater			Dermal Contact with Groundwater				Inhalation of Vapor from Groundwater				Target HI
					Intake:	7.8E-06		Intake:	2.6E+00			Intake:	1.4E-02			1.0E+00
Analyte Group	**Constituent**	**CASRN**	**Carc Class**	**C_{gw}** (mg/L)	**RfD_{oral}** (mg/kg/d)	**HQ_{oral}**	**RBC** (mg/L)	**DA** (L/cm^2-event)	**RfD_{derm}** $(mg/kg/d)^{-1}$	**HQ_{derm}**	**RBC** (mg/L)	**C_{air}** (mg/m^3)	**RfC** (mg/m^3)	**$HQ_{inh,ig}$**	**RBC** (mg/L)	**RBC** (mg/L)
INORG	Aluminum	7429-90-5	D	1.0E+00	1.0E+00	7.8E-06	1.3E+05	2.0E-06	1.0E+00	5.2E-06	1.9E+05		5.0E-03			7.7E+04
INORG	Antimony	7440-36-0		1.0E+00	4.0E-04	2.0E-02	5.1E+01	2.0E-06	4.0E-04	1.3E-02	7.7E+01					3.1E+01
INORG	Arsenic	7440-38-2	A	1.0E+00	3.0E-04	2.6E-02	3.8E+01	2.0E-06	3.0E-04	1.7E-02	5.8E+01					2E+01
INORG	Barium	7440-39-3	D	1.0E+00	7.0E-02	1.1E-04	8.9E+03	2.0E-06	7.0E-02	7.4E-05	1.4E+04					5E+03
INORG	Beryllium	7440-41-7	B1	1.0E+00	2.0E-03	3.9E-03	2.6E+02	2.0E-06	2.0E-03	2.6E-03	3.9E+02		2.0E-05			2E+02
INORG	Cadmium	7440-43-9	B1	1.0E+00	1.0E-03	7.8E-03	1.3E+02	2.0E-06	1.0E-03	5.2E-03	1.9E+02					8E+01
INORG	Calcium	7440-70-2		1.0E+00												
INORG	Chromium (total)	7440-47-3		1.0E+00	3.0E-03	2.6E-03	3.8E+02	2.0E-06	3.0E-03	1.7E-03	5.8E+02		1.0E-04			2E+02
INORG	Chromium III	16065-83-1	D	1.0E+00	1.5E+00	5.2E-06	1.9E+05	2.0E-06	1.5E+00	3.4E-06	2.9E+05					1E+05
INORG	Chromium VI	18540-29-9	A	1.0E+00	3.0E-03	2.6E-03	3.8E+02	4.0E-06	3.0E-03	3.4E-03	2.9E+02		1.0E-04			2E+02
INORG	Cobalt	7440-48-4	B1	1.0E+00	2.0E-02	3.9E-04	2.6E+03	8.0E-07	2.0E-02	1.0E-04	9.7E+03		2.0E-05			2E+03
INORG	Copper	7440-50-8	D	1.0E+00	4.0E-02	2.0E-04	5.1E+03	2.0E-06	4.0E-02	1.3E-04	7.7E+03					3E+03
INORG	Cyanide (total)	57-12-5	D	1.0E+00	2.0E-02	3.9E-04	2.6E+03	2.0E-06	2.0E-02	2.6E-04	3.9E+03					2E+03
INORG	Iron	7439-89-6	D	1.0E+00	3.0E-01	2.6E-05	3.8E+04	2.0E-06	3.0E-01	1.7E-05	5.8E+04					2E+04
INORG	Lead	7439-92-1	B2	1.0E+00				2.0E-06								
INORG	Magnesium	7439-95-4		1.0E+00	9.7E+00	8.1E-07	1.2E+06	2.0E-06	9.7E+00	5.3E-07	1.9E+06					7E+05
INORG	Manganese	7439-96-5	D	1.0E+00	1.4E-01	5.6E-05	1.8E+04	2.0E-06	1.4E-01	3.7E-05	2.7E+04		5.0E-05			1E+04
INORG	Mercury	7439-97-6	D	1.0E+00	3.0E-04	2.6E-02	3.8E+01	2.0E-06	3.0E-04	1.7E-02	5.8E+01	1.2E-01	3.0E-04	5.5E+00	1.8E-01	2E-01
INORG	Nickel	7440-02-0	A	1.0E+00	2.0E-02	3.9E-04	2.6E+03	4.0E-07	2.0E-02	5.2E-05	1.9E+04					2E+03
INORG	Potassium	7440-09-7		1.0E+00				4.0E-06								
INORG	Selenium	7782-49-2	D	1.0E+00	5.0E-03	1.6E-03	6.4E+02	2.0E-06	5.0E-03	1.0E-03	9.7E+02					4E+02
