2007 CERCLA PRIORITY LIST OF HAZARDOUS SUBSTANCES THAT WILL BE THE SUBJECT OF TOXICOLOGICAL PROFILES AND SUPPORT DOCUMENT

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY
DIVISION OF TOXICOLOGY

IN COOPERATION WITH THE
U.S. ENVIRONMENTAL PROTECTION AGENCY

DECEMBER 2007

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The 2007 PRIORITY LIST OF HAZARDOUS SUBSTANCES

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

2007 PRIORITY LIST OF HAZARDOUS SUBSTANCES

2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
1	ARSENIC	1672.58	1	007440-38-2
2	LEAD	1534.07	2	007439-92-1
3	MERCURY	1504.69	3	007439-97-6
4	VINYL CHLORIDE	1387.75	4	000075-01-4
5	POLYCHLORINATED BIPHENYLS	1365.78	5	001336-36-3
6	BENZENE	1355.96	6	000071-43-2
7	CADMIUM	1324.22	8	007440-43-9
8	POLYCYCLIC AROMATIC HYDROCARBONS	1316.98	7	130498-29-2
9	BENZO(A)PYRENE	1312.45	9	000050-32-8
10	BENZO(B)FLUORANTHENE	1266.55	10	000205-99-2
11	CHLOROFORM	1223.03	11	000067-66-3
12	DDT, P,P'-	1193.36	12	000050-29-3
13	AROCLOR 1254	1182.63	13	011097-69-1
14	AROCLOR 1260	1177.77	14	011096-82-5
15	DIBENZO(A,H)ANTHRACENE	1165.88	15	000053-70-3
16	TRICHLOROETHYLENE	1154.73	16	000079-01-6
17	DIELDRIN	1150.91	17	000060-57-1
18	CHROMIUM, HEXAVALENT	1149.98	18	018540-29-9
19	PHOSPHORUS, WHITE	1144.77	19	007723-14-0
20	CHLORDANE	1133.21	21	000057-74-9
21	DDE, P,P'-	1132.49	20	000072-55-9
22	HEXACHLOROBUTADIENE	1129.63	22	000087-68-3
23	COAL TAR CREOSOTE	1124.32	23	008001-58-9
24	ALDRIN	1117.22	25	000309-00-2
25	DDD, P,P'-	1114.83	24	000072-54-8
26	BENZIDINE	1114.24	26	000092-87-5
27	AROCLOR 1248	1112.20	27	012672-29-6
28	CYANIDE	1099.48	28	000057-12-5
29	AROCLOR 1242	1093.14	29	053469-21-9
30	AROCLOR	1091.52	62	012767-79-2
31	TOXAPHENE	1086.65	30	008001-35-2
32	HEXACHLOROCYCLOHEXANE, GAMMA-	1081.63	32	000058-89-9
33	TETRACHLOROETHYLENE	1080.43	31	000127-18-4
34	HEPTACHLOR	1072.67	33	000076-44-8
35	1,2-DIBROMOETHANE	1064.06	34	000106-93-4
36	HEXACHLOROCYCLOHEXANE, BETA-	1060.22	37	000319-85-7
37	ACROLEIN	1059.07	36	000107-02-8
38	DISULFOTON	1058.85	35	000298-04-4
39	BENZO(A)ANTHRACENE	1057.96	38	000056-55-3
40	3,3'-DICHLOROBENZIDINE	1051.61	39	000091-94-1
41	ENDRIN	1048.57	41	000072-20-8
42	BERYLLIUM	1046.12	40	007440-41-7
43	HEXACHLOROCYCLOHEXANE, DELTA-	1038.27	42	000319-86-8

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2005 PRIORITY LIST OF HAZARDOUS SUBSTANCES

2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
44	1,2-DIBROMO-3-CHLOROPROPANE	1035.55	43	000096-12-8
45	PENTACHLOROPHENOL	1028.01	45	000087-86-5
46	HEPTACHLOR EPOXIDE	1027.12	44	001024-57-3
47	CARBON TETRACHLORIDE	1023.32	46	000056-23-5
48	AROCLOR 1221	1018.41	47	011104-28-2
49	COBALT	1015.57	50	007440-48-4
50	DDT, O,P'-	1014.71	49	000789-02-6
51	AROCLOR 1016	1014.33	48	012674-11-2
52	DI-N-BUTYL PHTHALATE	1007.49	52	000084-74-2
53	NICKEL	1005.40	55	007440-02-0
54	ENDOSULFAN	1004.65	54	000115-29-7
55	ENDOSULFAN SULFATE	1003.56	53	001031-07-8
56	DIAZINON	1002.08	57	000333-41-5
57	ENDOSULFAN, ALPHA	1001.30	58	000959-98-8
58	XYLENES, TOTAL	996.07	59	001330-20-7
59	CIS-CHLORDANE	995.08	51	005103-71-9
60	DIBROMOCHLOROPROPANE	994.87	60	067708-83-2
61	METHOXYCHLOR	994.47	61	000072-43-5
62	BENZO(K)FLUORANTHENE	981.26	63	000207-08-9
63	ENDRIN KETONE	978.99	64	053494-70-5
64	TRANS-CHLORDANE	973.99	56	005103-74-2
65	CHROMIUM(VI) OXIDE	969.58	66	001333-82-0
66	METHANE	959.78	67	000074-82-8
67	ENDOSULFAN, BETA	959.19	65	033213-65-9
68	AROCLOR 1232	955.64	68	011141-16-5
69	ENDRIN ALDEHYDE	954.86	69	007421-93-4
70	BENZOFLUORANTHENE	951.48	70	056832-73-6
71	TOLUENE	947.50	71	000108-88-3
72	2-HEXANONE	942.02	72	000591-78-6
73	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	938.11	73	001746-01-6
74	ZINC	932.89	74	007440-66-6
75	DIMETHYLARSINIC ACID	922.06	75	000075-60-5
76	DI(2-ETHYLHEXYL)PHTHALATE	919.02	76	000117-81-7
77	CHROMIUM	908.52	77	007440-47-3
78	NAPHTHALENE	896.67	78	000091-20-3
79	1,1-DICHLOROETHENE	891.19	79	000075-35-4
80	METHYLENE CHLORIDE	888.96	81	000075-09-2
81	AROCLOR 1240	888.11	80	071328-89-7
82	2,4,6-TRINITROTOLUENE	883.59	82	000118-96-7
83	BROMODICHLOROETHANE	870.00	83	000683-53-4
84	HYDRAZINE	864.41	85	000302-01-2
85	1,2-DICHLOROETHANE	863.99	84	000107-06-2
86	2,4,6-TRICHLOROPHENOL	863.71	86	000088-06-2

