APPENDIX B – TABLES

Table 1. Stauffer Chemical Company Site, Former Ponds/Dredged Material Piles Designations

Pond/Pile	Location	Sample Point	Date	Description
39	Northeast property	SB-02SZ	January 1988	Subsurface: saturated zone
		39-1C	December 1989	Composite depths
		SC-L7-01	April 1989	Surface soil
		SC-L7-02	April 1989	Surface soil
		SC-L7-03	April 1989	Subsurface: 3 feet
42	Western portion of the main production area	SB-12SZ	January 1988	Subsurface: saturated zone
		SC-L5-01	April 1989	Surface soil
		SC-L5-02	April 1989	Surface soil
		SC-L5-03	April 1989	Subsurface: 3 feet
		42-1C	December 1989	Composite depths
		SS68	September 1990	Surface soil
44A	Main production area; near power house and slag pits	44A-1C	December-1989	Composite depths
44B	Main production area; near power house and slag pits	44B-1C	December 1989	Composite depths
45	Main production area; near power house and slag pits	45-1C	December 1989	Composite depths
46A	Southern portion of the main production area	46A-2-5C	December 1989	Composite depths
46B	Southern portion of the main production area	46B-3-3C	December 1989	Composite depths
47	Southern portion of the main production area	47-3-1C	December 1989	Composite depths

Table 1. Stauffer Chemical Company Site, Former Ponds/Dredged Material Piles Designations (continued)

Pond/Pile	Location	Sample Point	Date	Description
48	Southern portion of the main production area	48-6-9C	December 1989	Composite depths
		PM93-2	March 1993	Surface soil
49A	Southern portion of the main production area	SC-SS-04	January 1988	Surface soil
		SC-L1-01	April 1989	Surface soil
		SC-L1-02	April 1989	Surface soil
		SC-L1-03	April 1989	Subsurface: 3 feet
		SC-L3-01	April 1989	Surface soil
		SC-L3-02	April 1989	Surface soil
		SC-L3-03	April 1989	Subsurface: 3 feet
		49A-6-23C	December 1989	Composite depths
		PM93-1 (two samples)	March 1993	Surface soil
49B	Southern portion of the main production area	SC-L2-01	April 1989	Surface soil
		SC-L2-02	April 1989	Surface soil
		SC-L2-03	April 1989	Subsurface: 3 feet
		49B-9-21C	December 1989	Composite depths
49C	Southern portion of the main production area	SC-SS-03	January 1988	Surface soil
		49C-9-13C	December 1989	Composite depths

Table 1. Stauffer Chemical Company Site, Former Ponds/Dredged Material Piles Designations (continued)

Pond/Pile	Location	Sample Point	Date	Description
49D	Southern portion of the main production area	49D-7-11C (two samples)	December 1989	Composite depths
		SS69	September 1990	Surface soil
49E	Southern portion of the main production area	SC-L4-01	April 1989	Surface soil
		SC-L4-02	April 1989	Surface soil
		SC-L4-03	April 1989	Subsurface: 3 feet
		49E-8-10C	December 1989	Composite depths
50	Southern portion of the main production area	This area was covered over by growth at the time of sampling (December 1989). Elemental phosphorus was found in borings during a preliminary investigation. No other samples were collected from this area.		
51	Southern portion of the main production area	SC-L6-01	April 1989	Surface soil
		SC-L6-02	April 1989	Surface soil
		SC-L6-03	April 1989	Subsurface: 3 feet
		51-4-5C	December 1989	Composite depths
		PM93-3	March 1993	Surface soil
52	Northeast portion of the slag storage area	52-1C	December 1989	Composite depths
Pile 1	Dredged material from pond 39; northeast property	SC-SS-02	January 1988	Surface composite

Table 1. Stauffer Chemical Company Site, Former Ponds/Dredged Material Piles Designations (continued)

Pond/Pile	Location	Sample Point	Date	Description
Pile 2	Dredged pond materials from ponds 49A, 49B, 49C, and 51 in the southern portion of the main production area	SB-08A	January 1988	Subsurface: 4 feet
		SB-08B	January 1988	Subsurface: 10 feet
		SB-08C	January 1988	Subsurface: 15 feet
		SC-P2-01	April 1989	Surface soil
		SC-P2-02	April 1989	Surface soil
		SC-P2-03	April 1989	Subsurface: 8 feet
Pile 3	Dredged material from pond 42; western portion of the main production area	SC-P3-01	April 1989	Surface soil
		SC-P3-02	April 1989	Surface soil
		SC-P3-03	April 1989	Subsurface: 5 feet
Pile 4	Area of a former pile of dredged pond material in southeast property; nearest to pond 49C	SS93-17	March 1993	Surface soil

Table 2. On-Site Soil Sampling Summary Data, Pond Soils

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Volatile Organic Compounds (VOCs)								
2-Butanone	0.007 J	0.007 J	SS69 surface	Sept-90	1/7	22,000	RBC-N	0
Acetone	0.009 J,B	0.31	PM93-2 surface	Mar-93	4/7	20,000	child-RMEG	0
Methylene chloride	0.005 J	0.027	PM93-2 surface	Mar-93	5/7	90	CREG	0
Toluene	0.005	0.005	SS68 surface	Sept-90	1/8	1,000	child-I-EMEG	0
Trichloroethylene	0.003 J	0.003 J	SS69 surface	Sept-90	1/7	2	CREG	0
Semivolatile Organic Compounds (SVOCs)								
Anthracene	0.66 J	0.66 J	PM93-2 surface	Mar-93	1/7	20,000	child-RMEG	0
Benzo[a]anthracene	0.073 J	2.8 J	PM93-2 surface	Mar-93	2/8	0.87	RBC-C	1
Benzo[a]pyrene	0.11 J	0.15 J	SC-SS-03 surface composite and SS69 surface	Jan-88 and Sept-90	3/8	0.1	CREG	3
Benzo[b]fluoranthene	0.15 J	5.2	PM93-2 surface	Mar-93	5/8	0.87	RBC-C	1

