TABLE 9
VALUES USED FOR DAILY INTAKE CALCULATIONS

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Fugitive Dust

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference
Inhalation of fugitive dust (upland soil)	Trespasser	Youth (6-19 years)	Upland Areas of Site	EPC	Exposure Point Concentration	Chemical-specific	mg/m^3	1
				RPair	Respirable Particulates in Air	32	ug/m^3	2.
				EF	Exposure Frequency	91	event/year	3.
				ED	Exposure Duration	1	hours/event	4.
				EP	Exposure Period	13	years	5.
				BW	Body Weight	43	kg	6.
				AT_c	Averaging Time-cancer	70	years	7.
				AT_{nc}	Averaging Time-noncancer	13	years	7.
				C1	Units Conversion Factor	365	days/year	
				C2	Units Conversion Factor	24	hours/day	
Inhalation of fugitive dust (bank soil)	Recreational User	Youth (6-19 years)	Neponset River Bank	EPC	Exposure Point Concentration	Chemical-specific	mg/m^3	1
				Rpair	Respirable Particulates in Air	32	ug/m^3	2.
				EF	Exposure Frequency	61	events/year	3.
				ED	Exposure Duration	1	hours/event	4.
				EP	Exposure Period	13	years	5.
				AT_c	Averaging Time-cancer	70	years	7.
				AT_{nc}	Averaging Time-noncancer	13	years	7.
				C1	Units Conversion Factor	365	days/year	
				C2	Units Conversion Factor	24	hours/day	
Inhalation and Incidental Ingestion	Construction or Utility Worker	Adult (>18 years)	Upland Areas of Site	EPC	Exposure Point Concentration	Chemical-specific	mg/m^3	1
				InhR	Inhalation Rate	42	liters/minute	8.
				Rpair	Respirable Particulates in Air	60	ug/m^3	2.
				EF	Exposure Frequency	130	events/year	3.
				ED	Exposure Duration	8	hours/event	4.
				EP	Exposure Period	0.5	years	8.
				BW	Body Weight	70	kg	6.
				AT_c	Averaging Time-cancer	70	years	7.
				AT_{nc}	Averaging Time-noncancer	0.5	years	7.
				C1	Units Conversion Factor	365	days/year	
				C2	Units Conversion Factor	24	hours/day	
				C3	Units Conversion Factor	1440	minutes/day	
				C4	Units Conversion Factor	0.001	m3/liter	
Inhalation	Facility Worker	Adult (>18 years)	Upland Areas of Site	EPC	Exposure Point Concentration	Chemical-specific	mg/m^3	1
				Rpair	Respirable Particulates in Air	32	ug/m^3	2.
				EF	Exposure Frequency	150	events/year	3.
				ED	Exposure Duration	8	hours/event	4.
				EP	Exposure Period	25	years	5.
				AT_c	Averaging Time-cancer	70	years	7.
				AT_{nc}	Averaging Time-noncancer	25	years	7.
				C1	Units Conversion Factor	365	days/year	
				C2	Units Conversion Factor	24	hours/day	
Inhalation	Resident	Child Outdoor (1-8 years)	Upland Areas of Site	EPC	Exposure Point Concentration	Chemical-specific	mg/m^3	1
				Rpair	Respirable Particulates in Air	32	ug/m^3	2.
				EF	Exposure Frequency	153	events/year	3.
				ED	Exposure Duration	2	hours/event	4.
				EP	Exposure Period	7	years	5.
				AT_{nc}	Averaging Time-noncancer	7	years	7.
				C1	Units Conversion Factor	365	days/year	
				C2	Units Conversion Factor	24	hours/day	
Inhalation	Resident	Child/Adult Outdoor (1-31 years)	Upland Areas of Site	EPC	Exposure Point Concentration	Chemical-specific	mg/m^3	1
				Rpair	Respirable Particulates in Air	32	ug/m^3	2.
				EF	Exposure Frequency	153	event/year	3.
				ED	Exposure Duration	2	hours/event	4.
				EP	Exposure Period	30	years	5.
				AT_c	Averaging Time-cancer	70	years	7.
				C1	Units Conversion Factor	365	days/year	
				C2	Units Conversion Factor	24	hours/day	

TABLE 9
VALUES USED FOR DAILY INTAKE CALCULATIONS

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Average Daily Exposure (ADE) Equations (Construction Worker/Utility Worker):

$ADI_{inhalation}$ (mg/m^3) = EPC * EF * EP * ED * 1/AT * 1/C1 * 1/C2

Where : EPC = Soil EPC (mg/kg) * [RPair (ug/m³) * [OHM]soil (mg/kg) * 0.5 * 0.000000001 (kg/ug)]

$ADI_{ingestion}$ (mg/kg-d) = EPC * 1/BW (1/kg) * IR (l/min) * EF (events/year) * ED (hours/event) * EP (years) * 1/AP (1/year) * 1/C1 * 1/C2 * C3 * C4

Where : EPC = Soil EPC (mg/kg) * [RPair (ug/m³) * [OHM]soil (mg/kg) * 2 * 0.000000001 (kg/ug)]

Average Daily Exposure (ADE) Equations (Facility Worker and Resident):

$ADI_{inhalation}$ (mg/m^3) = EPC * EF * EP * ED * 1/AT * 1/C1 * 1/C2

Where : EPC = Soil EPC (mg/kg) * [RPair (ug/m³) * [OHM]soil (mg/kg) * 0.000000001 (kg/ug)]

Notes:

1. EPCs for outdoor particulates were estimated from soil EPCs using the emission equations provided above.

2. The airborne particulate concentration with particle aerodynamic diameter of less than 10 micrometers (PM10) was obtained from the Massachusetts Department of Environmental Protection (DEP), Bureau of Waste Site Cleanup and Office of Research and Standards, Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan, Interim Final Policy, WSC/ORS-95-141, July 1995.
   The PM10 value for the grading or excavation scenario was used to evaluate potential exposure to fugitive dust by construction workers.
   The PM10 value for the open field scenario was used to evaluate potential exposure by facility workers, tresspassers, recreational users, and residents.

3. Frequency of exposure describes how often the exposure event occurs over a given period of time. It was assumed that, during the 7 non-winter months, trespassers are exposed to soil 3 days per week; recreational users are exposed 2 days per week; facility workers are exposed 5 days per week; residents are exposed 5 days per week. Construction/utility workers were assumed to be exposed to contaminants in soil for 5 days per week over six months, per DEP guidance (1995).

4. The exposure duration describes how long each individual exposure event might last. For facility/construction worker inhalation of fugitive dust, the exposure duration was assumed to be 8 hours per event. For residents, the exposure duration was assumed to be 2 hours per event. Trespasser and recreational users of the Site were assumed to be exposed only one hour per event.

5. The exposure period describes the length of time over which the receptor comes into contact with contaminants. Trespassers and recreational users were assumed to be exposed over 13 years, reflecting the age range used to characterize these two groups. Residents were assumed to be exposed over a 30 year duration, in accordance with MADEP guidance (1995). Construction/utility workers were assumed to be exposed for only six months of a year (short-term construction scenario). For facility workers, we have assumed that exposure occurs one day per year over the course of 25 years based on EPA's default exposure parameters upper bound duration Risk Updates No. 2, August 1994.

6. Body weight is based on the 50th percentile body weight for males and females (18-70 years) from Appendix B, Table B-1 of MADEP 1995.

7. For noncancer risks, the averaging period is set equal to the duration of the exposure period. The averaging period is equal to a lifetime (i.e., 70 years) when estimating cancer risks.

8. The inhalation rate is back-calculated from the default inhalation rate of 20 m^3/day, from DEP Draft Technical Update: Characterization of Risk Due to Inhalation of Particulates by Construction Workers, April 2002.

TABLE 10
VALUES USED FOR DAILY INTAKE CALCULATIONS

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference	
Dermal contact with Groundwater	Construction Worker	Adult	Trench	EPC	Exposure Point Concentration	Chemical-specific	mg/L	Chemical-specific	1.
				DA_e	Absorbed dose per event	Chemical-specific	mg/cm^2-event	Calculated	
				Kp	Permeability coeffiecient	Chemical-specific	cm/h	USEPA, 2004	2.
				FA	Fraction Absorbed	Chemical-specific	Dimensionless	USEPA, 2004	2.
				BW	Body weight	70	kg	USEPA, 1999	3.
				SA	Skin surface area	2,207	cm^2	MADEP, 1995	4.
				EF	Event Frequency	1	events/day	Professional judgement	5.
				EF	Exposure Frequency	52	days/year	Professional judgement	5.
				ED	Exposure Duration	0.5	years	Professional judgement	5.
				tau_{event}	Lag time per event	Chemical-specific	hours/event	USEPA, 2004	2.
				t_e	Event duration	0.5	hours/event	Professional judgement	5.
				C1	Units Conversion Factor	365	days/year	Constant	
				C2	Units Conversion Factor	0.001	L/cm^3	Constant	
				AT_c	Averaging Time-cancer	70	years	USEPA, 1989	6.
				AT_{nc}	Averaging Time-noncancer	0.5	years	Professional judgement	7.

Average Daily Intake (ADI) Equation:

ADI_{dermal} (mg/kg-d) = DA_{event} * EP * EF * ED * SA * 1/BW * 1/AT * 1/C1

where for inorganics: DA_{event} (mg/cm^2-event)= EP * Kp * t_e * CF2

where for organics: DA_{event} = EP * 2 FA * Kp * C2 * SQRT{(6 * tau-event * t-e)/pi}

(short-duration exposures)

DA event is calculated separately in Table 19.

Notes:

1. EPC is the temporal average wellhead concentration in each exposure point based on groundwater monitoring data collected in 2002 and 2006.
2. Chemical-specific absorption coefficients/factors were obtained from USEPA, 2004.
3. Body weight (BW) is the adult body weight presented in USEPA, 1989.
4. Skin surface area (SA) is based on the 50th percentile skin surface area for males and females 18 to 70 years of age from Appendix B, Table B-2 Massachusetts Department of Environmental Protection (DEP), Bureau of Waste Site Cleanup and Office of Research and Standards, Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan, Interim Final Policy, WSC/ORS-95-141, July 1995. Parts of the body assumed to be exposed to groundwater include forearms (1,303 cm^2) and hands (904 cm^2).
5. Exposure Frequency (EF) assumed that construction workers would be present at the site during a six-month period of site redevelopment work. Because OSHA mandates dewatering in excavation pits or trenches, construction workers were assumed to contact groundwater only while setting up or dismantling dewatering equipment at the beginning and ending of a work week (or 52 events per year, for six months of one year), for one-half hour per exposure event.
6. The averaging time (ATc) is set equal to a lifetime (i.e., 70 years) when estimating cancer risk. This is the recommended lifetime in USEPA, 1999.
7. The averaging time for noncancer effects (ATnc) is set equal to the exposure duration.

References:

USEPA, 2004. US EPA Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) EPA/540/R/99/005, July 2004.
USEPA, 1999. US EPA Exposure Factors Handbook EPA/600/C-99/001, February 1999
USEPA, 1989. US EPA Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual. (EPA/540/1-89/002).
MADEP, 1995. Appendix B, Massachusetts Department of Environmental Protection (DEP), Bureau of Waste Site Cleanup and Office of Research and Standards, Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan, Interim Final Policy, WSC/ORS-95-141, July 1995.

TABLE 11
VALUES USED FOR DAILY INTAKE CALCULATIONS

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Scenario Timeframe:	Current/future
Source Medium:	Groundwater
Exposure Medium:	Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference	
Inhalation of Indoor Air	Facility Worker	Adult (>18 years)	Disposal Site (Future facility)	EPC	Exposure Point Concentration	Chemical-specific	mg/m³	Chemical-specific	1.
				EF	Exposure Frequency	250	days/year	Professional judgement	2.
				ET	Exposure Time	8	hours/day	Professional judgement	3.
				ED	Exposure Duration	25	years	USEPA, 1994	4.
				AT_c	Averaging Time-cancer	70	years	USEPA, 1999	5.
				AT_{nc}	Averaging Time-noncancer	25	years	USEPA, 1999	6.
				C1	Units Conversion Factor	365	days/year	Constant	
				C2	Units Conversion Factor	24	hours/day	Constant	
Inhalation of Ambient Air	Construction or Utility Worker	Adult (>18 years)	Trench	EPC	Exposure Point Concentration	Chemical-specific	mg/m³	Chemical-specific	1.
				EF	Exposure Frequency	183	days/year	Professional judgement	2.
				ET	Exposure Time	8	hours/day	Professional judgement	3.
				ED	Exposure Duration	0.5	years	USEPA, 1994	4.
				AT_c	Averaging Time-cancer	70	years	USEPA, 1999	5.
				AT_{nc}	Averaging Time-noncancer	0.5	years	USEPA, 1999	6.
				C1	Units Conversion Factor	365	days/year	Constant	
				C2	Units Conversion Factor	24	hours/day	Constant	
Inhalation of Indoor Air	Resident	Infant 0-1 year (Subchronic effects)	Disposal Site (future house)	EPC	Exposure Point Concentration	Chemical-specific	mg/m³	Chemical-specific	1.
				EF	Exposure Frequency	350	days/year	Professional judgement	7.
				ET	Exposure Time	24	hours/day	Professional judgement	8.
				ED	Exposure Duration	1	years	MADEP, 1992	9.
				AT_{nc}	Averaging Time-noncancer	1	years	USEPA, 1999	6.
				C1	Units Conversion Factor	365	days/year	Constant	
				C2	Units Conversion Factor	24	hours/day	Constant	
Inhalation of Indoor Air	Resident	Child 1-8 years (Chronic, noncancer effects)	Disposal Site (future house)	EPC	Exposure Point Concentration	Chemical-specific	mg/m³	Chemical-specific	1.
				EF	Exposure Frequency	350	days/year	Professional judgement	7.
				ET	Exposure Time	24	hours/day	Professional judgement	8.
				ED	Exposure Duration	7	years	MADEP, 1992	9.
				AT_{nc}	Averaging Time-noncancer	7	years	USEPA, 1999	6.
				C1	Units Conversion Factor	365	days/year	Constant	
				C2	Units Conversion Factor	24	hours/day	Constant	
Inhalation of Indoor Air	Resident	Adult 1-31 years (Cancer effects)	Disposal Site (future house)	EPC	Exposure Point Concentration	Chemical-specific	mg/m³	Chemical-specific	1.
				EF	Exposure Frequency	350	days/year	Professional judgement	7.
				ET	Exposure Time	24	hours/day	Professional judgement	8.
				ED	Exposure Duration	30	years	USEPA, 1994	9.
				AT_c	Averaging Time-cancer	70	years	USEPA, 1999	5.
				C1	Units Conversion Factor	365	days/year	Constant	
				C2	Units Conversion Factor	24	hours/day	Constant	

TABLE 11
VALUES USED FOR DAILY INTAKE CALCULATIONS

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court

Average Daily Exposure (ADE) Equation:
$ADI_{inhalation}$ $(mg/m^3) = EPC * EF * EP * ED * 1/AT * 1/C1 * 1/C2$

1. Indoor air concentrations resulting from vapor intrusion were estimated from soil gas EPCs using the MADEP modified Johnson & Ettinger Vapor Intrusion Model, 2006. EPCs for ambient air were estimated from groundwater EPCs using a USEPA emissions model (USEPA, 1990).

2. Exposure Frequency (EF) describes how often the exposure event occurs over a given period of time. We assumed that facility workers could be exposed to COPCs in indoor air five days a week for 50 weeks.

3. The exposure time (ET) describes how long each individual exposure event might last. We assumed an exposure time of 8 hours/day, a typical work day.

4. The exposure duration (ED) for facility workers was assumed to be 25 years based on EPA's default exposure parameter upper bound duration of exposure for workers. EPA Region I, Risk Updates No. 2, August 1994.

5. The averaging time (AT_c) is set equal to a lifetime (i.e., 70 years) when estimating cancer risk. This is the recommended lifetime in USEPA, 1999.

6. The averaging time for noncancer effects (AT_{nc}) is set equal to the exposure duration.

7. For Exposure Frequency, we assumed that residents could be exposed to COPCs in indoor air 350 days per year. These assumptions follow the guidance provided in Appendix B of Massachusetts Department of Environmental Protection (DEP), Bureau of Waste Site Cleanup and Office of Research and Standards, Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan, Interim Final Policy, WSC/ORS-95-141, July 1995.

8. For both child and adult, it was assumed that they would be exposed to indoor air 24 hours/day.

9. Since subchronic exposures of a toddler (0 through 1 years of age) were evalutated, the ED for noncancer effects was set at 1 year. Since chronic exposures for a young child (1 through 7 years of age) were evaluated, the ED for nonc was set at 7 years. For cancer effects, a 30-year exposure, which incorporates the age groups which experience the highest rate of exposure (i.e., 1 through 30 years of age), was evaluated. These ED values are those recommended in t Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup and Office of Research and Standards, User's Guide, Risk Assessment Shortform Residential Exposure Scenario, WSC/ORS-124-92, October 199

References:

MADEP, 1995. Appendix B, Massachusetts Department of Environmental Protection (DEP), Bureau of Waste Site Cleanup and Office of Research and Standards, Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan, Interim Final Policy, WSC/ORS-95-141, July 1995.

MADEP, 1992. Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup and Office of Research and Standards, User's Guide, Risk Assessment Shortform Residential Exposure Scenario, WSC/ORS-124-October 1992.

USEPA, 1999. US EPA Exposure Factors Handbook EPA/600/C-99/001, February 1999

USEPA, 1994. US EPA Region 1, Risk Updates No. 2, August 1994.

TABLE 12
VALUES USED FOR DAILY INTAKE CALCULATIONS

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Scenario Timeframe:	Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Reference
Incidental ingestion and dermal contact	Recreational User or Resident	Youth (6 through 18 years)	Neponset River	EPC	Exposure Point Concentration	Chemical-specific	mg/kg	1
				IR_{sed}	Ingestion rate of sediment	50	mg/day	2
				AF	Sediment adherence factor	1	mg/cm^2 - d	3.
				SA	Skin surface area	2,587	cm^2	4
				EF	Exposure Frequency	61	events/year	5
				ED	Exposure Duration	1	day/event	6
				EP	Exposure Period	13	years	7.
				BW	Body weight	43	kg	8.
				AT_c	Averaging Time-cancer	70	years	9.
				AT_{nc}	Averaging Time-noncancer	13	years	9.
				RAF_d	Relative Absorption Factor	Chemical-specific	unitless	10
				C1	Units Conversion Factor	365	days/year	
				C2	Units Conversion Factor	1,000,000	mg/kg	

Sediment Average Daily Intake (ADI) Equations:

$ADI_{ingestion}$ (mg/kg-d) = EPC * IR * EF * ED * EP * 1/BW * 1/AT * 1/C1 * 1/C2 * RAF

ADI_{dermal} (mg/kg-d) = EPC * SA * AF * EF * ED * EP * 1/BW * 1/AT * 1/C1 * 1/C2 * RAF

Notes:

1. EPCs for sediment were based on the mean concentration from sediment samples collected at the Site.
2. Daily sediment ingestion rate is based on the mean soil ingestion rate recommended by EPA for adults (50 mg/day), obtained from the US EPA Exposure Factors Handbook EPA/600/C-99/001, February 1999.
3. The Adherence Factor for sediment was obtained from MADEP's "Technical Update: Weighted Skin-Soil Adherence Factors", April 2002.
4. Skin surface area is based on the 50th percentile skin surface area for males and females 6 through 18 years of age, from Appendix B, Table B-2 of MADEP 1995. Parts of the body assumed to be exposed included hands, forearms and feet.
5. Frequency of exposure describes how often the exposure event occurs over a given period of time. It was assumed that recreational users/residents would be exposed to contaminants in sediment 2 days per week, during the seven non-winter months.
6. The exposure duration describes how long each individual exposure event might last. For dermal contact with and incidental ingestion of sediment, exposure duration is by definition 1 day/event. During this event, the recreational user is assumed to receive the daily intake of contaminants.
7. The duration of the exposure period (EP) describes the length of time over which the receptor comes into contact with contaminants. The EP reflects the age range of 6 through 18 years.
8. Body weight is based on the 50th percentile body weight for males and females from Appendix B, Table B-1 of the Massachusetts Department of Environmental Protection (DEP), Bureau of Waste Site Cleanup and Office of Research and Standards, Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan, Interim Final Policy, WSC/ORS-95-141, July 1995, age-weighted for specific age groups.
9. For noncancer risks, the averaging period is set equal to the duration of the exposure period. The averaging period is equal to a lifetime (i.e., 70 years) when estimating cancer risks.
10. Relative absorption factors were obtained from MADEP, Bureau of Waste Site Cleanup and Office of Research and Standards (ORS), Workbook: MCP Toxicity.xls, Sheet Toxicity, January 2007. Please see Table 16 for details.

TABLE 13a
ADULT LEAD METHODOLOGY - Facility Worker Scenario
Site-Wide Exposures

Former Lewis Chemical Company
0 12-24 Fairmount Court
Hyde Park, MA

Calculation of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1] 1*	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario Using Equation 1
PbS[2]	X	Soil lead concentration	ug/g or ppm	261
$R_{fetal/maternal}$	X	Fetal/maternal PbB ratio	--	0.9
BKSF	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i[3]	X	Geometric standard deviation PbB	--	2.0
PbB_0[3]	X	Baseline PbB	ug/dL	2.0
IR_S	X	Soil ingestion rate	g/day	0.050
$AF_{S,D}$	X	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	X	Exposure frequency (same for soil and dust)	days/yr	150
$AT_{S,D}$	X	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**		**ug/dL**	**2**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**		**ug/dL**	**6**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**		**ug/dL**	**10**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**		**%**	**1%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}). We have used Equation 1 for the facility worker scenario, as this receptor is assumed to contact only outdoor soil.

When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

[2] Soil lead concentration is the arithmetic mean lead concentration in soil at the site, exclusive of the hotspots.

[3] GSDi and PbB_0 are updated values, obtained from EPA, Blood Lead Concentrations of US Adult Females: Summary Statistics from Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52, March 2002. Values presented are those estimated for the Northeast Region (all races/ethnicities).

[4] The acceptable probability that estimated fetal blood lead levels exceed the target blood level is 5%.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS * BKSF * IR_{S+D} * AF_{S,D} * EF_S / AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 13b
ADULT LEAD METHODOLOGY - Facility Worker Scenario
Hot Spot #2

Former Lewis Chemical Company
0 12-24 Fairmount Court
Hyde Park, MA

Calculation of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1] 1*	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario Using Equation 1
PbS[2]	X	Soil lead concentration	ug/g or ppm	79
$R_{fetal/maternal}$	X	Fetal/maternal PbB ratio	--	0.9
BKSF	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i[3]	X	Geometric standard deviation PbB	--	2.0
PbB_0[3]	X	Baseline PbB	ug/dL	2.0
IR_S	X	Soil ingestion rate	g/day	0.050
$AF_{S,D}$	X	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	X	Exposure frequency (same for soil and dust)	days/yr	150
$AT_{S,D}$	X	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**		**ug/dL**	**2**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**		**ug/dL**	**6**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**		**ug/dL**	**10**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**		**%**	**0.7%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}). We have used Equation 1 for the facility worker scenario, as this receptor is assumed to contact only outdoor soil.

When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

[2] Soil lead concentration is the arithmetic mean lead concentration in soil at Hot Spot #2.

[3] GSDi and PbB_0 are updated values, obtained from EPA, Blood Lead Concentrations of US Adult Females: Summary Statistics from Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52, March 2002. Values presented are those estimated for the Northeast Region (all races/ethnicities).

[4] The acceptable probability that estimated fetal blood lead levels exceed the target blood level is 5%.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 14a
ADULT LEAD METHODOLOGY - Construction Worker Scenario
Site-Wide Exposures

Former Lewis Chemical Corporation
0 12-24 Fairmount Court
Hyde Park, MA

Calculation of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1] 1*	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario Using Equation 1
PbS[2]	X	Soil lead concentration	ug/g or ppm	261
$R_{fetal/maternal}$	X	Fetal/maternal PbB ratio	--	0.9
BKSF	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i[3]	X	Geometric standard deviation PbB	--	2.0
PbB_0[3]	X	Baseline PbB	ug/dL	2.0
IR_S	X	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
K_{SD}		Mass fraction of soil in dust	--	--
$AF_{S,D}$	X	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	X	Exposure frequency (same for soil and dust)	days/yr	130
$AT_{S,D}$	X	Averaging time (same for soil and dust)	days/yr	183
PbB_{adult}	**PbB of adult worker, geometric mean**		**ug/dL**	**3**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**		**ug/dL**	**8**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**		**ug/dL**	**10**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**		**%**	**3%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}). We have used Equation 1 for the construction worker scenario, as this receptor is assumed to contact only outdoor soil.

When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

[2] Soil lead concentration is the arithmetic mean lead concentration in soil at the site, exclusive of soils in the hotspots.

[3] GSDi and PbB_0 are updated values, obtained from EPA, Blood Lead Concentrations of US Adult Females: Summary Statistics from Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52, March 2002. Values presented are those estimated for the Northeast Region (all races/ethnicities).

[4] The acceptable probability that estimated fetal blood lead levels exceed the target blood level is 5%.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 14b
ADULT LEAD METHODOLOGY - Construction Worker Scenario
Hot Spot #2

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Calculation of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1] 1*	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario Using Equation 1
PbS[2]	X	Soil lead concentration	ug/g or ppm	79
$R_{fetal/maternal}$	X	Fetal/maternal PbB ratio	--	0.9
BKSF	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i[3]	X	Geometric standard deviation PbB	--	2.0
PbB_0[3]	X	Baseline PbB	ug/dL	2.0
IR_S	X	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
K_{SD}		Mass fraction of soil in dust	--	--
$AF_{S,D}$	X	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	X	Exposure frequency (same for soil and dust)	days/yr	130
$AT_{S,D}$	X	Averaging time (same for soil and dust)	days/yr	183
PbB_{adult}	**PbB of adult worker, geometric mean**		**ug/dL**	**2**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**		**ug/dL**	**6**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**		**ug/dL**	**10**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**		**%**	**1%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}). We have used Equation 1 for the construction worker scenario, as this receptor is assumed to contact only outdoor soil.

When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

[2] Soil lead concentration is the arithmetic mean lead concentration in soil at the site, exclusive of soils in the hotspots.

[3] GSDi and PbB_0 are updated values, obtained from EPA, Blood Lead Concentrations of US Adult Females: Summary Statistics from Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52, March 2002. Values presented are those estimated for the Northeast Region (all races/ethnicities).

