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**APPENDIX A**  
**Generic SSLs**

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## APPENDIX A

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### Generic SSLs

Table A-1 provides generic SSLs for 110 chemicals. Generic SSLs are derived using default values in the standardized equations presented in Part 2 of this document. The default values (listed in Table A-2) are conservative and are likely to be protective for the majority of site conditions across the nation.

However, the generic SSLs are not necessarily protective of all known human exposure pathways, reasonable land uses, or ecological threats. Thus, before applying generic SSLs at a site, it is extremely important to compare the conceptual site model (see the *User's Guide*) with the assumptions behind the SSLs to ensure that the site conditions and exposure pathways match those used to develop generic SSLs (see Parts 1 and 2 and Table A-2). If this comparison indicates that the site is more complex than the SSL scenario, or that there are significant exposure pathways **not** accounted for by the SSLs, then generic SSLs are not sufficient for a full evaluation of the site. A more detailed site-specific approach will be necessary to evaluate the additional pathways or site conditions.

Generic SSLs are presented separately for major pathways of concern in both surface and subsurface soils. The first column to the right of the chemical name presents levels based on direct ingestion of soil and the second column presents levels based on inhalation. As discussed in the *User's Guide*, the fugitive dust pathway may be of concern for certain metals but does not appear to be of concern for organic compounds. Therefore, SSLs for the fugitive dust pathway are only presented for inorganic compounds. Except for mercury, no SSLs for the inhalation of volatiles pathway are provided for inorganic compounds because these chemicals are not volatile.

The user should note that several of the generic SSLs for the inhalation of volatiles pathway are determined by the soil saturation concentration ( $C_{\text{sat}}$ ), which is used to address and screen the potential presence of nonaqueous phase liquids (NAPLs). As explained in Section 2.4.4, for compounds that are liquid at ambient soil temperature, concentrations above  $C_{\text{sat}}$  indicate a potential for free-phase liquid contamination to be present and the need for additional investigation.

The third column presents generic SSL values for the migration to ground water pathway developed using a default DAF (dilution-attenuation factor) of 20 to account for natural processes that reduce contaminant concentrations in the subsurface (see Section 2.5.6). SSLs in Table A-1 are rounded to two significant figures except for values less than 10, which are rounded to one significant figure. Note that the 20 DAF values in Table A-1 are not exactly 20 times the 1 DAF values because each SSL is calculated independently in both the 20 DAF and 1 DAF columns, with the final value presented according to the aforementioned rounding conventions.

The fourth column contains the generic SSLs for the migration to ground water pathway developed assuming no dilution or attenuation between the source and the receptor well (i.e., a DAF of 1). These values can be used at sites where little or no dilution or attenuation of soil leachate concentrations is expected at a site (e.g., sites with shallow water tables, fractured media, karst topography, or source size greater than 30 acres).

Generally, if an SSL is not exceeded for a pathway of concern, the user may eliminate the pathway or areas of the site from further investigation. If more than one exposure pathway is of concern, the lowest SSL should be used.