Table 2. On-Site Soil Sampling Summary Data, Pond Soils (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Benzo[g,h,i]perylene	0.09 J	1.5 J	PM93-2 surface	Mar-93	4/7	20,000	child-RMEG, anthracene	0
Benzo[k]fluoranthene	0.052 J	1.1 J	PM93-2 surface	Mar-93	4/8	8.7	RBC-C	0
bis(2-Ethylhexyl) phthalate	0.3 J,B	2.2 J	PM93-2 surface	Mar-93	3/7	50	CREG	0
Chrysene	0.061 J	4.8	PM93-2 surface	Mar-93	4/8	87	RBC-C	0
di-n-Butyl phthalate	0.078 J,B	0.67 J,B	PM93-2 surface	Mar-93	5/7	5,000	child-RMEG	0
Fluoranthene	0.036 J	3.9	PM93-2 surface	Mar-93	4/8	2,000	child-RMEG	0
Indeno[1,2,3-cd] pyrene	0.11 J	1.8 J	PM93-2 surface	Mar-93	4/7	0.87	RBC-C	1
Phenanthrene	0.036 J	2 J	PM93-2 surface	Mar-93	3/7	2,000	child-RMEG, fluoranthene	0
Pyrene	0.1 J	3.3	PM93-2 surface	Mar-93	2/7	2,000	child-RMEG	0
Pesticides/Polychlorinated Biphenyls								
Arochlor 1248	3.1	3.1	SS69 surface	Sept-90	1/7	1	child-EMEG, arochlor 1254	1

Table 2. On-Site Soil Sampling Summary Data, Pond Soils (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Inorganics-Metals								
Aluminum (Al)	180	7,600	SC-SS-03 surface composite	Jan-88	42/42	100,000	child-I-EMEG	0
Antimony (Sb)	20.8	52	PM93-3 surface	Mar-93	10/15	20	child-RMEG	10
Arsenic (As)	4.2	340 J,N	SB12-SZ saturated zone	Jan-88	48/59	0.5	CREG	48
Barium (Ba)	2	140	SB12-SZ saturated zone	Jan-88	40/42	4,000	child-RMEG	0
Beryllium (Be)	0.71 X	2	PM93-1 surface	Mar-93	9/15	50	child-C-EMEG	0
Cadmium (Cd)	0.99	66 J	SB-02SZ saturated zone	Jan-88	54/59	10	child-C-EMEG	47
Calcium (Ca)	1,430	440,000 J	SC-SS-03 surface composite	Jan-88	42/42	NA	NA	NA
Chromium (Cr)	1.7	226	PM93-2 surface	Mar-93	58/59	200	child-RMEG Cr^{6+}	1
Cobalt (Co)	1.3 X	4.7	SS68 surface	Sept-90	5/15	500	child-I-EMEG	0
Copper (Cu)	1.8	1,040	PM93-2 surface	Mar-93	26/42	3,100	RBC-N	0

Table 2. On-Site Soil Sampling Summary Data, Pond Soils (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Iron (Fe)	24	12,000	SC-SS-02 surface composite	Jan-88	42/42	23,000	RBC-N	0
Lead (Pb)	1.6	900	PM93-2 surface	Mar-93	59/59	400	EPA AL	2
Magnesium (Mg)	39	14,000	SB-08C 15 feet/ dredge	Jan-88	40/42	NA	NA	NA
Manganese (Mn)	2.4	160	SB-08B 10 feet/ dredge	Jan-88	40/42	3,000	child-RMEG	0
Mercury (Hg)	0.095	2.2	PM93-2 surface	Mar-93	35/42	20	child-RMEG, $HgCl_2$	0
Nickel (Ni)	2.7	43	SC-SS-02 surface composite	Jan-88	27/42	1,000	child-RMEG	0
Potassium (K)	174	4,820	PM93-3 surface	Mar-93	32/42	NA	NA	NA
Selenium (Se)	6.6	39 J, N	SC-SS-03 surface composite	Jan-88	30/42	300	child-C-EMEG	0
Silver (Ag)	2.8	19.3	PM93-2 surface	Mar-93	31/42	300	child-RMEG	0
Sodium (Na)	25.7	14,100	PM93-3 surface	Mar-93	30/42	NA	NA	NA
Thallium (Tl)	2.9 J	37	SC-P2-03 surface	Apr-89	32/42	4	child-RMEG	31

Table 2. On-Site Soil Sampling Summary Data, Pond Soils (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
			composite/ dredge					
Vanadium (V)	2.4	110	SC-SS-02 surface composite	Jan-88	39/42	200	child-I-EMEG	0
Zinc (Zn)	4.2	1,200 J	SC-SS-03, SC-SS-04 surface composites	Jan-88	41/42	20,000	child-C-EMEG	0
Inorganics-Other								
Chloride	47.2	1,190	51-4-5C composite depths	Dec-89	10/19	NA	NA	NA
Cyanide	0.86	12.6	45-1C composite depths	Dec-89	9/44	1,000	child-RMEG	0
Fluoride	5	410,000 J	SB-02SZ saturated zone	Jan-88	32/32	3,000	child-RMEG, FNa	4
Phosphorus (Total)	343	121,000	SS69 surface	Sept-90	27/27	NA	NA	NA