[4] The acceptable probability that estimated fetal blood lead levels exceed the target blood level is 5%.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 15a
SUMMARY OF EXPOSURE POINT CONCENTRATIONS - CURRENT SITE-WIDE EXPOSURES

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Cas Number	Chemical of Potential Concern	Current Trespasser		Current Recreational User		
		Soil[1] EPC (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m^3)	Bank Soil[3] EPC (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m^3)	Sediment[4] EPC (mg/kg)
Volatile Organic Compounds (VOCs)						
71-55-6	1,1,1-Trichloroethane	4.04E+00	1.29E-07	7.95E-01	2.54E-08	1.93E-01
75-34-3	1,1-Dichloroethane	3.03E+00	9.71E-08	--	NC	1.63E-01
75-35-4	1,1-Dichloroethene	--	NC	--	NC	8.25E-03
120-82-1	1,2,4-Trichlorobenzene	--	NC	--	NC	1.25E-01
95-63-6	1,2,4-Trimethylbenzene	4.18E-01	1.34E-08	--	NC	2.94E-02
95-50-1	1,2-Dichlorobenzene	--	NC	--	NC	8.13E-01
107-06-2	1,2-Dichloroethane	2.88E-01	9.22E-09	--	NC	8.25E-03
108-67-8	1,3,5-Trimethylbenzene	3.74E-01	1.20E-08	--	NC	1.10E-02
106-46-7	1,4-Dichlorobenzene	--	NC	--	NC	4.75E-03
78-93-3	2-Butanone	--	NC	--	NC	1.70E-02
99-87-6	4-Isopropyltoluene	--	NC	--	NC	6.23E-02
108-10-1	4-Methyl-2-pentanone	--	NC	--	NC	5.75E-03
67-64-1	Acetone	--	NC	--	NC	8.08E-02
71-43-2	Benzene	--	NC	--	NC	7.25E-03
75-15-0	Carbon Disulfide	--	NC	--	NC	9.25E-03
108-90-7	Chlorobenzene	--	NC	--	NC	1.20E-02
75-00-3	Chloroethane	--	NC	--	NC	2.49E+00
156-59-2	cis-1,2-Dichloroethene	3.45E+00	1.10E-07	2.45E-01	7.84E-09	2.55E-01
100-41-4	Ethylbenzene	1.68E-01	5.38E-09	--	NC	2.54E-01
75-09-2	Methylene Chloride	--	NC	--	NC	8.50E-03
104-51-8	n-Butylbenzene	6.26E-01	2.00E-08	--	NC	--
103-65-1	n-Propylbenzene	--	NC	--	NC	5.75E-03
135-98-8	sec-Butylbenzene	3.59E-01	1.15E-08	--	NC	5.25E-03
127-18-4	Tetrachloroethene	5.99E+01	1.92E-06	1.45E+00	4.64E-08	5.42E-01
108-88-3	Toluene	3.09E-01	9.90E-09	2.30E-01	7.36E-09	1.02E+00
156-60-5	trans-1,2-Dichloroethene	--	NC	--	NC	1.37E-01
79-01-6	Trichloroethene	4.69E+00	1.50E-07	1.85E+00	5.92E-08	2.62E-01
75-69-4	Trichlorofluoromethane	--	NC	--	NC	2.00E-03
75-01-4	Vinyl Chloride	--	NC	--	NC	4.22E-02
1330-20-7	Xylenes (Total)	3.13E-01	1.00E-08	--	NC	4.70E-01
Semi-volatile Organic Compounds (SVOCs)						
120-12-7	Anthracene	7.90E-01	2.53E-08	--	NC	--
56-55-3	Benzo(a)anthracene	3.00E+00	9.60E-08	--	NC	--
50-32-8	Benzo(a)pyrene	3.05E+00	9.76E-08	--	NC	--
205-99-2	Benzo(b)fluoranthene	3.60E+00	1.15E-07	--	NC	--
191-24-2	Benzo(g,h,i)perylene	2.05E+00	6.56E-08	--	NC	--
207-08-9	Benzo(k)fluoranthene	2.05E+00	6.56E-08	--	NC	--
86-74-8	Carbazole	--	NC	--	NC	7.45E-01
218-01-9	Chrysene	3.00E+00	9.60E-08	--	NC	--
53-70-3	Dibenzo(a,h)anthracene	4.33E-01	1.38E-08	--	NC	--
132-64-9	Dibenzofuran	--	NC	--	NC	4.47E-01
117-84-0	Di-n-octylphthalate	--	NC	--	NC	9.17E-01
206-44-0	Fluoranthene	5.70E+00	1.82E-07	--	NC	--
193-39-5	Indeno(1,2,3-cd)pyrene	2.20E+00	7.04E-08	--	NC	--
85-01-8	Phenanthrene	3.80E+00	1.22E-07	--	NC	--
129-00-0	Pyrene	4.70E+00	1.50E-07	--	NC	--
Petroleum Hydrocarbons						
NA c11-c22	C11-C22 Aromatic Hydrocarbons	9.90E+01	3.17E-06	--	NC	--
NA c19-36	C19-C36 Aliphatic Hydrocarbons	7.10E+01	2.27E-06	--	NC	--
NA c5-8	C5-C8 Aliphatic Hydrocarbons	8.23E+01	2.63E-06	--	NC	--
NA c9-12	C9-C12 Aliphatic Hydrocarbons	2.95E+00	9.44E-08	--	NC	--
Polychlorinated Biphenyls (PCBs)						
11141-16-5	Aroclor 1232	8.52E-01	2.73E-08	--	NC	--
12672-29-6	Aroclor 1248	8.06E+00	2.58E-07	1.14E+01	3.63E-07	--
Inorganics						
7440-38-2	Arsenic, Total	--	NC	--	NC	5.67E+00
7440-39-3	Barium, Total	7.20E+01	2.30E-06	--	NC	--
7440-47-3	Chromium, Total	1.80E+01	5.76E-07	--	NC	--
7439-92-1	Lead, Total	3.47E+02	1.11E-05	2.00E+02	6.40E-06	--
7439-97-6	Mercury, Total	3.15E+00	1.01E-07	--	NC	--
7782-49-2	Selenium, Total	--	NC	--	NC	1.29E+00

Notes:
1. Soil EPCs represent the arithmetic mean concentration of samples collected between 0 and 3 feet bgs (ESM-13,ESM-15,I-A03-S,I-A08-S, I-B05-S,I-B08-S,I-B10-S,I-C09-S,I-D10-S,II-A01-S,II-A03-S,II-A05-S,II-A07-S,II-A09-S,II-A11-S,III-E02-S,III-E05-S,III-F03-S, TP-06,TP-06 RA).
2. Fugitive Dust EPCs were calculated from soil EPCs; the equations and parameters used are presented in Table 9.
3. Bank Soil EPCs represent the average detected concentration of samples collected along the bank at the Site (II-A01-S, II-A03-S, II-A05-S).
4. Sediment EPCs represent the average detected concentration of samples collected at the Site (S-03,S04,S-06,S08,S-09,SED-DS,SED-DUP, SED-MC,SED-SH,SED-SHDL,USGS-BGY-106,USGS-BGY-107).

"--" = Not a constituent of potential concern in medium/exposure point.
NC = Not calculated.

TABLE 15b
SUMMARY OF EXPOSURE POINT CONCENTRATIONS - FUTURE SITE-WIDE EXPOSURES

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Cas Number	Constituent	Future Trespasser		Future Facility Worker			Future Construction/Utility Worker					Future Resident		
		Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m³)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] (mg/m³)	Estimated Indoor Air[3] (mg/m³)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust EPC[2] (mg/m³) GI System	Respiratory System	Site Groundwater[4] EPC (mg/L)	Estimated Ambient Air[5] (mg/m³)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m³)	Estimated Indoor Air[3] (mg/m³)
Volatile Organic Compounds (VOCs)														
71-55-6	1,1,1-Trichloroethane	5.10E+01	1.63E-06	5.10E+01	1.63E-06	2.42E-01	5.10E+01	6.12E-06	1.53E-06	2.98E+00	4.22E-03	5.10E+01	1.63E-06	8.92E-01
75-34-3	1,1-Dichloroethane	2.26E+00	7.23E-08	2.26E+00	7.23E-08	3.22E-03	2.26E+00	2.71E-07	6.77E-08	4.69E-01	7.50E-04	2.26E+00	7.23E-08	1.21E-02
75-35-4	1,1-Dichloroethene	9.60E-01	3.07E-08	9.60E-01	3.07E-08	4.48E-03	9.60E-01	1.15E-07	2.88E-08	5.73E-02	9.58E-05	9.60E-01	3.07E-08	1.56E-02
120-82-1	1,2,4-Trichlorobenzene	--	NC	--	NC	--	--	NC	NC	5.02E-03	5.25E-06	--	NC	--
95-63-6	1,2,4-Trimethylbenzene	9.17E-01	2.94E-08	9.17E-01	2.94E-08	7.99E-04	9.17E-01	1.10E-07	2.75E-08	1.84E-02	2.69E-05	9.17E-01	2.94E-08	2.99E-03
95-50-1	1,2-Dichlorobenzene	1.14E+00	3.65E-08	1.14E+00	3.65E-08	--	1.14E+00	1.37E-07	3.42E-08	3.06E-02	3.70E-05	1.14E+00	3.65E-08	--
107-06-2	1,2-Dichloroethane	1.86E-01	5.94E-09	1.86E-01	5.94E-09	1.56E-03	1.86E-01	2.23E-08	5.57E-09	4.78E-02	6.56E-05	1.86E-01	5.94E-09	5.14E-03
108-67-8	1,3,5-Trimethylbenzene	4.98E-01	1.59E-08	4.98E-01	1.59E-08	--	4.98E-01	5.97E-08	1.49E-08	3.95E-03	5.83E-06	4.98E-01	1.59E-08	--
106-46-7	1,4-Dichlorobenzene	2.21E-01	7.07E-09	2.21E-01	7.07E-09	--	2.21E-01	2.65E-08	6.63E-09	2.06E-03	2.55E-06	2.21E-01	7.07E-09	--
78-93-3	2-Butanone	4.55E-02	1.46E-09	4.55E-02	1.46E-09	--	4.55E-02	5.46E-09	1.37E-09	--	--	4.55E-02	1.46E-09	--
99-87-6	4-Isopropyltoluene	1.51E+00	4.84E-08	1.51E+00	4.84E-08	--	1.51E+00	1.81E-07	4.54E-08	6.04E-02	8.47E-05	1.51E+00	4.84E-08	--
67-64-1	Acetone	4.59E-02	1.47E-09	4.59E-02	1.47E-09	--	4.59E-02	5.51E-09	1.38E-09	--	--	4.59E-02	1.47E-09	--
75-25-2	Bromoform	3.25E-03	1.04E-10	3.25E-03	1.04E-10	--	3.25E-03	3.90E-10	9.75E-11	--	--	3.25E-03	1.04E-10	--
75-15-0	Carbon Disulfide	3.09E-02	9.87E-10	3.09E-02	9.87E-10	--	3.09E-02	3.70E-09	9.26E-10	--	--	3.09E-02	9.87E-10	--
108-90-7	Chlorobenzene	9.37E-02	3.00E-09	9.37E-02	3.00E-09	--	9.37E-02	1.12E-08	2.81E-09	2.26E-02	3.27E-05	9.37E-02	3.00E-09	--
75-00-3	Chloroethane	3.70E-03	1.18E-10	3.70E-03	1.18E-10	--	3.70E-03	4.44E-10	1.11E-10	1.83E-02	3.71E-05	3.70E-03	1.18E-10	--
156-59-2	cis-1,2-Dichloroethene	4.47E+00	1.43E-07	4.47E+00	1.43E-07	9.00E-02	4.47E+00	5.36E-07	1.34E-07	3.00E+00	4.76E-03	4.47E+00	1.43E-07	3.39E-01
100-41-4	Ethylbenzene	6.03E+00	1.93E-07	6.03E+00	1.93E-07	1.52E-03	6.03E+00	7.24E-07	1.81E-07	6.81E-01	1.06E-03	6.03E+00	1.93E-07	5.68E-03
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	--	NC	--	NC	2.87E-02	--	NC	NC	--	--	--	NC	1.51E-01
98-82-8	Isopropylbenzene	1.21E-01	3.89E-09	1.21E-01	3.89E-09	--	1.21E-01	1.46E-08	3.64E-09	1.31E-03	1.95E-06	1.21E-01	3.89E-09	--
1634-04-4	Methyl tert butyl ether	2.33E-03	7.47E-11	2.33E-03	7.47E-11	--	2.33E-03	2.80E-10	7.00E-11	2.50E-03	--	2.33E-03	7.47E-11	--
75-09-2	Methylene Chloride	4.36E-01	1.39E-08	4.36E-01	1.39E-08	3.55E-03	4.36E-01	5.23E-08	1.31E-08	1.41E-01	2.35E-04	4.36E-01	1.39E-08	1.18E-02
91-20-3	Naphthalene	8.26E-01	2.64E-08	8.26E-01	2.64E-08	--	8.26E-01	9.92E-08	2.48E-08	3.22E-03	--	8.26E-01	2.64E-08	--
104-51-8	n-Butylbenzene	3.22E-01	1.03E-08	3.22E-01	1.03E-08	--	3.22E-01	3.87E-08	9.67E-09	--	--	3.22E-01	1.03E-08	--
103-65-1	n-Propylbenzene	3.85E-01	1.23E-08	3.85E-01	1.23E-08	--	3.85E-01	4.62E-08	1.16E-08	1.31E-03	1.94E-06	3.85E-01	1.23E-08	--
135-98-8	sec-Butylbenzene	3.93E-01	1.26E-08	3.93E-01	1.26E-08	--	3.93E-01	4.71E-08	1.18E-08	4.86E-03	6.88E-06	3.93E-01	1.26E-08	--
127-18-4	Tetrachloroethene	5.47E+01	1.75E-06	5.47E+01	1.75E-06	2.68E-01	5.47E+01	6.57E-06	1.64E-06	7.29E-02	9.28E-05	5.47E+01	1.75E-06	1.02E+00
108-88-3	Toluene	2.04E+01	6.54E-07	2.04E+01	6.54E-07	5.26E-03	2.04E+01	2.45E-06	6.13E-07	5.84E-01	9.73E-04	2.04E+01	6.54E-07	1.86E-02
156-60-5	trans-1,2-Dichloroethene	5.35E-03	1.71E-10	5.35E-03	1.71E-10	1.22E-03	5.35E-03	6.42E-10	1.61E-10	3.97E-02	6.52E-05	5.35E-03	1.71E-10	4.68E-03
79-01-6	Trichloroethene	4.38E+01	1.40E-06	4.38E+01	1.40E-06	1.94E-01	4.38E+01	5.25E-06	1.31E-06	1.71E-01	2.41E-04	4.38E+01	1.40E-06	7.10E-01
75-01-4	Vinyl Chloride	2.56E-01	8.18E-09	2.56E-01	8.18E-09	1.84E-03	2.56E-01	3.07E-08	7.67E-09	1.93E-01	4.02E-04	2.56E-01	8.18E-09	6.01E-03
1330-20-7	Xylenes (Total)	1.27E+01	4.07E-07	1.27E+01	4.07E-07	6.74E-03	1.27E+01	1.53E-06	3.81E-07	1.10E+00	1.71E-03	1.27E+01	4.07E-07	2.50E-02
Semi-volatile Organic Compounds (SVOCs)														
91-57-6	2-Methylnaphthalene	2.95E-01	9.43E-09	2.95E-01	9.43E-09	--	2.95E-01	3.54E-08	8.84E-09	--	--	2.95E-01	9.43E-09	--
83-32-9	Acenaphthene	3.86E-01	1.24E-08	3.86E-01	1.24E-08	--	3.86E-01	4.63E-08	1.16E-08	--	--	3.86E-01	1.24E-08	--
208-96-8	Acenaphthylene	2.61E-01	8.35E-09	2.61E-01	8.35E-09	--	2.61E-01	3.13E-08	7.82E-09	--	--	2.61E-01	8.35E-09	--
120-12-7	Anthracene	6.30E-01	2.02E-08	6.30E-01	2.02E-08	--	6.30E-01	7.56E-08	1.89E-08	--	--	6.30E-01	2.02E-08	--
56-55-3	Benzo(a)anthracene	1.69E+00	5.39E-08	1.69E+00	5.39E-08	--	1.69E+00	2.02E-07	5.06E-08	4.67E-04	NV	1.69E+00	5.39E-08	--
50-32-8	Benzo(a)pyrene	1.56E+00	4.98E-08	1.56E+00	4.98E-08	--	1.56E+00	1.87E-07	4.67E-08	5.00E-04	NV	1.56E+00	4.98E-08	--
205-99-2	Benzo(b)fluoranthene	1.56E+00	5.00E-08	1.56E+00	5.00E-08	--	1.56E+00	1.88E-07	4.69E-08	8.33E-04	NV	1.56E+00	5.00E-08	--
191-24-2	Benzo(g,h,i)perylene	1.37E+00	4.39E-08	1.37E+00	4.39E-08	--	1.37E+00	1.65E-07	4.11E-08	5.00E-04	NV	1.37E+00	4.39E-08	--
207-08-9	Benzo(k)fluoranthene	1.21E+00	3.89E-08	1.21E+00	3.89E-08	--	1.21E+00	1.46E-07	3.64E-08	4.33E-04	NV	1.21E+00	3.89E-08	--
218-01-9	Chrysene	1.84E+00	5.87E-08	1.84E+00	5.87E-08	--	1.84E+00	2.20E-07	5.51E-08	4.67E-04	NV	1.84E+00	5.87E-08	--
206-44-0	Fluoranthene	3.28E+00	1.05E-07	3.28E+00	1.05E-07	--	3.28E+00	3.93E-07	9.84E-08	8.33E-04	NV	3.28E+00	1.05E-07	--
86-73-7	Fluorene	3.23E-01	1.04E-08	3.23E-01	1.04E-08	--	3.23E-01	3.88E-08	9.70E-09	--	--	3.23E-01	1.04E-08	--
193-39-5	Indeno(1,2,3-cd)pyrene	9.93E-01	3.18E-08	9.93E-01	3.18E-08	--	9.93E-01	1.19E-07	2.98E-08	4.67E-04	NV	9.93E-01	3.18E-08	--
85-01-8	Phenanthrene	2.75E+00	8.81E-08	2.75E+00	8.81E-08	--	2.75E+00	3.30E-07	8.26E-08	--	--	2.75E+00	8.81E-08	--
129-00-0	Pyrene	2.73E+00	8.75E-08	2.73E+00	8.75E-08	--	2.73E+00	3.28E-07	8.20E-08	8.33E-04	NV	2.73E+00	8.75E-08	--

TABLE 15b
SUMMARY OF EXPOSURE POINT CONCENTRATIONS - FUTURE SITE-WIDE EXPOSURES

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Cas Number	Constituent	Future Trespasser		Future Facility Worker			Future Construction/Utility Worker					Future Resident		
		Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m³)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] (mg/m³)	Estimated Indoor Air[3] (mg/m³)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust EPC[2] (mg/m³) GI System	Respiratory System	Site Groundwater[4] EPC (mg/L)	Estimated Ambient Air[5] (mg/m³)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m³)	Estimated Indoor Air[3] (mg/m³)
Petroleum Hydrocarbons						--								
NA c11-c22	C11-C22 Aromatic Hydrocarbons	1.01E+02	3.22E-06	1.01E+02	3.22E-06	--	1.01E+02	1.21E-05	3.02E-06	--	--	1.01E+02	3.22E-06	--
NA c19-36	C19-C36 Aliphatic Hydrocarbons	1.01E+02	3.24E-06	1.01E+02	3.24E-06	--	1.01E+02	1.21E-05	3.04E-06	1.16E+00	NV	1.01E+02	3.24E-06	--
NA c5-8	C5-C8 Aliphatic Hydrocarbons	4.37E+01	1.40E-06	4.37E+01	1.40E-06	--	4.37E+01	5.24E-06	1.31E-06	--	--	4.37E+01	1.40E-06	--
NA c9-10	C9-C10 Aromatic Hydrocarbons	2.20E+01	7.05E-07	2.20E+01	7.05E-07	--	2.20E+01	2.64E-06	6.61E-07	5.63E-01	8.27E-04	2.20E+01	7.05E-07	--
NA c9-12	C9-C12 Aliphatic Hydrocarbons	1.85E+01	5.92E-07	1.85E+01	5.92E-07	--	1.85E+01	2.22E-06	5.55E-07	--	--	1.85E+01	5.92E-07	--
NA c9-18	C9-C18 Aliphatic Hydrocarbons	3.38E+01	1.08E-06	3.38E+01	1.08E-06	--	3.38E+01	4.06E-06	1.02E-06	--	--	3.38E+01	1.08E-06	--
Polychlorinated Biphenyls (PCBs)						--								
11141-16-5	Aroclor 1232	4.83E-01	1.55E-08	4.83E-01	1.55E-08	--	4.83E-01	5.80E-08	1.45E-08	--	NV	4.83E-01	1.55E-08	--
53469-21-9	Aroclor 1242	--	NC	--	NC	--	--	NC	NC	9.23E-04	NC	--	NC	--
12672-29-6	Aroclor 1248	3.09E+00	9.90E-08	3.09E+00	9.90E-08	--	3.09E+00	3.71E-07	9.28E-08	--	--	3.09E+00	9.90E-08	--
Inorganics														
7440-39-3	Barium, Total	4.41E+01	1.41E-06	4.41E+01	1.41E-06	--	4.41E+01	5.29E-06	1.32E-06	1.30E-01	NC	4.41E+01	1.41E-06	--
7440-47-3	Chromium, Total	1.68E+01	5.37E-07	1.68E+01	5.37E-07	--	1.68E+01	2.01E-06	5.03E-07	--	--	1.68E+01	5.37E-07	--
7439-92-1	Lead, Total	2.59E+02	8.29E-06	--	NC	--	--	NC	NC	--	--	--	NC	--
7439-97-6	Mercury, Total	6.50E-01	2.08E-08	6.50E-01	2.08E-08	--	6.50E-01	7.80E-08	1.95E-08	--		6.50E-01	2.08E-08	--
7440-22-4	Silver, Total	6.53E-01	2.09E-08	6.53E-01	2.09E-08	--	6.53E-01	7.83E-08	1.96E-08	--		6.53E-01	2.09E-08	--

Notes:
1. Soil EPCs represent the arithmetic mean concentration of Site samples (excluding hot spots) collected between 0 and 15 feet bgs (DUP2,DUP3,DUP4,ESM-02,ESM-03 DL,ESM-04,ESM-04 DL,ESM-05,ESM-05 DL,ESM-06,ESM-06 DL,ESM-07,ESM-08,ESM-08 DL,ESM-09,ESM-09 DL, ESM-10,ESM-11,ESM-12,, ESM-13,ESM-14,ESM-15,, ESM-16,ESMB2,I-A03-D,I-A03-M,I-A03-S,I-A08-M,I-A08-S,I-B05-M,I-B05-S,I-B08-M,I-B08-S,I-B10-M,I-B10-S,I-C09-D,I-C09-M,I-C09-S,I-D10-D,I-D10-M,I-D10-S,II-A01-D,II-A01-M,II-A01-S,II-A03-D,II-A03-S,II-A05-D, II-A05-M,II-A05-S,II-A07-D,II-A07-M,II-A07-S,, II-A09-M,II-A09-S,II-A11-M,II-A11-M2,II-A11-S,, III-C02-D,III-C02-M,III-E02-M,III-E02-S,III-E05-D,III-E05-M,III-E05-S,III-F03-M,III-F03-S,TP-01B,TP-01B RA,TP-02,TP-03,TP-04,TP-04 RA,TP-06,TP-06 RA).
2. Fugitive Dust EPCs were calculated from soil EPCs; the equations and parameters used are presented in Table 9, Values used for Daily Intake Calculations - Fugitive Dust.
3. Indoor Air concentrations were modeled from soil gas concentrations using the MADEP vapor intrusion model. The soil gas input concentrations represent the average soil gas concentrations underneath the building (SG-01,SG-02,SG-03,SG-04,SG-05,SG-06).
4. "Site" Groundwater EPCs represent the average of the temporal average wellhead concentration of the following Site monitoring wells (DUP,DUP 2,ESM-01,ESM-02,ESM-04,ESM-04 DUP,ESM-07,ESM-08,ESM-10,ESM-11,ESM-12,ESM-13,ESM-14,ESM-16).
5. Ambient (trench) Air concentrations were modeled from groundwater EPCs, using an EPA air emissions model (USEPA, 1990).
"-" = Not a constituent of potential concern for medium/exposure point.
NC = Not calculated.