INORG	Silver	7440-22-4	D	1.0E+00	5.0E-03	1.6E-03	6.4E+02	1.2E-06	5.0E-03	6.2E-04	1.6E+03		1.0E-05			5E+02
INORG	Sodium	7440-23-5		1.0E+00				2.0E-06								
INORG	Thallium	7440-28-0		1.0E+00	7.0E-05	1.1E-01	8.9E+00	2.0E-06	7.0E-05	7.4E-02	1.4E+01					5E+00
INORG	Vanadium	7440-62-2		1.0E+00	7.0E-03	1.1E-03	8.9E+02	2.0E-06	7.0E-03	7.4E-04	1.4E+03					5E+02
INORG	Zinc	7440-66-6	D	1.0E+00	3.0E-01	2.6E-05	3.8E+04	1.2E-06	3.0E-01	1.0E-05	9.7E+04					3E+04
				Hazard Index		**2.7E+00**	1.0E+00	**Hazard Index**		**7.0E+02**	1.0E+00	**Hazard Index**		**3.0E+01**	1.0E+00	

Table H-5: Risk Based Criteria for Excavation Worker Groundwater Contact
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Excavation Worker Groundwater Contact Cancer	Excavation Worker Groundwater Contact Non-Cancer	Excavation Worker Groundwater Contact Combined
VOC	Acetone	67-64-1		1.1E+05	1.1E+05
VOC	Benzene	71-43-2	2.7E+00	8.8E+00	2.7E+00
VOC	Bromochloromethane	74-97-5			
VOC	Bromodichloromethane	75-27-4	2.1E+01	3.8E+02	2.1E+01
VOC	Bromoform	75-25-2	3.8E+01	4.6E+02	3.8E+01
VOC	Bromomethane	74-83-9		2.0E+00	2.0E+00
VOC	2-Butanone	78-93-3		3.6E+03	3.6E+03
VOC	Carbon Disulfide	75-15-0		2.1E+02	2.1E+02
VOC	Carbon Tetrachloride	56-23-5	1.5E+00	5.2E+00	1.5E+00
VOC	Chlorobenzene	108-90-7		2.1E+01	2.1E+01
VOC	Chloroethane	75-00-3	3.1E+03	3.2E+03	3.1E+03
VOC	Chloroform	67-66-3	1.4E+00	2.1E+01	1.4E+00
VOC	Chloromethane	74-87-3		2.7E+01	2.7E+01
VOC	Cumene	98-82-8		1.8E+02	1.8E+02
VOC	Cyclohexane	110-82-7		2.3E+03	2.3E+03
VOC	1,2-Dibromo-3-chloropropane	96-12-8	6.4E+00	1.7E-01	1.7E-01
VOC	Dibromochloromethane	124-48-1	1.9E+01	4.5E+02	1.9E+01
VOC	1,2-Dibromoethane	106-93-4	2.4E-02		2.4E-02
VOC	1,2-Dichlorobenzene	95-50-1		7.3E+01	7.3E+01
VOC	1,3-Dichlorobenzene	541-73-1		1.1E+04	1.1E+04
VOC	1,4-Dichlorobenzene	106-46-7	7.8E+00	6.7E+01	7.8E+00
VOC	Dichlorodifluoromethane	75-71-8		9.0E+01	9.0E+01
VOC	1,1-Dichloroethane	75-34-3		1.9E+02	1.9E+02
VOC	1,2-Dichloroethane	107-06-2	1.1E+00	2.2E+00	1.1E+00
VOC	1,1-Dichloroethene	75-35-4		7.3E+01	7.3E+01
VOC	1,2-Dichloroethene (total)	540-59-0		1.1E+03	1.1E+03
VOC	cis-1,2-Dichloroethene	156-59-2		1.3E+03	1.3E+03
VOC	trans-1,2-Dichloroethene	156-60-5		2.6E+03	2.6E+03
VOC	1,2-Dichloropropane	78-87-5	1.7E+01	1.8E+00	1.8E+00
VOC	1,3-Dichloropropene (total)	542-75-6	4.5E+00	8.7E+00	4.5E+00
VOC	cis-1,3-Dichloropropene	10061-01-5	7.3E+00	9.0E+00	7.3E+00
VOC	trans-1,3-Dichloropropene	10061-02-6			
VOC	Ethyl Benzene	100-41-4		4.2E+02	4.2E+02
VOC	2-Hexanone	591-78-6		2.2E+00	2.2E+00