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2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
87	2,4-DINITROPHENOL	860.45	87	000051-28-5
88	BIS(2-CHLOROETHYL) ETHER	859.88	88	000111-44-4
89	THIOCYANATE	849.21	89	000302-04-5
90	ASBESTOS	841.54	90	001332-21-4
91	CHLORINE	840.37	92	007782-50-5
92	CYCLOTRIMETHYLENETRINITRAMINE (RDX)	840.28	91	000121-82-4
93	HEXACHLOROBENZENE	838.34	93	000118-74-1
94	2,4-DINITROTOLUENE	837.88	96	000121-14-2
95	RADIUM-226	835.93	94	013982-63-3
96	ETHION	834.03	97	000563-12-2
97	1,1,1-TRICHLOROETHANE	833.81	95	000071-55-6
98	URANIUM	833.41	98	007440-61-1
99	ETHYLBENZENE	832.13	99	000100-41-4
100	RADIUM	828.07	100	007440-14-4
101	THORIUM	825.17	101	007440-29-1
102	4,6-DINITRO-O-CRESOL	822.78	102	000534-52-1
103	1,3,5-TRINITROBENZENE	820.17	103	000099-35-4
104	CHLOROBENZENE	819.69	105	000108-90-7
105	RADON	817.89	104	010043-92-2
106	RADIUM-228	816.76	106	015262-20-1
107	THORIUM-230	814.72	107	014269-63-7
107	URANIUM-235	814.72	107	015117-96-1
109	BARIUM	813.46	109	007440-39-3
110	FLUORANTHENE	812.40	113	000206-44-0
111	URANIUM-234	812.11	110	013966-29-5
112	N-NITROSODI-N-PROPYLAMINE	811.05	111	000621-64-7
113	THORIUM-228	810.36	112	014274-82-9
114	RADON-222	809.78	114	014859-67-7
115	HEXACHLOROCYCLOHEXANE, ALPHA-	809.56	116	000319-84-6
116	1,2,3-TRICHLOROBENZENE	808.41	143	000087-61-6
117	MANGANESE	807.90	115	007439-96-5
118	COAL TARS	807.07	117	008007-45-2
119	CHRYSOTILE ASBESTOS	806.68	119	012001-29-5
119	STRONTIUM-90	806.68	119	010098-97-2
121	PLUTONIUM-239	806.67	118	015117-48-3
122	POLONIUM-210	806.39	122	013981-52-7
123	METHYLMERCURY	806.39	121	022967-92-6
124	PLUTONIUM-238	806.01	123	013981-16-3
125	LEAD-210	805.90	124	014255-04-0
126	PLUTONIUM	805.23	125	007440-07-5
127	CHLORPYRIFOS	804.93	125	002921-88-2
128	COPPER	804.86	133	007440-50-8
129	AMERICIUM-241	804.55	128	086954-36-1

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2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
130	RADON-220	804.54	127	022481-48-7
131	AMOSITE ASBESTOS	804.07	129	012172-73-5
132	IODINE-131	803.48	130	010043-66-0
133	HYDROGEN CYANIDE	803.08	132	000074-90-8
134	TRIBUTYLTIN	802.61	131	000688-73-3
135	GUTHION	802.32	134	000086-50-0
136	NEPTUNIUM-237	802.13	135	013994-20-2
137	CHRYSENE	802.10	139	000218-01-9
138	CHLORDECONE	801.64	136	000143-50-0
138	IODINE-129	801.64	136	015046-84-1
138	PLUTONIUM-240	801.64	136	014119-33-6
141	S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	797.88	140	000078-48-8
142	BROMINE	789.15	142	007726-95-6
143	POLYBROMINATED BIPHENYLS	789.11	141	067774-32-7
144	DICOFOL	787.56	144	000115-32-2
145	PARATHION	784.14	145	000056-38-2
146	1,1,2,2-TETRACHLOROETHANE	782.15	146	000079-34-5
147	SELENIUM	778.98	147	007782-49-2
148	HEXACHLOROCYCLOHEXANE, TECHNICAL GRADE	774.91	148	000608-73-1
149	TRICHLOROFLUOROETHANE	770.74	149	027154-33-2
150	TRIFLURALIN	770.12	150	001582-09-8
151	DDD, O,P'-	768.73	151	000053-19-0
152	4,4'-METHYLENEBIS(2-CHLOROANILINE)	766.66	152	000101-14-4
153	HEXACHLORODIBENZO-P-DIOXIN	760.42	153	034465-46-8
154	HEPTACHLORODIBENZO-P-DIOXIN	754.47	154	037871-00-4
155	PENTACHLOROBENZENE	753.58	155	000608-93-5
156	1,3-BUTADIENE	747.31	201	000106-99-0
157	AMMONIA	745.55	156	007664-41-7
158	2-METHYLNAPHTHALENE	743.24	157	000091-57-6
159	1,4-DICHLOROBENZENE	737.32	159	000106-46-7
160	1,1-DICHLOROETHANE	736.23	158	000075-34-3
161	ACENAPHTHENE	731.25	160	000083-32-9
162	1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN	726.14	161	039001-02-0
163	1,1,2-TRICHLOROETHANE	724.96	162	000079-00-5
164	TRICHLOROETHANE	723.32	163	025323-89-1
165	HEXACHLOROCYCLOPENTADIENE	719.01	164	000077-47-4
166	HEPTACHLORODIBENZOFURAN	718.58	165	038998-75-3
167	1,2-DIPHENYLHYDRAZINE	713.90	166	000122-66-7
168	2,3,4,7,8-PENTACHLORODIBENZOFURAN	710.71	167	057117-31-4
169	TETRACHLOROBIPHENYL	709.21	168	026914-33-0
170	CRESOL, PARA-	707.83	169	000106-44-5
171	OXYCHLORDANE	706.32	170	027304-13-8
172	1,2-DICHLOROBENZENE	704.91	171	000095-50-1

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2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
173	1,2-DICHLOROETHENE, TRANS-	704.04	178	000156-60-5
174	INDENO(1,2,3-CD)PYRENE	703.30	180	000193-39-5
175	GAMMA-CHLORDENE	702.59	172	056641-38-4
176	CARBON DISULFIDE	702.55	174	000075-15-0
177	TETRACHLOROPHENOL	702.54	173	025167-83-3
178	AMERICIUM	701.62	175	007440-35-9
178	URANIUM-233	701.62	175	013968-55-3
180	PALLADIUM	700.66	177	007440-05-3
181	HEXACHLORODIBENZOFURAN	700.56	179	055684-94-1
182	PHENOL	696.96	183	000108-95-2
183	CHLOROETHANE	693.90	182	000075-00-3
184	ACETONE	693.31	181	000067-64-1
185	P-XYLENE	690.20	185	000106-42-3
186	DIBENZOFURAN	689.19	187	000132-64-9
187	ALUMINUM	688.13	186	007429-90-5
188	2,4-DIMETHYLPHENOL	685.76	189	000105-67-9
189	CARBON MONOXIDE	684.49	188	000630-08-0
190	TETRACHLOROETHANE	677.97	190	025322-20-7
191	HYDROGEN SULFIDE	676.51	193	007783-06-4
192	PENTACHLORODIBENZOFURAN	673.21	192	030402-15-4
193	CHLOROMETHANE	670.19	191	000074-87-3
194	BIS(2-METHOXYETHYL) PHTHALATE	666.08	194	034006-76-3
195	BUTYL BENZYL PHTHALATE	659.38	195	000085-68-7
196	CRESOL, ORTHO-	658.66	196	000095-48-7
197	HEXACHLOROETHANE	653.10	199	000067-72-1
198	VANADIUM	651.70	198	007440-62-2
199	N-NITROSODIMETHYLAMINE	650.71	200	000062-75-9
200	1,2,4-TRICHLOROBENZENE	647.30	203	000120-82-1
201	BROMOFORM	643.53	202	000075-25-2
202	TETRACHLORODIBENZO-P-DIOXIN	635.74	204	041903-57-5
203	1,3-DICHLOROBENZENE	631.41	205	000541-73-1
204	PENTACHLORODIBENZO-P-DIOXIN	625.12	207	036088-22-9
205	N-NITROSODIPHENYLAMINE	624.79	208	000086-30-6
206	1,2-DICHLOROETHYLENE	622.49	206	000540-59-0
207	2,3,7,8-TETRACHLORODIBENZOFURAN	622.15	210	051207-31-9
208	2-BUTANONE	620.01	209	000078-93-3
209	2,4-DICHLOROPHENOL	616.45	212	000120-83-2
210	1,4-DIOXANE	616.29	215	000123-91-1
211	FLUORINE	613.28	214	007782-41-4
212	NITRITE	612.64	216	014797-65-0
213	CESIUM-137	612.50	217	010045-97-3
214	SILVER	612.19	213	007440-22-4
215	CHROMIUM TRIOXIDE	610.85	218	007738-94-5