TABLE 15c
SUMMARY OF EXPOSURE POINT CONCENTRATIONS - HOT SPOT #1

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Cas Number	Constituent	Future Trespasser		Future Facility Worker		Future Construction/Utility Worker					Future Resident	
		Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m^3)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] (mg/m^3)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust EPC[2] (mg/m^3) GI System	Estimated Fugitive Dust EPC[2] (mg/m^3) Respiratory System	Site Groundwater[3] EPC (mg/L)	Estimated Ambient Air[4] (mg/m^3)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m^3)
Volatile Organic Compounds (VOCs)												
71-55-6	1,1,1-Trichloroethane	3.00E+03	9.60E-05	3.00E+03	9.60E-05	3.00E+03	3.60E-04	9.00E-05	6.55E+01	9.28E-02	3.00E+03	9.60E-05
79-00-5	1,1,2-Trichloroethane	--	NC	--	NC	--	NC	NC	7.00E-02	7.69E-05	--	NC
75-34-3	1,1-Dichloroethane	--	NC	--	NC	--	NC	NC	2.32E+00	3.71E-03	--	NC
75-35-4	1,1-Dichloroethene	--	NC	--	NC	--	NC	NC	2.58E+00	4.31E-03	--	NC
95-63-6	1,2,4-Trimethylbenzene	--	NC	--	NC	--	NC	NC	5.58E-02	8.15E-05	--	NC
95-50-1	1,2-Dichlorobenzene	--	NC	--	NC	--	NC	NC	1.89E-01	2.29E-04	--	NC
107-06-2	1,2-Dichloroethane	--	NC	--	NC	--	NC	NC	1.70E+00	2.33E-03	--	NC
71-43-2	Benzene	--	NC	--	NC	--	NC	NC	9.22E-02	1.66E-04	--	NC
108-90-7	Chlorobenzene	--	NC	--	NC	--	NC	NC	3.66E-01	5.30E-04	--	NC
75-00-3	Chloroethane	--	NC	--	NC	--	NC	NC	6.17E-02	1.25E-04	--	NC
156-59-2	cis-1,2-Dichloroethene	--	NC	--	NC	--	NC	NC	2.91E+01	4.62E-02	--	NC
100-41-4	Ethylbenzene	--	NC	--	NC	--	NC	NC	7.86E-01	1.23E-03	--	NC
75-09-2	Methylene Chloride	--	NC	--	NC	--	NC	NC	1.89E+00	3.16E-03	--	NC
127-18-4	Tetrachloroethene	1.60E+03	5.12E-05	1.60E+03	5.12E-05	1.60E+03	1.92E-04	4.80E-05	5.75E+00	7.31E-03	1.60E+03	5.12E-05
108-88-3	Toluene	6.80E+02	2.18E-05	6.80E+02	2.18E-05	6.80E+02	8.16E-05	2.04E-05	1.19E+01	1.99E-02	6.80E+02	2.18E-05
156-60-5	trans-1,2-Dichloroethene	--	NC	--	NC	--	NC	NC	1.66E-01	2.72E-04	--	NC
79-01-6	Trichloroethene	1.90E+03	6.08E-05	1.90E+03	6.08E-05	1.90E+03	2.28E-04	5.70E-05	7.20E+01	1.02E-01	1.90E+03	6.08E-05
75-01-4	Vinyl Chloride	--	NC	--	NC	--	NC	NC	1.10E+00	2.28E-03	--	NC
1330-20-7	Xylenes (Total)	--	NC	--	NC	--	NC	NC	1.12E+00	1.73E-03	--	NC
Polychlorinated Biphenyls (PCBs)												
53469-21-9	Aroclor 1242	--	NC	--	NC	--	NC	NC	2.23E-02	--	--	NC
12672-29-6	Aroclor 1248	1.70E+00	5.44E-08	1.70E+00	5.44E-08	1.70E+00	2.04E-07	5.10E-08	--	--	1.70E+00	5.44E-08

Notes:
1. Soil EPCs represent the detected concentration at "VOC Hot Spot 1" sample II-A-03m (5-7').
2. Fugitive Dust EPCs were calculated from soil EPCs; the equations and parameters used are presented in Table 9, Values used for Daily Intake Calculations - Fugitive Dust.
3. "VOC Hot Spot 1" groundwater EPCs represent the average of the temporal average wellhead concentration of the following Site monitoring wells (ESM-5, ESM-6, ESM-15, PZ-02, ESM-9 and B1/OW-1).
4. Ambient (trench) Air concentrations were modeled from groundwater EPCs, using an EPA air emissions model (USEPA, 1990).
"-" = Not a constituent of potential concern for medium/exposure point.
NC = Not calculated.

TABLE 15d
SUMMARY OF EXPOSURE POINT CONCENTRATIONS - HOT SPOT #2

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Cas Number	Constituent	Future Trespasser		Future Facility Worker		Future Construction/Utility Worker					Future Resident	
		Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m^3)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] (mg/m^3)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust EPC[2] (mg/m^3) GI System	Respiratory System	Site Groundwater[3] EPC (mg/L)	Estimated Ambient Air[4] (mg/m^3)	Site Soil[1] (mg/kg)	Estimated Fugitive Dust[2] EPC (mg/m^3)
Volatile Organic Compounds (VOCs)												
71-55-6	1,1,1-Trichloroethane	2.20E+01	7.04E-07	2.20E+01	7.04E-07	2.20E+01	2.64E-06	6.60E-07	7.41E+00	1.05E-02	2.20E+01	7.04E-07
75-34-3	1,1-Dichloroethane	--	NC	--	NC	--	NC	NC	2.03E+00	3.24E-03	--	NC
75-35-4	1,1-Dichloroethene	3.33E+00	1.06E-07	3.33E+00	1.06E-07	3.33E+00	3.99E-07	9.98E-08	3.35E-01	5.60E-04	3.33E+00	1.06E-07
95-63-6	1,2,4-Trimethylbenzene	3.58E+00	1.14E-07	3.58E+00	1.14E-07	3.58E+00	4.29E-07	1.07E-07	2.03E-02	2.96E-05	3.58E+00	1.14E-07
95-50-1	1,2-Dichlorobenzene	1.22E+01	3.90E-07	1.22E+01	3.90E-07	1.22E+01	1.46E-06	3.66E-07	3.29E-01	3.98E-04	1.22E+01	3.90E-07
107-06-2	1,2-Dichloroethane	--	NC	--	NC	--	NC	NC	2.65E-01	3.64E-04	--	NC
108-67-8	1,3,5-Trimethylbenzene	2.90E+00	9.28E-08	2.90E+00	9.28E-08	2.90E+00	3.48E-07	8.70E-08	--	NC	2.90E+00	9.28E-08
106-46-7	1,4-Dichlorobenzene	1.20E+00	3.84E-08	1.20E+00	3.84E-08	1.20E+00	1.44E-07	3.60E-08	--	NC	1.20E+00	3.84E-08
99-87-6	4-Isopropyltoluene	2.88E+00	9.20E-08	2.88E+00	9.20E-08	2.88E+00	3.45E-07	8.63E-08	--	NC	2.88E+00	9.20E-08
71-43-2	Benzene	--	NC	--	NC	--	NC	NC	2.64E-02	4.75E-05	--	NC
108-90-7	Chlorobenzene	2.30E-01	7.36E-09	2.30E-01	7.36E-09	2.30E-01	2.76E-08	6.90E-09	--	NC	2.30E-01	7.36E-09
156-59-2	cis-1,2-Dichloroethene	2.35E+01	7.52E-07	2.35E+01	7.52E-07	2.35E+01	2.82E-06	7.05E-07	1.99E+01	3.16E-02	2.35E+01	7.52E-07
100-41-4	Ethylbenzene	7.00E+00	2.24E-07	7.00E+00	2.24E-07	7.00E+00	8.40E-07	2.10E-07	4.17E-01	6.52E-04	7.00E+00	2.24E-07
98-82-8	Isopropylbenzene	6.40E-01	2.05E-08	6.40E-01	2.05E-08	6.40E-01	7.68E-08	1.92E-08	--	NC	6.40E-01	2.05E-08
91-20-3	Naphthalene	1.90E+00	6.08E-08	1.90E+00	6.08E-08	1.90E+00	2.28E-07	5.70E-08	--	--	1.90E+00	6.08E-08
103-65-1	n-Propylbenzene	2.70E+00	8.64E-08	2.70E+00	8.64E-08	2.70E+00	3.24E-07	8.10E-08	--	NC	2.70E+00	8.64E-08
95-47-6	o-xylene	6.30E+00	2.02E-07	6.30E+00	2.02E-07	6.30E+00	7.56E-07	1.89E-07	3.49E-01	5.36E-04	6.30E+00	2.02E-07
106-42-3/108-38-3	p/m-Xylene	2.50E+01	8.00E-07	2.50E+01	8.00E-07	2.50E+01	3.00E-06	7.50E-07	1.27E+00	NC	2.50E+01	8.00E-07
135-98-8	sec-Butylbenzene	6.30E-01	2.02E-08	6.30E-01	2.02E-08	6.30E-01	7.56E-08	1.89E-08	--	NC	6.30E-01	2.02E-08
127-18-4	Tetrachloroethene	1.30E+01	4.16E-07	1.30E+01	4.16E-07	1.30E+01	1.56E-06	3.90E-07	1.42E+00	1.80E-03	1.30E+01	4.16E-07
108-88-3	Toluene	5.88E+01	1.88E-06	5.88E+01	1.88E-06	5.88E+01	7.05E-06	1.76E-06	1.45E+01	2.42E-02	5.88E+01	1.88E-06
156-60-5	trans-1,2-Dichloroethene	--	NC	--	NC	--	NC	NC	1.09E-01	1.79E-04	--	NC
79-01-6	Trichloroethene	1.03E+01	3.28E-07	1.03E+01	3.28E-07	1.03E+01	1.23E-06	3.08E-07	4.31E+00	6.08E-03	1.03E+01	3.28E-07
75-01-4	Vinyl Chloride	1.20E+00	3.84E-08	1.20E+00	3.84E-08	1.20E+00	1.44E-07	3.60E-08	2.56E+00	5.34E-03	1.20E+00	3.84E-08
1330-20-7	Xylenes (Total)	2.07E+01	6.61E-07	2.07E+01	6.61E-07	2.07E+01	2.48E-06	6.20E-07	1.66E+00	2.58E-03	2.07E+01	6.61E-07
Petroleum Hydrocarbons												
NA c19-36	C19-C36 Aliphatic Hydrocarbons	--	NC	--	NC	--	NC	NC	1.50E+02	--	--	NC
Polychlorinated Biphenyls (PCBs)												
53469-21-9	Aroclor 1242	--	NC	--	NC	--	NC	NC	6.83E-04	--	--	NC
12672-29-6	Aroclor 1248	2.44E-01	7.82E-09	2.44E-01	7.82E-09	2.44E-01	2.93E-08	7.33E-09	--	--	2.44E-01	7.82E-09
Inorganics												
7440-39-3	Barium, Total	3.09E+01	9.89E-07	3.09E+01	9.89E-07	3.09E+01	3.71E-06	9.27E-07	7.00E-02	--	3.09E+01	9.89E-07
7440-47-3	Chromium, Total	1.36E+01	4.35E-07	1.36E+01	4.35E-07	1.36E+01	1.63E-06	4.08E-07	--	--	1.36E+01	4.35E-07
7439-92-1	Lead, Total	7.95E+01	2.54E-06	--	NC	--	NC	NC	--	--	--	NC
7439-97-6	Mercury, Total	1.50E-01	4.80E-09	1.50E-01	4.80E-09	1.50E-01	1.80E-08	4.50E-09	--	--	1.50E-01	4.80E-09
7440-22-4	Silver, Total	5.10E-01	1.63E-08	5.10E-01	1.63E-08	5.10E-01	6.12E-08	1.53E-08	--	--	5.10E-01	1.63E-08

Notes:
1. Soil EPCs represent the arithmetic mean concentration of "VOC Hot Spot 2" samples (ESM-03 (10-12'), II-A-09D (13-14')).
2. Fugitive Dust EPCs were calculated from soil EPCs; the equations and parameters used are presented in Table 9, Values used for Daily Intake Calculations - Fugitive Dust.
3. "VOC Hot Spot 2" Groundwater EPCs represent the average of the temporal average wellhead concentration of the following Site monitoring wells (ESM-3, PZ-01, PZ-03).
4. Ambient (trench) Air concentrations were modeled from groundwater EPCs, using an EPA air emissions model (USEPA, 1990).
"-" = Not a constituent of potential concern for medium/exposure point.
NC = Not calculated.

TABLE 16
RELATIVE ABSORPTION FACTORS FOR SOIL

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Oral Absorption Fraction from Soil[1]	Dermal Absorption Fraction from Soil	Source
Organics				
1,1,1-Trichloroethane	71-55-6	1.0E+00	1.0E-01	MADEP 2007
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	76-13-1	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
1,1,2-Trichloroethane	79-00-5	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
1,1-Dichloroethane	75-34-3	1.3E+00	1.3E-01	MADEP 2007
1,1-Dichloroethene	75-35-4	1.0E+00	1.0E-01	MADEP 2007
1,2,4-Trichlorobenzene	120-82-1	1.0E+00	8.0E-02	MADEP 2007
1,2,4-Trimethylbenzene	95-63-6	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
1,2-Dichlorobenzene	95-50-1	1.0E+00	1.0E-01	MADEP 2007
1,2-Dichloroethane	107-06-2	1.0E+00	1.0E-01	MADEP 2007
1,3,5-Trimethylbenzene	108-67-8	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
1,4-Dichlorobenzene	106-46-7	1.0E+00	1.0E-01	MADEP 2007
2-Butanone	78-93-3	1.0E+00	1.0E-01	MADEP 2007
2-Methylnaphthalene	91-57-6	3.6E-01	1.0E-01	MADEP 2007
4-Isopropyltoluene	99-87-6	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
4-Methyl-2-pentanone	108-10-1	1.0E+00	1.0E-01	MADEP 2007
Acenaphthene	83-32-9	3.6E-01	1.0E-01	MADEP 2007
Acenaphthylene	208-96-8	3.6E-01	1.0E-01	MADEP 2007
Acetone	67-64-1	1.0E+00	1.0E-01	MADEP 2007
Anthracene	120-12-7	3.6E-01	1.0E-01	MADEP 2007
Aroclor 1232	11141-16-5	8.5E-01	1.6E-01	MADEP 2007 (total PCBs)
Aroclor 1242	53469-21-9	8.5E-01	1.6E-01	MADEP 2007 (total PCBs)
Aroclor 1248	12672-29-6	8.5E-01	1.6E-01	MADEP 2007 (total PCBs)
Aroclor 1254	11097-69-1	8.5E-01	1.6E-01	MADEP 2007 (total PCBs)
Aroclor 1260	11096-82-5	8.5E-01	1.6E-01	MADEP 2007 (total PCBs)
Benzene	71-43-2	1.0E+00	8.0E-02	MADEP 2007
Benzo(a)anthracene	56-55-3	2.8E-01	2.0E-02	MADEP 2007
Benzo(a)pyrene	50-32-8	2.8E-01	2.0E-02	MADEP 2007
Benzo(b)fluoranthene	205-99-2	2.8E-01	2.0E-02	MADEP 2007
Benzo(g,h,i)perylene	191-24-2	3.6E-01	1.0E-01	MADEP 2007
Benzo(k)fluoranthene	207-08-9	2.8E-01	2.0E-02	MADEP 2007
Bromoform	75-25-2	1.0E+00	1.1E-01	MADEP 2007
Carbazole	86-74-8	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Carbon disulfide	75-15-0	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Chlorobenzene	108-90-7	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Chloroethane	75-00-3	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Chrysene	218-01-9	2.8E-01	2.0E-02	MADEP 2007
cis-1,2-Dichloroethene	156-59-2	1.0E+00	1.0E-01	MADEP 2007
Dibenzo(a,h)anthracene	53-70-3	2.8E-01	2.0E-02	MADEP 2007
Dibenzofuran	132-64-9	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Di-n-octylphthalate	117-84-0	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Ethylbenzene	100-41-4	1.0E+00	2.0E-01	MADEP 2007
Fluoranthene	206-44-0	3.6E-01	1.0E-01	MADEP 2007
Fluorene	86-73-7	3.6E-01	1.0E-01	MADEP 2007
Indeno(1,2,3-cd)pyrene	193-39-5	2.8E-01	2.0E-02	MADEP 2007
Isopropylbenzene	98-82-8	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Methyl tert butyl ether	1634-04-4	1.0E+00	1.0E-01	MADEP 2007
Methylene Chloride	75-09-2	1.0E+00	1.0E-01	MADEP 2007
Naphthalene	91-20-3	3.6E-01	1.0E-01	MADEP 2007
n-Butylbenzene	104-51-8	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
n-Propylbenzene	103-65-1	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Phenanthrene	85-01-8	3.6E-01	1.0E-01	MADEP 2007
Pyrene	129-00-0	3.6E-01	1.0E-01	MADEP 2007
sec-Butylbenzene	135-98-8	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Tetrachloroethene	127-18-4	1.0E+00	1.0E-01	MADEP 2007
Toluene	108-88-3	1.0E+00	1.2E-01	MADEP 2007
Total PCBs	1336-36-3	8.5E-01	1.6E-01	MADEP 2007
trans-1,2-Dichloroethene	156-60-5	1.0E+00	1.0E-01	MADEP 2007
Trichloroethene	79-01-6	1.0E+00	1.0E-01	MADEP 2007
Trichlorofluoromethane	75-69-4	1.0E+00	1.0E-02	Default for organics; USEPA Region 4, 2000
Vinyl chloride	75-01-4	1.0E+00	1.0E-01	MADEP 2007
Xylenes (Total)	1330-20-7	1.0E+00	1.2E-01	MADEP 2007

TABLE 16
RELATIVE ABSORPTION FACTORS FOR SOIL

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Oral Absorption Fraction from Soil[1]	Dermal Absorption Fraction from Soil	Source
Petroleum Hydrocarbons				
C5-C8 Aliphatic Hydrocarbons	NA c5-8	1.0E+00	1.0E+00	MADEP, 2003
C9-C12 Aliphatic Hydrocarbons	NA c9-12	1.0E+00	5.0E-01	MADEP, 2003
C9-C10 Aromatic Hydrocarbons	NA c9-10	1.0E+00	5.0E-01	MADEP, 2003
C9-C18 Aliphatic Hydrocarbons	NA c9-18	1.0E+00	5.0E-01	MADEP, 2003
C19-C36 Aliphatic Hydrocarbons	NA c19-36	1.0E+00	1.0E-01	MADEP, 2003
C11-C22 Aromatic Hydrocarbons	NA c11-c22	3.6E-01	1.0E-01	MADEP, 2003
Inorganics				
Arsenic, Total	7440-38-2	1.0E+00	3.0E-02	MADEP 2007
Barium	7440-39-3	1.0E+00	5.0E-02	MADEP 2007
Cadmium, Total	7440-43-9	1.0E+00	1.4E-01	MADEP 2007
Chromium, Total	7440-47-3	1.0E+00	9.0E-02	MADEP 2007
Lead, Total	7439-92-1	5.0E-01	6.0E-03	MADEP 2007
Mercury, Total	7439-97-6	1.0E+00	5.0E-02	MADEP 2007
Selenium, Total	7782-49-2	1.0E+00	2.0E-03	MADEP 2007
Silver, Total	7440-22-4	1.0E+00	2.5E-01	MADEP 2007

Footnotes:

1. Assumed 100% for compounds without MADEP oral Raf values.

MADEP 2007 = MADEP, Bureau of Waste Site Cleanup and Office of Research and Standards (ORS), Workbook:
MCP Toxicity.xls, Sheet Toxicity, January 23, 2007

USEPA. 2000. Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health
Risk Assessment Bulletins. EPA Region 4, originally published November 1995, Website version last updated
May 2000: http://www.epa.gov/region4/waste/oftecser/healtbul.htm

MADEP, 2003 = Massachusetts Department of Environmental Protection. 2003. Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology; chronic values for dermal contact with soil.

TABLE 17
CONSTITUENT-SPECIFIC PARAMETERS USED IN ESTIMATING DERMAL ABSORPTION FROM WATER

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

CAS Number	Chemical of Potential Concern	Permeability Coefficient (Kp) (cm/hour) [a]		Tau (hour/event) [a]	Fraction Absorbed (FA) (unitless) [a]
Organics					
71-55-6	1,1,1-Trichloroethane	1.3E-02		0.6	1
79-00-5	1,1,2-Trichloroethane	6.4E-03		0.6	1
75-34-3	1,1-Dichloroethane	6.7E-03		0.38	1
75-35-4	1,1-Dichloroethene	1.2E-02		0.37	1
120-82-1	1,2,4-Trichlorobenzene	6.6E-02		1.11	1
95-63-6	1,2,4-Trimethylbenzene	1.1E-01	c	1	1
108-67-8	1,3,5-Trimethylbenzene	6.1E-02	c	1	1
95-50-1	1,2-Dichlorobenzene	4.1E-02		0.71	1
107-06-2	1,2-Dichloroethane	4.2E-03		0.38	1
106-46-7	1,4-Dichlorobenzene	4.2E-02		0.71	1
78-93-3	2-Butanone	9.6E-04		0.27	1
91-57-6	2-Methylnaphthalene	1.4E-01	c	1	1
99-87-6	4-Isopropyltoluene	7.0E-02	c	0.42	1
208-96-8	Acenaphthylene	8.4E-02	c	1	1
83-32-9	Acenaphthene	1.0E-03	c	1	1
67-64-1	Acetone	5.2E-04	c	1	1
120-12-7	Anthracene	2.3E-01	c	1	1
71-43-2	Benzene	1.5E-02		0.29	1
56-55-3	Benzo(a)anthracene	4.7E-01		2.03	1
50-32-8	Benzo(a)pyrene	7.0E-01		2.69	1
205-99-2	Benzo(b)fluoranthene	7.0E-01		2.77	1
191-24-2	Benzo(g,h,i)perylene	2.0E+00	c	1	1
207-08-9	Benzo(k)fluoranthene	1.2E+00	c	1	1
75-15-0	Carbon disulfide	1.7E-02		0.3	1
108-90-7	Chlorobenzene	2.8E-02		0.46	1
75-00-3	Chloroethane	6.1E-03		0.24	1
156-59-2	cis-1,2-Dichloroethene	7.7E-03		0.37	1
218-01-9	Chrysene	4.7E-01		2.03	1
53-70-3	Dibenzo(a,h)anthracene	1.5E+00		3.88	0.6
132-64-9	Dibenzofuran	1.5E-01	d	1	1
100-41-4	Ethylbenzene	4.9E-02		0.42	1
206-44-0	Fluoranthene	2.2E-01		1.45	1
193-39-5	Indeno(1,2,3-cd)pyrene	1.0E+00		3.78	0.6
98-82-8	Isopropylbenzene	7.0E-02	e	1	1
75-09-2	Methylene Chloride	3.5E-03		0.32	1
1634-04-4	Methyl tert butyl ether	2.1E-03	c	1	1
91-20-3	Naphthalene	4.7E-02		0.56	1
104-51-8	n-Butylbenzene	1.8E-01	c	1	1
103-65-1	n-Propylbenzene	9.2E-02	c	1	1
85-01-8	Phenanthrene	1.4E-01		1.06	1
129-00-0	Pyrene	3.2E-01	c	1	1
135-98-8	sec-Butylbenzene	1.0E-03		1	1
127-18-4	Tetrachloroethene	3.3E-02		0.91	1
156-60-5	trans-1,2-Dichloroethene	7.7E-03		0.37	1
79-01-6	Trichloroethene	1.2E-02		0.58	1
108-88-3	Toluene	3.1E-02		0.35	1
75-69-4	Trichlorofluoromethane	1.3E-02		0.63	1
75-01-4	Vinyl Chloride	5.6E-03		0.24	1
1330-20-7	Xylenes (total)	7.0E-02	e	0.42	1
Petroleum Hydrocarbons					
NA c5-8	C5-C8 Aliphatic Hydrocarbons	2.0E-01	d	1	1
NA c9-10	C9-C10 Aromatic Hydrocarbons	3.3E-01	d	1	1
NA c9-12	C9-C12 Aliphatic Hydrocarbons	6.5E-01	d	1	1
NA c9-18	C9-C18 Aliphatic Hydrocarbons	6.5E-01	d	1	1
NA c11-c22	C11-C22 Aromatic Hydrocarbons	4.6E-01	d	1	1
NA c19-36	C19-C36 Aliphatic Hydrocarbons	3.6E-01	d	1	1

TABLE 17
CONSTITUENT-SPECIFIC PARAMETERS USED IN ESTIMATING DERMAL ABSORPTION FROM WATER

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

CAS Number	Chemical of Potential Concern	Permeability Coefficient (Kp) (cm/hour) [a]		Tau (hour/event) [a]	Fraction Absorbed (FA) (unitless) [a]
Inorganics					
7440-38-2	Arsenic, Total	1.0E-03	b	Not Applicable	Not Applicable
7440-39-3	Barium, Total	1.0E-03	b	Not Applicable	Not Applicable
7440-43-9	Cadmium, Total	1.0E-03		Not Applicable	Not Applicable
7440-47-3	Chromium, Total	2.0E-03		Not Applicable	Not Applicable
7439-92-1	Lead, Total	1.0E-04		Not Applicable	Not Applicable
7439-97-6	Mercury, Total	1.0E-03		Not Applicable	Not Applicable
7782-49-2	Selenium, Total	1.0E-03	b	Not Applicable	Not Applicable
7440-22-4	Silver, Total	6.0E-04		Not Applicable	Not Applicable
Polychlorinated Biphenyls					
53469-21-9	Aroclor 1242	4.3E-01	g	11.29	0.5

NOTES:

a Tau, FA, and/or Kp Value obtained from US EPA, RAGS Part E, Supplemental Guidance for Dermal Risk Assessment Final, EPA/540/R/99/005, July 2004. Exhibits 3-1 and B-3, unless otherwise noted.
A default value of 1 hr/event, and 1 (unitless) was used to represent the Tau and FA, respectively, for compounds not tested.

b A default value of 0.001 cm/hr was used to represent the Kp for inorganic compounds not tested, as recommended in US EPA, RAGS Part E, Supplemental Guidance for Dermal Risk Assessment Final, EPA/540/R/99/005, July 2004. Exhibit 3-1.

c Values obtained from the Risk Assessment Information System (RAIS), April 2006, which were calculated using USEPAs DERMWIN (The Dermal Permeability Coefficient) Program, which utilizes the equation listed below.
Value derived based on Equation 5.8 from U.S. EPA, "Dermal Exposure Assessment: Principles and Applications, Interim Report, ORSD, EPA 600/8-91/001B, January 1992, was used to calculate estimated Kp value.
log Kp = -2.72 + 0.71 log Kow - 0.0061 MW
Log Kow value obtained from Illustrated Handbook of Physical-Chemical Properties and Environmental Fate of Organic Compounds, Volume II, Mackay, Donald, Shiu, Wan Ying, and Ma, Kuo Ching, 1992.
Molecular weight and log Kow value obtained from Howard, 1989.
Molecular weight and log Kow value obtained from Groundwater Chemical Desk Reference, J.H. Montgomery; L.M. Welkon, 1990
Molecular weight and log Kow value obtained from Montgomery, John H., Groundwater Chemical Desk Reference Volume 2, 1991

d Values estimated using the equation above by Woodard & Curran.

e Value for m-xylene

f Value for trans-isomer

g Value for PCB-hexachlorobiphenyl

Table 18
Calculation of the Dermal Absorption Factor for Aqueous Exposures

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Average Daily Dose:
ADI_{dermal} (mg/kg-d) = DA_{event} * EV * EF * ED * SA * 1/BW * 1/AT * 1/Cl

DA_{event} = EPC * DAF

where for inorganics: DAF = Kp * te * CF2

where for organics: DAF = (2 FA * Kp * C2 * SQRT{(6 * tau-event * t-e)/pi})