Radiologic Parameters	Minimum (Bq/kg)	Confidence	Maximum (Bq/kg)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)	Number Above CV

								Value (Bq/kg)	Source	
Radium-226	14.8	±3.7	1,258	±111	44A-1C, 45-1C composite depths	Dec-89	30/32	5.4	NCRP screening limit (residential)	30

Sources:
NUS 1989 (one sampling point analyzed for VOCs and SVOCs, eight sampling points analyzed for metals and other inorganics).
NUS 1991 (27 sampling points analyzed for metals, 12 sampling points analyzed for other inorganics).
PBS&J 1990 (three samples analyzed for radium-226).
Weston 1990a (17 samples analyzed for metals and other inorganics, 29 samples analyzed for radium-226).
Weston 1990c (two sampling points analyzed for VOCs, SVOCs, pesticides, metals and other inorganics).
Weston 1993 (five samples analyzed for VOCs, SVOCs, pesticides, metals, and other inorganics).

Key:

B	detected in the associated laboratory blank and in the sample	N	presumptive evidence of presence of material
Bq/kg	Becquerel per kilogram	NCRP	National Council on Radiation Protection and Measurements
CRDL	contract-required detection limit	NA	not available
CREG	cancer risk evaluation guide	ppm	parts per million
C-EMEG	chronic environmental media evaluation guide (ATSDR)	RBC-C	risk-based concentration, for cancer effects
EPA AL	U.S. Environmental Protection Agency action level	RBC-N	risk-based concentration, for noncancer effects
I-EMEG	intermediate environmental media evaluation guide (ATSDR)	RMEG	reference dose media evaluation guide
J	estimated quantity below the quantitation limit	X	result is less than the CRDL, but greater than or equal to the instrument detection limit

Table 3. On-Site Soil Sampling Summary Data, Slag

Table 3. On-Site Soil Sampling Summary Data, Slag (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Volatile Organic Compounds (VOCs)								
No VOCs were detected in the on-site slag sample.								
Semivolatile Organic Compounds (SVOCs)								
Benzo[a]anthracene	0.12 J	0.12 J	SS93-14	Mar-93	1/1	0.87	RBC-C	0
Benzo[a]pyrene	0.11 J	0.11 J	SS93-14	Mar-93	1/1	0.1	CREG	1
Benzo[b]fluoranthene	0.17 J	0.17 J	SS93-14	Mar-93	1/1	0.87	RBC-C	0
Benzo[g,h,i]perylene	0.16 J	0.16 J	SS93-14	Mar-93	1/1	20,000	child-RMEG, anthracene	0
Benzo[k]fluoranthene	0.042 J	0.042 J	SS93-14	Mar-93	1/1	8.7	RBC-C	0
Chrysene	0.1 J	0.1 J	SS93-14	Mar-93	1/1	87	RBC-C	0
di-n-Butyl phthalate	0.19 J, B	0.19 J, B	SS93-14	Mar-93	1/1	5,000	child-RMEG	0
Fluoranthene	0.11 J	0.11 J	SS93-14	Mar-93	1/1	2,000	child-RMEG	0
Indeno[1,2,3-cd]pyrene	0.11 J	0.11 J	SS93-14	Mar-93	1/1	0.87	RBC-C	0
Phenanthrene	0.067 J	0.067 J	SS93-14	Mar-93	1/1	2,000	child-RMEG, fluoranthene	0
Pyrene	0.12 J	0.12 J	SS93-14	Mar-93	1/1	2,000	child-RMEG	0
Pesticides/Polychlorinated Biphenyls (PCBs)								
alpha-Chlordane	0.0015 J	0.0015 J	SS93-14	Mar-93	1/1	2	CREG	0
Dieldrin	0.0051	0.0051	SS93-14	Mar-93	1/1	0.04	CREG	0
gamma-Chlordane	0.0062	0.0062	SS93-14	Mar-93	1/1	2	CREG	0

Table 3. On-Site Soil Sampling Summary Data, Slag (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
p,p-DDT	0.0073	0.0073	SS93-14	Mar-93	1/1	2	CREG	0
Inorganics-Metals								
Aluminum (Al)	2,000	12,000	"Stauffer slag pile"	Jul-98	5/5	100,000	child-I-EMEG	0
Antimony (Sb)	0.0197	0.0197	"Stauffer slag pile"	Jul-98	1/5	20	child-RMEG	0
Arsenic (As)	0.00463	4.2	SS93-14	Mar-93	2/11	0.5	CREG	1
Barium (Ba)	32.8	108	"Stauffer slag pile"	Jul-98	2/2	4,000	child-RMEG	0
Beryllium (Be)	0.25 X	1.99	"Stauffer slag pile"	Jul-98	3/5	50	child-C-EMEG	0
Cadmium (Cd)	0.157	4.8	SS7	Dec-89	6/11	10	child-C-EMEG	0
Calcium (Ca)	49,500	49,500	SS93-14	Mar-93	1/1	NA	NA	NA
Chromium (Cr)	3.6	122	SS6	Dec-89	11/11	200	child-RMEG, Cr^{6+}	0
Cobalt (Co)	0.957	2.7 X	SS93-14	Mar-93	2/2	500	child-I-EMEG	0
Copper (Cu)	3.16	23.4	SS93-14	Mar-93	3/5	3,100	RBC-N	0
Iron (Fe)	3,130	10,600	SS93-14	Mar-93	2/2	23,000	RBC-N	0
Lead (Pb)	0.52	121	SS93-14	Mar-93	8/11	400	EPA AL	0
Magnesium (Mg)	394 X	394 X	SS93-14	Mar-93	1/1	NA	NA	NA