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2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
216	NITRATE	610.66	219	014797-55-8
217	POTASSIUM-40	608.91	220	013966-00-2
218	DINITROTOLUENE	607.65	221	025321-14-6
219	ANTIMONY	605.37	222	007440-36-0
220	COAL TAR PITCH	605.33	224	065996-93-2
221	THORIUM-227	605.32	223	015623-47-9
222	2,4,5-TRICHLOROPHENOL	604.83	225	000095-95-4
223	ARSENIC ACID	604.45	226	007778-39-4
224	ARSENIC TRIOXIDE	604.36	227	001327-53-3
225	PHORATE	603.10	228	000298-02-2
226	BENZOPYRENE	603.00	230	073467-76-2
227	CRESOLS	602.74	229	001319-77-3
228	CHLORDANE, TECHNICAL	602.62	231	012789-03-6
229	DIMETHOATE	602.61	232	000060-51-5
230	ACTINIUM-227	602.57	233	014952-40-0
230	STROBANE	602.57	233	008001-50-1
232	4-AMINOBIPHENYL	602.51	235	000092-67-1
232	PYRETHRUM	602.51	235	008003-34-7
234	ARSINE	602.42	237	007784-42-1
235	NALED	602.32	238	000300-76-5
236	DIBENZOFURANS, CHLORINATED	602.13	239	042934-53-2
236	ETHOPROP	602.13	239	013194-48-4
238	ALPHA-CHLORDENE	601.94	241	056534-02-2
238	CARBOPHENOTHION	601.94	241	000786-19-6
240	DICHLORVOS	601.64	243	000062-73-7
241	CALCIUM ARSENATE	601.45	244	007778-44-1
241	MERCURIC CHLORIDE	601.45	244	007487-94-7
241	SODIUM ARSENITE	601.45	244	007784-46-5
244	FORMALDEHYDE	599.64	247	000050-00-0
245	2-CHLOROPHENOL	599.62	248	000095-57-8
246	PHENANTHRENE	597.68	249	000085-01-8
247	HYDROGEN FLUORIDE	588.03	250	007664-39-3
248	2,4-D ACID	584.47	251	000094-75-7
249	DIBROMOCHLOROMETHANE	580.59	252	000124-48-1
250	DIURON	579.16	253	000330-54-1
251	BUTYLATE	578.43	254	002008-41-5
252	DIMETHYL FORMAMIDE	578.23	255	000068-12-2
253	PYRENE	577.95	256	000129-00-0
254	DICHLOROBENZENE	577.70	211	025321-22-6
255	ETHYL ETHER	572.47	257	000060-29-7
256	DICHLOROETHANE	570.46	258	001300-21-6
257	4-NITROPHENOL	567.79	259	000100-02-7
258	1,3-DICHLOROPROPENE, CIS-	561.82	184	010061-01-5

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2007 RANK	SUBSTANCE NAME	TOTAL POINTS	2005 RANK	CAS #
259	PHOSPHINE	559.74	260	007803-51-2
260	TRICHLOROBENZENE	557.96	261	012002-48-1
261	2,6-DINITROTOLUENE	555.20	262	000606-20-2
262	FLUORIDE ION	549.64	263	016984-48-8
263	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	547.90	264	035822-46-9
264	METHYL PARATHION	545.83	265	000298-00-0
265	PENTAERYTHRITOL TETRANITRATE	545.59	266	000078-11-5
266	1,3-DICHLOROPROPENE, TRANS-	543.37	267	010061-02-6
267	BIS(2-ETHYLHEXYL)ADIPATE	540.20	268	000103-23-1
268	CARBAZOLE	534.52	269	000086-74-8
269	METHYL ISOBUTYL KETONE	533.24	271	000108-10-1
270	1,2-DICHLOROETHENE, CIS-	533.15	270	000156-59-2
271	STYRENE	532.70	272	000100-42-5
272	CARBARYL	530.98	273	000063-25-2
273	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	529.45	274	067562-39-4
274	ACRYLONITRILE	528.28	275	000107-13-1
275	1-METHYLNAPHTHALENE	526.51	NEW	000090-12-0

Substances were assigned the same rank when two (or more) substances received equivalent total point scores.

CAS # = Chemical Abstracts Service Registry Number

2
BACKGROUND

2. BACKGROUND

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act (SARA), establishes certain requirements for the Agency for Toxic Substances and Disease Registry (ATSDR) and the Environmental Protection Agency (EPA) with regard to hazardous substances that are most commonly found at facilities on the CERCLA National Priorities List (NPL). Section 104(i)(2) of CERCLA, as amended (42 U.S.C. 9604[i][2]), required that the two agencies prepare a list, in order of priority, of at least 100 hazardous substances that are most commonly found at facilities on the NPL and which, in their sole discretion, are determined to pose the most significant potential threat to human health due to their known or suspected toxicity to humans and the potential for human exposure to such substances (see 52 FR 12866, April 17, 1987).

CERCLA also required the agencies to revise the priority list to include 100 or more additional hazardous substances (see 53 FR 41280, October 20, 1988), and to include at least 25 additional hazardous substances in each of the three successive years following the 1988 revision (see 54 FR 43619, October 26, 1989; 55 FR 42067, October 17, 1990; 56 FR 52166, October 17, 1991). CERCLA also requires that ATSDR and EPA thereafter revise the list at least once a year to include additional hazardous substances that are determined to pose the most significant potential threat to human health. However, in 1995, the two agencies decided to alter the publication schedule of the priority list by moving to a 2-year publication schedule, reflecting the stability of this listing activity (see 60 FR 16478, March 30, 1995). As a result, the priority list is now on a 2-year publication schedule, with a yearly informal review and revision. Each substance on the CERCLA Priority List of Hazardous Substances is a candidate to become the subject of a toxicological profile prepared by ATSDR and subsequently a candidate for the identification of priority data needs.

The first priority list of 100 substances was published in the *Federal Register* on April 17, 1987 (52 FR 12866), that included a summary of the procedure used by ATSDR and EPA to compile the list. In that notice, the agencies solicited public comments on the approach adopted to evaluate and rank hazardous substances found at NPL sites. The agencies announced the intention to refine the listing process in response to these comments, and to continue to improve the listing process.

A second priority list of 100 additional substances was published on October 20, 1988 (53 FR 41280), and the revised procedure used to prepare the second priority list was summarized. For the most part, the same procedure was used to generate the third and fourth lists of 25 substances each (54 FR 43619, October 26, 1989; and 55 FR 42067, October 17, 1990).

The initial (1987-1990) priority lists of hazardous substances were based on the most comprehensive and relevant information available when the lists were developed. More comprehensive sources of information on the frequency of occurrence and the potential for human exposure to substances at NPL sites became available with the development of ATSDR's Hazardous Substance Release/Health Effects Database (HazDat). This database became available for agency use in early 1991 and contains information from public health assessments, site files, health consultations, toxicological profiles, and health studies, as well as other information. ATSDR developed this scientific and administrative database as a repository for information on hazardous substances found at NPL and non-NPL waste sites or emergency events and on the potential health effects of hazardous substances on human populations. Utilizing this database, ATSDR and EPA developed a revised approach and algorithm for ranking substances, and a notice announcing their intention to revise and rerank the Priority List of Hazardous Substances was published on June 27, 1991 (56 FR 29485). Subsequently, the 1991 priority list and the approach used to generate it were published in the *Federal Register* on October 17, 1991 (56 FR 52166).