					Constants		CW			
Chemical of Potential Concern	CAS Number	Permeability Coefficient (Kp) (cm/hour)	Tau (hour/event)	Fraction Absorbed (FA) (unitless)	C2 L/cm3	2FA	te (hr/event)	pi	SQRT(6tau*t/pi)	DA Factor CW
Volatile and Semi-Volatile Organic Compounds										
1,1,1-Trichloroethane	71-55-6	1.3E-02	6.0E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	7.6E-01	**2.0E-05**
1,1,2-Trichloroethane	79-00-5	6.4E-03	6.0E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	7.6E-01	**9.7E-06**
1,1-Dichloroethane	75-34-3	6.7E-03	3.8E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	6.0E-01	**8.1E-06**
1,1-Dichloroethene	75-35-4	1.2E-02	3.7E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.9E-01	**1.4E-05**
1,2,4-Trichlorobenzene	120-82-1	6.6E-02	1.1E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	1.0E+00	**1.4E-04**
1,2,4-Trimethylbenzene	95-63-6	1.1E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**2.1E-04**
1,2-Dichlorobenzene	95-50-1	4.1E-02	7.1E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	8.2E-01	**6.8E-05**
1,2-Dichloroethane	107-06-2	4.2E-03	3.8E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	6.0E-01	**5.1E-06**
1,3,5-Trimethylbenzene	108-67-8	6.1E-02	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**1.2E-04**
1,4-Dichlorobenzene	106-46-7	4.2E-02	7.1E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	8.2E-01	**6.9E-05**
2-Butanone	78-93-3	9.6E-04	2.7E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.1E-01	**9.7E-07**
2-Methylnaphthalene	91-57-6	1.4E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**2.8E-04**
4-Isopropyltoluene	99-87-6	7.0E-02	4.2E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	6.3E-01	**8.9E-05**
Acenaphthylene	208-96-8	8.4E-02	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**1.6E-04**
Acenaphthene	83-32-9	1.0E-03	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**2.0E-06**
Acetone	67-64-1	5.2E-04	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**1.0E-06**
Anthracene	120-12-7	2.3E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**4.4E-04**
Benzene	71-43-2	1.5E-02	2.9E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.3E-01	**1.6E-05**
Benzo(a)anthracene	56-55-3	4.7E-01	2.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	1.4E+00	**1.3E-03**
Benzo(a)pyrene	50-32-8	7.0E-01	2.7E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	1.6E+00	**2.2E-03**
Benzo(b)fluoranthene	205-99-2	7.0E-01	2.8E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	1.6E+00	**2.3E-03**
Benzo(g,h,i)perylene	191-24-2	2.0E+00	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**3.9E-03**
Benzo(k)fluoranthene	207-08-9	1.2E+00	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**2.3E-03**
Carbon disulfide	75-15-0	1.7E-02	3.0E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.4E-01	**1.8E-05**
Chlorobenzene	108-90-7	2.8E-02	4.6E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	6.6E-01	**3.7E-05**
Chloroethane	75-00-3	6.1E-03	2.4E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	4.8E-01	**5.8E-06**
cis-1,2-Dichloroethene	156-59-2	7.7E-03	3.7E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.9E-01	**9.2E-06**
Chrysene	218-01-9	4.7E-01	2.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	1.4E+00	**1.3E-03**
Dibenzo(a,h)anthracene	53-70-3	1.5E+00	3.9E+00	6.0E-01	1.0E-03	1.2E+00	5.0E-01	3.1E+00	1.9E+00	**2.1E-03**
Dibenzofuran	132-64-9	1.5E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**3.0E-04**
Ethylbenzene	100-41-4	4.9E-02	4.2E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	6.3E-01	**6.2E-05**
Fluoranthene	206-44-0	2.2E-01	1.5E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	1.2E+00	**5.2E-04**
Indeno(1,2,3-cd)pyrene	193-39-5	1.0E+00	3.8E+00	6.0E-01	1.0E-03	1.2E+00	5.0E-01	3.1E+00	1.9E+00	**1.4E-03**
Isopropylbenzene	98-82-8	7.0E-02	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**1.4E-04**
Methylene Chloride	75-09-2	3.5E-03	3.2E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.5E-01	**3.9E-06**
Methyl tert butyl ether	1634-04-4	2.1E-03	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**4.1E-06**
Naphthalene	91-20-3	4.7E-02	5.6E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	7.3E-01	**6.9E-05**
n-Butylbenzene	104-51-8	1.8E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**3.5E-04**
n-Propylbenzene	103-65-1	9.2E-02	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**1.8E-04**
Phenanthrene	85-01-8	1.4E-01	1.1E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	1.0E+00	**2.8E-04**
Pyrene	129-00-0	3.2E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**6.3E-04**
sec-butylbenzene	135-98-8	1.0E-03	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**2.0E-06**
Tetrachloroethene	127-18-4	3.3E-02	9.1E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.3E-01	**6.2E-05**
Toluene	108-88-3	3.1E-02	3.5E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.8E-01	**3.6E-05**
trans-1,2-Dichloroethene	156-60-5	7.7E-03	3.7E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	5.9E-01	**9.2E-06**
Trichlorofluoromethane	75-69-4	1.3E-02	6.3E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	7.8E-01	**2.0E-05**
Trichloroethene	79-01-6	1.2E-02	5.8E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	7.4E-01	**1.8E-05**
Vinyl Chloride	75-01-4	5.6E-03	2.4E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	4.8E-01	**5.4E-06**
Xylenes (Total)	1330-20-7	7.0E-02	4.2E-01	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	6.3E-01	**8.9E-05**
Aroclor 1242	53469-21-9	4.3E-01	1.1E+01	5.0E-01	1.0E-03	1.0E+00	5.0E-01	3.1E+00	3.3E+00	**7.1E-04**
Total Petroleum Hyrdrocarbons										
C5-C8 Aliphatic Hydrocarbons	NA c5-8	2.0E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**3.9E-04**
C9-C10 Aromatic Hydrocarbons	NA c9-10	3.3E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**6.4E-04**
C9-C12 Aliphatic Hydrocarbons	NA c9-12	6.5E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**1.3E-03**
C9-C18 Aliphatic Hydrocarbons	NA c9-18	6.5E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**1.3E-03**
C11-C22 Aromatic Hydrocarbons	NA c11-c22	4.6E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**9.0E-04**
C19-C36 Aliphatic Hydrocarbons	NA c19-36	3.6E-01	1.0E+00	1.0E+00	1.0E-03	2.0E+00	5.0E-01	3.1E+00	9.8E-01	**7.1E-04**
Inorganics										
Arsenic, Total	7440-38-2	1.0E-03	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**5.0E-07**
Barium, Total	7440-39-3	1.0E-03	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**5.0E-07**
Cadmium, Total	7440-43-9	1.0E-03	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**5.0E-07**
Chromium, Total	7440-47-3	2.0E-03	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**1.0E-06**
Lead, Total	7439-92-1	1.0E-04	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**5.0E-08**
Mercury, Total	7439-97-6	1.0E-03	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**5.0E-07**
Selenium, Total	7782-49-2	1.0E-03	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**5.0E-07**
Silver, Total	7440-22-4	6.0E-04	Not Applicable	Not Applicable	1.0E-03	2.0E+00	5.0E-01	3.1E+00	Not applicable	**3.0E-07**

Note:
ADI_{dermal} equations and dermal absorption parameters obtained from USEPA 2004.

TABLE 19
NON-CANCER TOXICITY DATA - ORAL/DERMAL
Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Oral RfD			Oral Absorption Efficiency for Dermal (ABS_{gi}) (1)	Absorbed RfD for Dermal (2)			Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD: Target Organ(s)	
		Chronic	Subchronic	Units		Chronic	Subchronic	Units			Source	Date
Organics												
1,1,1-Trichloroethane	71-55-6	9.00E-02	9.00E-01	mg/kg/day	--	9.00E-02	9.00E-01	mg/kg/day			HEAST (withdrawn)	1997
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	76-13-1	3.00E+01	3.00E+01	mg/kg/day	--	3.00E+01	3.00E+01	mg/kg/day	Nervous system	10 x 1	IRIS	2/13/2007
1,1,2-Trichloroethane	79-00-5	4.00E-03	4.00E-02	mg/kg/day	--	4.00E-03	4.00E-02	mg/kg/day	Clinical serum chemistry	1000 x 1	IRIS	2/13/2007
1,1-Dichloroethane	75-34-3	1.00E-01	1.00E+00	mg/kg/day	--	1.00E-01	1.00E+00	mg/kg/day		1000	HEAST	1997
1,1-Dichloroethene	75-35-4	5.00E-02	5.00E-02	mg/kg/day	--	5.00E-02	5.00E-02	mg/kg/day	Liver	100 X 1	IRIS	2/13/2007
1,2,4-Trichlorobenzene	120-82-1	1.00E-02	1.00E-02	mg/kg/day	--	1.00E-02	1.00E-02	mg/kg/day	Adrenal glands, kidney	1000 x 1	IRIS	2/13/2007
1,2,4-Trimethylbenzene	95-63-6	5.00E-02	5.00E-02	mg/kg/day	--	5.00E-02	5.00E-02	mg/kg/day			Provisional; RAIS	2/13/2007
1,2-Dichlorobenzene	95-50-1	9.00E-02	9.00E-01	mg/kg/day	--	9.00E-02	9.00E-01	mg/kg/day	None observed	1000 x 1	IRIS	2/13/2007
1,2-Dichloroethane	107-06-2	2.00E-02	2.00E-01	mg/kg/day	--	2.00E-02	2.00E-01	mg/kg/day			MADEP	1992
1,3,5-Trimethylbenzene	108-67-8	5.00E-02	5.00E-02	mg/kg/day	--	5.00E-02	5.00E-02	mg/kg/day			Provisional; RAIS	2/13/2007
1,4-Dichlorobenzene	106-46-7	9.00E-02	9.00E-01	mg/kg/day	--	9.00E-02	9.00E-01	mg/kg/day	None observed	1000 x 1	IRIS (1,2-dichlorobenzene used as surrogate)	2/13/2007
2-Butanone	78-93-3	6.00E-01	6.00E-01	mg/kg/day	--	6.00E-01	6.00E-01	mg/kg/day	Whole body	1000 x 1	IRIS	2/13/2007
2-Butanone	78-93-3	6.00E-01	6.00E-01	mg/kg/day	--	6.00E-01	6.00E-01	mg/kg/day	Whole body	1000 x 1	IRIS	2/13/2007
2-Methylnaphthalene	91-57-6	4.00E-03	4.00E-02	mg/kg/day	--	4.00E-03	4.00E-02	mg/kg/day	Lungs	1000 x 1	IRIS	2/13/2007
4-Isopropyltoluene	99-87-6	1.00E-01	1.00E-01	mg/kg/day	--	1.00E-01	1.00E-01	mg/kg/day	Kidney	1000 x 1	IRIS (isopropylbenzene used as surrogate)	2/13/2007
4-Methyl-2-pentanone	108-10-1	8.00E-02	8.00E-01	mg/kg/day		8.00E-02	8.00E-01	mg/kg/day	Whole body	3000	HEAST	1997
Acenaphthene	83-32-9	6.00E-02	6.00E-01	mg/kg/day	--	6.00E-02	6.00E-01	mg/kg/day	Hepatoxicity	3000 x 1	IRIS	2/13/2007
Acenaphthylene	208-96-8	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Acetone	67-64-1	9.00E-01	2.70E+00	mg/kg/day	--	9.00E-01	2.70E+00	mg/kg/day	Kidney	1000 x 1	IRIS	2/13/2007
Anthracene	120-12-7	3.00E-01	3.00E+00	mg/kg/day	--	3.00E-01	3.00E+00	mg/kg/day	No observed effects	3000 x 1	IRIS	2/13/2007
Aroclor 1232	11141-16-5	2.00E-05	5.00E-05	mg/kg/day	--	2.00E-05	5.00E-05	mg/kg/day	eyes/nails/immune system	300 x 1	IRIS	2/13/2007
Aroclor 1242	53469-21-9	2.00E-05	5.00E-05	mg/kg/day	--	2.00E-05	5.00E-05	mg/kg/day	eyes/nails/immune system	300 x 1	IRIS	2/13/2007
Aroclor 1248	12672-29-6	2.00E-05	5.00E-05	mg/kg/day	--	2.00E-05	5.00E-05	mg/kg/day	eyes/nails/immune system	300 x 1	IRIS	2/13/2007
Aroclor 1254	11097-69-1	2.00E-05	5.00E-05	mg/kg/day	--	2.00E-05	5.00E-05	mg/kg/day	eyes/nails/immune system	300 x 1	IRIS	2/13/2007
Aroclor 1260	11096-82-5	2.00E-05	5.00E-05	mg/kg/day	--	2.00E-05	5.00E-05	mg/kg/day	eyes/nails/immune system	300 x 1	IRIS	2/13/2007
Benzene	71-43-2	4.00E-03	1.00E-02	mg/kg/day	--	4.00E-03	1.00E-02	mg/kg/day	Blood/Immune	300 x 1	IRIS	2/13/2007
Benzo(a)anthracene	56-55-3	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Benzo(a)pyrene	50-32-8	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Benzo(b)fluoranthene	205-99-2	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Benzo(g,h,i)perylene	191-24-2	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Benzo(k)fluoranthene	207-08-9	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Bromoform	75-25-2	2.00E-02	2.00E-01	mg/kg/day	--	2.00E-02	2.00E-01	mg/kg/day	Liver	1000 x 1	IRIS	2/13/2007
Carbazole	86-74-8	2.50E-02	2.50E-02	mg/kg/day		2.50E-02	2.50E-02	mg/kg/day	Liver/kidney	100 X 1	IRIS (diphenylamine used as surrogate)	2/13/2007
Carbon disulfide	75-15-0	1.00E-01	1.00E-01	mg/kg/day	--	1.00E-01	1.00E-01	mg/kg/day	Fetus	100 X 1	IRIS	2/13/2007
Chlorobenzene	108-90-7	2.00E-02	2.00E-01	mg/kg/day	--	2.00E-02	2.00E-01	mg/kg/day	Liver	1000 x 1	IRIS	2/13/2007
Chloroethane	75-00-3	4.00E-01	4.00E-01	mg/kg/day	--	4.00E-01	4.00E-01	mg/kg/day			Region 9 PRG Table	12/1/2004
Chrysene	218-01-9	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
cis-1,2-Dichloroethene	156-59-2	1.00E-02	1.00E-01	mg/kg/day	--	1.00E-02	1.00E-01	mg/kg/day		3000	HEAST	1997
Dibenzo(a,h)anthracene	53-70-3	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Dibenzofuran	132-64-9	2.00E-03	2.00E-03	mg/kg/day	--	2.00E-03	2.00E-03	mg/kg/day			Region 9 PRG Table	12/1/2004
Di-n-octylphthalate	117-84-0	4.00E-02	4.00E-02	mg/kg/day		4.00E-02	4.00E-02	mg/kg/day			Provisional; RAIS	2/13/2007
Ethylbenzene	100-41-4	1.00E-01	1.00E+00	mg/kg/day	--	1.00E-01	1.00E+00	mg/kg/day	Liver, kidney	1000 x 1	IRIS	2/13/2007
Fluoranthene	206-44-0	4.00E-02	4.00E-01	mg/kg/day	--	4.00E-02	4.00E-01	mg/kg/day	Blood, liver, kidney	3000 x 1	IRIS	2/13/2007
Fluorene	86-73-7	4.00E-02	4.00E-01	mg/kg/day	--	4.00E-02	4.00E-01	mg/kg/day	Blood	3000 x 1	IRIS	2/13/2007
Indeno(1,2,3-cd)pyrene	193-39-5	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Isopropylbenzene	98-82-8	1.00E-01	1.00E-01	mg/kg/day	--	1.00E-01	1.00E-01	mg/kg/day	Kidney	1000 x 1	IRIS	2/13/2007
Methyl tert butyl ether	1634-04-4	1.00E-01	1.00E+00	mg/kg/day	--	1.00E-01	1.00E+00	mg/kg/day			MADEP ORS	2007
Methylene Chloride	75-09-2	6.00E-02	6.00E-02	mg/kg/day		6.00E-02	6.00E-02	mg/kg/day	Liver	100 X 1	IRIS	2/13/2007
Naphthalene	91-20-3	2.00E-02	2.00E-01	mg/kg/day	--	2.00E-02	2.00E-01	mg/kg/day	Whole body	3000 x 1	IRIS	2/13/2007
n-Butylbenzene	104-51-8	4.00E-02	4.00E-02	mg/kg/day	--	4.00E-02	4.00E-02	mg/kg/day			Region 9 PRG Table	12/1/2004
n-Propylbenzene	103-65-1	4.00E-02	4.00E-02	mg/kg/day	--	4.00E-02	4.00E-02	mg/kg/day			Region 9 PRG Table	12/1/2004
Phenanthrene	85-01-8	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2007
Pyrene	129-00-0	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day	Kidney	3000 x 1	IRIS	2/13/2007

TABLE 19
NON-CANCER TOXICITY DATA - ORAL/DERMAL
Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Oral RfD			Oral Absorption Efficiency for Dermal (ABS_{gi}) (1)	Absorbed RfD for Dermal (2)			Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD: Target Organ(s)	
		Chronic	Subchronic	Units		Chronic	Subchronic	Units			Source	Date
sec-Butylbenzene	135-98-8	4.00E-02	4.00E-02	mg/kg/day	--	4.00E-02	4.00E-02	mg/kg/day			Region 9 PRG Table (value for tert-butylbenzene)	12/1/2004
Tetrachloroethene	127-18-4	1.00E-02	1.00E-01	mg/kg/day	--	1.00E-02	1.00E-01	mg/kg/day	Liver, whole body	1000 x 1	IRIS	2/13/2007
Toluene	108-88-3	8.00E-02	8.00E-02	mg/kg/day	--	8.00E-02	8.00E-02	mg/kg/day	Kidney	3000 x 1	IRIS	2/13/2007
Total PCBs	1336-36-3	2.00E-05	5.00E-05	mg/kg/day	--	2.00E-05	5.00E-05	mg/kg/day	eyes/nails/immune system	300 x 1	IRIS	2/13/2007
trans-1,2-Dichloroethene	156-60-5	2.00E-02	2.00E-01	mg/kg/day	--	2.00E-02	2.00E-01	mg/kg/day	Blood chemistry	1000 x 1	IRIS	2/13/2007
Trichloroethene	79-01-6	2.00E-03	2.00E-02	mg/kg/day	--	2.00E-03	2.00E-02	mg/kg/day			MADEP	2007
Trichlorofluoromethane	75-69-4	3.00E-01	3.00E-01	mg/kg/day	--	3.00E-01	3.00E-01	mg/kg/day	Survival and histopathology	1000 x 1	IRIS	2/13/2007
Vinyl chloride	75-01-4	3.00E-03	3.00E-03	mg/kg/day	--	3.00E-03	3.00E-03	mg/kg/day	Liver	30 x 1	IRIS	2/13/2007
Xylenes (Total)	1330-20-7	2.00E-01	2.00E-01	mg/kg/day	--	2.00E-01	2.00E-01	mg/kg/day	Whole body	1000 x 1	IRIS	2/13/2007
Petroleum Hydrocarbons												
C5-C8 Aliphatic Hydrocarbons	NA c5-8	4.00E-02	4.00E-01	mg/kg/day	--	4.00E-02	4.00E-01	mg/kg/day			MADEP	2003
C9-C12 Aliphatic Hydrocarbons	NA c9-12	1.00E-01	1.00E+00	mg/kg/day	--	1.00E-01	1.00E+00	mg/kg/day			MADEP	2003
C9-C10 Aromatic Hydrocarbons	NA c9-10	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2003
C9-C18 Aliphatic Hydrocarbons	NA c9-18	1.00E-01	1.00E+00	mg/kg/day	--	1.00E-01	1.00E+00	mg/kg/day			MADEP	2003
C19-C36 Aliphatic Hydrocarbons	NA c19-36	2.00E+00	6.00E+00	mg/kg/day	--	2.00E+00	6.00E+00	mg/kg/day			MADEP	2003
C11-C22 Aromatic Hydrocarbons	NA c11-c22	3.00E-02	3.00E-01	mg/kg/day	--	3.00E-02	3.00E-01	mg/kg/day			MADEP	2003
Inorganics												
Arsenic, Total	7440-38-2	3.00E-04	3.00E-04	mg/kg/day	--	3.00E-04	3.00E-04	mg/kg/day	Skin; vascular system	3 x 1	IRIS	2/13/2007
Barium, Total	7440-39-3	2.00E-01	2.00E-01	mg/kg/day	0.07	1.40E-02	1.40E-02	mg/kg/day	Kidney	300 x 1	IRIS	2/13/2007
Chromium, Total	7440-47-3	3.00E-03	2.00E-02	mg/kg/day	0.025	7.50E-05	5.00E-04	mg/kg/day	Skin; vascular system	3 x 1	IRIS	2/13/2007
Cadmium, Total	7440-43-9	1.00E-03	1.00E-03	mg/kg/day	--	2.50E-05	2.50E-05	mg/kg/day	Kidney	300 x 1	IRIS	2/13/2007
Diet		1.00E-03	1.00E-03	mg/kg/day	0.025	2.50E-05	2.50E-05	mg/kg/day	Kidney	10 x 1	IRIS	2/13/2007
Water		5.00E-04	5.00E-04	mg/kg/day	0.05	2.50E-05	2.50E-05	mg/kg/day	Kidney	10 x 1	IRIS	2/13/2007
Lead, Total	7439-92-1	7.50E-04	7.50E-04	mg/kg/day	--	7.50E-04	7.50E-04	mg/kg/day	Nervous system		MADEP, 1992	1992
Mercury, Total	7439-97-6	3.00E-04	3.00E-04	mg/kg/day	--	3.00E-04	3.00E-04	mg/kg/day	Immune system	1000 x 1	IRIS	2/13/2007
Selenium, Total	7782-49-2	5.00E-03	5.00E-03	mg/kg/day	--	5.00E-03	5.00E-03	mg/kg/day	Cardiovascular, alimentary and nervous systems (selenosis)	3 x 1	IRIS	2/13/2007
Silver, Total	7440-22-4	5.00E-03	5.00E-03	mg/kg/day	0.04	2.00E-04	2.00E-04	mg/kg/day	Skin (argyria)	3 x 1	IRIS	2/13/2007

Footnotes:
IRIS = USEPA's Integrated Risk Information System (www.epa.gov/iris). Searched February 2007.
RAIS = Oak Ridge National Laboratory's Risk Assessment Information System. (http://risk.lsd.ornl.gov/tox/tox_values.shtml). Values presented are Provisional Peer Reviewed Toxicity Values (PPRTV), unless otherwise noted. RAIS searched in February 2007.
Region 9 = USEPA Region 9 Preliminary Remediation Goal (PRG) table, October 2004 (with December 2004 updates).
MADEP 2003 = Massachusetts Department of Environmental Protection. 2003. Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology.
MADEP 2007 = MADEP, Bureau of Waste Site Cleanup and Office of Research and Standards (ORS), Workbook: MCP Toxicity.xls, Sheet Toxicity, January 23, 2007
DEP = Memo from Andrew Friedman, ORS, Revisions to Dose-Response Values used in Human Health Risk Assessment, August 18, 2004.
MADEP, 1992 = Residential Shortform.doc
HEAST = National Center for Exposure Assessment, Health Effects Assessment Summary Tables, 1997.
-- = No information available.
* Value for Thallium chloride and thallium carbonate.
(1) Source: Exhibit 4-1, from USEPA, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part E (Supplemental Guidance for Dermal Risk Assessment), Final, July 2004. Compounds lacking ABSgi values were assumed to have an oral absorption efficiency of 100%.
(2) Derivation of RfD based on absorbed dose

$$RfD_{ABS} = RfD_o * ABS_{GI}$$ (USEPA, 2004)

TABLE 20
NON-CANCER TOXICITY DATA - INHALATION
Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Inhalation RfC			Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC:Source	
		Chronic	Subchronic	Units			Source	Date
Organics								
1,1,1-Trichloroethane	71-55-6	5.20E+00	5.20E+00	(mg/m^3)			MADEP CHEM/AAL	2007
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	76-13-1	3.00E+01	3.00E+01	(mg/m^3)			HEAST	1997
1,1,2-Trichloroethane	79-00-5	7.40E-02	7.40E-02	(mg/m^3)			MADEP CHEM/AAL	2007
1,1-Dichloroethane	75-34-3	5.00E-01	5.00E+00	(mg/m^3)	None observed	1000	HEAST	1997
1,1-Dichloroethene	75-35-4	2.00E-01	2.00E-01	(mg/m^3)	Liver	30 X 1	IRIS	2/13/2007
1,2,4-Trichlorobenzene	120-82-1	2.00E-01	2.00E+00	(mg/m^3)			HEAST	1997
1,2,4-Trimethylbenzene	95-63-6	6.00E-03	6.00E-03	(mg/m^3)			Provisional Value; RAIS	2/13/2007
1,2-Dichlorobenzene	95-50-1	2.00E-01	2.00E-01	(mg/m^3)			HEAST	1997
1,2-Dichloroethane	107-06-2	5.50E-02	5.50E-02	(mg/m^3)			MADEP CHEM/AAL	2007
1,3,5-Trimethylbenzene	108-67-8	6.00E-03	6.00E-03	(mg/m^3)			Provisional Value; RAIS	2/13/2007
1,4-Dichlorobenzene	106-46-7	8.00E-01	2.40E+00	(mg/m^3)	Liver	100 X 1	IRIS	2/13/2007
2-Butanone	78-93-3	5.00E+00	5.00E+00	(mg/m^3)	Development/fetus	300 x 1	IRIS	2/13/2007
2-Methylnaphthalene	91-57-6	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
4-Isopropyltoluene	99-87-6	4.00E-01	4.00E-01	(mg/m^3)	Kidney/adrenal gland	1000 x 1	IRIS	2/13/2007
4-Methyl-2-pentanone	108-10-1	3.00E+00	3.00E+00	(mg/m^3)	Developmental/fetus	300 x 1	IRIS	2/13/2007
Acenaphthene	83-32-9	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Acenaphthylene	208-96-8	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Acetone	67-64-1	8.00E-01	8.00E-01	(mg/m^3)			MADEP CHEM/AAL	2007
Anthracene	120-12-7	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Aroclor 1232	11141-16-5	2.00E-05	2.00E-05	(mg/m^3)			IRIS	2/13/2007
Aroclor 1242	53469-21-9	2.00E-05	2.00E-05	(mg/m^3)			IRIS	2/13/2007
Aroclor 1248	12672-29-6	2.00E-05	2.00E-05	(mg/m^3)			IRIS	2/13/2007
Aroclor 1254	11097-69-1	2.00E-05	2.00E-05	(mg/m^3)			IRIS	2/13/2007
Aroclor 1260	11096-82-5	2.00E-05	2.00E-05	(mg/m^3)			IRIS	2/13/2007
Benzene	71-43-2	3.00E-02	9.00E-02	(mg/m^3)	Blood/Immune	300 x 1	IRIS	2/13/2007
Benzo(a)anthracene	56-55-3	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Benzo(a)pyrene	50-32-8	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Benzo(b)fluoranthene	205-99-2	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Benzo(g,h,i)perylene	191-24-2	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Benzo(k)fluoranthene	207-08-9	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Bromoform	75-25-2	7.00E-02	7.00E-01	(mg/m^3)			MADEP	2007
Carbazole	86-74-8	--	--					
Carbon disulfide	75-15-0	7.00E-01	7.00E-01	(mg/m^3)	Peripheral Nervous System	30 X 1	IRIS	2/13/2007
Chlorobenzene	108-90-7	2.00E-02	2.00E-02	(mg/m^3)			HEAST	1997
Chloroethane	75-00-3	1.00E+01	1.00E+01	(mg/m^3)	Development/fetus	300 x 1	IRIS	
Chrysene	218-01-9	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
cis-1,2-Dichloroethene	156-59-2	3.50E-02	3.50E-02	(mg/m^3)			MADEP	2007
Dibenzo(a,h)anthracene	53-70-3	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Dibenzofuran	132-64-9	7.00E-03	7.00E-03	(mg/m^3)			Calculated (1); Region 9	2004
Di-n-octylphthalate	117-84-0	--	--					
Ethylbenzene	100-41-4	1.00E+00	1.00E+00	(mg/m^3)	Development/fetus	300 x 1	IRIS	2/13/2007
Fluoranthene	206-44-0	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Fluorene	86-73-7	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Indeno(1,2,3-cd)pyrene	193-39-5	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Isopropylbenzene	98-82-8	4.00E-01	4.00E-01	(mg/m^3)	Kidney/adrenal gland	1000 x 1	IRIS	2/13/2007
Methyl tert butyl ether	1634-04-4	3.00E+00	3.00E+00	(mg/m^3)	Kidney, liver	100 x 1	IRIS	2/13/2007
Methylene Chloride	75-09-2	3.00E+00	3.00E+00	(mg/m^3)			HEAST	1997
Naphthalene	91-20-3	3.00E-03	3.00E-03	(mg/m^3)	Respiratory system	3000 x 1	IRIS	2/13/2007
n-Butylbenzene	104-51-8	1.40E-01	1.40E-01	(mg/m^3)			Calculated (1); Region 9	2004
n-Propylbenzene	103-65-1	1.40E-01	1.40E-01	(mg/m^3)			Calculated (1); Region 9	2004
Phenanthrene	85-01-8	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Pyrene	129-00-0	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007