**Table A-1. Generic SSLs <sup>a</sup>**

<b>Organics</b>		<b>Migration to ground water</b>			
<b>CAS No.</b>	<b>Compound</b>	<b>Ingestion (mg/kg)</b>	<b>Inhalation volatiles (mg/kg)</b>	<b>20 DAF (mg/kg)</b>	<b>1 DAF (mg/kg)</b>
83-32-9	Acenaphthene	4,700 <sup>b</sup>	--- <sup>c</sup>	570 <sup>b</sup>	29 <sup>b</sup>
67-64-1	Acetone	7,800 <sup>b</sup>	1.0E+05 <sup>d</sup>	16 <sup>b</sup>	0.8 <sup>b</sup>
309-00-2	Aldrin	0.04 <sup>e</sup>	3 <sup>e</sup>	0.5 <sup>e</sup>	0.02 <sup>e</sup>
120-12-7	Anthracene	23,000 <sup>b</sup>	--- <sup>c</sup>	12,000 <sup>b</sup>	590 <sup>b</sup>
56-55-3	Benz( <i>a</i> )anthracene	0.9 <sup>e</sup>	--- <sup>c</sup>	2 <sup>e</sup>	0.08 <sup>e,f</sup>
71-43-2	Benzene	22 <sup>e</sup>	0.8 <sup>e</sup>	0.03	0.002 <sup>f</sup>
205-99-2	Benzo( <i>b</i> )fluoranthene	0.9 <sup>e</sup>	--- <sup>c</sup>	5 <sup>e</sup>	0.2 <sup>e,f</sup>
207-08-9	Benzo( <i>k</i> )fluoranthene	9 <sup>e</sup>	--- <sup>c</sup>	49 <sup>e</sup>	2 <sup>e</sup>
65-85-0	Benzoic acid	3.1E+05 <sup>b</sup>	--- <sup>c</sup>	400 <sup>b,i</sup>	20 <sup>b,i</sup>
50-32-8	Benzo( <i>a</i> )pyrene	0.09 <sup>e,f</sup>	--- <sup>c</sup>	8	0.4
111-44-4	Bis(2-chloroethyl)ether	0.6 <sup>e</sup>	0.2 <sup>e,f</sup>	0.0004 <sup>e,f</sup>	2E-05 <sup>e,f</sup>
117-81-7	Bis(2-ethylhexyl)phthalate	46 <sup>e</sup>	31,000 <sup>d</sup>	3,600	180
75-27-4	Bromodichloromethane	10 <sup>e</sup>	3,000 <sup>d</sup>	0.6	0.03
75-25-2	Bromoform	81 <sup>e</sup>	53 <sup>e</sup>	0.8	0.04
71-36-3	Butanol	7,800 <sup>b</sup>	10,000 <sup>d</sup>	17 <sup>b</sup>	0.9 <sup>b</sup>
85-68-7	Butyl benzyl phthalate	16,000 <sup>b</sup>	930 <sup>d</sup>	930 <sup>d</sup>	810 <sup>b</sup>
86-74-8	Carbazole	32 <sup>e</sup>	--- <sup>c</sup>	0.6 <sup>e</sup>	0.03 <sup>e,f</sup>
75-15-0	Carbon disulfide	7,800 <sup>b</sup>	720 <sup>d</sup>	32 <sup>b</sup>	2 <sup>b</sup>
56-23-5	Carbon tetrachloride	5 <sup>e</sup>	0.3 <sup>e</sup>	0.07	0.003 <sup>f</sup>
57-74-9	Chlordane	0.5 <sup>e</sup>	20 <sup>e</sup>	10	0.5
106-47-8	<i>p</i> -Chloroaniline	310 <sup>b</sup>	--- <sup>c</sup>	0.7 <sup>b</sup>	0.03 <sup>b,f</sup>
108-90-7	Chlorobenzene	1,600 <sup>b</sup>	130 <sup>b</sup>	1	0.07
124-48-1	Chlorodibromomethane	8 <sup>e</sup>	1,300 <sup>d</sup>	0.4	0.02
67-66-3	Chloroform	100 <sup>e</sup>	0.3 <sup>e</sup>	0.6	0.03
95-57-8	2-Chlorophenol	390 <sup>b</sup>	53,000 <sup>d</sup>	4 <sup>b,i</sup>	0.2 <sup>b,f,i</sup>
218-01-9	Chrysene	88 <sup>e</sup>	--- <sup>c</sup>	160 <sup>e</sup>	8 <sup>e</sup>
72-54-8	DDD	3 <sup>e</sup>	--- <sup>c</sup>	16 <sup>e</sup>	0.8 <sup>e</sup>
72-55-9	DDE	2 <sup>e</sup>	--- <sup>c</sup>	54 <sup>e</sup>	3 <sup>e</sup>
50-29-3	DDT	2 <sup>e</sup>	--- <sup>g</sup>	32 <sup>e</sup>	2 <sup>e</sup>
53-70-3	Dibenz( <i>a,h</i> )anthracene	0.09 <sup>e,f</sup>	--- <sup>c</sup>	2 <sup>e</sup>	0.08 <sup>e,f</sup>
84-74-2	Di- <i>n</i> -butyl phthalate	7,800 <sup>b</sup>	2,300 <sup>d</sup>	2,300 <sup>d</sup>	270 <sup>b</sup>
95-50-1	1,2-Dichlorobenzene	7,000 <sup>b</sup>	560 <sup>d</sup>	17	0.9
106-46-7	1,4-Dichlorobenzene	27 <sup>e</sup>	--- <sup>g</sup>	2	0.1 <sup>f</sup>
91-94-1	3,3-Dichlorobenzidine	1 <sup>e</sup>	--- <sup>c</sup>	0.007 <sup>e,f</sup>	0.0003 <sup>e,f</sup>
75-34-3	1,1-Dichloroethane	7,800 <sup>b</sup>	1,300 <sup>b</sup>	23 <sup>b</sup>	1 <sup>b</sup>
107-06-2	1,2-Dichloroethane	7 <sup>e</sup>	0.4 <sup>e</sup>	0.02	0.001 <sup>f</sup>
75-35-4	1,1-Dichloroethylene	1 <sup>e</sup>	0.07 <sup>e</sup>	0.06	0.003 <sup>f</sup>
156-59-2	<i>cis</i> -1,2-Dichloroethylene	780 <sup>b</sup>	1,200 <sup>d</sup>	0.4	0.02
156-60-5	<i>trans</i> -1,2-Dichloroethylene	1,600 <sup>b</sup>	3,100 <sup>d</sup>	0.7	0.03
120-83-2	2,4-Dichlorophenol	230 <sup>b</sup>	--- <sup>c</sup>	1 <sup>b,i</sup>	0.05 <sup>b,f,i</sup>