Using the same approach and the same algorithm from the 1991 listing activity, subsequent priority lists of hazardous substances were developed and notices were published on October 28, 1992 (57 FR 48801), February 28, 1994 (59 FR 9486), April 29, 1996 (61 FR 18744), November 17, 1997 (62 FR 61332), October 21, 1999 (64 FR 56792), October 25, 2001 (66 FR 54014), November 7, 2003 (68 FR 63098), December 7, 2005 (70 FR 72840). This year's 2007 Priority List of Hazardous Substances used additional information entered into ATSDR's HazDat database since development of the 2005 priority list. The site-specific information from HazDat that is used in the listing activity has been collected from ATSDR public health assessments and health consultations, and from site file data packages used to develop public health assessments. The new information includes more recent NPL frequency of occurrence data, additional concentration data, and more information on exposure to substances present at NPL sites. A total of 859 candidate substances have been evaluated this year to create the priority list of 275 substances.

2.1 Listing Activity Workgroup

During the initial development of the current algorithm, a listing activity workgroup was created. For the 1991 and 1992 listing activities, the workgroup consisted of members of the divisions and offices of ATSDR, as well as representatives from the EPA (Office of Water, Office of Pollution Prevention and Toxic Substances, and Office of Emergency and Remedial Response) and the Centers for Disease Control and Prevention (National Center for Environmental Health [NCEH]).

In the summer of 1991, workgroup members met and discussed potential sources of information for the revised priority list and identified practical sources of information for the 1991 listing activity. The workgroup formulated the strategies for development of preliminary reports to assess the extent of data available in various databases, developed the scoring scheme for the subcomponents of the algorithm, and determined the weight assigned to subcomponents in calculating the total score in the ranking algorithm.

The workgroup also reviewed the toxicity/environmental scores (TESs) developed for substances lacking reportable quantities (RQs). After the 1991 list was developed, the workgroup members reviewed the list before releasing it to the public in October 1991. In the spring of 1992, the workgroup reconvened and discussed public comments received on the 1991 priority list. The workgroup decided, on the basis of favorable public comment, that the algorithm used for the 1991 list would again be used to develop the 1992 Priority List of Hazardous Substances.

Workgroup members met again in the summer of 1992 to discuss the toxicity scores assigned to new substances identified as candidates for the 1992 list. At that time, the workgroup discussed new HazDat data entered into the system since the 1991 priority list and were briefed on the efforts under way in the ATSDR Division of Toxicology to use this new information in the 1992 activity. There was no formal workgroup meeting for the 1993 listing activity because all formulations and strategies developed in 1991 and reviewed in 1992 were used to generate the 1993 Priority List of Hazardous Substances.

In the summer of 1994, the listing activity workgroup met once again to review the performance of the current algorithm used to develop the priority list and determine if any enhancements could be made to enrich the listing process. Many analyses of the listing parameters were performed and presented to the workgroup. As a result, a modification was made to the point assignment calculations for the source contribution component (see Section 3.4.1.5). The workgroup also discussed issues pertaining to the development of an algorithm to be used to generate a priority list of hazardous substances at U.S. Department of Energy NPL sites. This workgroup consisted of participants from the four divisions within ATSDR, NCEH and EPA.

It was stated in previous issues of this Support Document that refinements will be made to this listing process where possible, and that ATSDR intended to develop a strategy to better assess the toxicity of radionuclides for listing purposes. In 2001, a revised strategy was implemented to better assess the toxicity of radionuclides to provide more comparative values and consistency in this activity. Refer to Section 3.3.3.5 of this document for details on this revision.

2.2 Sources of Information Used in the Development of the Priority List

The priority lists of hazardous substances developed before 1991 were based on the most comprehensive and relevant information available when the lists were developed. Sources of information used in listing activities before 1991 are described in Table 1.

Table 1. Sources of Information for Previous Listing Activities (pre-1991)

Type of Information	Source	Limitations
Frequency of Occurrence at NPL Sites	Contract Laboratory Program (CLP) Statistical Database	Limited to target analytes. Frequency of occurrence tends to vary significantly only for the most frequently detected substances.
	Hazard Ranking System (HRS) Database	Only 15 substances of concern per site are listed.
	Special Analytical Services (SAS) Database	Only those substances with 5 or more requests are included.
Toxicity	EPA Reportable Quantity (RQ) Methodology	Not established for all substances.
Potential for Human Exposure	Contract Laboratory Program (CLP) Statistical Database	Limited concentration data.
	National Priorities List (NPL) Technical Database	Indirect information; frequency used as correlate of exposure potential.
	National Human Adipose Tissue Survey (NHATS)	Indirect information; applies to general population.
	U.S. Dept. of Transportation, Hazardous Materials Information System (DOT/HMIS)	Indirect information on releases on U.S. highways.
	Acute Hazardous Events (AHE) Database	Indirect information; industrial spill/accident information for U.S.
	National Response Center (NRC) Database	Indirect information; contains non-NPL information on releases greater than RQ.
	Removal Tracking System (RTS)	Indirect information; only includes substances that triggered clean-up activities.
	NEXIS Newswire Reports	Indirect information; applies to general population.

After reviewing and considering a number of information sources, the 1991 listing workgroup chose the sources shown in Table 2 for use in developing the priority list. The sources of information described in Table 2 were regarded by the workgroup as those representing the most comprehensive, reliable, and readily accessible data for developing the 1991 Priority List of Hazardous Substances. These information sources were retained for use in developing all subsequent priority lists of hazardous substances.

Table 2. Sources of Information Used in Development of the 2007 Priority List of Hazardous Substances

Type of Information	Source	Advantages
Frequency of Occurrence at NPL Sites	HazDat site file and public health assessment information	Substances not limited to CLP target analytes.
Toxicity	Reportable Quantity (RQ)	Well-established method for toxicity scoring.
	Toxicity/ Environmental Score (TES)	Provides consistency by basing toxicity scores for substances lacking RQs on the RQ methodology.
Potential for Human Exposure	HazDat concentration data	Data not limited to CLP target analytes. Ability to specify media to be included.
	HazDat data on exposure status of populations	Provides evidence of human exposure based on information in ATSDR public health assessments and health consultations.

3
METHODOLOGY USED IN THE GENERATION OF THE 2007 PRIORITY LIST OF HAZARDOUS SUBSTANCES

3. METHODOLOGY USED IN THE GENERATION OF THE PRIORITY LIST

3.1 OVERVIEW

The ranking of hazardous substances on the priority list is based on three criteria, which are combined to result in the total score. The three criteria are:

- FREQUENCY OF OCCURRENCE AT NPL SITES - ATSDR's HazDat database is the source of data for the frequency of occurrence of substances at NPL hazardous waste sites or facilities. Presence in at least one environmental medium per NPL site constitutes one occurrence (see Section 3.2).

- TOXICITY - If available, final Reportable Quantities (RQs) are used to assess the toxicity of candidate substances during the listing activity. If a final RQ is not available, the RQ methodology is applied to candidate substances to establish a Toxicity/Environmental Score (TES). This process is only used in scoring the substances with respect to their toxicity, and does not represent regulatory amounts (see Section 3.3).

- POTENTIAL FOR HUMAN EXPOSURE - The exposure component is based on two parts: the concentration of the substances in environmental media and the exposure status of populations. HazDat serves as the source of this information. HazDat contains concentration data and exposure information obtained from ATSDR public health assessments and health consultations (see Section 3.4).