TABLE 20
NON-CANCER TOXICITY DATA - INHALATION
Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Inhalation RfC			Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC:Source	
		Chronic	Subchronic	Units			Source	Date
sec-Butylbenzene	135-98-8	1.40E-01	1.40E-01	(mg/m^3)			Calculated (1); Region 9	2004
Tetrachloroethene	127-18-4	4.60E+00	4.60E+00	(mg/m^3)			MADEP CHEM/AAL	2007
Toluene	108-88-3	5.00E+00	5.00E+00	(mg/m^3)	Nervous system	10 x 1	IRIS	2/13/2007
Total PCBs	1336-36-3	2.00E-05	2.00E-05	(mg/m^3)			MADEP CHEM/AAL	2007
trans-1,2-Dichloroethene	156-60-5	7.00E-02	7.00E-01	(mg/m^3)			IRIS (1)	2/13/2007
Trichloroethene	79-01-6	1.80E-01	1.80E-01	(mg/m^3)			MADEP CHEM/AAL	2007
Trichlorofluoromethane	75-69-4	7.00E-01	7.00E-01	(mg/m^3)			HEAST	1997
Vinyl chloride	75-01-4	1.00E-01	1.00E-01	(mg/m^3)	Liver	30 x 1	IRIS	2/13/2007
Xylenes (Total)	1330-20-7	1.00E-01	3.00E-01	(mg/m^3)	Nervous System	300 x 1	IRIS	2/13/2007
Petroleum Hydrocarbons								
C5-C8 Aliphatic Hydrocarbons	NA c5-8	2.00E-01	2.00E-01	(mg/m^3)			MADEP	2007
C9-C12 Aliphatic Hydrocarbons	NA c9-12	2.00E-01	6.00E-01	(mg/m^3)			MADEP	2007
C9-C10 Aromatic Hydrocarbons	NA c9-10	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
C9-C18 Aliphatic Hydrocarbons	NA c9-18	2.00E-01	6.00E-01	(mg/m^3)			MADEP	2007
C19-C36 Aliphatic Hydrocarbons	NA c19-36	NA	NA	(mg/m^3)			MADEP	2007
C11-C22 Aromatic Hydrocarbons	NA c11-c22	5.00E-02	5.00E-01	(mg/m^3)			MADEP	2007
Inorganics								
Arsenic, Total	7440-38-2	2.50E-06	2.50E-06	(mg/m^3)			MADEP CHEM/AAL	2007
Barium, Total	7440-39-3	5.00E-04	5.00E-03	(mg/m^3)			HEAST	1997
Cadmium, Total	7440-43-9	2.00E-05	2.00E-05	(mg/m^3)			MADEP CHEM/AAL	2007
Chromium, Total	7440-47-3	1.00E-04	3.00E-04	(mg/m^3)	Lungs	300 x 1	IRIS (hexavalent Cr)	2/13/2007
Lead, Total	7439-92-1	1.00E-03	1.00E-03	(mg/m^3)			MADEP CHEM/AAL	2007
Mercury, Total	7439-97-6	3.00E-04	3.00E-04	(mg/m^3)	Nervous system	30	HEAST	1997
Selenium, Total	7782-49-2	3.00E-03	3.00E-03	(mg/m^3)			MADEP CHEM/AAL	2007
Silver, Total	7440-22-4	1.40E-04	1.40E-04	(mg/m^3)			MADEP ORS	2007

Footnotes:
IRIS = USEPA's Integrated Risk Information System (www.epa.gov/iris). Searched February 2007.
RAIS = Oak Ridge National Laboratory's Risk Assessment Information System. (http://risk.lsd.ornl.gov/tox/tox_values.shtml). Values presented are Provisional Peer Reviewed Toxicity Values (PPRTV), unless otherwise noted.
Region 9 = USEPA Region 9 Preliminary Remediation Goal (PRG) table, October 2004 (with December 2004 updates).
MADEP, 2003 = Massachusetts Department of Environmental Protection. 2003. Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology.
MADEP, CHEM/AAL = Massachusetts Department of Environmental Protection. The Chemical Health Effects Assessment Methodology and the Method to Derive Allowable Ambient Limits.
(http://www.mass.gov/dep/ors/orspubs.htm#air) (as cited in MADEP 2007)
HEAST = National Center for Exposure Assessment, Health Effects Assessment Summary Tables, 1997.
-- = No information available.
DEP = Memo from Andrew Friedman, ORS, Revisions to Dose-Response Values used in Human Health Risk Assessment, August 18, 2004.
MADEP ORS = Value developed by MADEP Office of Research and Standards staff, as cited in MADEP 2007.
MADEP 2007 = MADEP, Bureau of Waste Site Cleanup and Office of Research and Standards (ORS), Workbook: MCP Toxicity.xls, Sheet Toxicity, January 23, 2007
(1) RfC calculated from the inhalation RfD provided in the EPA Region 9 PRG table (October 2004). RfC = RfDi * (70 kg / 20 m^3/day)

TABLE 21
CANCER TOXICITY DATA - ORAL/DERMAL

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (ABS_{gi}) (1)	Absorbed Cancer Slope Factor for Dermal		USEPA 1986 Weight of Evidence/ Cancer Guideline Description	Oral CSF	
		Value	Units		Value	Units		Source	Date
Organics									
1,1,1-Trichloroethane	71-55-6	--		--	--	$(mg/kg-day)^{-1}$	D	IRIS	2/13/2007
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	76-13-1	--		--	--	$(mg/kg-day)^{-1}$	--		
1,1,2-Trichloroethane	79-00-5	5.70E-02	$(mg/kg-day)^{-1}$	--	5.70E-02	$(mg/kg-day)^{-1}$	C	IRIS	2/13/2007
1,1-Dichloroethane	75-34-3	--		--	--	$(mg/kg-day)^{-1}$	C	IRIS	2/13/2007
1,1-Dichloroethene	75-35-4	--		--	--	$(mg/kg-day)^{-1}$	C	IRIS	2/13/2007
1,2,4-Trichlorobenzene	120-82-1	--		--	--		D		
1,2,4-Trimethylbenzene	95-63-6	--		--	--		--		
1,2-Dichlorobenzene	95-50-1	--		--	--	$(mg/kg-day)^{-1}$	D	IRIS	2/13/2007
1,2-Dichloroethane	107-06-2	9.10E-02	$(mg/kg-day)^{-1}$	--	9.10E-02	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
1,3,5-Trimethylbenzene	108-67-8	--		--	--		--		
1,4-Dichlorobenzene	106-46-7	2.40E-02	$(mg/kg-day)^{-1}$	--	2.40E-02	$(mg/kg-day)^{-1}$	C	HEAST	1997
2-Butanone	78-93-3	--		--	--		D		
2-Butanone	78-93-3	--		--	--	$(mg/kg-day)^{-1}$	D	IRIS	2/13/2007
2-Methylnaphthalene	91-57-6	--		--	--		--		
4-Isopropyltoluene	99-87-6	--		--	--	$(mg/kg-day)^{-1}$	--		
4-Methyl-2-pentanone	108-10-1	--		--	--	$(mg/kg-day)^{-1}$	--		
Acenaphthene	83-32-9	--		--	--		--		
Acenaphthylene	208-96-8	--		--	--		D	IRIS	2/13/2007
Acetone	67-64-1	--		--	--		--		
Anthracene	120-12-7	--		--	--		D	IRIS	2/13/2007
Aroclor 1232	11141-16-5	2.00E+00	$(mg/kg-day)^{-1}$	--	2.00E+00	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1242	53469-21-9	2.00E+00	$(mg/kg-day)^{-1}$	--	2.00E+00	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1248	12672-29-6	2.00E+00	$(mg/kg-day)^{-1}$	--	2.00E+00	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1254	11097-69-1	2.00E+00	$(mg/kg-day)^{-1}$	--	2.00E+00	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1260	11096-82-5	2.00E+00	$(mg/kg-day)^{-1}$	--	2.00E+00	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Benzene	71-43-2	5.50E-02	$(mg/kg-day)^{-1}$	--	5.50E-02	$(mg/kg-day)^{-1}$	A	IRIS	2/13/2007
Benzo(a)anthracene	56-55-3	7.30E-01	$(mg/kg-day)^{-1}$	--	7.30E-01	$(mg/kg-day)^{-1}$	B2	IRIS (2)	2/13/2007
Benzo(a)pyrene	50-32-8	7.30E+00	$(mg/kg-day)^{-1}$	--	7.30E+00	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Benzo(b)fluoranthene	205-99-2	7.30E-01	$(mg/kg-day)^{-1}$	--	7.30E-01	$(mg/kg-day)^{-1}$	B2	IRIS (2)	2/13/2007
Benzo(g,h,i)perylene	191-24-2	--		--	--		--		
Benzo(k)fluoranthene	207-08-9	7.30E-02	$(mg/kg-day)^{-1}$	--	7.30E-02	$(mg/kg-day)^{-1}$	B2	IRIS (2)	2/13/2007
Bromoform	75-25-2	7.90E-03	$(mg/kg-day)^{-1}$	--	7.90E-03	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Carbazole	86-74-8	--		--	--	$(mg/kg-day)^{-1}$	--		
Carbon disulfide	75-15-0	--		--	--		--		
Chlorobenzene	108-90-7	--		--	--		D		
Chloroethane	75-00-3	--		--	--	$(mg/kg-day)^{-1}$	--		
Chrysene	218-01-9	7.30E-02	$(mg/kg-day)^{-1}$	--	7.30E-02	$(mg/kg-day)^{-1}$	B2	MADEP	2007
cis-1,2-Dichloroethene	156-59-2	--		--	--	$(mg/kg-day)^{-1}$	D	IRIS	2/13/2007
Dibenzo(a,h)anthracene	53-70-3	7.30E+00	$(mg/kg-day)^{-1}$	--	7.30E+00	$(mg/kg-day)^{-1}$	B2	IRIS (2)	2/13/2007
Dibenzofuran	132-64-9	--		--	--		--		
Di-n-octylphthalate	117-84-0	--		--	--	$(mg/kg-day)^{-1}$	--		
Ethylbenzene	100-41-4	--		--	--		D		
Fluoranthene	206-44-0	--		--	--		D	IRIS	2/13/2007
Fluorene	86-73-7	--		--	--		D	IRIS	2/13/2007
Indeno(1,2,3-cd)pyrene	193-39-5	7.30E-01	$(mg/kg-day)^{-1}$	--	7.30E-01	$(mg/kg-day)^{-1}$	B2	IRIS (2)	2/13/2007
Isopropylbenzene	98-82-8	--		--	--		D		
Methyl tert butyl ether	1634-04-4	--		--	--		--		
Methylene Chloride	75-09-2	7.50E-03	$(mg/kg-day)^{-1}$	--	7.50E-03	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
Naphthalene	91-20-3	--		--	--		C		
n-Butylbenzene	104-51-8	--		--	--		--		
n-Propylbenzene	103-65-1	--		--	--		--		
Phenanthrene	85-01-8	--		--	--		D		
Pyrene	129-00-0	--		--	--		D		
sec-Butylbenzene	135-98-8	--		--	--		--		
Tetrachloroethene	127-18-4	5.10E-02	$(mg/kg-day)^{-1}$	--	5.10E-02	$(mg/kg-day)^{-1}$	C-B2	MADEP	2007
Toluene	108-88-3	--		--	--		--		
Total PCBs	1336-36-3	2.00E+00	$(mg/kg-day)^{-1}$	--	2.00E+00	$(mg/kg-day)^{-1}$	B2	IRIS	2/13/2007
trans-1,2-Dichloroethene	156-60-5	--		--	--	$(mg/kg-day)^{-1}$	--		

TABLE 21
CANCER TOXICITY DATA - ORAL/DERMAL

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (ABS_{gi}) (1)	Absorbed Cancer Slope Factor for Dermal		USEPA 1986 Weight of Evidence/ Cancer Guideline Description	Oral CSF	
		Value	Units		Value	Units		Source	Date
Trichloroethene	79-01-6	1.10E-02	$(mg/kg-day)^{-1}$	--	1.10E-02	$(mg/kg-day)^{-1}$	C-B2	MADEP	2007
Trichlorofluoromethane	75-69-4	--		--	--		--		
Vinyl chloride	75-01-4	1.50E+00		--	1.50E+00	$(mg/kg-day)^{-1}$	A	IRIS	2/13/2007
Vinyl chloride-Adulthood		7.20E-01	$(mg/kg-day)^{-1}$	--	7.20E-01	$(mg/kg-day)^{-1}$	A	IRIS	2/13/2007
Vinyl chloride-Lifetime from birth		1.50E+00	$(mg/kg-day)^{-1}$	--	1.50E+00	$(mg/kg-day)^{-1}$	A	IRIS	2/13/2007
Xylenes (Total)	1330-20-7	--		--	--		--		
Petroleum Hydrocarbons									
C5-C8 Aliphatic Hydrocarbons	NA c5-8	--		--	--		--		
C9-C12 Aliphatic Hydrocarbons	NA c9-12	--		--	--		--		
C9-C10 Aromatic Hydrocarbons	NA c9-10	--		--	--		--		
C9-C18 Aliphatic Hydrocarbons	NA c9-18	--		--	--		--		
C19-C36 Aliphatic Hydrocarbons	NA c19-36	--		--	--		--		
C11-C22 Aromatic Hydrocarbons	NA c11-c22	--		--	--		--		
Inorganics									
Arsenic, Total	7440-38-2	1.50E+00	$(mg/kg-day)^{-1}$	--	1.50E+00	$(mg/kg-day)^{-1}$	A	IRIS	2/13/2007
Barium, Total	7440-39-3	--		7.00E-02	--		D		
Cadmium, Total	7440-43-9	--		2.50E-02	--		B1		
Chromium, Total	7440-47-3	--		2.50E-02	--		A (via inhalation)		
Lead, Total	7439-92-1	--		--	--		B2		
Mercury, Total	7439-97-6	--		--	--		C/D		
Selenium, Total	7782-49-2	--		--	--		D		
Silver, Total	7440-22-4	--		4.00E-02	--		D		

Footnotes:

Source: Exhibit 4-1, from USEPA, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part E (Supplemental Guidance for Dermal Risk Assessment), Final, July 2004.

(1) Derivation of dermal CSF based on absorbed dose

$$SFABS = SFo / ABSGI$$

2. The following toxicity equivalency factors (TEFs) were applied to the toxicity value for benzo(a)pyrene to derive a toxicity value for the seven carcinogenic PAHs:

Benzo(a)pyrene	1	chrysene	0.001
Benzo(a)anthracene	0.1	dibenz(a,h)anthracene	1
benzo(b)fluoranthene	0.1	indeno(1,2,3-cd)pyrene	0.1
benzo(k)fluoranthene	0.01		

IRIS = USEPA's Integrated Risk Information System (www.epa.gov/iris). Searched February 2007.

Region 9 = USEPA Region 9 Preliminary Remediation Goal (PRG) table, October 2004.

HEAST = National Center for Exposure Assessment, Health Effects Assessment Summary Tables, 1997.

MADEP 2007: 'Toxicity.xls' spreadsheet, Office of Research & Standards. January 23, 2007.

-- = No information available.

TABLE 22
CANCER TOXICITY DATA - INHALATION
Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk or Inhalation CSF: Source	
		Value	Units	Value	Units		Source	Date
Organics								
1,1,1-Trichloroethane	71-55-6	--				D		
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 11	76-13-1	--				--		
1,1,2-Trichloroethane	79-00-5	1.60E-02	$(mg/m^3)^{-1}$	5.60E-02	$(mg/kg/day)^{-1}$	C	IRIS	2/13/2007
1,1-Dichloroethane	75-34-3	--				C		
1,1-Dichloroethene	75-35-4	--				C	IRIS	2/13/2007
1,2,4-Trichlorobenzene	120-82-1	--		--		D		
1,2,4-Trimethylbenzene	95-63-6	--		--		--		
1,2-Dichlorobenzene	95-50-1	--				D		
1,2-Dichloroethane	107-06-2	2.60E-02	$(mg/m^3)^{-1}$	9.10E-02	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
1,3,5-Trimethylbenzene	108-67-8	--		--		--		
1,4-Dichlorobenzene	106-46-7	6.86E-03	$(mg/m^3)^{-1}$	--	$(mg/kg/day)^{-1}$	C	Back-calculated (2); HEAST	1997
2-Butanone	78-93-3	--		--		D		
2-Butanone	78-93-3	--				D		
2-Methylnaphthalene	91-57-6	--		--		--		
4-Isopropyltoluene	99-87-6	--				--		
4-Methyl-2-pentanone	108-10-1	--				--		
Acenaphthene	83-32-9	--				--		
Acenaphthylene	208-96-8	--		--		D		
Acetone	67-64-1	--		--		--		
Anthracene	120-12-7	--		--		D		
Aroclor 1232	11141-16-5	1.00E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1242	53469-21-9	1.00E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1248	12672-29-6	1.00E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1254	11097-69-1	1.00E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
Aroclor 1260	11096-82-5	1.00E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
Benzene	71-43-2	7.80E-03	$(mg/m^3)^{-1}$	2.73E-02	$(mg/kg/day)^{-1}$	A	IRIS	2/13/2007
Benzo(a)anthracene	56-55-3	2.09E-01	$(mg/m^3)^{-1}$	3.08E-01	$(mg/kg/day)^{-1}$	B2	Calculated (1)	2/13/2007
Benzo(a)pyrene	50-32-8	2.09E+00	$(mg/m^3)^{-1}$	3.08E+00	$(mg/kg/day)^{-1}$	B2	Back-calculated (2); IRIS	2/13/2007
Benzo(b)fluoranthene	205-99-2	2.09E-01	$(mg/m^3)^{-1}$	3.08E-01	$(mg/kg/day)^{-1}$	B2	Calculated (1)	2/13/2007
Benzo(g,h,i)perylene	191-24-2	--		--		--		
Benzo(k)fluoranthene	207-08-9	2.09E-02	$(mg/m^3)^{-1}$	3.08E-02	$(mg/kg/day)^{-1}$	B2	Calculated (1)	2/13/2007
Bromoform	75-25-2	1.10E-03	$(mg/m^3)^{-1}$	3.85E-03	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
Carbazole	86-74-8	--				--		
Carbon disulfide	75-15-0	--		--		--		
Chlorobenzene	108-90-7	--		--		D		
Chloroethane	75-00-3	--				--		
Chrysene	218-01-9	2.09E-02	$(mg/m^3)^{-1}$	3.08E-03	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
cis-1,2-Dichloroethene	156-59-2	--				D		
Dibenzo(a,h)anthracene	53-70-3	2.09E+00	$(mg/m^3)^{-1}$	3.08E+00	$(mg/kg/day)^{-1}$	B2	Calculated (1)	2/13/2007
Dibenzofuran	132-64-9	--		--		--		
Di-n-octylphthalate	117-84-0	--				--		
Ethylbenzene	100-41-4	--		--		D		
Fluoranthene	206-44-0	--		--		D	IRIS	2/13/2007
Fluorene	86-73-7	--		--		D		5/4/2006
Indeno(1,2,3-cd)pyrene	193-39-5	2.09E-01	$(mg/m^3)^{-1}$	3.08E-01	$(mg/kg/day)^{-1}$	B2	Calculated (1)	2/13/2007
Isopropylbenzene	98-82-8	--		--		D		
Methyl tert butyl ether	1634-04-4	--		--		--		
Methylene Chloride	75-09-2	4.70E-04	$(mg/m^3)^{-1}$			B2	IRIS	2/13/2007
Naphthalene	91-20-3	--		--		C		
n-Butylbenzene	104-51-8	--		--		--		
n-Propylbenzene	103-65-1	--		--		--		
Phenanthrene	85-01-8	--		--		D		
Pyrene	129-00-0	--		--		D		

TABLE 22
CANCER TOXICITY DATA - INHALATION
Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk or Inhalation CSF: Source	
		Value	Units	Value	Units		Source	Date
sec-Butylbenzene	135-98-8	--		--		--		
Tetrachloroethene	127-18-4	5.52E-02	$(mg/m^3)^{-1}$	1.93E-01	$(mg/kg/day)^{-1}$	C-B2	MADEP	2007
Toluene	108-88-3	--		--		--		
Total PCBs	1336-36-3	1.00E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg/day)^{-1}$	B2	IRIS	2/13/2007
trans-1,2-Dichloroethene	156-60-5	--				--		
Trichloroethene	79-01-6	1.70E-03	$(mg/m^3)^{-1}$	5.95E-03	$(mg/kg/day)^{-1}$	C-B2	MADEP	2007
Trichlorofluoromethane	75-69-4	--		--		--		
Vinyl chloride	75-01-4	8.80E-03		3.08E-02		A	IRIS	2/13/2007
Vinyl chloride-Adulthood		4.40E-03	$(mg/m^3)^{-1}$	1.54E-02	$(mg/kg/day)^{-1}$		IRIS	2/13/2007
Vinyl chloride-Lifetime from birth		8.80E-03	$(mg/m^3)^{-1}$	3.08E-02	$(mg/kg/day)^{-1}$		IRIS	2/13/2007
Xylenes (Total)	1330-20-7	--		--		--		
Petroleum Hydrocarbons								
C5-C8 Aliphatic Hydrocarbons	NA c5-8	--		--		--		
C9-C12 Aliphatic Hydrocarbons	NA c9-12	--		--		--		
C9-C10 Aromatic Hydrocarbons	NA c9-10	--		--		--		
C9-C18 Aliphatic Hydrocarbons	NA c9-18	--		--		--		
C19-C36 Aliphatic Hydrocarbons	NA c19-36	--		--		--		
C11-C22 Aromatic Hydrocarbons	NA c11-c22	--		--		--		
Inorganics								
Arsenic, Total	7440-38-2	4.30E+00	$(mg/m^3)^{-1}$	1.51E+01	$(mg/kg/day)^{-1}$	A	IRIS	2/13/2007
Barium, Total	7440-39-3	--		--		D		
Cadmium, Total	7440-43-9	1.80E+00	$(mg/m^3)^{-1}$	6.30E+00	$(mg/kg/day)^{-1}$	B1	IRIS	2/13/2007
Chromium, Total	7440-47-3	1.20E+01	$(mg/m^3)^{-1}$	4.20E+01	$(mg/kg\text{-}d)^{-1}$	A (via inhalation)	IRIS	2/13/2007
Lead, Total	7439-92-1	--		--		B2		
Mercury, Total	7439-97-6	--				C/D		
Selenium, Total	7782-49-2	--		--		D		
Silver, Total	7440-22-4	--		--		D		

Footnotes:

IRIS = USEPA's Integrated Risk Information System (www.epa.gov/iris). Searched February 2007.

HEAST = National Center for Exposure Assessment, Health Effects Assessment Summary Tables, 1997.

MADEP 2007: 'Toxicity.xls' spreadsheet, Office of Research & Standards. January 23, 2007.

A blank space indicates that no toxicity information is available.