**Table A-1 (continued)**

<b>Organics</b>		<b>Migration to ground water</b>			
<b>CAS No.</b>	<b>Compound</b>	<b>Ingestion (mg/kg)</b>	<b>Inhalation volatiles (mg/kg)</b>	<b>20 DAF (mg/kg)</b>	<b>1 DAF (mg/kg)</b>
78-87-5	1,2-Dichloropropane	9 <sup>e</sup>	15 <sup>b</sup>	0.03	0.001 <sup>f</sup>
542-75-6	1,3-Dichloropropene	4 <sup>e</sup>	0.1 <sup>e</sup>	0.004 <sup>e</sup>	0.0002 <sup>e</sup>
60-57-1	Dieldrin	0.04 <sup>e</sup>	1 <sup>e</sup>	0.004 <sup>e</sup>	0.0002 <sup>e,f</sup>
84-66-2	Diethylphthalate	63,000 <sup>b</sup>	2,000 <sup>d</sup>	470 <sup>b</sup>	23 <sup>b</sup>
105-67-9	2,4-Dimethylphenol	1,600 <sup>b</sup>	--- <sup>c</sup>	9 <sup>b</sup>	0.4 <sup>b</sup>
51-28-5	2,4-Dinitrophenol	160 <sup>b</sup>	--- <sup>c</sup>	0.3 <sup>b,f,i</sup>	0.01 <sup>b,f,i</sup>
121-14-2	2,4-Dinitrotoluene	0.9 <sup>e</sup>	--- <sup>c</sup>	0.0008 <sup>e,f</sup>	4E-05 <sup>e,f</sup>
606-20-2	2,6-Dinitrotoluene	0.9 <sup>e</sup>	--- <sup>c</sup>	0.0007 <sup>e,f</sup>	3E-05 <sup>e,f</sup>
117-84-0	Di- <i>n</i> -octyl phthalate	1,600 <sup>b</sup>	10,000 <sup>d</sup>	10,000 <sup>d</sup>	10,000 <sup>d</sup>
115-29-7	Endosulfan	470 <sup>b</sup>	--- <sup>c</sup>	18 <sup>b</sup>	0.9 <sup>b</sup>
72-20-8	Endrin	23 <sup>b</sup>	--- <sup>c</sup>	1	0.05
100-41-4	Ethylbenzene	7,800 <sup>b</sup>	400 <sup>d</sup>	13	0.7
206-44-0	Fluoranthene	3,100 <sup>b</sup>	--- <sup>c</sup>	4,300 <sup>b</sup>	210 <sup>b</sup>
86-73-7	Fluorene	3,100 <sup>b</sup>	--- <sup>c</sup>	560 <sup>b</sup>	28 <sup>b</sup>
76-44-8	Heptachlor	0.1 <sup>e</sup>	4 <sup>e</sup>	23	1
1024-57-3	Heptachlor epoxide	0.07 <sup>e</sup>	5 <sup>e</sup>	0.7	0.03
118-74-1	Hexachlorobenzene	0.4 <sup>e</sup>	1 <sup>e</sup>	2	0.1 <sup>f</sup>
87-68-3	Hexachloro-1,3-butadiene	8 <sup>e</sup>	8 <sup>e</sup>	2	0.1 <sup>f</sup>
319-84-6	-HCH ( -BHC)	0.1 <sup>e</sup>	0.8 <sup>e</sup>	0.0005 <sup>e,f</sup>	3E-05 <sup>e,f</sup>