VOC	Methyl Acetate	79-20-9		1.3E+05	1.3E+05
VOC	Methyl tert-butyl ether	1634-04-4	2.7E+03	1.2E+03	1.2E+03
VOC	4-Methyl-2-pentanone	108-10-1		1.8E+03	1.8E+03
VOC	Methylcyclohexane	108-87-2			
VOC	Methylene Chloride	75-09-2	4.9E+01	7.3E+02	4.9E+01
VOC	Styrene	100-42-5		2.8E+02	2.8E+02
VOC	1,1,2,2-Tetrachloroethane	79-34-5	6.6E-01	8.0E+02	6.6E-01
VOC	Tetrachloroethene	127-18-4	6.1E+00	6.4E+01	6.1E+00
VOC	Toluene	108-88-3		1.6E+02	1.6E+02
VOC	1,2,4-Trichlorobenzene	120-82-1		1.3E+01	1.3E+01
VOC	1,1,1-Trichloroethane	71-55-6		7.6E+02	7.6E+02
VOC	1,1,2-Trichloroethane	79-00-5	2.0E+00	6.8E+01	2.0E+00
VOC	Trichloroethene	79-01-6	1.4E+01	4.0E+01	1.4E+01
VOC	Trichlorofluoromethane	75-69-4		3.1E+02	3.1E+02
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		1.7E+04	1.7E+04
VOC	Vinyl Chloride	75-01-4	7.1E-01	2.1E+01	7.1E-01
VOC	Xylenes (total)	1330-20-7		4.4E+01	4.4E+01
SVOC	Acenaphthene	83-32-9		7.7E+03	7.7E+03
SVOC	Acenaphthylene	208-96-8		3.8E+03	3.8E+03
SVOC	Acetophenone	98-86-2		1.3E+04	1.3E+04

Table H-5: Risk Based Criteria for Excavation Worker Groundwater Contact
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Excavation Worker Groundwater Contact Cancer	Excavation Worker Groundwater Contact Non-Cancer	Excavation Worker Groundwater Contact Combined
SVOC	Anthracene	120-12-7		3.8E+04	3.8E+04
SVOC	Atrazine	1912-24-9	4.0E+01	4.5E+03	4.0E+01
SVOC	Benzaldehyde	100-52-7		1.3E+04	1.3E+04
SVOC	Benzo(a)anthracene	56-55-3	1.4E-02		1.4E-02
SVOC	Benzo(a)pyrene	50-32-8	8.7E-04		8.7E-04
SVOC	Benzo(b)fluoranthene	205-99-2	7.6E-03		7.6E-03
SVOC	Benzo(g,h,i)perylene	191-24-2		3.8E+03	3.8E+03
SVOC	Benzo(k)fluoranthene	207-08-9	1.2E+02		1.2E+02
SVOC	Biphenyl	92-52-4		6.4E+03	6.4E+03
SVOC	bis(2-Chloroethoxy)methane	111-91-1			
SVOC	bis(2-Chloroethyl) ether	111-44-4	3.8E-01		3.8E-01
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	2.3E-01	9.1E-01	2.3E-01
SVOC	4-Bromophenyl-phenyl ether	101-55-3			
SVOC	Butylbenzylphthalate	85-68-7		2.6E+04	2.6E+04
SVOC	Caprolactam	105-60-2		6.4E+04	6.4E+04
SVOC	Carbazole	86-74-8	4.5E+02		4.5E+02
SVOC	4-Chloro-3-methylphenol	59-50-7			
SVOC	4-Chloroaniline	106-47-8		5.1E+02	5.1E+02
SVOC	2-Chloronaphthalene	91-58-7		1.0E+04	1.0E+04
SVOC	2-Chlorophenol	95-57-8		7.1E+01	7.1E+01
SVOC	4-Chlorophenyl-phenyl ether	7005-72-3			
SVOC	Chrysene	218-01-9	1.4E+00		1.4E+00
SVOC	Dibenz(a,h)anthracene	53-70-3	8.1E-04		8.1E-04
SVOC	Dibenzofuran	132-64-9		2.6E+02	2.6E+02
SVOC	3,3'-Dichlorobenzidine	91-94-1	7.2E-01		7.2E-01