(1) The following toxicity equivalency factors (TEFs) were applied to the toxicity value for benzo(a)pyrene to derive a toxicity value for the seven carcinogenic PAHs:

Benzo(a)pyrene	1	chrysene	0.01
Benzo(a)anthracene	0.1	dibenz(a,h)anthracene	1
benzo(b)fluoranthene	0.1	indeno(1,2,3-cd)pyrene	0.1
benzo(k)fluoranthene	0.01		

(2) Back-calculated from the oral CSF via the following equation: unit Risk = oral CSF * 20 m3/day * (1/70kg)

TABLE 23a
SUMMARY OF TOTAL HAZARD INDICES AND RISK ESTIMATES
SITE/UPLAND EXPOSURES

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Receptor	Exposure Pathway	Noncarcinogenic Hazard Index (HI)	Subchronic	Chronic	Pathway Percent Contribution to HI	Excess Lifetime Cancer Risk Estimate	Pathway Percent Contribution to Risk
Youth Trespasser	Dermal Contact with Soil	Subtotal:	--	0.2	53%	1E-06	50%
(Current)	Incidental Ingestion of Soil	Subtotal:	--	0.2	47%	1E-06	49%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0004	0.10%	1E-08	0.5%
	Total for Youth Trespasser :		**NC**	**0.4**		**3E-06**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**NO**	
Youth Trespasser	Dermal Contact with Soil	Subtotal:	--	0.1	53%	7E-07	49%
(Future)	Incidental Ingestion of Soil	Subtotal:	--	0.1	47%	7E-07	50%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0002	0.1%	1E-08	0.9%
	Total for Youth Trespasser :		**NC**	**0.2**		**1E-06**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**NO**	
Recreational User	Dermal Contact with Bank Soil	Subtotal:	--	0.1	50%	1E-06	39%
(Current/Future)	Incidental Ingestion of Bank Soil	Subtotal:	--	0.1	46%	7E-07	28%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0002	0%	5E-11	0.002%
	Dermal Contact with Sediment	Subtotal:	--	0.006	2%	5E-07	20%
	Incidental Ingestion of Sediment	Subtotal:	--	0.004	1%	3E-07	13%
	Total for Recreational User :		**NC**	**0.3**		**2E-06**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**NO**	
Facility Worker*	Dermal Contact with Soil	Subtotal:	--	0.03	3%	3E-07	0.03%
(Future)	Incidental Ingestion of Soil	Subtotal:	--	0.06	6%	1E-06	0.1%
	Inhalation of Fugitive Dust	Subtotal:	--	0.002	0.2%	3E-07	0.03%
	Inhalation of Indoor Air	Subtotal:	--	0.9	92%	1E-03	99.8%
	Total for Facility Worker* :		**NC**	**1.0**		**1E-03**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**YES**	
Construction/Utility Worker*	Dermal Contact with Soil	Subtotal:	0.1	--	37%	7E-08	13%
	Incidental Ingestion of Soil	Subtotal:	0.05	--	20%	7E-08	13%
	Inhalation of Fugitive Dust (GI)	Subtotal:	0.0008	--	0.3%	1E-09	0.2%
	Inhalation of Fugitive Dust (Respiratory)	Subtotal:	0.001	--	0%	5E-09	0.9%
	Dermal Contact with Groundwater	Subtotal:	0.07	--	30%	4E-07	72%
	Inhalation of Ambient (Trench) Air	Subtotal:	0.03	--	11%	1E-08	2%
	Total for Construction/Utility Worker* :		**0.2**	**NC**		**6E-07**	
	MCP Risk Limits		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**NO**	
Resident*	Dermal Contact with Soil	Subtotal:	--	2	13%	8E-06	0.03%
(Future)	Incidental Ingestion of Soil	Subtotal:	--	1	7%	7E-06	0.03%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0005	0.003%	1E-07	0.0004%
	Inhalation of Indoor Air	Subtotal:	14	14	79%	2E-02	99.9%
	Recreational Exposures**	Subtotal:		0.3		2E-06	
	Total for Resident* :		**14**	**18**		**2E-02**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**YES**	**YES**		**YES**	

Notes:
NC = Not calculated for receptor/pathway.
All cancer and noncancer risk calculations are provided in Attachment 4.
* Cumulative Risk estimates for residents, facility workers and construction workers do not include risks from lead exposures. Lead risks for these receptors were evaluated using the USEPA IEUBK and Adult Lead Methodology models for the residential and commercial/industrial scenarios, respectively.
**We added risks calculated for the recreational user scenario to the cumulative risks for the resident.
Risks may not appear to sum correctly due to rounding.

TABLE 23b
SUMMARY OF TOTAL HAZARD INDICES AND RISK ESTIMATES
HOT SPOT #1

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Receptor	Exposure Pathway	Noncarcinogenic Hazard Index (HI)	Subchronic	Chronic	Pathway Percent Contribution to HI	Excess Lifetime Cancer Risk Estimate	Pathway Percent Contribution to Risk
Youth Trespasser (Future)	Dermal Contact with Soil	Subtotal:	--	0.3	43%	4E-06	43%
	Incidental Ingestion of Soil	Subtotal:	--	0.4	57%	6E-06	57%
	Inhalation of Fugitive Dust	Subtotal:	--	0.00003	0.01%	6E-09	0.1%
	Total for Youth Trespasser :		**NC**	**0.6**		**1E-05**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**NO**	
Facility Worker* (Future)	Dermal Contact with Soil	Subtotal:	--	0.06	5%	2E-06	0.2%
	Incidental Ingestion of Soil	Subtotal:	--	0.4	27%	1E-05	0.9%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0004	0.03%	1E-07	0.01%
	Inhalation of Indoor Air	Subtotal:	--	1	69%	1E-03	99%
	Total for Facility Worker* :		**NC**	**1**		**1E-03**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**YES**	
Construction/Utility Worker*	Dermal Contact with Soil	Subtotal:	0.1	--	4%	4E-07	11%
	Incidental Ingestion of Soil	Subtotal:	0.1	--	5%	5E-07	14%
	Inhalation of Fugitive Dust (GI)	Subtotal:	0.002	--	0.1%	9.E-09	0.2%
	Inhalation of Fugitive Dust (Respiratory)	Subtotal:	0.0003	--	0.01%	2.E-09	0.1%
	Dermal Contact with Groundwater	Subtotal:	2	--	76%	2E-06	56%
	Inhalation of Ambient (Trench) Air	Subtotal:	0.3	--	15%	8E-07	20%
	Total for Construction/Utility Worker* :		**2**	**NC**		**4E-06**	
	MCP Risk Limits		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**YES**	**NO**		**NO**	
Resident* (Future)	Dermal Contact with Soil	Subtotal:	--	6	20%	4E-05	0.2%
	Incidental Ingestion of Soil	Subtotal:	--	8	28%	5E-05	0.2%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0001	0.0004%	4E-08	0.0002%
	Inhalation of Indoor Air	Subtotal:	14	14	52%	2E-02	99.6%
	Recreational Exposures**	Subtotal:	--	0.3	1%	2E-06	0.01%
	Total for Resident* :		**14**	**28**		**2E-02**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**YES**	**YES**		**YES**	

Notes:
NC = Not calculated for receptor/pathway.
All cancer and noncancer risk calculations are provided in Attachment 4.
* Cumulative Risk estimates for residents, facility workers and construction workers do not include risks from lead exposures. Lead risks for these receptors were evaluated using the USEPA IEUBK and Adult Lead Methodology models for the residential and commercial/industrial scenarios, respectively.
**We added risks calculated for the recreational user scenario to the cumulative risks for the resident.
Risks may not appear to sum correctly due to rounding.

TABLE 23c
SUMMARY OF TOTAL HAZARD INDICES AND RISK ESTIMATES
HOT SPOT #2

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Receptor	Exposure Pathway	Noncarcinogenic Hazard Index (HI)	Subchronic	Chronic	Pathway Percent Contribution to HI	Excess Lifetime Cancer Risk Estimate	Pathway Percent Contribution to Risk
Youth Trespasser (Future)	Dermal Contact with Soil	Subtotal:	--	0.04	65%	1E-07	43%
	Incidental Ingestion of Soil	Subtotal:	--	0.02	35%	2.E-07	53%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0001	0.1%	1E-08	3%
	Total for Youth Trespasser :		**NC**	**0.1**		**3E-07**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**NO**	
Facility Worker* (Future)	Dermal Contact with Soil	Subtotal:	--	0.010	1%	4E-08	0.003%
	Incidental Ingestion of Soil	Subtotal:	--	0.008	1%	2E-07	0.02%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0010	0.1%	3E-07	0.02%
	Inhalation of Indoor Air	Subtotal:	--	1	98%	1E-03	99.96%
	Total for Facility Worker* :		**NC**	**1**		**1E-03**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**YES**	
Construction/Utility Worker*	Dermal Contact with Soil	Subtotal:	0.02	--	6%	4E-07	26%
	Incidental Ingestion of Soil	Subtotal:	0.006	--	1%	5E-07	32%
	Inhalation of Fugitive Dust (GI)	Subtotal:	0.0001	--	0.02%	2.E-10	0.01%
	Inhalation of Fugitive Dust (Respiratory)	Subtotal:	0.0008	--	0.2%	4.E-09	0.2%
	Dermal Contact with Groundwater	Subtotal:	0.2	--	51%	5E-07	31%
	Inhalation of Ambient (Trench) Air	Subtotal:	0.2	--	42%	2E-07	10%
	Total for Construction/Utility Worker* :		**0.4**	**NC**		**2E-06**	
	MCP Risk Limits		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**NO**	**NO**		**NO**	
Resident* (Future)	Dermal Contact with Soil	Subtotal:	--	1	5%	1E-06	0.006%
	Incidental Ingestion of Soil	Subtotal:	--	0.2	1%	2E-06	0.006%
	Inhalation of Fugitive Dust	Subtotal:	--	0.0002	0.002%	8E-08	0.0003%
	Inhalation of Indoor Air	Subtotal:	14	14	92%	2E-02	99.98%
	Recreational Exposures**	Subtotal:	--	0.3	2%	2E-06	0.01%
	Total for Resident* :		**14**	**16**		**2E-02**	
	MCP Risk Limits:		**1**	**1**		**1E-05**	
	Exceed MCP Acceptable Limits?		**YES**	**YES**		**YES**	

Notes:
NC = Not calculated for receptor/pathway.
All cancer and noncancer risk calculations are provided in Attachment 4.
* Cumulative Risk estimates for residents, facility workers and construction workers do not include risks from lead exposures. Lead risks for these receptors were evaluated using the USEPA IEUBK and Adult Lead Methodology models for the residential and commercial/industrial scenarios, respectively.
**We added risks calculated for the recreational user scenario to the cumulative risks for the resident.
Risks may not appear to sum correctly due to rounding.

TABLE 24a

COMPARISON OF CONCENTRATIONS IN SITE SOIL TO MCP UPPER CONCENTRATION LIMITS[1]

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

	CAS Number	Soil (mg/kg)			
		Mean Concentration [2]			Upper Concentration Limit [3]
		Site	HS#1	HS#2	
Volatile Organic Compounds					
1,1,1-Trichloroethane	71-55-6	51.0	3,000	22.0	**10,000**
1,1-Dichloroethane	75-34-3	2.26	--	--	**10,000**
1,1-Dichloroethene	75-35-4	0.960	--	3.33	**10,000**
1,2,4-Trimethylbenzene	95-63-6	0.917	--	3.58	**1,000**
1,2-Dichlorobenzene	95-50-1	1.14	--	12.2	**10,000**
1,2-Dichloroethane	107-06-2	0.186	--	--	**6,000**
1,3,5-Trimethylbenzene	108-67-8	0.498	--	2.90	**1,000**
1,4-Dichlorobenzene	106-46-7	0.221	--	1.20	**10,000**
2-Butanone	78-93-3	0.0455	--	--	**10,000**
4-Isopropyltoluene	99-87-6	1.51	--	2.88	**1,000**
Acetone	67-64-1	0.0459	--	--	**10,000**
Bromoform	75-25-2	0.00325	--	--	**10,000**
Carbon Disulfide	75-15-0	0.0309	--	--	**1,000**
Chlorobenzene	108-90-7	0.0937	--	0.230	**10,000**
Chloroethane	75-00-3	0.00370	--	--	**1,000**
cis-1,2-Dichloroethene	156-59-2	4.47	--	23.5	**5,000**
Ethylbenzene	100-41-4	6.03	--	7.00	**10,000**
Isopropylbenzene	98-82-8	0.121	--	0.640	**1,000**
Methyl tert butyl ether	1634-04-4	0.00233	--	--	**5,000**
Methylene Chloride	75-09-2	0.436	--	--	**10,000**
Naphthalene	91-20-3	0.826	--	1.90	**10,000**
n-Butylbenzene	104-51-8	0.322	--	--	**1,000**
n-Propylbenzene	103-65-1	0.385	--	2.70	**1,000**
sec-Butylbenzene	135-98-8	0.393	--	0.630	**1,000**
Tetrachloroethene	127-18-4	54.7	1,600	13.0	**10,000**
Toluene	108-88-3	20.4	680	58.8	**10,000**
trans-1,2-Dichloroethene	156-60-5	0.00535	--	--	**10,000**
Trichloroethene	79-01-6	43.8	1,900	10.3	**10,000**
Vinyl Chloride	75-01-4	0.256	--	1.20	**300**
Xylenes (Total)	1330-20-7	12.7	--	20.7	**10,000**
Semi-volatile Organic Compounds (SVOCs)					
2-Methylnaphthalene	91-57-6	0.295	--	--	**10,000**
Acenaphthene	83-32-9	0.386	--	--	**10,000**
Anthracene	120-12-7	0.630	--	--	**10,000**
Benzo(a)anthracene	56-55-3	1.69	--	--	**3,000**
Benzo(a)pyrene	50-32-8	1.56	--	--	**300**
Benzo(b)fluoranthene	205-99-2	1.56	--	--	**3,000**
Benzo(g,h,i)perylene	191-24-2	1.37	--	--	**10,000**
Benzo(k)fluoranthene	207-08-9	1.21	--	--	**10,000**
Chrysene	218-01-9	1.84	--	--	**400**
Dibenzo(a,h)anthracene	53-70-3	0.308	--	--	**300**
Fluoranthene	206-44-0	3.28	--	--	**10,000**
Indeno(1,2,3-cd)pyrene	193-39-5	0.993	--	--	**3,000**
Phenanthrene	85-01-8	2.75	--	--	**10,000**
Pyrene	129-00-0	2.73	--	--	**10,000**
Petroleum Hydrocarbons					
C11-C22 Aromatic Hydrocarbons	$NA_{c11-c22}$	101	--	--	**10,000**
C19-C36 Aliphatic Hydrocarbons	NA_{c19-36}	101	--	--	**20,000**
C5-C8 Aliphatic Hydrocarbons	NA_{c5-8}	43.7	--	--	**5,000**
C9-C10 Aromatic Hydrocarbons	NA_{c9-10}	22.0	--	--	**5,000**
C9-C12 Aliphatic Hydrocarbons	NA_{c9-12}	18.5	--	--	**20,000**
C9-C18 Aliphatic Hydrocarbons	NA_{c9-18}	33.8	--	--	**20,000**
Polychlorinated Biphenyls (PCBs)					
Aroclor 1232	11141-16-5	0.483	--	--	**100**
Aroclor 1248	12672-29-6	3.09	1.70	0.244	**100**
Inorganics					
Barium, Total	7440-39-3	44.1	NA	30.9	**10,000**
Chromium, Total	7440-47-3	16.8	NA	13.6	**2,000**
Lead, Total	7439-92-1	261	--	79.5	**3,000**
Mercury, Total	7439-97-6	0.650	NA	0.150	**300**
Silver, Total	7440-22-4	0.653	NA	0.510	**2,000**

Notes:
mg/kg = milligrams per kilogram.
mg/L = milligrams per liter.

1. Upper Concentration Limits are from Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup, Massachusetts Contingency Plan (MCP), 310 CMR 40.0996.
2. Arithmetic mean among soil samples per exposure point, based on 2002 through 2006 data.
3. The Upper Concentration Limits obtained from 310 CMR 40.0996(7) , Table 6. For constituents without MCP UCLs, we used a default UCL of 1,000 mg/kg for soil and 10 mg/L for groundwater, in accordance with 310 CMR 40.0996 (8)(a).
4. * = Indicates that the concentration exceeds the Upper Concentration Limit.
5. -- = Constituent not a chemical of potential concern (i.e., not detected) at this exposure point.

TABLE 24b
COMPARISON OF CONCENTRATIONS IN SITE GROUNDWATER TO MCP UPPER CONCENTRATION LIMITS[1]

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

	CAS Number	Groundwater (mg/L)			
		Mean Concentration[2]			Upper Concentration Limit[3]
		Site	HS #1	HS#2	
Volatile Organic Compounds (VOCs)					
1,1,1-Trichloroethane	71-55-6	2.98	65.5	7.41	**100**
1,1,2-Trichloroethane	79-00-5	--	0.0700	--	**100**
1,1-Dichloroethane	75-34-3	0.469	2.32	2.03	**100**
1,1-Dichloroethene	75-35-4	0.0573	2.58	0.335	**100**
1,2,4-Trichlorobenzene	120-82-1	0.00502	--	--	**100**
1,2,4-Trimethylbenzene	95-63-6	0.0184	0.0558	0.0203	**10**
1,2-Dichlorobenzene	95-50-1	0.0306	0.189	0.329	**20**
1,2-Dichloroethane	107-06-2	0.0478	1.70	0.265	**100**
1,3,5-Trimethylbenzene	108-67-8	0.00395	--	--	**10**
1,4-Dichlorobenzene	106-46-7	0.00206	--	--	**80**
4-Isopropyltoluene	99-87-6	0.0604	--	--	**10**
Benzene	71-43-2	--	0.0922	0.0264	**100**
Chlorobenzene	108-90-7	0.0226	0.366	--	**10**
Chloroethane	75-00-3	0.0183	0.0617	--	**10**
cis-1,2-Dichloroethene	156-59-2	3.00	29.1	19.9	**100**
Ethylbenzene	100-41-4	0.681	0.786	0.417	**100**
Isopropylbenzene	98-82-8	0.00131	--	--	**10**
Methylene Chloride	75-09-2	0.141	1.89	--	**100**
n-Propylbenzene	103-65-1	0.00131	--	--	**10**
sec-Butylbenzene	135-98-8	0.00486	--	--	**10**
Tetrachloroethene	127-18-4	0.0729	5.75	1.42	**100**
Toluene	108-88-3	0.584	11.9	14.5	**80**
trans-1,2-Dichloroethene	156-60-5	0.0397	0.166	0.109	**100**
Trichloroethene	79-01-6	0.171	72.0	4.31	**50**
Vinyl Chloride	75-01-4	0.193	1.10	2.56	**100**
Xylenes (Total)	1330-20-7	1.10	1.12	1.66	**100**
Semi-volatile Organic Compounds (SVOCs)					
Benzo(a)anthracene	56-55-3	0.000467	--	--	**10**
Benzo(a)pyrene	50-32-8	0.000500	--	--	**5**
Benzo(b)fluoranthene	205-99-2	0.000833	--	--	**4**
Benzo(g,h,i)perylene	191-24-2	0.000500	--	--	**30**
Benzo(k)fluoranthene	207-08-9	0.000433	--	--	**1**
Chrysene	218-01-9	0.000467	--	--	**30**
Fluoranthene	206-44-0	0.000833	--	--	**2**
Indeno(1,2,3-cd)pyrene	193-39-5	0.000467	--	--	**1**
Pyrene	129-00-0	0.000833	--	--	**0.8**
Petroleum Hydrocarbons					
C19-C36 Aliphatic Hydrocarbons	NA c19-36	1.16	--	150	**100**
C9-C10 Aromatic Hydrocarbons	NA c9-10	0.563	--	--	**100**
Polychlorinated Biphenyls (PCBs)					
Aroclor 1242	53469-21-9	0.000923	0.0223	0.000683	**0.005**
Inorganics					
Barium, Total	7440-39-3	0.130	--	0.0700	**100**

Notes:

1. Upper Concentration Limits are from Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup, Massachusetts Contingency Plan, 310 CMR 40.0996.
2. Arithmetic mean among monitoring wells per exposure point, based on 2002 and 2006 data.
3. The Upper Concentration Limits obtained from 310 CMR 40.0996(7) , Table 6. For constituents without MCP UCLs, we used a default UCL of 1,000 mg/kg for soil and 10 mg/L for groundwater, in accordance with 310 CMR 40.0996 (8)(a).

"--" = Constituent not a chemical of potential concern (i.e., not detected) at this exposure point.

TABLE 25
STAGE 1 ECOLOGICAL RISK CHARACTERIZATION SCREENING
COMPARISON OF SEDIMENT CONCENTRATIONS TO ECOLOGICAL BENCHMARKS FOR SEDIMENT

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

CAS No.	Chemical of Potential Concern	Maximum (mg/kg)	Stage I Benchmark		
			Value (mg/kg)	Reference	
Volatile Organic Compounds (VOCs)					
71-55-6	1,1,1-Trichloroethane	**0.8**	0.17	Ecotox Threshold	EPA 1996
75-34-3	1,1-Dichloroethane	**0.7**	0.000575	Ecological Screening Level	EPA Region 5
75-35-4	1,1-Dichloroethene	**0.022**	0.01	Ecological Screening Level	EPA Region 5
120-82-1	1,2,4-Trichlorobenzene	0.4	9.2	Ecotox Threshold	EPA 1996
95-63-6	1,2,4-Trimethylbenzene	0.087	--		
95-50-1	1,2-Dichlorobenzene	**6.3**	0.34	Ecotox Threshold	EPA 1996
107-06-2	1,2-Dichloroethane	0.022	0.26	Ecological Screening Level	EPA Region 5
108-67-8	1,3,5-Trimethylbenzene	0.033	--		
106-46-7	1,4-Dichlorobenzene	0.008	0.35	Ecotox Threshold	EPA 1996
78-93-3	2-Butanone	**0.048**	0.04	Ecological Screening Level	EPA Region 5
99-87-6	4-Isopropyltoluene	0.2	--		
108-10-1	4-Methyl-2-pentanone	0.012	0.02	Ecological Screening Level	EPA Region 5
67-64-1	Acetone	**0.22**	0.0099	Ecological Screening Level	EPA Region 5
71-43-2	Benzene	0.018	0.057	Ecotox Threshold	EPA 1996
75-15-0	Carbon Disulfide	**0.022**	0.02	Ecological Screening Level	EPA Region 5
108-90-7	Chlorobenzene	0.037	0.82	Ecotox Threshold	EPA 1996
75-00-3	Chloroethane	22	--		
156-59-2	cis-1,2-Dichloroethene	**0.8**	0.65	Value for trans-isomer.	EPA Region 5
100-41-4	Ethylbenzene	1	3.6	Ecotox Threshold	EPA 1996
75-09-2	Methylene Chloride	0.023	0.15	Ecological Screening Level	EPA Region 5
91-20-3	Naphthalene	0.41	0.48	Ecotox Threshold	EPA 1996
103-65-1	n-Propylbenzene	0.012	--		
135-98-8	sec-Butylbenzene	0.01	--		
127-18-4	Tetrachloroethene	**3.9**	0.53	Ecotox Threshold	EPA 1996
108-88-3	Toluene	**8.1**	0.67	Ecotox Threshold	EPA 1996
156-60-5	trans-1,2-Dichloroethene	0.6	0.65	Ecological Screening Level	EPA Region 5
79-01-6	Trichloroethene	1.1	1.6	Ecotox Threshold	EPA 1996
75-69-4	Trichlorofluoromethane	0.002	--		
75-01-4	Vinyl Chloride	0.15	0.2	Ecological Screening Level	EPA Region 5
1330-20-7	Xylenes (Total)	0.39	0.43	Ecological Screening Level	EPA Region 5
Inorganics					
7440-38-2	Arsenic	12.7	33	Screening Criterion	MADEP 2006
7782-49-2	Selenium	**4.3**	1	Apparent Effects Threshold,	Buchman, 1999.

Notes:
-- = Benchmark not available; **Bold font** indicates maximum detected concentration exceeds benchmark.

EPA 1996. EPA Sediment Quality Benchmarks. From: ECO Update: Ecotox Thresholds. Intermittent Bulletin, Vol. 3, No. 2. Office of Solid Waste & Emergency Response. EPA 540/F-95/038. January 1996.
EPA Region 5 Ecological Screening Levels. August 22, 2003. http://www.epa.gov/reg5rcra/ca/ESL.pdf
MADEP 2006. Technical Update: Revised Sediment Screening Values. Office of Research & Standards, Boston, MA. January 2006.
Buchman, M.F., 1999. NOAA Screening Quick Reference Tables (SQUIRT). NOAA HAZMAT Report 99-1, Seattle, WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration. 12 pgs.