319-85-7	-HCH ( -BHC)	0.4 <sup>e</sup>	--- <sup>g</sup>	0.003 <sup>e</sup>	0.0001 <sup>e,f</sup>
58-89-9	-HCH (Lindane)	0.5 <sup>e</sup>	--- <sup>c</sup>	0.009	0.0005 <sup>f</sup>
77-47-4	Hexachlorocyclopentadiene	550 <sup>b</sup>	10 <sup>b</sup>	400	20
67-72-1	Hexachloroethane	46 <sup>e</sup>	55 <sup>e</sup>	0.5 <sup>e</sup>	0.02 <sup>e,f</sup>
193-39-5	Indeno(1,2,3- <i>cd</i> )pyrene	0.9 <sup>e</sup>	--- <sup>c</sup>	14 <sup>e</sup>	0.7 <sup>e</sup>
78-59-1	Isophorone	670 <sup>e</sup>	4,600 <sup>d</sup>	0.5 <sup>e</sup>	0.03 <sup>e,f</sup>
7439-97-6	Mercury	23 <sup>b,i</sup>	10 <sup>b,i</sup>	2 <sup>i</sup>	0.1 <sup>i</sup>
72-43-5	Methoxychlor	390 <sup>b</sup>	--- <sup>c</sup>	160	8
74-83-9	Methyl bromide	110 <sup>b</sup>	10 <sup>b</sup>	0.2 <sup>b</sup>	0.01 <sup>b,f</sup>
75-09-2	Methylene chloride	85 <sup>e</sup>	13 <sup>e</sup>	0.02 <sup>e</sup>	0.001 <sup>e,f</sup>
95-48-7	2-Methylphenol	3,900 <sup>b</sup>	--- <sup>c</sup>	15 <sup>b</sup>	0.8 <sup>b</sup>
91-20-3	Naphthalene	3,100 <sup>b</sup>	--- <sup>c</sup>	84 <sup>b</sup>	4 <sup>b</sup>
98-95-3	Nitrobenzene	39 <sup>b</sup>	92 <sup>b</sup>	0.1 <sup>b,f</sup>	0.007 <sup>b,f</sup>
86-30-6	<i>N</i> -Nitrosodiphenylamine	130 <sup>e</sup>	--- <sup>c</sup>	1 <sup>e</sup>	0.06 <sup>e,f</sup>
621-64-7	<i>N</i> -Nitrosodi- <i>n</i> -propylamine	0.09 <sup>e,f</sup>	--- <sup>c</sup>	5E-05 <sup>e,f</sup>	2E-06 <sup>e,f</sup>
1336-36-3	PCBs	1 <sup>h</sup>	--- <sup>h</sup>	--- <sup>h</sup>	--- <sup>h</sup>
87-86-5	Pentachlorophenol	3 <sup>e,j</sup>	--- <sup>c</sup>	0.03 <sup>f,i</sup>	0.001 <sup>f,i</sup>
108-95-2	Phenol	47,000 <sup>b</sup>	--- <sup>c</sup>	100 <sup>b</sup>	5 <sup>b</sup>
129-00-0	Pyrene	2,300 <sup>b</sup>	--- <sup>c</sup>	4,200 <sup>b</sup>	210 <sup>b</sup>
100-42-5	Styrene	16,000 <sup>b</sup>	1,500 <sup>d</sup>	4	0.2
79-34-5	1,1,2,2-Tetrachloroethane	3 <sup>e</sup>	0.6 <sup>e</sup>	0.003 <sup>e,f</sup>	0.0002 <sup>e,f</sup>