Using these three criteria, the hazard potential of each candidate substance was ranked according to the following algorithm:

TOTAL SCORE	=	*NPL FREQUENCY*	+	*TOXICITY*	+	*POTENTIAL FOR HUMAN EXPOSURE*
(1,800 *max. points*)		(600 *points*)		(600 *points*)		(300 *conc. pts.*) + (300 *exposure pts.*)

Substances were ordinally ranked on the basis of their total score. Appendix A provides a summary report of the 2007 priority list in rank order. Appendices E and F, respectively, provide alphabetical and Chemical Abstracts Service (CAS) number sorts of the 2007 Priority List.

3.1.1 Criteria for Inclusion on the Priority List

Substances considered for the 2007 priority list of hazardous substances came from the universe of substances present at NPL sites, as indicated in HazDat from either health assessment or site file information. Currently, approximately 3,300 uniquely identifiable substances are found at hazardous waste sites according to HazDat. Only those substances found at three or more NPL sites were considered for the priority list; 859 substances were found at three or more sites.

The list of candidate substances was reviewed to identify petroleum-related substances. Substances of petroleum origin are regulated by legislation other than CERCLA [see CERCLA Section 101(14)]; and therefore, are excluded from becoming potential toxicological profile candidates under CERCLA. These substances were assigned TES values of zero and total point scores of -1 to place them at the bottom of the list of candidate substances. Appendix J lists these substances.

3.2 DETERMINATION OF THE FREQUENCY OF OCCURRENCE CRITERION

3.2.1 Overview

ATSDR's HazDat database was selected as the source of data for the frequency of occurrence of substances at NPL hazardous waste sites or facilities. The sources of HazDat site-specific information include ATSDR public health assessments and health consultations, and other site-specific documents submitted to ATSDR by EPA, state agencies, and other parties. HazDat has information on approximately 1,664 sites that have been proposed for, listed on, or delisted from the NPL.

HazDat contains information on substances found in various environmental media. The number of NPL sites at which a substance was identified in any environmental medium in health assessment or site-file documents was used to indicate the frequency of occurrence. Contaminants included in HazDat are substances identified in the ATSDR site files as having been positively identified at the site as a result of chemical analyses (i.e., at concentrations above the limits of detection), inventories, or other documentation collected during the ATSDR health assessment process. Substances identified in documents as "Tentatively Identified Compounds" (TICs) are not included in ATSDR's HazDat system and, therefore, were not considered in the determination of frequency-of-occurrence for the priority list. Presence of a substance in at least one environmental medium per NPL site constitutes one occurrence.

3.2.2 Frequency of Occurrence Scoring

The frequency-of-occurrence component of the algorithm was assigned a maximum score of 600 points. These points were distributed between the maximum and minimum frequencies, with the maximum frequency receiving 600 points. Lead had the highest frequency of 1,238 and therefore received 600 frequency points. The assignment of points for the remainder of substances was calculated using the following formula:

$$\frac{\textit{Current substance's frequency}}{\textit{Maximum frequency}} \times 600$$

For example, if a substance's NPL frequency = 840; then its frequency points = (840/1,238) x 600 = 407.

This method of point assignment was used in an effort to scale the measured frequency values into the allotted point range of 1-600, while maintaining their proportional relationship. As mentioned in Section 3.1.1, only those substances found at three or more NPL sites were considered for the priority list.

3.3 DETERMINATION OF THE TOXICITY COMPONENT

3.3.1 Overview

The Reportable Quantity (RQ) approach has continued to be used as the toxicity hazard scoring system for several reasons. This approach provides the most complete characterization of toxicity of all hazard scoring systems reviewed; other schemes were more limited in either the consideration of different types of toxic effects, severity of effects, or potency. In addition, toxicity data used in the RQ approach are derived from primary peer-reviewed literature, and RQs have already been established for the majority of substances that are frequently detected at hazardous waste sites. Moreover, the determination of RQ health effect values uses weight-of-evidence considerations in evaluating data.

The reportable quantity ranking scheme was developed by EPA to set RQs for hazardous substances as required by CERCLA. Section 103(a) of CERCLA, requires any person in charge of a vessel or an offshore or onshore facility from which a hazardous substance has been released in a quantity that equals or exceeds its RQ must immediately notify the National Response Center and state and local response authorities of the release. RQs are developed for individual chemicals and for waste streams that have already been designated as hazardous substances under CERCLA, Section 101(14).

Each CERCLA hazardous substance is assigned to one of five tiered RQ categories (1, 10, 100, 1,000, and 5,000 pounds) on the basis of acute toxicity, chronic toxicity, carcinogenicity, aquatic toxicity, and ignitability and reactivity. RQs are determined separately for each criterion; the lowest of these is selected as the RQ for the substance, subject to adjustment for potential hydrolysis, photolysis, or biodegradation in the environment. The RQ scoring scheme is described in the following four *Federal Register* notices: 50 FR 13456, April 4, 1985; 51 FR 34534, September 29, 1986; 52 FR 8140, March 16, 1987; 54 FR 35988, August 30, 1989.

The RQ methodology was applied for those candidate substances without final CERCLA RQs in order to establish a Toxicity/Environmental Score (TES). These scores were developed for use only in the ranking methodology and *do not* represent regulatory amounts. TESs have been assigned to more than 450 candidate substances. Substances that received a TES greater than 5,000 (using the RQ methodology) were dropped to the bottom of the candidate list because of their lack of known toxicity and received a rank of #712 and a total score of zero points. A breakdown of the TESs developed for candidate substances is provided in Appendix B. An overview of the toxicity scoring methodology is provided in Appendix C.

3.3.2 Sources of Information Used To Determine the Toxicity/Environmental Score (TES)

Several sources of information on toxicity, reactivity/ignitability, and environmental fate have been used to determine the TESs for substances lacking RQs. In the past and currently, the National Library of Medicine (NLM) online databases are one of the main sources of information. These databases include the Hazardous Substances Data Bank (HSDB), the Registry of Toxic Effects of Chemical Substances (RTECS), Chemical Carcinogenesis Research Information System (CCRIS), Integrated Risk Information System (IRIS), and TOXicology Information OnLINE (Toxline). In addition, EPA's ECOTOXicology database (ECOTOX) is also currently used. In the past, DIALOG online database files were used, as well as the following reference texts:

Sax I. 1984. *Dangerous properties of industrial materials.* 6th ed. New York: Van Nostrand Reinhold Company.

Sittig M. 1985. *Handbook of toxic and hazardous chemicals and carcinogens.* 2nd ed. Park Ridge, NJ: Noyes Publications.
Windholz M, editor. 1983. *The Merck Index.* 10th ed. Rahway, NJ: Merck and Company, Incorporated.

In 1996, the TESs and RQs for the candidate substances was reviewed. For this effort, NLM databases containing toxicity information for the substances were reviewed, along with the AQUIRE database (now part of ECOTOX). The purpose of this review was to determine if any new toxicity information had become available since the substances were first evaluated (most in 1991). As a result, a number of substances had their toxicity values (RQs or TESs) revised to reflect any additional information.

3.3.3 Assumptions Used in Determining the Toxicity/Environmental Score

3.3.3.1 Ignitability/Reactivity. Where no specific values were found to express potential for ignitability/reactivity, professional judgement was applied. For example, if a substance was classified as extremely flammable, but no flash point was given, a score of 10 was assigned for the ignitability/reactivity component. Similarly, if no information was found to indicate the substance was ignitable or reactive, the substance was assigned a score of >5,000 for this component of the TES.

3.3.3.2 Aquatic Toxicity. Specific aquatic toxicity data were lacking for many substances. In some of these cases, Sax (1984) was used to assess aquatic toxicity. The standard method of reporting aquatic toxicity in this text provides a range of toxicity without identifying the test species. Seventy-five percent of the maximum value was used for the aquatic toxicity component (for example, if the range was 100-1,000, the LC_{50} value used was 750) for substances that lacked any other source of aquatic toxicity information.