ATTACHMENT 1: LOCAL CONDITIONS SEDIMENT DATA

ATTACHMENT 1
LOCAL CONDITIONS SEDIMENT DATA
Former Lewis Chemical Corporation
0 12-24 Fairmount Court
Hyde Park, MA

USGS number	Sample Date	Sample Depth	Beryllium (ppm)	Aluminum (percent)	Antimony (ppm)	Arsenic (ppm)	Barium (ppm)	Cadmium (ppm)	Chromium (ppm)	Cobalt (ppm)	Copper (ppm)	Iron (percent)	Lead (ppm)	Manga-nese (ppm)	Nickel (ppm)	Scandium (ppm)	Silver (ppm)	Tin (ppm)	Vanadium (ppm)	Zinc (ppm)	Acenaph-thene (ppb)	Acenaph-thylene (ppb)
USGS-BGY-100			<.5	0.62	<5	<3	43	<1	--	3	9	0.96	20	206	11	1.3	0.3	<10	21	44.1	6.8	3.3
USGS-BGY-101			<.5	0.81	<5	<3	63	<1	--	4	8.8	1.17	15	225	13	1.5	<.2	<10	26	41.2	--	--
USGS-BGY-102			<.5	0.6	<5	<3	44	<1	--	3	7.7	1.09	19	153	11	1	<.2	<10	22	36.2	--	--
USGS-BGY-103			<.5	0.71	<5	<3	56	<1	--	4	13	1.15	30	181	14	1.3	0.4	<10	25	47.4	--	--
USGS-BGY-104			0.5	0.65	<5	<3	58	<1	--	5	34.9	1.39	75	223	15	1.4	0.3	<10	28	152	61.3	30.6
USGS-BGY-105			0.9	1.18	<5	6	131	1	--	10	115	2.88	210	657	46	2.5	1	19	52	387	--	--
USGS-BGY-106			0.8	1.07	<5	6	106	1	--	9	84.7	2.92	171	456	26	2.4	0.9	16	51	292	--	--
USGS-BGY-107			0.7	0.92	<5	3	83	<1	--	8	57.4	2.01	138	287	27	2.2	0.6	10	43	218	--	--
USGS-BGY-112			0.8	1.04	<5	4	92	<1	--	7	67.8	2.39	138	390	26	2.3	0.6	10	43	224	99	75
USGS-BGY-112-D			0.7	0.9	<5	<3	80	<1	--	6	56.4	2.2	135	382	23	2	0.8	<10	36	194	636	81
USGS-M2Y-003			0.8	0.9	<5	<3	89	<1	--	7	24.2	2.07	67	454	23	2	0.4	<10	40	103	--	--
USGS-BGY-115			0.6	1.14	<5	<3	71	<1	--	8	24	2.28	46	461	20	2.5	0.5	<10	50	72.3	--	--
USGS-M2Y-004			0.6	1.1	<5	<3	104	<1	--	10	14.8	2.13	19	1,790	36	2.8	1.2	<10	39	88	--	--
USGS-BGY-116			0.7	1.46	<5	<3	108	<1	--	9	14.5	2.47	15	1,090	19	3.7	0.8	<10	47	62.8	--	--
USGS-BGY-117			<.5	0.54	<5	<3	51	<1	--	4	35	1.48	94	201	16	1	0.3	<10	29	123	--	--
USGS-BGY-118			0.5	0.85	<5	<3	68	<1	--	5	25.2	2.14	55	556	17	2	0.4	<10	39	84.5	--	--
USGS-BGY-118-D			<.5	0.7	<5	<3	63	<1	--	5	20.5	2.11	50	505	29	1.3	0.3	<10	29	85	--	--
USGS-BGY-119			0.6	1.06	<5	<3	66	<1	--	7	13.7	2.11	30	498	17	2.5	0.6	<10	38	79.7	--	--
USGS-BGY-121			0.8	1.6	<5	20	123	1	--	7	158	1.76	393	611	19	2.4	0.9	44	35	329	90.6	109
USGS-BGY-124			0.5	0.93	<5	<3	91	<1	--	7	10.2	1.87	23	1,090	15	2	0.9	<10	32	77.4	--	--
USGS-M2Y-012			0.6	1.02	9	<3	147	<1	--	10	57.6	2.86	119	1,330	39	1.9	1.4	<10	58	219	--	--
USGS-BGY-133			0.8	0.93	<5	6	150	2	--	10	85.4	2.52	207	1,530	22	1.7	1.1	11	39	402	363	134
USGS-M2Y-002																						
USGS-BGY-128																						
USGS-BGY-137																						
USGS-BGY-102-D																						
USGS-BGY-128-D																						
USGS-Composited sediment-grab				1.35	<5	10	61	<1	261	7	90.5		355	322	24	3.3	1.7	<10	40	185	45	60
LE_Mason-SD-21	Aug-01	0-12 in																				
LE_Mason-SD-22	Aug-01	0-12 in																				
LE_Mason-SD-23	Aug-01	0-12 in																				
LE_Mason-SD-24	Aug-01	0-12 in																				
LE_Mason-SD-24A	Aug-01	0-12 in																				
LE_Mason-SD-25	Aug-01	0-12 in																				
LE_Mason-SD-26	Aug-01	0-12 in																				
LE_Mason-SD-27	Aug-01	0-12 in																				
LE_Mason-SD-29	Aug-01	0-12 in																				
LE_Mason-SED-1	Aug-01	0-4 in																				
LE_Mason-SED-2	Aug-01	0-2 in																				
LE_Mason-SED-3*	Aug-01	0-4 in																				
LE_Mason-SED-4	Aug-01	0-2 in																				
LE_Mason-SED-5	Aug-01	0-4 in																				
LE_Mason-SED-6	Aug-01	0-2 in																				
LE_Mason-SED-7	Aug-01	0-3 in																				
LE_Mason-SED-8	Aug-01	0-2 in																				
LE_Mason-SED-9	Aug-01	0-1 in																				
LE_Mason-SED-10	Aug-01	0-2 in																				
LE_Mason-SED-11	Aug-01	0-2 in																				
LE_Mason-SED-12	Aug-01	0-2 in																				
LE_Mason-SED-13	Aug-01	0-3 in																				
LE_Mason-SED-14	Aug-01	0-4 in																				
LE_Mason-SED-15	Aug-01	0-3 in																				
LE_Mason-SED-16	Aug-01	0-6 in																				
LE_Mason-SED-17	Aug-01	0-6 in																				
LE_Mason-SED-18	Aug-01	0-3 in																				
LE_Mason-SED-19	Aug-01	0-4																				
LE_Mason-SED-20	Aug-01	0-6 in																				
LE_Mason-SED-21	Aug-01	6 to 12																				
LE_Mason-SED-22	Aug-01	0-6 in																				

ATTACHMENT 1
LOCAL CONDITIONS SEDIMENT DATA
Former Lewis Chemical Corporation
0 12-24 Fairmount Court
Hyde Park, MA

	Polyaromatic hydrocarbons																Polychlorinated biphenyls									
USGS number	Anthra-cene (ppb)	Benzo(a)-anthra-cene (ppb)	Benzo(a)-pyrene (ppb)	Benzo(b)-fluoran-thene (ppb)	Benzo-(ghi)-perylene (ppb)	Benzo(k)-fluoran-thene (ppb)	Bis (2-ethyl-hexyl) phthalate (ppb)	Chrysene (ppb)	Dibenzo (a,h)-anthra-cene (ppb)	Fluoran-thene (ppb)	Fluorene (ppb)	Indeno (1,2,3-cd)-pyrene (ppb)	2-Methyl-naph-thalene (ppb)	Naphtha-lene (ppb)	Phenan-threne (ppb)	Pyrene (ppb)	Aroclor 1016 (ppb)	Aroclor 1221 (ppb)	Aroclor 1232 (ppb)	Aroclor 1242 (ppb)	Aroclor 1248 (ppb)	Aroclor 1254 (ppb)	Aroclor 1260 (ppb)	Aroclor 1262 (ppb)	Aroclor 1268 (ppb)	Total PCBs (mg/kg)
USGS-BGY-100	17	86.9	115	220	108	66.8		148	22.8	287	10.2	116		12.3	115	249	<170	<170	<170	<170	<170	<170	<170	<170	<170	
USGS-BGY-101	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	<160	<160	<160	310	<160	<160	
USGS-BGY-102	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	<160	<160	<160	<160	<160	<160	
USGS-BGY-103	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	<160	<160	<160	<160	<160	<160	
USGS-BGY-104	220	1,040	1,170	1,960	913	540		1,460	215	2,430	96.5	1,030		97.3	1,270	2,590	<100	<100	<100	<100	<100	800	170	<100	<100	970
USGS-BGY-105	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<380	<380	<380	6,900	<380	3,400	280	<380	<380	10,580
USGS-BGY-106	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<350	<350	<350	5,800	<350	2,300	580	<350	<350	8,680
USGS-BGY-107	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<170	<170	<170	2,200	<170	1,300	220	<170	<170	3,720
USGS-BGY-112	398	1,880	2,210	3,570	1,670	1,010		2,690	383	4,480	154	1,900		152	2,330	4,510	<330	<330	<330	4,100	<330	1,800	970	<330	<330	6,870
USGS-BGY-112-D	1,650	4,330	4,370	6,520	2,970	2,100		4,610	726	9,850	637	3,370		221	7,200	10,300	<330	<330	<330	3,900	<330	1,900	910	<330	<330	6,710
USGS-M2Y-003	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<330	<330	<330	7,100	<330	2,100	840	<330	<330	10,040
USGS-BGY-115	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<170	<170	<170	480	<170	240	<170	<170	<170	720
USGS-M2Y-004	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	240	<160	<160	<160	<160	<160	240
USGS-BGY-116	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	360	<160	<160	<160	<160	<160	360
USGS-BGY-117	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	320	<160	210	<160	<160	<160	530
USGS-BGY-118	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	<160	<160	<160	<160	<160	<160	
USGS-BGY-118-D	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	<160	<160	<160	<160	<160	<160	
USGS-BGY-119	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	<160	<160	<160	<160	<160	<160	
USGS-BGY-121	632	2,390	1,680	2,370	907	821		2,710	270	4,850	280	1,050		379	1,330	5,420	<160	<160	<160	320	<160	<160	<160	<160	<160	320
USGS-BGY-124	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	160	<160	<160	<160	<160	<160	160
USGS-M2Y-012	--	--	--	--	--	--		--	--	--	--	--		--	--	--	<160	<160	<160	3,300	<160	1,100	680	<160	<160	5,080
USGS-BGY-133	1,130	4,180	4,380	7,040	2,840	1,900		5,230	754	9,120	454	3,370		238	6,000	9,470	<160	<160	<160	<160	<160	<160	<160	<160	<160	
USGS-M2Y-002																										
USGS-BGY-128																										
USGS-BGY-137																										
USGS-BGY-102-D																										
USGS-BGY-128-D																										
USGS-Composited sediment-grab	190	790	870	1,500	700	500		980	150	1,800	61	620		73	930	1,800	<100	<100	<100	840	<100	700	100	<100	<100	
LE_Mason-SD-21																										6.3
LE_Mason-SD-22																										4.7
LE_Mason-SD-23																										0.35
LE_Mason-SD-24																										66
LE_Mason-SD-24A																										41.3
LE_Mason-SD-25																										24.5
LE_Mason-SD-26																										20.78
LE_Mason-SD-27																										104.4
LE_Mason-SD-29																										59.9
LE_Mason-SED-1																										2.54
LE_Mason-SED-2																										2.25
LE_Mason-SED-3*																										1.37
LE_Mason-SED-4																										1.36
LE_Mason-SED-5																										21.5
LE_Mason-SED-6																										0.487
LE_Mason-SED-7																										7.25
LE_Mason-SED-8																										1.59
LE_Mason-SED-9																										3.94
LE_Mason-SED-10																										52.4
LE_Mason-SED-11																										0.604
LE_Mason-SED-12																										7.5
LE_Mason-SED-13																										2.46
LE_Mason-SED-14																										2.28
LE_Mason-SED-15																										0.514
LE_Mason-SED-16																										0.49
LE_Mason-SED-17																										4.33
LE_Mason-SED-18																										0.598
LE_Mason-SED-19																										2.67
LE_Mason-SED-20																										0.704
LE_Mason-SED-21																										<0.2
LE_Mason-SED-22																										4.03

ATTACHMENT 1
LOCAL CONDITIONS SEDIMENT DATA
Former Lewis Chemical Corporation
0 12-24 Fairmount Court
Hyde Park, MA

USGS number	Sample Date	Sample Depth	Beryllium (ppm)	Aluminum (percent)	Antimony (ppm)	Arsenic (ppm)	Barium (ppm)	Cadmium (ppm)	Chromium (ppm)	Cobalt (ppm)	Copper (ppm)	Iron (percent)	Lead (ppm)	Manga-nese (ppm)	Nickel (ppm)	Scandium (ppm)	Silver (ppm)	Tin (ppm)	Vanadium (ppm)	Zinc (ppm)	Acenaph-thene (ppb)	Acenaph-thylene (ppb)
LE_Mason-SED-23	Aug-01	6 to 12																				
LE_Mason-SED-24	Aug-01	0-6 in																				
LE_Mason-SED-25	Aug-01	6 to 12																				
LE_Mason-SED-26	Aug-01	0-6 in																				
LE_Mason-SED-27	Aug-01	6 to 12 in																				
LE_Mason-SED-28*	Aug-01	12 to 21 in																				
LE_Mason-SED-29	Aug-01	0-6 in																				
LE_Mason-SED-30	Aug-01	6 to 12 in																				
LE_Mason-SED-31	Aug-01	0-6 in																				
LE_Mason-SED-32	Aug-01	6 to 12 in																				
LE_Mason-SED-33	Aug-01	12 to 24 in																				
LE_Mason-SED-34	Aug-01	0-6 in																				
LE_Mason-SED-35	Aug-01	6 to 12 in																				
LE_Mason-SED-36*	Aug-01	12 to 24 in																				
LE_Mason-SED-37	Aug-01	0-4 in																				

ATTACHMENT 1
LOCAL CONDITIONS SEDIMENT DATA
Former Lewis Chemical Corporation
0 12-24 Fairmount Court
Hyde Park, MA

	Polyaromatic hydrocarbons																Polychlorinated biphenyls									
USGS number	Anthra-cene (ppb)	Benzo(a)-anthra-cene (ppb)	Benzo(a)-pyrene (ppb)	Benzo(b)-fluoran-thene (ppb)	Benzo-(ghi)-perylene (ppb)	Benzo(k)-fluoran-thene (ppb)	Bis (2-ethyl-hexyl) phthalate (ppb)	Chrysene (ppb)	Dibenzo (a,h)-anthra-cene (ppb)	Fluoran-thene (ppb)	Fluorene (ppb)	Indeno (1,2,3-cd)-pyrene (ppb)	2-Methyl-naph-thalene (ppb)	Naphtha-lene (ppb)	Phenan-threne (ppb)	Pyrene (ppb)	Aroclor 1016 (ppb)	Aroclor 1221 (ppb)	Aroclor 1232 (ppb)	Aroclor 1242 (ppb)	Aroclor 1248 (ppb)	Aroclor 1254 (ppb)	Aroclor 1260 (ppb)	Aroclor 1262 (ppb)	Aroclor 1268 (ppb)	Total PCBs (mg/kg)
LE_Mason-SED-23																										0.993
LE_Mason-SED-24																										3.4
LE_Mason-SED-25																										<0.16
LE_Mason-SED-26																										<0.25
LE_Mason-SED-27																										<0.14
LE_Mason-SED-28*																										<0.13
LE_Mason-SED-29																										0.702
LE_Mason-SED-30																										<0.13
LE_Mason-SED-31																										2.71
LE_Mason-SED-32																										<0.15
LE_Mason-SED-33																										<0.15
LE_Mason-SED-34																										0.161
LE_Mason-SED-35																										<0.12
LE_Mason-SED-36*																										<0.11
LE_Mason-SED-37																										15.1

ATTACHMENT 1
LOCAL CONDITIONS SEDIMENT DATA
Former Lewis Chemical Corporation
0 12-24 Fairmount Court
Hyde Park, MA

USGS number	Sample Date	Sample Depth	Beryllium (ppm)	Aluminum (percent)	Antimony (ppm)	Arsenic (ppm)	Barium (ppm)	Cadmium (ppm)	Chromium (ppm)	Cobalt (ppm)	Copper (ppm)	Iron (percent)	Lead (ppm)	Manga-nese (ppm)	Nickel (ppm)	Scandium (ppm)	Silver (ppm)	Tin (ppm)	Vanadium (ppm)	Zinc (ppm)	Acenaph-thene (ppb)	Acenaph-thylene (ppb)
LE_Mason-SED-38	Aug-01	0-6 in																				
LE_Mason-SED-39	Aug-01	6 to 12 in																				
LE_Mason-SED-40	Aug-01	12 to 24 in																				
LE_Mason-SED-41	Aug-01	24 to 36 in																				
LE_Mason-SED-42	Aug-01	0-5 in																				
LE_Mason-U-1	9/14/2000	0.5 ft																		NA	<280	<280
LE_Mason-U-2	9/14/2000	0.5 ft																		NA	<950	<950
LE_Mason-U-3	9/14/2000	0.5 ft																		NA	<1900	<1900
LE_Mason-U-4	9/14/2000	0.5 ft																		NA	<870	1350
LE_Mason-U-5	9/14/2000	0.5 ft																		NA	26800	<4200
LE_Mason-U-6	9/14/2000	0.5 ft																		NA	<310	<310
LE_Mason-U-7	9/14/2000	0.5 ft																		NA	132000	<14000
LE_Mason-U-8	9/14/2000	0.5 ft																		NA	1810	<1300
LE_Mason-U-9	9/14/2000	0.5 ft																		NA	425	<360
LE_Mason-U-10	9/14/2000	0.5 ft																		NA	13400	<1700
LE_Mason-U-11	9/14/2000	0.5 ft																		NA	<290	<290
LE_Mason-U-12	9/14/2000	0.5 ft																		NA	<460	<460
LE_Mason-SD-4	3/22/2000	0 ft																		18.8	<600	<600
LE_Mason-SD-5	3/22/2000	0 ft																		3700	629	532
LE_Mason-SD-6	3/22/2000	0 ft																		NA	NA	NA
LE_Mason-SD-7	3/22/2000	0 ft																		867	<410	<410
LE_Mason-SD-8	3/22/2000	0 ft																		1360	2190	<2400
LE_Mason-SD-9	3/22/2000	0 ft																		169	24400	3220
LE_Mason-SD-10	6/20/2000	0 ft																		NA	<3600	<3600
LE_Mason-SD-11	6/20/2000	0 ft																		NA	<280	<280
LE_Mason-SD-12	6/19/2000	0 ft																		NA	3900	<780
LE_Mason-SD-13	6/19/2000	0 ft																		NA	<570	<570
LE_Mason-SD-14-3	6/20/2000	3 ft																		NA	78700	<15000
LE_Mason-SD-14-3.5	6/20/2000	3.5 ft																		NA	28600	<4600
LE_Mason-SD-15	6/19/2000	0 ft																		NA	<580	<580
LE_Mason-SD-16	9/14/2000	0.5 ft																		NA	2130	<340
LE_Mason-SD-17	9/14/2000	0.5 ft																		NA	938	<300
LE_Mason-SD-18	9/14/2000	0.5 ft																		NA	7670	<2900
LE_Mason-SD-19	9/14/2000	0.5 ft																		NA	<3900	<3900
LE_Mason-SD-20	9/14/2000	0.5 ft																		NA	5680	<320

Notes:
USGS sediment-grab samples collected along the lower Neponset River in 2002 and 2003 (composited sediment-grab sample collected from the estuarine part of the lower Neponset River just downstream of the Walter Baker Dam) (USGS, 2002-03. Data on Sediment Quality and Concentrations of Polychlorinated Biphenyls from the Lower Neponset River, Massachusets, 2002-03; Open File Report 2004-1280)

[D, duplicate; LD, laboratory duplicate; RPD, relative percent different; TOC, total organic carbon; USGS, U.S. Geological Survey; ppm, parts per million;
<, actual value is less than value shown; *, both quality-assurance samples less than detection limit; --, no data]
MS, matrix spike; MSD, matrix-spike duplicate; PR, Percent Recovery; RPD, relative percent difference; USGS, U.S. Geological Survey; ppb, parts per billion; <, actual value is less than value shown; --, no data]
[Aroclor analysis done by the AXYS Analytical laboratory. USGS, U.S. Geological Survey; ΣPCBs, total concentration of polychlorinated biphenyls; ppb, parts per billion; <, actual value is less than value shown; D, duplicate]
[USGS, U.S. Geological Survey, ppb, parts per billion; <, actual value is less than value shown; D, Duplicate]

LE_Mason-SD-21 to SD-27, SD-29 and SED-1 to SED-42 are sediment samples collected in August in Mother Brook downstream of the L.E. Mason Site, between the railway bridge and the confluence of Mother Brook and the the Neponset River (Shaw Environmental, Inc., December 2004. Phase II/III Comprehensive Site Assessment and Remedial Action Plan Addendum, table 2 and Figure 4)
* maximum of sample and duplicate, or lower of reporting limits if both were non-detect.
LE_Mason-U-1 to U12 and SD-1 to SD-3 are sediment samples collected upstream of the L.E. Mason Site in 2000. (IT Group, February 27, 2001. Imminent Hazard Evaluation Mother Brook Sediment Evaluation L.E. Mason Company; Project # 803585-1201)
LE_Mason-SD-4 to SD-20 and SD-28 are sediment samples collected adjacent to the L.E. Mason Facility in 2000. (IT Group, February 27, 2001. Imminent Hazard Evaluation Mother Brook Sediment Evaluation L.E. Mason Company; Project # 803585-1201)

ATTACHMENT 1
LOCAL CONDITIONS SEDIMENT DATA
Former Lewis Chemical Corporation
0 12-24 Fairmount Court
Hyde Park, MA

	Polyaromatic hydrocarbons																Polychlorinated biphenyls										
USGS number	Anthra-cene (ppb)	Benzo(a)-anthra-cene (ppb)	Benzo(a)-pyrene (ppb)	Benzo(b)-fluoran-thene (ppb)	Benzo-(ghi)-perylene (ppb)	Benzo(k)-fluoran-thene (ppb)	Bis (2-ethyl-hexyl) phthalate (ppb)	Chrysene (ppb)	Dibenzo (a,h)-anthra-cene (ppb)	Fluoran-thene (ppb)	Fluorene (ppb)	Indeno (1,2,3-cd)-pyrene (ppb)	2-Methyl-naph-thalene (ppb)	Naphtha-lene (ppb)	Phenan-threne (ppb)	Pyrene (ppb)	Aroclor 1016 (ppb)	Aroclor 1221 (ppb)	Aroclor 1232 (ppb)	Aroclor 1242 (ppb)	Aroclor 1248 (ppb)	Aroclor 1254 (ppb)	Aroclor 1260 (ppb)	Aroclor 1262 (ppb)	Aroclor 1268 (ppb)	Total PCBs (mg/kg)
LE_Mason-SED-38																											9.11
LE_Mason-SED-39																											1.98
LE_Mason-SED-40																											<0.13
LE_Mason-SED-41																											<0.19
LE_Mason-SED-42																											5.31
LE_Mason-U-1	<280	<280	<280	<280	<280	<280	NA	<280	<280	<280	<280	<280	NA	<280	<280	<280											
LE_Mason-U-2	<950	<950	1090	<950	<950	<950	NA	<950	<950	<950	<950	<950	NA	<950	<950	<950											
LE_Mason-U-3	4240	13200	13100	18500	4310	8030	NA	17000	<1900	34000	2010	4640	NA	<1900	26200	28500											
LE_Mason-U-4	2240	8310	9740	12500	3880	5160	NA	11700	1190	14600	975	4320	NA	878	7630	16000											
LE_Mason-U-5	35400	61600	53000	68300	14500	26200	NA	68400	4650	150000	24200	16700	NA	11200	174000	118000											
LE_Mason-U-6	<310	382	386	713	<310	<310	NA	725	<310	1280	<310	<310	NA	<310	310	1180											
LE_Mason-U-7	202000	345000	310000	393000	78000	126000	NA	328000	28100	670000	146000	88900	NA	513000	700000	538000											
LE_Mason-U-8	1450	3910	3780	4180	2290	1790	NA	4770	<1300	8170	<1300	1970	NA	<1300	5710	7790											
LE_Mason-U-9	666	1300	1240	1450	458	496	NA	1470	<360	2670	438	492	NA	398	1980	2350											
LE_Mason-U-10	18600	33400	28700	33800	8170	16000	NA	35900	2690	74800	14500	9300	NA	16300	85400	62100											
LE_Mason-U-11	<290	<290	<290	<290	<290	<290	NA	<290	<290	<290	<290	<290	NA	<290	<290	<290					0.53						
LE_Mason-U-12	<460	1040	1110	1340	682	<460	NA	1240	<460	1710	<460	626	NA	<460	1470	1760											
LE_Mason-SD-4	<600	<600	<600	<600	<600	<600	<1200	<600	<600	<600	<600	<600	<1200	<1000	<600	<600											
LE_Mason-SD-5	2880	7160	7290	10100	2460	3420	<790	7250	<390	13000	957	2630	<770	<550	11600	9840											
LE_Mason-SD-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<620	NA	NA											
LE_Mason-SD-7	1310	3860	3460	3760	2200	3390	<810	4010	<410	9470	<410	2610	<790	<580	6660	7260											
LE_Mason-SD-8	64800	41200	38400	41100	6850	12700	46800	41700	2100	61900	14000	7850	4490	8410	72400	68500											
LE_Mason-SD-9	54000	88300	98800	121000	12200	33200	<3600	92800	6080	228000	28500	20400	<720	16400	273000	235000											
LE_Mason-SD-10	12000	27000	23000	29500	13100	11300	NA	26200	<3600	62300	4340	13200	NA	<730	54300	52700											
LE_Mason-SD-11	<280	668	612	791	392	<280	NA	775	<280	1450	<280	349	NA	<300	1380	1610											
LE_Mason-SD-12	7570	17200	15100	16600	7330	11000	NA	20400	<780	42800	4990	7660	<780	1010	54500	35600											
LE_Mason-SD-13	<570	<570	<570	<570	<570	<570	NA	<570	<570	<570	<570	<570	<570	<570	<570	<570											
LE_Mason-SD-14-3	150,000	151000	148000	109000	74400	113000	NA	176000	21500	343000	87100	79900	23900	21400	526000	374000											
LE_Mason-SD-14-3.5	32900	54300	51000	39400	25600	39800	NA	65600	7400	122000	25700	26200	7130	7320	197000	140000											
LE_Mason-SD-15	<580	1320	1640	1650	974	1940	NA	1760	<580	2520	<580	<580	<580	<580	1460	3060											
LE_Mason-SD-16	<7650	7060	7110	7820	4370	6110	NA	7890	<1320	15800	3130	3680	<690	900	19400	13900											
LE_Mason-SD-17	2180	3900	3350	3900	1460	1520	NA	4330	423	8160	1390	1430	<560	635	7990	7100											
LE_Mason-SD-18	14200	24200	22000	26400	5850	10900	NA	27400	1860	49900	7660	6430	<1100	4150	56200	48500											
LE_Mason-SD-19	20800	17100	16000	19400	4550	8390	NA	19400	1370	37900	3590	5000	<800	<3900	22800	35200											
LE_Mason-SD-20	7350	11900	12700	12600	7740	9530	NA	14800	2110	28900	4630	8330	880	2280	42800	23600											

Notes: **Notes:**
USGS sediment-grab sample USGS sediment-grab samples collected along the lower Neponset River in 2002 and 2003 (composited sediment-grab sample collected from the estuarine part of the lower Neponset River just downstream
of the Walter Baker Dam) (U of the Walter Baker Dam) (USGS, 2002-03. Data on Sediment Quality and Concentrations of Polychlorinated Biphenyls from the Lower Neponset River, Massachusets, 2002-03; Open File Report 2004-1280)

[D, duplicate; LD, laboratory c [D, duplicate; LD, laboratory duplicate; RPD, relative percent different; TOC, total organic carbon; USGS, U.S. Geological Survey; ppm, parts per million;
<, actual value is less than va <, actual value is less than value shown; *, both quality-assurance samples less than detection limit; --, no data]
MS, matrix spike; MSD, matri MS, matrix spike; MSD, matrix-spike duplicate; PR, Percent Recovery; RPD, relative percent difference; USGS, U.S. Geological Survey; ppb, parts per billion; <, actual value is less than value shown; --, no data]
[Aroclor analysis done by the [Aroclor analysis done by the AXYS Analytical laboratory. USGS, U.S. Geological Survey; ΣPCBs, total concentration of polychlorinated biphenyls; ppb, parts per billion; <, actual value is less than value shown; D, duplicate]
[USGS, U.S. Geological Surv [USGS, U.S. Geological Survey, ppb, parts per billion; <, actual value is less than value shown; D, Duplicate]

LE_Mason-SD-21 to SD-27, S LE_Mason-SD-21 to SD-27, SD-29 and SED-1 to SED-42 are sediment samples collected in August in Mother Brook downstream of the L.E. Mason Site, between the railway bridge and the confluence of Mother Brook and the the Neponset River (Shaw Environmental, Inc., Decemb Environmental, Inc., December 2004. Phase II/III Comprehensive Site Assessment and Remedial Action Plan Addendum, table 2 and Figure 4)
* maximum of sample and d* maximum of sample and duplicate, or lower of reporting limits if both were non-detect.
LE_Mason-U-1 to U12 and SI LE_Mason-U-1 to U12 and SD-1 to SD-3 are sediment samples collected upstream of the L.E. Mason Site in 2000. (IT Group, February 27, 2001. Imminent Hazard Evaluation Mother Brook Sediment Evaluation L.E. Mason Company; Project # 803585-1201)
LE_Mason-SD-4 to SD-20 an LE_Mason-SD-4 to SD-20 and SD-28 are sediment samples collected adjacent to the L.E. Mason Facility in 2000. (IT Group, February 27, 2001. Imminent Hazard Evaluation Mother Brook Sediment Evaluation L.E. Mason Company; Project # 803585-1201)

ATTACHMENT 2: LOCAL CONDITIONS EVALUATION-STATISTICAL OUTPUT

Attachment 2
Local Conditions Evaluation: Statistical Output

The Wilcoxon Rank Sum test was conducted to compare site sediment concentrations vs. local conditions sediment concentrations for arsenic, cadmium, lead and silver. StatGraphics software (version 5.1, Manugistics) was used to perform the statistical analyses. The Wilcoxon Rank Sum test was performed to test the null hypothesis (H_0) that the median site sediment COPC data is equal to the median local conditions sediment data. The alternative hypothesis (H_A) is that the median site sediment data do not equal the median background data. An $\alpha = 0.20$ (or an 80% confidence) was used for this analysis.