**Table A-1 (continued)**

<b>Organics</b>			<b>Migration to ground water</b>		
<b>CAS No.</b>	<b>Compound</b>	<b>Ingestion (mg/kg)</b>	<b>Inhalation volatiles (mg/kg)</b>	<b>20 DAF (mg/kg)</b>	<b>1 DAF (mg/kg)</b>
127-18-4	Tetrachloroethylene	12 <sup>e</sup>	11 <sup>e</sup>	0.06	0.003 <sup>f</sup>
108-88-3	Toluene	16,000 <sup>b</sup>	650 <sup>d</sup>	12	0.6
8001-35-2	Toxaphene	0.6 <sup>e</sup>	89 <sup>e</sup>	31	2
120-82-1	1,2,4-Trichlorobenzene	780 <sup>b</sup>	3,200 <sup>d</sup>	5	0.3 <sup>f</sup>
71-55-6	1,1,1-Trichloroethane	--- <sup>c</sup>	1,200 <sup>d</sup>	2	0.1
79-00-5	1,1,2-Trichloroethane	11 <sup>e</sup>	1 <sup>e</sup>	0.02	0.0009 <sup>f</sup>
79-01-6	Trichloroethylene	58 <sup>e</sup>	5 <sup>e</sup>	0.06	0.003 <sup>f</sup>
95-95-4	2,4,5-Trichlorophenol	7,800 <sup>b</sup>	--- <sup>c</sup>	270 <sup>b,i</sup>	14 <sup>b,i</sup>
88-06-2	2,4,6-Trichlorophenol	58 <sup>e</sup>	200 <sup>e</sup>	0.2 <sup>e,f,i</sup>	0.008 <sup>e,f,i</sup>
108-05-4	Vinyl acetate	78,000 <sup>b</sup>	1,000 <sup>b</sup>	170 <sup>b</sup>	8 <sup>b</sup>
75-01-4	Vinyl chloride	0.3 <sup>e</sup>	0.03 <sup>e</sup>	0.01 <sup>f</sup>	0.0007 <sup>f</sup>
108-38-3	<i>m</i> -Xylene	1.6E+05 <sup>b</sup>	420 <sup>d</sup>	210	10
95-47-6	<i>o</i> -Xylene	1.6E+05 <sup>b</sup>	410 <sup>d</sup>	190	9
106-42-3	<i>p</i> -Xylene	1.6E+05 <sup>b</sup>	460 <sup>d</sup>	200	10