SVOC	2,4-Dichlorophenol	120-83-2		1.5E+01	1.5E+01
SVOC	Diethylphthalate	84-66-2		1.3E+04	1.3E+04
SVOC	2,4-Dimethylphenol	105-67-9		2.0E+02	2.0E+02
SVOC	Dimethylphthalate	131-11-3			
SVOC	Di-n-butylphthalate	84-74-2		1.2E+02	1.2E+02
SVOC	4,6-Dinitro-2-methylphenol	534-52-1		1.3E+01	1.3E+01
SVOC	2,4-Dinitrophenol	51-28-5		8.2E+01	8.2E+01
SVOC	2,4-Dinitrotoluene	121-14-2	2.5E+00	4.8E+01	2.5E+00
SVOC	2,6-Dinitrotoluene	606-20-2	2.9E+00	2.8E+01	2.9E+00
SVOC	Di-n-octylphthalate	117-84-0		2.6E+03	2.6E+03
SVOC	Fluoranthene	206-44-0		1.2E+01	1.2E+01
SVOC	Fluorene	86-73-7		5.1E+03	5.1E+03
SVOC	Hexachlorobenzene	118-74-1	7.1E-03	1.4E-01	7.1E-03
SVOC	Hexachlorobutadiene	87-68-3	5.2E-01	1.5E-01	1.5E-01
SVOC	Hexachlorocyclopentadiene	77-47-4		1.4E-01	1.4E-01
SVOC	Hexachloroethane	67-72-1	5.3E+00	2.0E+00	2.0E+00
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	8.2E-03		8.2E-03
SVOC	Isophorone	78-59-1	2.0E+03	5.4E+03	2.0E+03
SVOC	2-Methylnaphthalene	91-57-6		1.7E+00	1.7E+00
SVOC	2-Methylphenol	95-48-7		7.5E+02	7.5E+02
SVOC	4-Methylphenol	106-44-5		7.9E+01	7.9E+01
SVOC	Naphthalene	91-20-3		1.6E+00	1.6E+00
SVOC	2-Nitroaniline	88-74-4		1.6E-01	1.6E-01
SVOC	3-Nitroaniline	99-09-2	4.3E+02	3.2E+01	3.2E+01
SVOC	4-Nitroaniline	100-01-6	4.3E+02	3.8E+02	3.8E+02
SVOC	Nitrobenzene	98-95-3		3.0E+00	3.0E+00
SVOC	2-Nitrophenol	88-75-5			
SVOC	4-Nitrophenol	100-02-7		1.0E+03	1.0E+03
SVOC	N-Nitrosodiphenylamine	86-30-6	7.9E+01	1.1E+02	7.9E+01

Table H-5: Risk Based Criteria for Excavation Worker Groundwater Contact
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Excavation Worker Groundwater Contact Cancer	Excavation Worker Groundwater Contact Non-Cancer	Excavation Worker Groundwater Contact Combined
SVOC	N-Nitroso-di-n-propylamine	621-64-7	3.6E-01		3.6E-01
SVOC	N-Nitrosomorpholine	59-89-2			
SVOC	2,2'-oxybis(1-Chloropropane)	108-60-1	5.4E+00	5.1E+03	5.4E+00
SVOC	Pentachlorophenol	87-86-5	3.1E-01	1.6E+01	3.1E-01
SVOC	Phenanthrene	85-01-8		3.8E+03	3.8E+03
SVOC	Phenol	108-95-2		7.8E+03	7.8E+03
SVOC	Pyrene	129-00-0		3.8E+03	3.8E+03
SVOC	2,4,5-Trichlorophenol	95-95-4		1.3E+04	1.3E+04
SVOC	2,4,6-Trichlorophenol	88-06-2	1.4E+01	2.4E-01	2.4E-01
P/PCB	PCBs (total)	1336-36-3	6.5E-03	3.7E-03	3.7E-03
P/PCB	Aroclor-1016	12674-11-2	1.3E+02	8.9E+00	8.9E+00
P/PCB	Aroclor-1221	11104-28-2	4.5E+00		4.5E+00
P/PCB	Aroclor-1232	11141-16-5	4.5E+00		4.5E+00
P/PCB	Aroclor-1242	53469-21-9	4.5E+00		4.5E+00
P/PCB	Aroclor-1248	12672-29-6	4.5E+00		4.5E+00
P/PCB	Aroclor-1254	11097-69-1	4.5E+00	2.6E+00	2.6E+00