Wilcoxon Rank Sum Test - Arsenic

Median of Site Arsenic: 4.45
Median of Local Conditions Arsenic: 1.5

Mann-Whitney (Wilcoxon) W test to compare medians

Null hypothesis: median Site Arsenic = median Local Conditions Arsenic
Alt. hypothesis: median Site Arsenic NE median Local Conditions Arsenic

Average rank of Site As: 21.5
Average rank of LC As: 13.3333

W = 20.0 P-value = 0.0452197

The StatAdvisor

This option runs a Mann-Whitney W test to compare the medians of the two samples. This test is constructed by combining the two samples, sorting the data from smallest to largest, and comparing the average ranks of the two samples in the combined data. Since the P-value is less than 0.20, there is a statistically significant difference between the medians at the 80.0% confidence level.

Wilcoxon Rank Sum Test - Cadmium

Median of Site Cadmium: 0.645
Median of Local Conditions Cadmium: 0.5

Mann-Whitney (Wilcoxon) W test to compare medians

Null hypothesis: median Site Cadmium = median Local Conditions Cadmium
Alt. hypothesis: median Site Cadmium NE median Local Conditions Cadmium

Average rank of Site Cadmium: 18.0
Average rank of Local Conditions Cadmium: 13.9167

W = 34.0 P-value = 0.284796

The StatAdvisor

This option runs a Mann-Whitney W test to compare the medians of the two samples. This test is constructed by combining the two samples, sorting the data from smallest to largest, and comparing the average ranks of the two samples in the combined data. Since the P-value is greater than or equal to 0.20, there is not a statistically significant difference between the medians at the 80.0% confidence level.

Wilcoxon Rank Sum Test - Lead

Median of Site Lead: 109.0
Median of Local Conditions Lead: 71.0

Mann-Whitney (Wilcoxon) W test to compare medians

Null hypothesis: median Site Lead = median Local Conditions Lead
Alt. hypothesis: median Site Lead NE median Local Conditions Lead

Average rank of Site Lead: 18.25
Average rank of Local Conditions Lead: 15.9167

W = 82.0 P-value = 0.556712

The StatAdvisor

This option runs a Mann-Whitney W test to compare the medians of the two samples. This test is constructed by combining the two samples, sorting the data from smallest to largest, and comparing the average ranks of the two samples in the combined data. Since the P-value is greater than or equal to 0.20, there is not a statistically significant difference between the medians at the 80.0% confidence level.

Wilcoxon Rank Sum Test - Silver

Median of Site Silver: 0.95
Median of Local Conditions Silver: 0.6

Mann-Whitney (Wilcoxon) W test to compare medians

Null hypothesis: median Site Silver = median Local Conditions Silver
Alt. hypothesis: median Site Silver NE median Local Conditions Silver

Average rank of Site Silver: 20.0
Average rank of Local Conditions Silver: 15.3333

W = 68.0 P-value = 0.230061

The StatAdvisor

This option runs a Mann-Whitney W test to compare the medians of the two samples. This test is constructed by combining the two samples, sorting the data from smallest to largest, and comparing the average ranks of the two samples in the combined data. Since the P-value is greater than or equal to 0.20, there is not a statistically significant difference between the medians at the 80.0% confidence level.

ATTACHMENT 3: JOHNSON & ETTINGER VAPOR INTRUSION MODEL

ATTACHMENT 3

DESCRIPTION OF THE MADEP VAPOR INTRUSION MODEL

1.0 INTRODUCTION

The Massachusetts Department of Environmental Protection (MADEP) vapor intrusion model was run to calculate site-specific attenuation factors for both commercial and residential scenarios at the Former Lewis Chemical Corporation Disposal Site (the site) located at 0 & 12-24 Fairmount Court in Hyde Park, Massachusetts. The attenuation factor (α) relates a groundwater or soil gas concentration to an indoor air concentration, and is based on a vapor intrusion model initially developed by Johnson and Ettinger (1991). Where appropriate, Woodard & Curran (W&C) integrated site-specific information (i.e., depth to contamination, building size and soil characteristics) and chemical-specific information (i.e., diffusion through air and/or water) into this model.

MADEP has provided this model via a compilation of Excel spreadsheets ('MCP GW2 alpha.xls', January 2006) The spreadsheets allow site-specific information on depth to contamination, soil type, size of building and building ventilation rate, and calculates an attenuation factor that can be used to estimate indoor air concentrations. For this evaluation, Site soil gas data collected from the Site were used to evaluate potential human health risks due to vapor intrusion.

2.0 MODEL DESCRIPTION

The Johnson and Ettinger model used to derive the attenuation factors considers a mass balance whereby the mass transport rate of contaminants volatilizing from the subsurface under the building equals the mass transport rate through a crack in the basement or foundation slab, which also equals the mass transport rate into building air. The mathematical model can be divided into three primary components:

- Diffusion of the contaminant from groundwater under the building to soil gas beneath the foundation,
- Transport from the soil gas into the buildings, and
- Dilution of the mass flow through the crack by the building air exchange rate.

This conceptual model is shown graphically below. Equation parameters and the values used in calculating the site-specific attenuation factor, α, for each chemical of potential concern (COPC) are shown on Tables in the accompanying tables.

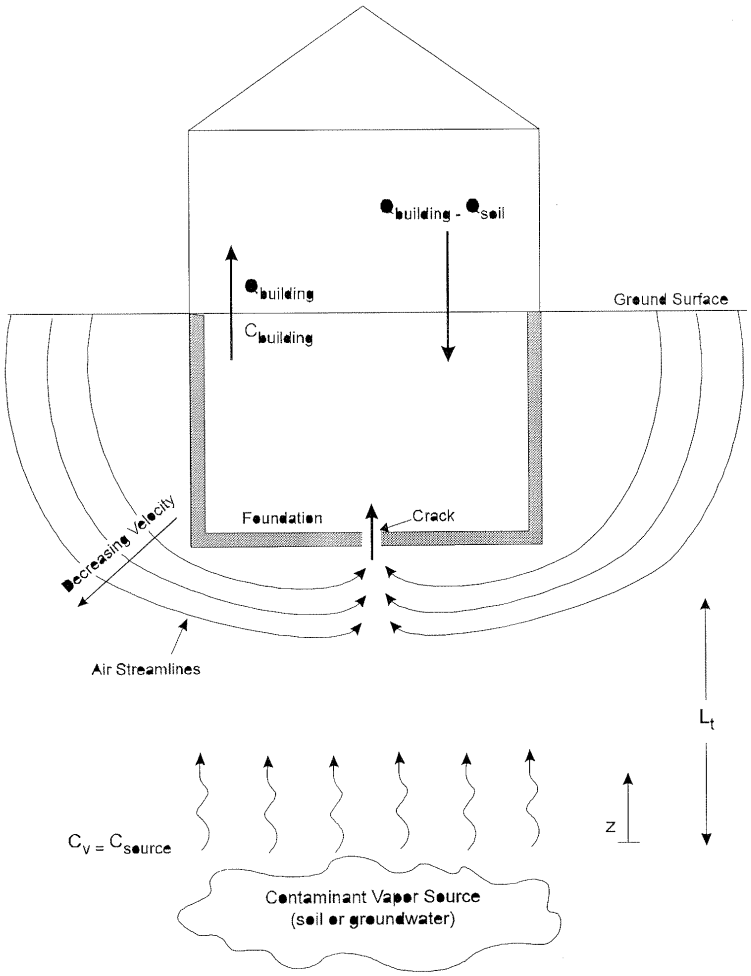

Figure No. 1 - V

The first part of the model calculates the overall effective diffusion coefficient (D^{eff}_T). The input parameters for this part of the calculation are related to the type of soil at the site and the diffusion properties of the contaminants. In order to calculate D^{eff}_T, a US Soil Conservation Service (SCS) soil type must be selected, based on the soil type at the site. Due to the variable composition of the overburden (sandy fill), we assumed that soils were best characterized as sand. A porosity of 0.43, the model default, was used for total porosity for the vadose zone soils, based on the range of porosity for sand (0.25-0.5) and silt (0.35-0.50) described by Freeze and Cherry (1979). For this Site, we used soil gas data collected from beneath the slab of the existing building's foundation to estimate indoor air concentrations; thus, we did not include the first model component (diffusion from groundwater to soil gas) in our estimations, but rather applied the site-specific attenuation factors to soil gas concentrations.

The second component of the model calculates the vapor flow (Q_{soil}) through the hypothetical crack in the building foundation. Transport from soil gas under a foundation is assumed to occur by a combination of convective and diffusive transport mechanisms. The crack length is the floor-wall seam perimeter, which was adjusted to reflect the approximate dimensions of each building evaluated, as discussed in Section 3.0. The area of the enclosed space below grade (A_B) was also adjusted to reflect the building size, as

was the crack-to-total area ratio (η). A crack width of 0.1 cm was assumed, which is consistent with MADEP assumptions. The final part of the model dilutes the flux of contaminant entering the building by the air exchange rate in the building. Building parameters for the commercial and residential scenarios are discussed in the following section.

3.0 ESTIMATION OF INDOOR AIR CONCENTRATIONS

We used soil gas analytical results from April 2006 to estimate indoor air concentrations within the proposed residences, as previously discussed in the risk characterization report. The equation used to estimate indoor air concentrations based on the contaminant concentration in soil gas is:

$$[OHM]_{air} = [OHM]_{sg} * \alpha$$

where:

$[OHM]_{air}$	=	The calculated indoor air concentration (mg/m^3)
$[OHM]_{sg}$	=	The source concentration in soil gas (mg/m^3)
α	=	An attenuation factor calculated based on site-specific data (dimensionless)

W&C used this equation to estimate the concentration of contaminants in indoor air from soil gas data. Parameters used to derive indoor air concentrations are described below.

Due to the variable composition of the overburden, mainly sand (smaller particles associated with a lower permeability) and gravel (large particles associated with a higher permeability) across the Site, we made a simplifying assumption that Site soils would have the physical characteristics of sand. We assumed an air exchange rate (AER) of one air change per hour (ACH) for the commercial scenario and 0.45 ACH for the residential scenario, which are the USEPA default AERs (USEPA, 1999) for commercial and residential buildings, respectively. We used MADEP default building footprint dimensions in the model.

Six soil gas samples were collected from the Site in April 2006 from beneath the existing (vacant) building's foundation to evaluate potential vapor intrusion issues. Concentrations of detected volatile organic compounds (VOCs) in soil gas were relatively consistent among the six samples. We therefore used the average concentration of each constituent as the soil gas concentration for each COPC. For results reported as non-detect, we included one-half the laboratory reporting limit (LRL) in calculation of the average concentration. The depth of the soil gas samples (1.5 feet bgs) and the soil gas exposure point concentrations (EPCs) were incorporated into the vapor intrusion model to estimate indoor air concentrations for both the commercial and residential scenarios. Chemical/physical parameters, model assumptions and calculation of the site-specific attenuation factors are presented in Table 3-1 through 3-9. Estimated indoor air EPCs are presented in Table 3-5 and 3-9 for the commercial and residential scenarios, respectively.

4.0 UNCERTAINTIES

The uncertainties associated with the model are related to the representativeness of the assumptions made. The greater the assumptions deviate from the actual conditions, the lower the reliability of the model. The model uses some assumptions that MADEP used to calculate the recently-updated (2006) Method 1 GW-2

standards, which are protective of indoor air exposures of volatile constituents in groundwater to residences. We adjusted the MADEP spreadsheets to reflect actual site conditions, where appropriate.

The model is highly sensitive to variations in building ventilation and soil moisture content. Where possible, we have included conservative assumptions about soil characteristics and building parameters to capture some of the uncertainty.

Sink or removal mechanisms such as wall and surface adsorption or absorption, which would reduce airborne contamination, have not been included in this model. The degree of removal would be chemical-dependent, with the more reactive compounds preferentially removed. Data, however, are not available regarding how much of each compound would be lost.

5.0 REFERENCES

Environmental Quality Management, Inc, 1997, User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings, prepared for the United States EPA, September, 1997.

Freeze, R Allan and Cherry, John. 1979. Groundwater. Prentice-Hall, Inc. Englewood, NJ.

Johnson, P.C. and R.A. Ettinger. 1991. Heuristic model for predicting the intrusion rate of contaminant vapors into buildings. *Environmental Science & Technology*. 25 (8): 1445-1452.

Massachusetts Department of Environmental Protection (MADEP), January 2006. Development of MCP Risk-Based Levels for Soil and Groundwater, MCP GW2 alpha.xls (provided as downloadable Excel spreadsheets through the MADEP website (http://www.state.ma.us/dep/bwsc).

United States Environmental Protection Agency (USEPA). 1999. *Exposure Factors Handbook.* Office of Health and Environmental Assessment. Washington, D.C. (EPA/600/C-99/001).

TABLE 3-1
CHEMICAL-PHYSICAL PARAMETERS USED IN VAPOR INTRUSION MODEL

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS	Diffusivity in air, Da (cm^2/s)	Diffusivity in water, Dw (cm^2/s)	Henry's law constant H' (unitless)	Henry's law constant at ref temp H (atm-m^3/mol)	Henry's law constant reference temperature, TR (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta Hv,\beta$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Pure component water solubility, S (mg/L)	Molecular Weight
DICHLOROETHANE, 1,1-	75-34-3	7.42E-02	1.05E-05	2.30E-01	5.62E-03	25	6,895	330.55	523.00	5040	98.96
DICHLOROETHANE, 1,2-	107-06-2	1.04E-01	9.90E-06	4.83E-02	1.18E-03	25	7,643	356.65	561.00	8600	98.96
DICHLOROETHYLENE, 1,1-	75-35-4	9.00E-02	1.04E-05	1.07E+00	2.61E-02	25	6,247	304.75	576.05	2420	96.94
DICHLOROETHYLENE, CIS-1,2-	156-59-2	7.36E-02	1.13E-05	1.67E-01	4.08E-03	25	7,192	333.65	544.00	6410	96.94
DICHLOROETHYLENE, TRANS-1,2-	156-60-5	7.07E-02	1.19E-05	3.84E-01	9.38E-03	25	6,717	320.85	516.50	4520	96.94
DICHLOROMETHANE	75-09-2	1.01E-01	1.17E-05	1.33E-01	3.25E-03	25	6,706	313.00	510.00	13000	84.93
ETHYLBENZENE	100-41-4	7.50E-02	7.80E-06	3.22E-01	7.88E-03	25	8,501	409.34	617.20	169	106.17
TETRACHLOROETHYLENE	127-18-4	7.20E-02	8.20E-06	7.24E-01	1.77E-02	25	8,288	394.40	620.20	206	165.83
TOLUENE	108-88-3	8.70E-02	8.60E-06	2.72E-01	6.64E-03	25	7,930	383.78	591.79	526	92.14
TRICHLOROETHANE, 1,1,1-	71-55-6	7.80E-02	8.80E-06	7.04E-01	1.72E-02	25	7,136	347.24	545.00	1290	133.41
TRICHLOROETHYLENE	79-01-6	7.90E-02	9.10E-06	4.03E-01	9.85E-03	25	7,505	360.36	544.20	1280	131.39
1,2,4-TRIMETHYLBENZENE	95-63-6	7.50E-02	7.30E-06	2.52E-01	6.95E-03	27		442.45		57	120.2
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON 113)	76-13-1	2.88E-02	8.07E-06	2.15E+01	5.26E-01	25	6,463	320.85	487.30	170	187.4
VINYL CHLORIDE	75-01-4	1.06E-01	1.23E-06	1.14E+00	2.78E-02	25	5,250	259.25	432.00	8800	62.5
XYLENES (Mixed Isomers)	1330-20-7	7.69E-02	8.44E-06	2.71E-01	6.63E-03	25	8,525	411.52	616.20	106	106.17

TABLE 3-2
VAPOR INTRUSION MODEL: SITE-SPECIFIC CALCULATIONS BASED ON DATA ENTERED
FACILITY WORKER SCENARIO

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Average soil/ groundwater temperature, T_S (^oC)
15	45.72	10
Slab	Soil gas samples collected 1.5'bgs	

Site Soil Information

MORE ↓

ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (A, B, or C)	ENTER SCS soil type directly above water table
	Totals must add up to value of L_{WT}			
213	0	0	A	S

MORE ↓

Stratum A - Decends down from the soil surface to at least the depth entered for L_F, and perhaps as deep as the water table (L_{WT})

ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)		ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)
S	OR		1.5	0.43	0.06

TABLE 3-2(Continued)
VAPOR INTRUSION MODEL: SITE-SPECIFIC CALCULATIONS BASED ON DATA ENTERED
FACILITY WORKER SCENARIO

MORE ↓

Stratum B - Located below Stratum A, extending to Stratum C or the water table. Thickness may be zero if only one stratum is considered.

ENTER	ENTER	ENTER
Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)
1.5	0.43	0.06

MORE ↓

Stratum C - Located below Stratum B, extending to the water table. Thickness may be zero if only one or two strata are considered.

ENTER	ENTER	ENTER
Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.06

Building Information - Modify ONLY if Site-specific information is documented.

MORE ↓

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{crack} (cm)	Soil-bldg. pressure differential, ΔP (g/cm-s^2)	Enclosed space floor length, L_B (cm)	Enclosed space floor width, W_B (cm)	Enclosed space height, H_B (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	1

END

TABLE 3-3
VAPOR INTRUSION MODEL: SITE-SPECIFIC CALCULATIONS BASED ON DATA ENTERED
FACILITY WORKER SCENARIO

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Building Information
MORE ↓

Source-building separation, L_T (cm)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Area of crack, A_{crack} (cm^2)
30.72	3,844	1.25E+05	9.24E+05	4.16E-04	15	1.75E-04	30.72	15	0.10	9.45E+01	3.84E+02

Capillary Zone
MORE ↓

Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)
17.05	0.43	0.177	0.253

Soil Strata

Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)
0.370	0.019	9.92E-08	0.987	9.79E-08	0.370	0.370

END

TABLE 3-4
VAPOR INTRUSION MODEL: CALCULATION OF THE INFINITE SOURCE INDOOR ATTENUATION COEFFICIENT
FACILITY WORKER SCENARIO

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Capill. Zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total effective diffusion coefficient, D^{eff}_T (cm^2/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Exponent of equivalent foundation Peclet # exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)
DICHLOROETHANE, 1,1-	75-34-3	7,450	2.89E-03	1.24E-01	1.46E-02	1.26E-03	1.18E-03	1.46E-02	2.74E+109	2.07E-04
DICHLOROETHANE, 1,2-	107-06-2	8,522	5.51E-04	2.37E-02	2.05E-02	1.78E-03	1.67E-03	2.05E-02	1.20E+78	2.62E-04
DICHLOROETHYLENE, 1,1-	75-35-4	6,392	1.47E-02	6.34E-01	1.78E-02	1.52E-03	1.43E-03	1.78E-02	1.68E+90	2.37E-04
DICHLOROETHYLENE, CIS-1,2-	156-59-2	7,734	2.04E-03	8.79E-02	1.45E-02	1.25E-03	1.18E-03	1.45E-02	2.13E+110	2.06E-04
DICHLOROETHYLENE, TRANS-1,2-	156-60-5	7,136	4.96E-03	2.13E-01	1.40E-02	1.19E-03	1.13E-03	1.40E-02	7.16E+114	1.99E-04
DICHLOROMETHANE	75-09-2	7,034	1.73E-03	7.46E-02	1.99E-02	1.71E-03	1.61E-03	1.99E-02	2.50E+80	2.56E-04
ETHYLBENZENE	100-41-4	10,155	3.18E-03	1.37E-01	1.48E-02	1.27E-03	1.20E-03	1.48E-02	1.86E+108	2.08E-04
TETRACHLOROETHYLENE	127-18-4	9,553	7.53E-03	3.24E-01	1.42E-02	1.21E-03	1.15E-03	1.42E-02	6.04E+112	2.02E-04
TOLUENE	108-88-3	9,154	2.93E-03	1.26E-01	1.72E-02	1.47E-03	1.39E-03	1.72E-02	2.17E+93	2.31E-04
TRICHLOROETHANE, 1,1,1-	71-55-6	7,885	8.50E-03	3.66E-01	1.54E-02	1.32E-03	1.24E-03	1.54E-02	1.28E+104	2.14E-04
TRICHLOROETHYLENE	79-01-6	8,557	4.58E-03	1.97E-01	1.56E-02	1.33E-03	1.26E-03	1.56E-02	6.13E+102	2.16E-04
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON 113)	76-13-1	6,972	2.82E-01	1.21E+01	5.68E-03	4.85E-04	4.59E-04	5.68E-03	8.97E+281	9.62E-05
VINYL CHLORIDE	75-01-4	5,000	1.78E-02	7.65E-01	2.09E-02	1.79E-03	1.69E-03	2.09E-02	4.04E+76	2.64E-04
XYLENES (Mixed Isomers)	1330-20-7	10,248	2.65E-03	1.14E-01	1.52E-02	1.30E-03	1.23E-03	1.52E-02	3.93E+105	2.12E-04

TABLE 3-5
PREDICTED INDOOR AIR CONCENTRATION FOR
FACILITY WORKER SCENARIO

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

Chemical of Potential Concern	CAS Number	Soil Gas Concentration (mg/m^3)	Attenuation Factor (a)	Estimated Indoor Air Concentration (mg/m^3)	MADEP Background Indoor Air Concentration[3]
Volatile Organic Compounds					
1,1,1-Trichloroethane	71-55-6	1.1E+03	2.1E-04	2.4E-01	
1,1-Dichloroethane	75-34-3	1.6E+01	2.1E-04	3.2E-03	
1,1-Dichloroethene	75-35-4	1.9E+01	2.4E-04	4.5E-03	
1,2,4-Trimethylbenzene	95-63-6	3.8E+00	2.1E-04	8.0E-04	
1,2-Dichloroethane	107-06-2	6.0E+00	2.6E-04	1.6E-03	
cis-1,2-Dichloroethene	156-59-2	4.4E+02	2.1E-04	9.0E-02	
Ethylbenzene	100-41-4	7.3E+00	2.1E-04	1.5E-03	
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	76-13-1	3.0E+02	9.6E-05	2.9E-02	
Methylene chloride	75-09-2	1.4E+01	2.6E-04	3.5E-03	
Tetrachloroethene	127-18-4	1.3E+03	2.0E-04	2.7E-01	
Toluene	108-88-3	2.3E+01	2.3E-04	5.3E-03	
trans-1,2-Dichloroethene	156-60-5	6.1E+00	2.0E-04	1.2E-03	
Trichloroethene	79-01-6	9.0E+02	2.2E-04	1.9E-01	
Vinyl chloride	75-01-4	7.0E+00	2.6E-04	1.8E-03	
Total Xylenes	1330-20-7	3.2E+01	2.1E-04	6.7E-03	

Notes:

1. $[OHM]_{air}$ = [OHM]vapor * alpha

   Where:

   $[OHM]_{air}$ = Estimated indoor air concentration, in units of mg/m^3.

   $[OHM]_{vapor}$ = Concentration of chemical in soil gas, based on the average concentration detected among soil gas samples SG-1 through SG-6, April 2006.

   alpha = A calculated attenuation factor that relates the indoor air concentration to the concentration in the soil vapor. Dimensionless.

TABLE 3-6
VAPOR INTRUSION MODEL ASSUMPTIONS
RESIDENTIAL SCENARIO

Former Lewis Chemical Corporation
0 & 12-24 Fairmount Court
Hyde Park, MA

MORE ↓	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Average soil/ groundwater temperature, T_S (°C)
	183	45.72	10

Soil gas samples collected 1.5'bgs

Site Soil Information

MORE ↓	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (A, B, or C)	ENTER SCS soil type directly above water table
	Totals must add up to value of L_{WT}				
	213	0	0	A	S

MORE ↓	Stratum A - Decends down from the soil surface to at least the depth entered for L_F, and perhaps as deep as the water table (L_{WT})	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)
		S			1.5	0.43	0.06

TABLE 3-6 Continued
VAPOR INTRUSION MODEL ASSUMPTIONS
RESIDENTIAL SCENARIO

MORE ↓

Stratum B - Located below Stratum A, extending to Stratum C or the water table. Thickness may be zero if only one stratum is considered.

ENTER	ENTER	ENTER
Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	Stratum B soil total porosity, n^B (unitless)	Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)
1.5	0.43	0.06

MORE ↓

Stratum C - Located below Stratum B, extending to the water table. Thickness may be zero if only one or two strata are considered.

ENTER	ENTER	ENTER
Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	Stratum C soil total porosity, n^C (unitless)	Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
1.5	0.43	0.06

Building Information - Modify ONLY if Site-specific information is documented.

MORE ↓

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Enclosed space floor thickness, L_{crack} (cm)	Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	Enclosed space floor length, L_B (cm)	Enclosed space floor width, W_B (cm)	Enclosed space height, H_B (cm)	Floor-wall seam crack width, w (cm)	Indoor air exchange rate, ER (1/h)
15	40	961	961	488	0.1	0.45

END