**Table A-1 (continued)**

<i>Inorganics</i>		<u>Migration to ground water</u>			
		Ingestion (mg/kg)	Inhalation fugitive particulate (mg/kg)	20 DAF (mg/kg)	1 DAF (mg/kg)
CAS No.	Compound				
7440-36-0	Antimony	31 <sup>b</sup>	--- <sup>c</sup>	5	0.3
7440-38-2	Arsenic	0.4 <sup>e</sup>	750 <sup>e</sup>	29 <sup>i</sup>	1 <sup>i</sup>
7440-39-3	Barium	5,500 <sup>b</sup>	6.9E+05 <sup>b</sup>	1,600 <sup>i</sup>	82 <sup>i</sup>
7440-41-7	Beryllium	0.1 <sup>e</sup>	1,300 <sup>e</sup>	63 <sup>i</sup>	3 <sup>i</sup>
7440-43-9	Cadmium	78 <sup>b,m</sup>	1,800 <sup>e</sup>	8 <sup>i</sup>	0.4 <sup>i</sup>
7440-47-3	Chromium (total)	390 <sup>b</sup>	270 <sup>e</sup>	38 <sup>i</sup>	2 <sup>i</sup>
16065-83-1	Chromium (III)	78,000 <sup>b</sup>	--- <sup>c</sup>	--- <sup>g</sup>	--- <sup>g</sup>
18540-29-9	Chromium (VI)	390 <sup>b</sup>	270 <sup>e</sup>	38 <sup>i</sup>	2 <sup>i</sup>
57-12-5	Cyanide (amenable)	1,600 <sup>b</sup>	--- <sup>c</sup>	40	2
7439-92-1	Lead	400 <sup>k</sup>	--- <sup>k</sup>	--- <sup>k</sup>	--- <sup>k</sup>
7440-02-0	Nickel	1,600 <sup>b</sup>	13,000 <sup>e</sup>	130 <sup>i</sup>	7 <sup>i</sup>
7782-49-2	Selenium	390 <sup>b</sup>	--- <sup>c</sup>	5 <sup>i</sup>	0.3 <sup>i</sup>
7440-22-4	Silver	390 <sup>b</sup>	--- <sup>c</sup>	34 <sup>b,i</sup>	2 <sup>b,i</sup>
7440-28-0	Thallium	--- <sup>c</sup>	--- <sup>c</sup>	0.7 <sup>i</sup>	0.04 <sup>i</sup>
7440-62-2	Vanadium	550 <sup>b</sup>	--- <sup>c</sup>	6,000 <sup>b</sup>	300 <sup>b</sup>
7440-66-6	Zinc	23,000 <sup>b</sup>	--- <sup>c</sup>	12,000 <sup>b,i</sup>	620 <sup>b,i</sup>

DAF = Dilution and attenuation factor.

<sup>a</sup> Screening levels based on human health criteria only.

<sup>b</sup> Calculated values correspond to a noncancer hazard quotient of 1.

<sup>c</sup> No toxicity criteria available for that route of exposure.

<sup>d</sup> Soil saturation concentration ( $C_{sat}$ ).

<sup>e</sup> Calculated values correspond to a cancer risk level of 1 in 1,000,000.

<sup>f</sup> Level is at or below Contract Laboratory Program required quantitation limit for Regular Analytical Services (RAS).

<sup>g</sup> Chemical-specific properties are such that this pathway is not of concern at any soil contaminant concentration.

<sup>h</sup> A preliminary remediation goal of 1 mg/kg has been set for PCBs based on *Guidance on Remedial Actions for Superfund Sites with PCB Contamination* (U.S. EPA, 1990) and on EPA efforts to manage PCB contamination.

<sup>i</sup> SSL for pH of 6.8.

<sup>j</sup> Ingestion SSL adjusted by a factor of 0.5 to account for dermal exposure.

<sup>k</sup> A screening level of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (U.S. EPA, 1994).

<sup>l</sup> SSL is based on RfD for mercuric chloride (CAS No. 007487-94-7).

<sup>m</sup> SSL is based on dietary RfD.

**Table A-2. Generic SSLs: Default Parameters and Assumptions**

Parameter	SSL pathway		Default
	Inhalation	Migration to ground water	
<b>Source Characteristics</b>			
Continuous vegetative cover	●		50 percent
Roughness height	○		0.5 cm for open terrain; used to derive $U_{t,7}$
Source area (A)	●	○	0.5 acres (2,024 m <sup>2</sup> ); used to derive L for MTG
Source length (L)		●	45 m (assumes square source)
Source depth		○	Extends to water table (i.e., no attenuation in unsaturated zone)
<b>Soil Characteristics</b>			
Soil texture	○	○	Loam; defines soil characteristics/ parameters
Dry soil bulk density ( $\rho_b$ )	●	●	1.5 kg/L
Soil porosity (n)	●	○	0.43
Vol. soil water content ( $\theta_w$ )	●	●	0.15 (INH); 0.30 (MTG)
Vol. soil air content ( $\theta_a$ )	●	●	0.28 (INH); 0.13 (MTG)
Soil organic carbon ( $f_{oc}$ )	●	●	0.006 (0.6%, INH); 0.002 (0.2 %, MTG)
Soil pH	○	○	6.8; used to determine pH-specific $K_d$ (metals) and $K_{oc}$ (ionizable organics)
Mode soil aggregate size	○		0.5 mm; used to derive $U_{t,7}$
Threshold windspeed @ 7 m ( $U_{t,7}$ )	●		11.32 m/s
<b>Meteorological Data</b>			
Mean annual windspeed ( $U_m$ )	●		4.69 m/s (Minneapolis, MN)
Air dispersion factor (Q/C)	●		90th percentile conterminous U.S.
Volatilization Q/C	●		68.81; Los Angeles, CA; 0.5-acre source
Fugitive particulate Q/C	●		90.80; Minneapolis, MN; 0.5-acre source
<b>Hydrogeologic Characteristics</b>			
Hydrogeologic setting		○	Generic (national); surficial aquifer
Dilution/attenuation factor (DAF)		●	20