P/PCB	Aroclor-1260	11096-82-5	4.5E+00		4.5E+00
P/PCB	Aldrin	309-00-2	4.1E-04	3.1E-03	4.1E-04
P/PCB	alpha-BHC	319-84-6	1.4E-01	6.4E+01	1.4E-01
P/PCB	beta-BHC	319-85-7	2.8E+00	2.6E+01	2.8E+00
P/PCB	delta-BHC	319-86-8			
P/PCB	gamma-BHC	58-89-9	2.5E-01	1.4E+00	2.5E-01
P/PCB	Chlordane	57-74-9	5.0E-02	1.2E-01	5.0E-02
P/PCB	alpha-Chlordane	5103-71-9	2.6E+01	6.4E+01	2.6E+01
P/PCB	gamma-Chlordane	5103-74-2	2.6E+01	6.4E+01	2.6E+01
P/PCB	4,4'-DDD	72-54-8	5.1E-02	5.2E-01	5.1E-02
P/PCB	4,4'-DDE	72-55-9	1.3E-02	4.5E-02	1.3E-02
P/PCB	4,4'-DDT	50-29-3	2.7E-02	6.6E-02	2.7E-02
P/PCB	Dieldrin	60-57-1	3.3E-03	4.0E-02	3.3E-03
P/PCB	Endosulfan I	959-98-8		7.7E+02	7.7E+02
P/PCB	Endosulfan II	33213-65-9		7.7E+02	7.7E+02
P/PCB	Endosulfan sulfate	1031-07-8		7.7E+02	7.7E+02
P/PCB	Endrin	72-20-8		3.9E-01	3.9E-01
P/PCB	Endrin aldehyde	7421-93-4		3.8E+01	3.8E+01
P/PCB	Endrin ketone	53494-70-5			
P/PCB	Heptachlor	76-44-8	2.9E-03	9.9E-02	2.9E-03
P/PCB	Heptachlor epoxide	1024-57-3	1.2E-01	1.7E+00	1.2E-01
P/PCB	Methoxychlor	72-43-5		6.4E+02	6.4E+02
P/PCB	Toxaphene	8001-35-2	4.9E-02		4.9E-02
INORG	Aluminum	7429-90-5		7.7E+04	7.7E+04
INORG	Antimony	7440-36-0		3.1E+01	3.1E+01
INORG	Arsenic	7440-38-2	3.6E+00	2.3E+01	3.6E+00
INORG	Barium	7440-39-3		5.4E+03	5.4E+03
INORG	Beryllium	7440-41-7		1.5E+02	1.5E+02
INORG	Cadmium	7440-43-9		7.7E+01	7.7E+01
INORG	Calcium	7440-70-2			
INORG	Chromium (total)	7440-47-3		2.3E+02	2.3E+02
INORG	Chromium III	16065-83-1		1.2E+05	1.2E+05
INORG	Chromium VI	18540-29-9		1.7E+02	1.7E+02
INORG	Cobalt	7440-48-4		2.0E+03	2.0E+03
INORG	Copper	7440-50-8		3.1E+03	3.1E+03
INORG	Cyanide (total)	57-12-5		1.5E+03	1.5E+03
INORG	Iron	7439-89-6		2.3E+04	2.3E+04
INORG	Lead	7439-92-1			

Table H-5: Risk Based Criteria for Excavation Worker Groundwater Contact
Vernay Laboratories, Inc. Yellow Springs, Ohio

Chem Group	Chemical	CASRN	Excavation Worker Groundwater Contact Cancer	Excavation Worker Groundwater Contact Non-Cancer	Excavation Worker Groundwater Contact Combined
INORG	Magnesium	7439-95-4		7.5E+05	7.5E+05
INORG	Manganese	7439-96-5		1.1E+04	1.1E+04
INORG	Mercury	7439-97-6		1.8E-01	1.8E-01
INORG	Nickel	7440-02-0		2.3E+03	2.3E+03
INORG	Potassium	7440-09-7			
INORG	Selenium	7782-49-2		3.8E+02	3.8E+02
INORG	Silver	7440-22-4		4.6E+02	4.6E+02
INORG	Sodium	7440-23-5			
INORG	Thallium	7440-28-0		5.4E+00	5.4E+00
INORG	Vanadium	7440-62-2		5.4E+02	5.4E+02
INORG	Zinc	7440-66-6		2.7E+04	2.7E+04
Notes:					
1	Criteria are calculated with a target cancer risk level of 1E-5 and an HQ of 1.				