Table 3. On-Site Soil Sampling Summary Data, Slag (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Manganese (Mn)	145	471	"Stauffer slag pile"	Jul-98	2/2	3,000	child-RMEG	0
Mercury (Hg)	0.0248	0.0248	"Stauffer slag pile"	Jul-98	1/5	20	child-RMEG, $HgCl_2$	0
Nickel (Ni)	14.8	40	Slag/7-7"	Sept-97	3/5	1,000	child-RMEG	0
Potassium (K)	278 X	278 X	SS93-14	Mar-93	1/1	NA	NA	NA
Selenium (Se)	0.33 X	0.414	"Stauffer slag pile"	Jul-98	2/5	300	child-C-EMEG	0
Silver (Ag)	0.00141	0.00141	"Stauffer slag pile"	Jul-98	1/5	300	child-RMEG	0
Sodium (Na)	582 X	582 X	SS93-14	Mar-93	1/1	NA	NA	NA
Thallium (Tl)	0.47	0.57 X	SS93-14	Mar-93	2/5	4	child-RMEG	0
Vanadium (V)	28.7	29.6	SS93-14	Mar-93	2/2	200	child-I-EMEG	0
Zinc (Zn)	6.7	186	SS93-14	Mar-93	4/5	20,000	child-C-EMEG	0
Inorganics-Other								
Cyanide	2	6.5	SS54	Apr-90	7/10	1,000	child-RMEG	0
Fluoride	30	1,920	SS54	Apr-90	11/11	3,000	child-RMEG, FNa	0
Phosphorus (Total)	1,610	48,500	SS6	Dec-89	10/10	NA	NA	NA

Table 3. On-Site Soil Sampling Summary Data, Slag (continued)

Radiologic Parameters	Minimum (Bq/kg)	Confidence	Maximum (Bq/kg)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
								Value (Bq/kg)	Source	
Gross alpha	9,990	±655	9,990	±655	Slag/2–6"	Sept-97	1/1	NA	NA	NA
Gross beta	4,590	±264	4,590	±264	Slag/2–6"	Sept-97	1/1	NA	NA	NA
Radium-226	777	±74	2,730	NA	SS48	Mar-90	12/12	5.4	NCRP screening limit (residential)	12

Sources:
PBS&J 1990 (one sampling point analyzed for radium-226).
Parsons 1997 (three sampling points analyzed for metals, other inorganics, and radionuclides).
EPA 1999a (one sampling point analyzed for metals, other inorganics, and radium-226).
Weston 1990a (six sampling points analyzed for metals and other inorganics; seven samples analyzed for radium-226).
Weston 1993 (one sampling point analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and other inorganics).

Key:

B	detected in the associated laboratory blank and in the sample
Bq/kg	Becquerel per kilogram
CRDL	contract-required detection limit
CREG	cancer risk evaluation guide
C-EMEG	chronic environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
EPA AL	U.S. Environmental Protection Agency action level
I-EMEG	intermediate environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
J	estimated quantity below the quantitation limit
NA	not available
ppm	parts per million
RBC-C	risk-based concentration, for cancer effects
RBC-N	risk-based concentration, for noncancer effects
RMEG	reference dose media evaluation guide
X	result is less than the CRDL, but greater than or equal to the instrument detection limit

Table 4. On-Site Soil Sampling Data, Surface Soil

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Volatile Organic Compounds (VOCs)								
1,1,1-Trichloroethane	0.003 J	0.003 J	SS64	Apr-90	1/21	22,000	RBC-N	0
Acetone	0.005 J,B	0.66 E,B	SS66	Apr-90	11/21	20,000	child-RMEG	0
Bromoform	0.002 J	0.002 J	SS37C	Dec-89	1/21	90	CREG	0
Carbon disulfide	0.003 J	0.15	SS64 & SS66	Apr-90	7/22	5,000	child-RMEG	0
Chloroform	0.001 J	0.002 J	SS63 & SS65	Apr-90	3/22	100	CREG	0
Chloromethane	0.001 J	0.003 J	SS65	Apr-90	2/21	49	RBC-C	0
Ethylbenzene	0.001 J	0.001 J	SS38C	Dec-89	1/21	5,000	child-RMEG	0
Methylene chloride	0.005 B	0.48 E,B	SS64	Apr-90	17/21	90	CREG	0
Tetrachloroethylene	0.001 J	0.007	SS64 & SS66	Apr-90	9/21	500	child-RMEG	0
Toluene	0.002 J	0.041	SS66	Apr-90	9/22	1,000	child-I-EMEG	0
Semivolatile Organic Compounds (SVOCs)								
1,2-Dichlorobenzene	0.012 T,C	0.012 T,C	SS37C	Dec-89	1/23	5,000	child-RMEG	0
1,3-Dichlorobenzene	0.0056 T,C	0.0056 T,C	SS37C	Dec-89	1/23	2,300	RBC-N	0
1,4-Dichlorobenzene	0.0069 T,C	0.0069 T,C	SS37C	Dec-89	1/23	20,000	child-I-EMEG	0
2-Methylnaphthalene	0.045 J	0.077 J	SS93-10	Mar-93	3/23	2,000	RBC-N	0
2,4-Dichlorophenol	0.057 J	1.2	SS34C	Dec-89	3/23	200	child-I-EMEG	0
2,4,5-Trichlorophenol	0.17 J	0.17 J	SS34C	Dec-89	1/23	5,000	child-RMEG	0
2,4,6-Trichlorophenol	0.29 J	0.29 J	SS34C	Dec-89	1/23	60	CREG	0
Acenaphthylene	0.11 J	0.77	SS93-1	Mar-93	3/23	4,700	RBC-N	0