3.3.3.3 Chronic Toxicity. Some substances lacked chronic toxicity data in the NLM online databases, but were mentioned in HSDB or Sax as having developmental or reproductive effects at a specified dose. For these substances, the developmental or reproductive effects were used to assess the chronic toxicity component because these effects are given the highest effect ranking (R_e in the RQ methodology) and potentially occur, regardless of duration of exposure.

3.3.3.4 Carcinogenicity. Substances classified by EPA or the International Agency for Research on Cancer (IARC) in cancer classification groups A, B, or C were assigned TES scores of 1, 10, or 100, respectively. Substances with limited evidence of carcinogenicity in animals, but not classified by IARC or EPA for carcinogenicity, were assigned a TES score of 100. Substances with evidence of carcinogenicity in animals, but noted in the data source as "lacking sufficient evidence for carcinogenicity" by EPA or IARC were not evaluated for carcinogenicity (group D - insufficient evidence). Substances for which no information on carcinogenicity could be located were not evaluated for carcinogenicity.

3.3.3.5 Radionuclides. The RQs for radionuclides are expressed in curies (seven tiered categories), whereas other RQs are expressed in pounds. Before 2001, all radionuclides were assigned a TES of 1 and received the highest number of toxicity points, based on the potential carcinogenicity associated with exposure to various types of radiation. However, in 2001, a reassessment and revision was made to the toxicity scores for radionuclides for purposes of developing this priority list. To provide comparative values and consistency in this activity, the 7 tiered categories of radionuclide RQs (in curies) are now distributed into the toxicity point scale (see Section 3.3.4) so that the most harmful radionuclides receive the highest number of toxicity points and the less harmful radionuclides receive a lower number of toxicity points. Radionuclides with an RQ equal to 0.001 curie, 0.01 curie, or 0.1 curie still receive a TES of 1 and receive the highest number of 600 points for the toxicity component.

Radionuclides with an RQ equal to 1 curie receive a TES of 10 (400 toxicity points); 10 curies receive a TES of 100 (178 toxicity points); 100 curies receive a TES of 1,000 (53 toxicity points); and 1,000 curies receive a TES of 5,000 (10 toxicity points). This method of point assignment should allow the list to distinguish between the more harmful radionuclides (such as plutonium-238) and less harmful radionuclides (such as krypton-85).

3.3.3.6 Naturally Occurring Elements. TESs for several of the naturally occurring elements were based on values for the ionized forms of the element rather than the "pure" element because the ionized forms are those most likely to be found in environmental media. Substances for which this approach was used are presented in Table 3.

The RQ for phosphorus was not adjusted because of concern in the workgroup that pure phosphorus might in fact be found at certain sites. ATSDR recognizes the uncertainty in assigning TESs to naturally occurring inorganic substances.

Table 3. Substances with TESs Based on Ionized Forms

CAS Number	Chemical Name	CAS Number	Chemical Name
7439-95-4	Magnesium	7440-09-7	Potassium
7440-23-5	*Sodium	7440-24-6	Strontium
7440-46-2	Cesium	7440-67-7	Zirconium
14808-79-8	Sulfate	16887-00-6	Chloride

*EPA RQ was adjusted to reflect the toxicity of the ionic form most likely found under environmental conditions.

3.3.3.7 Substances Lacking Data. For several substances, essentially no relevant information was located. In these cases, TESs were assigned based on the RQs for structurally related substances (see Appendix B; TES=RQ column).

3.3.4 Toxicity Component Scoring

Various methods to assign points to the TES/RQ values were discussed and evaluated. The assignment of a "log scale" scoring system resulted in overemphasis of those substances that received an RQ or TES of 1 or 10, which overshadowed the other two components of the algorithm (NPL frequency and potential for human exposure) and tended to rank substances solely by their RQ or TES value. A scoring system using a 2/3 cumulative exponential decay was selected as the scoring method for the toxicity component of the priority list. Using this scoring system, the toxicity points value is equal to 2/3 raised to the exponent of the cumulative ordinal rank, multiplied by 600 (the highest value for the toxicity points = 600). The point assignments are presented in Table 4.

Table 4. Toxicity Component Scoring

Reportable Quantity or Toxicity/Environmental Score	Ordinal Rank	Cumulative Ordinal Rank (COR)	2/3 Raised to Exponent of COR	Toxicity Points ($2/3^{COR}$ x 600)
1	0	0	1.0000	600
10	1	1	0.6667	400
100	2	3	0.2963	178
1,000	3	6	0.0878	53

5,000	4	10	0.0173	10

3.4 DETERMINATION OF THE POTENTIAL FOR HUMAN EXPOSURE COMPONENT

In the approach for the priority list of hazardous substances, the most useful and directly relevant data to assess the potential for human exposure to hazardous substances at NPL sites were identified. The exposure component of the algorithm is based on two factors: concentrations of the substances in environmental media and exposure status of populations as described in ATSDR health assessments or consultations. These two parts of the potential-for-human-exposure portion of the algorithm were assigned a maximum of 300 points each. If no concentration or exposure data were available for the substance, no points were assigned.

3.4.1 Concentrations of the Substances in Environmental Media

3.4.1.1 Overview. To provide a means of ranking substances based on concentration data, the following formula for calculating a relative source contribution (SC) was used.

$$SC = \frac{(\overline{C_a}A_a) + (\overline{C_w}A_w) + (\overline{C_s}A_s)}{RQ \text{ or } TES}$$

Where $\overline{C_x}$ = geometric mean of maximum concentrations of the substance in a particular environmental medium (a = air, w = water, s = soil); A_x = standard exposure assumption for the particular environmental medium to approximate a theoretical daily dose to humans (e.g., 1 liter of drinking water consumed per day - see Section 3.4.1.4); and RQ or TES = the Reportable Quantity or Toxicity/Environmental Score for the substance.

The calculation of the source contribution was included in the methodology to distinguish between those substances that occur at low concentrations but are highly toxic and those substances that occur at higher concentrations but are relatively less toxic.

Note: Because of the complexity and uncertainty associated with calculating a daily dose for radioactive substances and asbestos compounds, source contribution values were not calculated for these substances.

3.4.1.2 Source of Concentration Data. HazDat served as the source of concentration data for NPL site contaminants. HazDat contains concentration data for hazardous substances that are documented in ATSDR health assessments and health consultations for NPL (as well as non-NPL) hazardous waste sites. The concentration data in HazDat represent the maximum concentration found in a particular environmental medium at a specific site. Concentrations were converted to standard units for calculating the estimated daily dose. The media and submedia used as sources of concentration data are presented in Table 5.

Table 5. Types of Media Used as Sources of Concentration Data

Media Type	Submedia
Water	Groundwater, public
	Groundwater, private
	Groundwater, unspecified
	Surface water (lakes, streams, ponds, etc.)
	Surface water, unspecified
Soil	Top soil
	Subsurface soil
	Soil, unspecified
Air	Air, outdoor
	Air, indoor
	Air, unspecified
	Air, personal monitoring

3.4.1.3 Calculation of the Geometric Mean of Maximum Concentrations. Since the concentration data in HazDat represent the maximum concentration found per environmental medium, the geometric mean calculated in this process represents the geometric mean of the maximum concentrations found per medium. Substances were evaluated per environmental medium, and the geometric mean for these maximum concentrations was calculated for all water, soil, or air data across all sites.

The geometric mean was chosen over other methods to calculate mean concentration because the geometric mean provides a reliable estimate of average concentration and attenuates distortion of the average by extreme outlying values. Units for geometric mean concentration were converted to milligrams per kilogram (mg/kg) for soil concentrations, milligrams per liter (mg/L) for water concentrations, and milligrams per cubic meter (mg/m^3) for air concentrations. Particulates were converted from parts per million (ppm) using molecular weight of substance in the calculation. Conversion to standard units per medium allowed a comparison of all substances under consideration for the priority list.