● Indicates input parameters directly used in SSL equations.

○ Indicates parameters/assumptions used to develop SSL input parameters.

INH = Inhalation pathway.

MTG = Migration to ground water pathway.

## Analysis of Effects of Source Size on Generic SSLs

A large number of commenters on the December 1994 Soil Screening Guidance suggested that most contaminated soil sources were 0.5 acre or less. Before changing this default assumption from 30 acres to 0.5 acre, the Office of Emergency and Remedial Response (OERR) conducted an analysis of the effects of changing the area of a contaminated soil source on generic SSLs calculated for the inhalation and migration to ground water exposure pathways. This analysis includes:

- An analysis of the sensitivity of SSLs to a change in source area from 30 acres to 0.5 acre
- Mass-limit modeling results showing the depth of contamination for a 30-acre source that corresponds to a 0.5-acre SSL.

All equations, assumptions, and model input parameters used in this analysis are consistent with those described in Part 2 of this document unless otherwise indicated. Chemical properties used in the analysis are described in Part 5 of this document.

In summary, the results of this analysis indicate that:

- The SSLs are not particularly sensitive to varying the source area from 30 acres to 0.5 acre. This reduction in source area lowers SSLs for the inhalation pathway by about a factor of 2 and lowers SSLs for the migration to ground water pathway by a factor of 2.9 under typical hydrogeologic conditions.
- Half-acre SSLs calculated for 43 volatile and semivolatile contaminants using the infinite source models correspond to mass-limit SSLs for a 30-acre source uniformly contaminated to a depth of about 1 to 21 meters (depending on contaminant and pathway); the average depth is 8 meters for the inhalation pathway (21 contaminants) and 11 meters for the migration to ground water pathway (43 contaminants).

**Sensitivity Analysis.** For the inhalation pathway, source area affects the Q/C value (a measure of dispersion), which directly affects the final SSL and is not chemical-specific. Higher Q/C values result in higher SSLs. As shown in Table 3 (Section 2.4.3), the effect of area on the Q/C value is not sensitive to meteorological conditions, with the ratio of a 0.5-acre Q/C to a 30-acre Q/C ranging from 1.93 to 1.96 over the 29 conditions analyzed. Decreasing the source area from 30 acres to 0.5 acre will therefore increase inhalation SSLs by about a factor of 2.

For the migration to ground water pathway, source area affects the DAF, which also directly affects the final SSLs and is not chemical-specific. The sensitivity analysis for the dilution factor is more complicated than for Q/C because increasing source area (expressed as the length of source parallel to ground water flow) not only increases infiltration to the aquifer, which decreases the dilution factor, but also increases the mixing zone depth, which tends to increase the dilution factor. The first effect generally overrides the second (i.e., longer sources have lower dilution factors) except for very thick aquifers (see Section 2.5.7).

The sensitivity analysis described in Section 2.5.7 shows that the dilution model is most sensitive to the aquifer's Darcy velocity (i.e., hydraulic conductivity  $\times$  hydraulic gradient). For a less conservative Darcy velocity (90th percentile), decreasing the source area from 30 acres to 0.5 acre increased the dilution factor by a factor of 3.1 (see Table 9, Section 2.5.7). For the conditions analyzed, decreasing the source area from 30 acres to 0.5 acre affected dilution factor from no increase to a factor of 4.3 increase. No increase in dilution factor for a 0.5-acre source was observed for the less conservative



(higher) aquifer thickness (46 m). In this case the decrease in mixing zone depth balances the decrease in infiltration rate for the smaller source.