Table 4. On-Site Soil Sampling Data, Surface Soil (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Anthracene	0.008 J	1.0	SS93-1	Mar-93	5/23	20,000	child-RMEG	0
Benzo[a]anthracene	0.056 J	2.9	SS93-10	Mar-93	10/24	0.87	RBC-C	4
Benzo[a]pyrene	0.025 J	2.7	SS65	Apr-90	11/24	0.1	CREG	6
Benzo[b]fluoranthene	0.051 J	4.3	SS93-1	Mar-93	13/24	0.87	RBC-C	4
Benzo[g,h,i]perylene	0.045 J	3.5	SS65	Apr-90	10/23	20,000	child-RMEG, anthracene	0
Benzo[k]fluoranthene	0.034 J	2.6	SS65	Apr-90	11/24	8.7	RBC-C	0
Benzoic acid	0.14 J,B	0.51 J,B	SS36C	Dec-89	8/16	200,000	child-RMEG	0
bis(2-Ethylhexyl) phthalate	0.043 J,B	1.0 J,B	SS65	Apr-90	9/23	50	CREG	0
Carbazole	0.084 J	0.57	SS93-10	Mar-93	3/7	32	RBC-C	0
Chrysene	0.042 J	2.8	SS65	Apr-90	13/24	87	RBC-C	0
di-n-Butyl phthalate	0.054 J	0.24 J,B	SS93-13	Mar-93	13/23	5,000	child-RMEG	0
Dibenzo[a,h] anthracene	0.1 J	0.34 J	SS93-1	Mar-93	3/23	0.087	RBC-C	3
Dibenzofuran	0.038 J	0.067 J	SS93-10	Mar-93	2/23	310	RBC-N	0
Fluoranthene	0.055 J	3.3	SS93-10	Mar-93	12/24	2,000	child-RMEG	0
Fluorene	0.066 J	0.075 J	SS93-1	Mar-93	2/23	2,000	child-RMEG	0
Indeno[1,2,3-cd] pyrene	0.060 J	3.1	SS65	Apr-90	10/23	0.87	RBC-C	3
Isophorone	0.24 J	0.33 J	SS66	Apr-90	2/23	700	CREG	0
Naphthalene	0.048 J	0.049 J	SS93-10	Mar-93	2/23	1,000	child-I-EMEG	0

Table 4. On-Site Soil Sampling Data, Surface Soil (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
							child-RMEG	
Phenanthrene	0.036 J	1.5	SS93-10	Mar-93	9/23	2,000	child-RMEG, fluoranthene	0
Phenol	0.006 T,J	0.01 T,J	SS64	Apr-90	2/23	30,000	child-RMEG	0
Pyrene	0.040 J	3.1	SS93-10	Mar-93	13/23	2,000	child-RMEG	0
Pesticides/Polychlorinated Biphenyls (PCBs)								
Arochlor-1254	0.21 J	0.21 J	SS65	Apr-90	1/28	1	child-C-EMEG	0
Arochlor-1260	0.076 J	0.076 J	SS64	Apr-90	1/28	0.32	RBC-C	0
Dieldrin	0.02	0.027	SS93-9A	Mar-93	2/28	0.04	CREG	0
pp-DDE	0.009	0.021	SS93-9A	Mar-93	2/28	2	CREG	0
pp-DDT	0.0038 J,B	0.013	SS51C	Apr-90	6/28	2	CREG	0
Inorganics-Metals								
Aluminum (Al)	67.4	6,810	SS93-8	Mar-93	23/23	100,000	child-I-EMEG	0
Antimony (Sb)	0.91 B	48.9	SS93-6	Mar-93	10/21	20	child-RMEG	4
Arsenic (As)	0.39 J	140	NE-1–6"	Sept-97	32/91	0.5	CREG	30
Barium (Ba)	2.4 X	80.9	SS93-3	Mar-93	14/15	4,000	child-RMEG	0
Beryllium (Be)	0.05 B	1.6	SS93-8	Mar-93	30/39	50	child-C-EMEG	0
Cadmium (Cd)	0.82 X	59	NE-1–6"	Sept-97	45/73	10	child-C-EMEG	7
Calcium (Ca)	36 X	377,000	SS93-8	Mar-93	16/17	NA	NA	NA