3.4.1.4 Calculation of Theoretical Daily Dose. The exposure assumptions for children (1 liter of water consumed per day, 200 milligrams of soil ingested per day, and 15 cubic meters of air breathed per day) were used to assist in the determination of a theoretical daily dose. These exposure

assumptions were multiplied by the geometric mean concentration for their respective media, and then added together to determine the theoretical daily dose. The theoretical daily dose is equal to the numerator of the source contribution formula (see Section 3.4.1.1).

3.4.1.5 Source Contribution Scoring. This component received 300 maximum points. The source contributions (SC) were scored according to their natural logarithms. In order to achieve a better distribution of the source contribution data, a normal-distribution approach was used. In this approach, a two-standard deviation "cutoff" is imposed, so that values above or below this cut-off receive 300 or 0 points, respectively, for this component (see Table 6). This allows for better discrimination of the individual data points; the 95% of the data within two standard deviations of the mean is more widely distributed across the 300 points that are available. This approach also ensures that average values fall in the center of the distribution, and prevents a particularly low or high outlier from drawing the average away from the center. The points are assigned using the following formula:

$$\frac{(\ln \text{Min. SC Cutoff} - \ln \text{current substance's SC})}{(\ln \text{Min. SC Cutoff} - \ln \text{Max. SC cutoff})} \times 300$$

Logarithms were used in order to retain discriminatory ability across the wide range of source contributions.

Table 6. SC Average and Cutoffs

SC Average	Min. SC Cutoff	Max. SC Cutoff
3.32E-4	6.77E-8	1.63

3.4.2 Exposure Status of Populations

3.4.2.1 Overview. Information concerning documented exposure or potential exposure to a particular substance, or to environmental media in which a substance was found was also used in the exposure component. In this component, the number of reported occurrences of exposure to a substance, or exposure or potential exposure to any media containing a substance, were counted. HazDat provides information obtained from ATSDR health assessments and health consultations on exposure or potential exposure to specific substances and to media, such as drinking water, in which substances have been reported. Substances were scored differentially with respect to identification of exposure to a particular *substance,* or of exposure or potential exposure to an *environmental medium* containing the substance (see Table 7).

3.4.2.2 Exposure Status Scoring. Exposures were broken down into three categories; the assignment of points to each of these categories is presented in Table 7. Information on all the exposure categories was assessed. If there were positive occurrences in Category 1 (exposure to contaminant), then that category was considered the prevailing exposure and the substance was scored on the basis of that exposure status. If there were no occurrences in Category 1, then Category 2 (exposure to medium containing contaminant) was used to assign exposure points; if there were no occurrences in Category 1 or 2, then Category 3 was used.

A maximum of 300 points was possible for this part of the algorithm. Points within each category were distributed from the highest to the lowest exposure instances, with the maximum exposure receiving 300 points. Lead had the highest exposure in Category 1 of 521, and therefore received

300 exposure points. The assignment of points for the remainder of substances was calculated using the following formula:

$$\frac{\text{Current substance's exposure}}{\text{Maximum exposure}} \times (\text{Max. allowed points} - \text{Min. allowed points}) + \text{Min. allowed points}$$

The Max. and Min. allowed points correspond to the specific prevailing category for the substance (see Table 7). For example, if a substance's prevailing exposure (from Category 1) equals 159, then its exposure points = [(159/521) x 100] + 200 = 231.

Table 7. Exposure Status Scoring

Exposure Status	Point Range Assignment
(1) Exposure to Contaminant	300 - 200
(2) Exposure to Medium Containing Contaminant	200 - 100
(3) Potential Exposure to Medium Containing Contaminant	100 - 1

Note that the design of the algorithm effectively causes high scores to be unlikely to appear in Category 2 or 3. This is because a substance that is found in numerous media pathways at numerous sites is also likely to have occurrences of exposure to the substance (Category 1). Thus, its Category 1 score prevails over its Category 2 or Category 3 score, as discussed. Due to this "masking" effect, only substances with exposure via media at a few sites have Category 2 or 3 scores that are not masked by Category 1 occurrences. Thus, exposure point scores based on Category 2 or 3 data alone are on the low end of the range of points available for those two categories. This effect on the point score is appropriate, because the documented existence of exposure to a substance (Category 1) is a considerably more reliable measure of exposure than indicators based solely on the inferred possibility of exposure via media (Categories 2 and 3).

4
REVISIONS TO THE PRIORITY LIST

4. REVISIONS TO THE PRIORITY LIST

4.1 Substances No Longer on the Priority List of Hazardous Substances

A list of substances that appeared on the 2005 priority list but not included on the 2007 priority list of 275 hazardous substances, is presented in Appendix K. These substances did not meet the criteria for inclusion on the priority list as a result of the use of the most recent information on the toxicity and presence of substances at NPL sites. ATSDR acknowledges that the listing of substances to develop toxicological profiles is not an absolute process. ATSDR's intention is to provide a list of substances of sufficient length to predict future directions in the profile development process, while ensuring that the list does not become too lengthy to manage and monitor. The substances in Appendix K will not be considered for development of toxicological profiles at this time, unless a profile is developed for related forms of the substance that are included on the priority list.

4.2 Future Revisions to the Priority List of Hazardous Substances

The next priority list will be published in 2009 and will include further refinements, where possible. In addition, new sources of information on NPL frequency, toxicity, and potential for human exposure will be evaluated as they become available and will be considered in the development of future priority lists of hazardous substances.

Since HazDat is a dynamic database, information on contaminants found at hazardous waste sites is continually being added to the system as new data become available. New site, health assessment, and consultation data will continue to be added as sites are identified and health assessments and consultations are completed. These data are reviewed and quality assurance procedures are performed before the data are incorporated into HazDat.

II. SUBSTANCES MOST FREQUENTLY FOUND IN COMPLETED EXPOSURE PATHWAYS AT HAZARDOUS WASTE SITES

II. SUBSTANCES MOST FREQUENTLY FOUND IN COMPLETED EXPOSURE PATHWAYS AT HAZARDOUS WASTE SITES

ATSDR's Division of Toxicology and Environmental Medicine publishes the following Completed Exposure Pathway Site Count Report (CEP Site Count Report) along with the CERCLA Priority List of Hazardous Substances. A completed exposure pathway (CEP) is an exposure pathway that links a contaminant source to a receptor population. The CEP ranking presented here is based on a site frequency count, and thus lists the number of sites at which a substance has been found in a CEP. ATSDR's HazDat database contains this information, which is derived from ATSDR's public health assessments and consultations. Since this CEP report focuses on documented exposure, it provides an important prioritization based on substances to which people have been exposed.

This CEP ranking is very similar to a subcomponent in the CERCLA priority list algorithm called "Exposure to Contaminant". This subcomponent is part of the potential-for-human-exposure component of the listing algorithm, and is an incident count of substances in a completed exposure pathway. An incident count, rather than a site count, is more appropriate for the priority list because it adds more discrimination to the less frequent substances on the list. Another difference between the two exposure counts is that since the priority list is mandated by CERCLA, it only uses data from sites on the CERCLA National Priorities List (NPL), whereas this CEP ranking uses data from all sites in HazDat.

Substances on the CEP list are similar to the substances on the CERCLA Priority List of Hazardous Substances. However, some substances frequently found in CEPs have a very low toxicity (e.g., sodium). These low toxicity substances are not on the CERCLA priority list because it incorporates three different components – toxicity, frequency of occurrence, and potential for human exposure – to determine its priority substances. Thus, because of their low toxicity, these substances are not on the CERCLA priority list and consequently are not the subject of toxicological profiles.