**Mass-Limit Analysis.** The infinite source assumption is one of the more conservative assumptions inherent in the SSL models, especially for small sources. This assumption should provide adequate protection for sources with larger areas than those used to calculate SSLs. To test this hypothesis the SSL mass-limit models (Section 2.6) were used to calculate, for 43 volatile and semivolatile chemicals, the depth at which a mass-limit SSL for a 30-acre source is equal to a 0.5-acre infinite-source SSL.

The mass-limit models are simple mass-balance models that calculate SSLs based on the conservative assumption that the entire mass of contamination in a source either volatilizes (inhalation model) or leaches (migration to ground water model) over the exposure period of interest. These models were developed to correct the mass-balance violation in the infinite source models for highly volatile or soluble contaminants.

Table A-3 presents the results of this analysis. These results demonstrate that 0.5-acre infinite source SSLs are protective of uniformly contaminated 30-acre source areas of significant depth. For the 21 chemicals analyzed for the inhalation pathway, these source depths range up to 21 meters, with an average depth of 8 meters and a standard deviation of 5.7. For the migration to ground water pathway, source depths for 43 contaminants range to 21 meters, with an average of 11 meters and a standard deviation of 5.4.

## References

- U.S. EPA (Environmental Protection Agency). 1990. *Guidance on Remedial Actions for Superfund Sites with PCB Contamination*. Office of Solid Waste and Emergency Response, Washington, DC. NTIS PB91-921206CDH.
- U.S. EPA (Environmental Protection Agency). 1994. *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. Office of Solid Waste and Emergency Response, Washington, DC. Directive 9355.4-12.

**Table A-3. Source Depth where 30-acre<sup>a</sup> Mass-Limit SSLs = 0.5-acre<sup>b</sup> Infinite-Source SSLs<sup>c</sup>**

Chemical	Source depth (m)	
	Inhalation	Migration to ground water <sup>c</sup>
Acetone	NA	21
Benzene	8.1	12
Benzoic acid	NA	21
Bis(2-chloroethyl)ether	0.7	18
Bromodichloromethane	NA	13
Bromoform	0.9	11
Butanol	NA	20
Carbon disulfide	19	11
Carbon tetrachloride	11	6
Chlorobenzene	3.5	6
Chlorodibromomethane	NA	13
Chloroform	8.3	14
2-Chlorophenol	NA	4
1,2-Dichlorobenzene	NA	3
1,4-Dichlorobenzene	NA	3
1,1-Dichloroethane	9.1	15
1,2-Dichloroethane	5.6	18
1,1-Dichloroethylene	15	10
<i>cis</i> -1,2-Dichloroethylene	NA	15
<i>trans</i> -1,2-Dichloroethylene	NA	12
2,4-Dichlorophenol	NA	8
1,2-Dichloropropane	6.2	14
1,3-Dichloropropene	12	12
2,4-Dimethylphenol	NA	7
2,4-Dinitrophenol	NA	21
2,4-Dinitrotoluene	NA	11
2,6-Dinitrotoluene	NA	12
Ethylbenzene	NA	4
Methyl bromide	12	17
Methylene chloride	8.9	18
2-Methylphenol	NA	11
Nitrobenzene	0.5	13
1,1,2,2-Tetrachloroethane	1.6	11
Tetrachloroethylene	8.7	7
Toluene	NA	7
1,1,1-Trichloroethane	NA	9
1,1,2-Trichloroethane	3.4	14
Trichloroethylene	6.8	7
Vinyl acetate	4.6	20

**Table A-3. (continued)**

<b>Chemical</b>	<b>Source depth (m)</b>	
	<b>Inhalation</b>	<b>Migration to ground water<sup>c</sup></b>
Vinyl chloride	21	13
<i>m</i> -Xylene	NA	4
<i>o</i> -Xylene	NA	4
<i>p</i> -Xylene	NA	4

NA = Risk-based SSL not available.

<sup>a</sup> Q/C = 35.15; DAF = 10.

<sup>b</sup> Q/C = 68.81; DAF = 20.

<sup>c</sup> Migration to ground water mass-limit analysis based on 70-yr exposure duration and 0.18 m/yr infiltration rate.