Table 4. On-Site Soil Sampling Data, Surface Soil (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Chromium (Cr)	0.58 B	163	SS93-3	Mar-93	64/75	200	child-RMEG	0
Cobalt (Co)	1.1	33.3	SS93-5	Mar-93	10/15	500	child-I-EMEG	0
Copper (Cu)	0.34 B	65.5	SS93-5	Mar-93	19/21	3,100	RBC-N	0
Iron (Fe)	250	44,800	SS93-3	Mar-93	17/17	23,000	RBC-N	2
Lead (Pb)	0.7	324	SS93-8	Mar-93	75/75	400	EPA AL	0
Magnesium (Mg)	34	3,910	SS93-21	Jul-93	15/15	NA	NA	NA
Manganese (Mn)	0.59 X	292	SS93-3	Mar-93	17/17	3,000	child-RMEG	0
Mercury (Hg)	0.066	0.67	NE-1–6"	Sept-97	5/21	20	child-RMEG, $HgCl_2$	0
Nickel (Ni)	0.91 B	115	SS93-5	Mar-93	19/21	1,000	child-RMEG	0
Potassium (K)	161 X	1,740	SS93-6	Mar-93	12/15	NA	NA	NA
Selenium (Se)	0.32	32.5	SS93-8	Mar-93	13/21	300	child-C-EMEG	0
Silver (Ag)	1.2 X	9.7	SS93-8	Mar-93	5/21	300	child-RMEG	0
Sodium (Na)	19.6 X	15,500	SS93-21	Jul-93	14/15	NA	NA	NA
Thallium (Tl)	0.37 X	15	NE-1–6"	Sept-97	9/21	4	child-RMEG	4
Vanadium (V)	1.4 X	252	SS93-5	Mar-93	15/15	200	child-I-EMEG	1
Zinc (Zn)	0.9 B	519	SS93-8	Mar-93	20/21	20,000	child-C-EMEG	0
Inorganics-Other								
Chloride	47.3	224	SS16	Dec-89	3/52	NA	NA	NA

Table 4. On-Site Soil Sampling Data, Surface Soil (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Cyanide	0.57	3.0	SS1	Dec-89	4/73	1,000	child-RMEG	0
Fluoride	3.1	4,230	SS17	Dec-89	75/77	3,000	child-C-EMEG, FNa	1
Phosphorus (total)	50	84,800	SS10	Dec-89	76/76	NA	NA	NA

Radiologic Parameters	Minimum (Bq/kg)	Confidence	Maximum (Bq/kg)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
								Value (Bq/kg)	Source	
Gross alpha	77.0 J	±21.4	29,800	540	NE-1–6"	Sept-97	6/7	NA	NA	NA
Gross beta	67.0 J	±26.2	17,800	233	NE-1–6"	Sept-97	6/7	NA	NA	NA
Polonium-210	7,522	NA	7,522	NA	SS93-21	Mar-93	1/1	210	NCRP screening limit (residential)	1
Radium-226	12.6 J	±3.62	1,813	±185	SS29	Dec-89	39/39	5.4	NCRP screening limit (residential)	39
Radon-222	110	NA	110	NA	SS93-21	Mar-93	1/1	NA	NA	NA

Sources: NUS 1989 (one sampling point analyzed for VOCs and SVOCs, metals, and other inorganics).
NUS 1991 (two sampling points analyzed for metals).
PBS&J 1990 (six sampling points analyzed for radium-226).
Parsons 1997 (six sampling points analyzed for metals, other inorganics, and radionuclides).
Parsons 1999 (18 samples analyzed for metals).

Table 4. On-Site Soil Sampling Data, Surface Soil (continued)

Weston 1990a (16 samples analyzed for VOCs, SVOCs, and pesticides/PCBs; 52 samples analyzed for metals and other inorganics; 23 samples analyzed for radium-226).
Weston 1990c (three samples analyzed for radionuclides).
Weston 1993 (7 samples analyzed for VOCs and SVOCs; 12 samples analyzed for pesticides/PCBs; 14 samples analyzed for metals; 18 samples analyzed for other inorganics; 1 sampling point analyzed for radionuclides).

On-site surface soil samples are those samples *not* taken from former ponds, dredge pond material, slag (from slag pits and storage area), or roads.

Key:

B	detected in the associated laboratory blank and in the sample
Bq/kg	Becquerel per kilogram
C	response factor from daily standard
CRDL	contract-required detection limit
CREG	cancer risk evaluation guide
C-EMEG	chronic environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
E	compound was detected beyond the calibration range and was subsequently analyzed at dilution
I-EMEG	intermediate environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
J	estimated quantity below the quantitation limit
NA	not available
NCRP	National Council on Radiation Protection and Measurements
ppm	parts per million
RBC-C	risk-based concentration, for cancer effects
RBC-N	risk-based concentration, for noncancer effects
RMEG	reference dose media evaluation guide
T	compound tentatively identified by laboratory during analysis
X	result is less than the CRDL, but greater than or equal to the instrument detection limit

Table 5. On-Site Soil Sampling Summary Data, Surface Soil Contaminants of Potential Concern

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Mean Detected (ppm)	Median Detected (ppm)	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Inorganics-Metals								
Arsenic (As)	0.39 J	140	20	5.0	32/91	0.5	CREG	30
Cadmium (Cd)	0.82 X	59	8.0	2.3	45/73	10	child-C-EMEG	7
Thallium (Tl)	0.37 X	15	6.4	2.8	9/21	4	child-RMEG	4
Inorganics-Other								
Fluoride	3.1	4,230	474	206	75/77	3,000	child-C-EMEG, FNa	1
Phosphorus (Total)	50	84,800	24,600	16,900	76/76	NA	NA	NA

Sources: NUS 1989 (one sampling point analyzed for metals and other inorganics).
NUS 1991 (two sampling points analyzed for metals).
Parsons 1997 (six sampling points analyzed for metals and other inorganics).
Parsons 1999 (18 samples analyzed for metals).
Weston 1990a (52 samples analyzed for metals and other inorganics).
Weston 1993 (14 samples analyzed for metals and 18 samples analyzed for other inorganics).