Note:
Unlike the CERCLA priority list, the CEP report also includes substance groups, process wastes, and other environmental hazards that have been identified at hazardous waste sites, but that do not have a Chemical Abstracts Service Registry Number (CAS number). Substances without CAS numbers have been excluded from the CERCLA priority list in order to focus the development of toxicological profiles on well-identified substances. Substances without CAS numbers appear on this report with a "pseudo-CAS number" assigned by ATSDR that begins with "HZ" and serves as a unique identifier for the particular substance.

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

2007 COMPLETED EXPOSURE PATHWAY SITE COUNT REPORT

Rank	Substance Name	Total Sites	NPL Sites	CAS Number
1	LEAD	476	284	007439-92-1
2	ARSENIC	405	231	007440-38-2
3	TRICHLOROETHYLENE	391	301	000079-01-6
4	TETRACHLOROETHYLENE	309	219	000127-18-4
5	BENZENE	242	147	000071-43-2
6	CADMIUM	236	151	007440-43-9
7	CHROMIUM	216	138	007440-47-3
8	MERCURY	189	100	007439-97-6
9	VOLATILE ORGANIC COMPOUNDS N.O.S.	185	124	HZ1900-01-T
10	POLYCHLORINATED BIPHENYLS	184	117	001336-36-3
11	MANGANESE	180	101	007439-96-5
12	ZINC	170	102	007440-66-6
13	COPPER	165	96	007440-50-8
14	BENZO(A)PYRENE	139	68	000050-32-8
15	1,1,1-TRICHLOROETHANE	134	108	000071-55-6
16	CHLOROFORM	126	93	000067-66-3
17	ANTIMONY	124	80	007440-36-0
17	NICKEL	124	75	007440-02-0
19	1,1-DICHLOROETHENE	122	98	000075-35-4
19	VINYL CHLORIDE	122	95	000075-01-4
21	POLYCYCLIC AROMATIC HYDROCARBONS	118	78	130498-29-2
22	METHYLENE CHLORIDE	116	73	000075-09-2
23	TOLUENE	114	68	000108-88-3
24	BARIUM	110	60	007440-39-3
25	BENZO(A)ANTHRACENE	102	50	000056-55-3
26	1,2-DICHLOROETHANE	99	78	000107-06-2
26	IRON	99	62	007439-89-6
26	VANADIUM	99	53	007440-62-2
29	DI(2-ETHYLHEXYL)PHTHALATE	96	64	000117-81-7
30	BENZO(B)FLUORANTHENE	94	39	000205-99-2
31	CHRYSENE	93	45	000218-01-9
32	1,1-DICHLOROETHANE	92	75	000075-34-3
33	CARBON TETRACHLORIDE	90	59	000056-23-5
34	METALS N.O.S.	88	55	HZ0900-01-T
35	BERYLLIUM	86	44	007440-41-7
36	BENZO(K)FLUORANTHENE	83	37	000207-08-9
36	PHENANTHRENE	83	35	000085-01-8
38	INDENO(1,2,3-CD)PYRENE	82	36	000193-39-5
39	NAPHTHALENE	81	41	000091-20-3
40	DIBENZO(A,H)ANTHRACENE	75	32	000053-70-3
41	DIELDRIN	74	37	000060-57-1
42	ETHYLBENZENE	73	43	000100-41-4
43	XYLENES, TOTAL	72	39	001330-20-7
44	THALLIUM	71	36	007440-28-0
45	ALUMINUM	70	43	007429-90-5
46	PENTACHLOROPHENOL	68	43	000087-86-5
47	DDT, P,P'-	66	41	000050-29-3
47	COBALT	66	30	007440-48-4
49	BENZO(GHI)PERYLENE	63	25	000191-24-2
50	SODIUM	61	34	007440-23-5
51	SELENIUM	58	24	007782-49-2
52	DDE, P,P'-	57	35	000072-55-9
53	1,2-DICHLOROETHENE, TRANS-	54	51	000156-60-5
54	1,2-DICHLOROETHENE, CIS-	52	38	000156-59-2
55	1,2-DICHLOROETHYLENE	51	43	000540-59-0
55	FLUORANTHENE	51	19	000206-44-0
57	2-METHYLNAPHTHALENE	50	22	000091-57-6

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

2007 COMPLETED EXPOSURE PATHWAY SITE COUNT REPORT

Rank	Substance Name	Total Sites	NPL Sites	CAS Number
57	PYRENE	50	20	000129-00-0
59	DDD, P,P'-	49	29	000072-54-8
59	HEPTACHLOR EPOXIDE	49	22	001024-57-3
61	CHLOROBENZENE	47	34	000108-90-7
62	CHLORDANE	45	31	000057-74-9
62	CYANIDE	45	23	000057-12-5
64	AROCLOR 1260	43	26	011096-82-5
64	SILVER	43	20	007440-22-4
66	MAGNESIUM	41	22	007439-95-4
66	DIBENZOFURAN	41	19	000132-64-9
68	PESTICIDES N.O.S.	40	22	HZ1200-01-T
68	ASBESTOS	40	12	001332-21-4
70	AROCLOR 1254	38	26	011097-69-1
71	ACETONE	37	20	000067-64-1
71	ALDRIN	37	14	000309-00-2
73	BROMODICHLOROMETHANE	36	26	000075-27-4
73	FLUORENE	36	13	000086-73-7
75	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	35	26	001746-01-6
76	2-BUTANONE	34	22	000078-93-3
77	NITRATE	33	24	014797-55-8
77	DIOXINS N.O.S.	33	22	HZ0400-05-T
77	CARBAZOLE	33	10	000086-74-8
77	ANTHRACENE	33	9	000120-12-7
81	CALCIUM	32	23	007440-70-2
81	ACENAPHTHYLENE	32	12	000208-96-8
83	1,2,4-TRIMETHYLBENZENE	31	6	000095-63-6
84	DI-N-BUTYL PHTHALATE	30	13	000084-74-2
84	HEPTACHLOR	30	11	000076-44-8
86	1,1,2-TRICHLOROETHANE	28	22	000079-00-5
86	1,1,2,2-TETRACHLOROETHANE	28	20	000079-34-5
86	BORON	28	15	007440-42-8
86	STYRENE	28	12	000100-42-5
86	1,4-DICHLOROBENZENE	28	10	000106-46-7
86	ACENAPHTHENE	28	9	000083-32-9
86	BUTYL BENZYL PHTHALATE	28	7	000085-68-7
93	1,2-DICHLOROPROPANE	27	20	000078-87-5
94	HEXACHLOROCYCLOHEXANE, GAMMA-	26	14	000058-89-9
95	POTASSIUM	25	17	007440-09-7
95	DIBROMOCHLOROMETHANE	25	16	000124-48-1
95	CHLOROMETHANE	25	14	000074-87-3
95	PHENOL	25	14	000108-95-2
99	CHROMIUM, HEXAVALENT	24	14	018540-29-9
100	CRESOL, PARA-	23	8	000106-44-5

All Sites = all sites with ATSDR activities; NPL Sites = current and former sites on the National Priorities List; CAS = Chemical Abstracts Service; CEP = Completed Exposure Pathway.

Summary Statistics for this 2007 HazDat Analysis:

	All Sites	NPL Sites
Number of Sites/Events in HazDat	5,501	1,689
Number of Public Health Assessments (PHAs)	2,414	1,641
Number of Sites/Events with CEPs	1,444	802
Number of CEP records (incidents) in HazDat	17,808	10,724
Number of CEP records (incidents) from PHAs	11,634	9,668
Total number of substances in CEPs	715	498