On-site surface soil samples are those samples *not* taken from former ponds, dredge pond material, slag (from slag pits and storage area), or roads.

Key:

ppm	parts per million
CRDL	contract-required detection limit
CREG	cancer risk evaluation guide
C-EMEG	chronic environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
J	estimated quantity below the quantitation limit
NA	not available
RMEG	reference dose media evaluation guide
X	result is less than the CRDL, but greater than or equal to the instrument detection limit

Table 6. Stauffer Chemical Company Site, Monitoring Well Identifications (1985 to 2003)

Semiannual Sampling (NUS 1989, SMC 2002)	Expanded Site Investigation (NUS 1989)	Final Listing Site Inspection (NUS 1991)	Remedial Investigation (Weston 1993)		(Parsons 1999)	Groundwater Studies Report (Parsons 2004)	Description	
January 1987 through February 2002	*January 1988*	*April 1989*	*March/ April 1993*	*July 1993*	*1998 and 1999*	*2002 and 2003*	*Location*	*Approximate Depth (feet)*
M-1	SC-MW-04ES	SC-MW-04ES	MW-4ES	—	—	—	Downgradient of slag disposal area	16
M-2	SC-MW-08ES	SC-MW-08ES	MW-8ES	—	MW-8ES	—	Downgradient of lagoons/calcium fluoride storage areas	17
M-3	SC-MW-06ES	SC-MW-06ES	MW-6ES	—	—		Downgradient of lagoons/calcium fluoride storage areas	15
M-4	SC-MW-05ES	SC-MW-05ES	MW-5ES	—	—	MW-5ES	Downgradient of lagoon no. 1	16
M-5	SC-MW-02ES	SC-MW-02ES	MW-2ES	—	—	MW-02-1S MW-02-13S MW-02-14S MW-02-1F	Downgradient of calcium fluoride deposit (near Pond 39)	15 (MW-2ES) S/UF (2002-2003)
M-6	SC-MW-03ES	SC-MW-03ES	—	—	—	MW-03-4F MW-03-5F	Downgradient of calcium fluoride deposit (near Pond 39)	15 (MW-3ES) UF (2002/2003)
M-7	SC-MW-07ES	SC-MW-07ES	MW-7ES	MW-7ES	MW-7ES		Background	18
—	SC-MW-01S	SC-MW-01S	MW-1S	MW-1S	MW-1S		Background	32
—	SC-MW-01F	SC-MW-01F	MW-1F	—	—		Background	50
—	SC-MW-02F	SC-MW-02F	MW-2F	—	—		Downgradient of lagoons/drum burial areas	50
—	SC-MW-03F	SC-MW-03F	MW-3F	—	—		Along east property line	50

Table 6. Stauffer Chemical Company Site, Monitoring Well Identifications (1985 to 2003) (continued)

Semiannual Sampling (NUS 1989, SMC 2002)	Expanded Site Investigation (NUS 1989)	Final Listing Site Inspection (NUS 1991)	Remedial Investigation (Weston 1993)		(Parsons 1999)	Groundwater Studies Report (Parsons 2004)	Description	
January 1987 through February 2002	*January 1988*	*April 1989*	*March/ April 1993*	*July 1993*	*1998 and 1999*	*2002 and 2003*	*Location*	*Approximate Depth (feet)*
—	SC-MW-04F	SC-MW-04F	MW-4F	—	—		South of Anclote River	50
—	SC-MW-07S	SC-MW-07S	MW-7S	—	—		Downgradient of lagoons/calcium fluoride storage areas	32
—	SC-MW-09S	SC-MW-09S	MW-9S	—	MW-9S		Downgradient of buried drum area (no. 3)	32
—	SC-MW-10S	SC-MW-10S	MW-10S	—	—		Along east property line	32
—	SC-MW-11S	SC-MW-11S	MW-11S	—	—		South of Anclote River	32
—	SC-TW-01	—	—	—	—		Background; northeast corner of the site	IBWT
—	SC-TW-03	—	—	—	—		South of Anclote Road and slag disposal area	IBWT
—	SC-TW-06	—	—	—	—		Old disposal pond near lagoon system	IBWT
—	SC-TW-07	—	—	—	—		Immediately southwest of buried drum area no. 1	IBWT
—	SC-TW-08	—	—	—	—		Downgradient of calcium fluoride storage area no. 3	IBWT
—	SC-TW-09	—	—	—	—		Southwest of drum disposal area no. 3	IBWT
—	SC-TW-11	—	—	—	—		Downgradient/west of facility complex	IBWT

Table 6. Stauffer Chemical Company Site, Monitoring Well Identifications (1985 to 2003) (continued)

Semiannual Sampling (NUS 1989, SMC 2002)	Expanded Site Investigation (NUS 1989)	Final Listing Site Inspection (NUS 1991)	Remedial Investigation (Weston 1993)		(Parsons 1999)	Groundwater Studies Report (Parsons 2004)	Description	
January 1987 through February 2002	*January 1988*	*April 1989*	*March/ April 1993*	*July 1993*	*1998 and 1999*	*2002 and 2003*	*Location*	*Approximate Depth (feet)*
—	SC-TW-13	—	—	—	—		Along east property boundary	IBWT
—	SC-TW-14	—	—	—	—		Along east property boundary	IBWT
—	SC-TW-16	—	—	—	—		Anclote River dredge disposal area	IBWT
—	—	—	MW93-1	—	—		Downgradient from former slag processing area	11
—	—	—	MW93-2	—	—	MW-02-10F	Just west of Anclote Road (to characterize possible upgradient/off-site sources)	16 (MW93-2) UF (MW-02-10)
—	—	—	MW93-3	—	—		South of pond 42	16
—	—	—	MW93-4	—	—		Central portion of site (to characterize impact of main process area)	20
—	—	—	MW93-5	—	MW93-5	MW-02-2F	North of pond 42	15 (MW-93-5) UF (MW-02-2F
—	—	—	WP93-1	—	—		Temporary well point installed radially around MW-93-4	S

Table 6. Stauffer Chemical Company Site, Monitoring Well Identifications (1985 to 2003) (continued)

Semiannual Sampling (NUS 1989, SMC 2002)	Expanded Site Investigation (NUS 1989)	Final Listing Site Inspection (NUS 1991)	Remedial Investigation (Weston 1993)		(Parsons 1999)	Groundwater Studies Report (Parsons 2004)	Description	
January 1987 through February 2002	*January 1988*	*April 1989*	*March/ April 1993*	*July 1993*	*1998 and 1999*	*2002 and 2003*	*Location*	*Approximate Depth (feet)*
—	—	—	WP93-2	—	—		Temporary well point installed radially around MW-93-4	S
—	—	—	WP93-3	—	—		Temporary well point installed radially around MW-93-4	S
—	—	—	WP93-4	—	—		Temporary well point installed radially around MW-93-4	S
—	—	—	WP93-5	—	—		Temporary well point installed radially around MW-93-4	S
—	—	—	—	WP93-6	—		Piezometer installed to evaluate water table elevation near MW93-1	12
—	—	—	—	WP93-7	—		Piezometer installed to evaluate water table elevation near MW93-1	7
—	—	—	—	WP93-8	—		Piezometer installed to evaluate water table elevation near MW93-1	13
—	—	—	—	—	MW-98-1		North of site and north of Anclote Road at Sweetbriar Drive	S
—	—	—	—	—	MW-98-2		Downgradient along western boundary of site	S

Table 6. Stauffer Chemical Company Site, Monitoring Well Identifications (1985 to 2003) (continued)

Semiannual Sampling (NUS 1989, SMC 2002)	Expanded Site Investigation (NUS 1989)	Final Listing Site Inspection (NUS 1991)	Remedial Investigation (Weston 1993)		(Parsons 1999)	Groundwater Studies Report (Parsons 2004)	Description	
January 1987 through February 2002	*January 1988*	*April 1989*	*March/ April 1993*	*July 1993*	*1998 and 1999*	*2002 and 2003*	*Location*	*Approximate Depth (feet)*
—	—	—	—	—	MW-98-3	MW-02-3F	Downgradient along western boundary of site	S (MW-98-3) UF (MW-02-3F)
—	—	—	—	—	MW-98-4		Downgradient along western boundary of site	S
						MW-02-4S MW-02-4F MW-03-6F	Within the potential remediation area (southeast of former clarifier)	S UF
						MW-02-5S MW-02-5F	25 feet southwest of pumping wells	S UF
						MW-02-6S	25 feet south of pumping wells	S
						MW-02-11S MW-02-11F	50 feet southwest of pumping wells	S UF
						MW-02-7S MW-02-7F	Within footprint of Pond 46B	S UF
						MW-02-8S	Within footprint of Pond 49B	S
						MW-02-9S	Adjacent to Pond 49A	S
						MW-02-10S	Adjacent to Pond 49A	S
						MW-02-12S MW-02-12F	Between Ponds 48 and 51	S UF

Table 6. Stauffer Chemical Company Site, Monitoring Well Identifications (1985 to 2003) (continued)

Semiannual Sampling (NUS 1989, SMC 2002)	Expanded Site Investigation (NUS 1989)	Final Listing Site Inspection (NUS 1991)	Remedial Investigation (Weston 1993)		(Parsons 1999)	Groundwater Studies Report (Parsons 2004)	Description	
January 1987 through February 2002	*January 1988*	*April 1989*	*March/ April 1993*	*July 1993*	*1998 and 1999*	*2002 and 2003*	*Location*	*Approximate Depth (feet)*
						MW-03-1S MW-03-1F	Eastern portion of South Parcel	S UF
						MW-03-2S MW-03-2F MW-03-3F	Southeast portion of South Parcel	S UF UF
						MW-03-4S MW-03-5S MW-03-6S MW-03-7S MW-03-7F	Along southern slag boundary in northwest and southwest corners of the North Parcel	S S S S UF
						MW-03-8F	Southern corner of North Parcel	UF

Key

IBWT	immediately below water table
MW	monitoring well
S	shallow
SI	site inspection
TW	temporary well
UF	Upper Floridan

Table 7. On-Site Groundwater Monitoring Summary Data, Surficial Aquifer

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Volatile Organic Compounds (VOCs)								
Carbon Disulfide	4 J	4 J	MW-8ES	Jan-88	1/3	1,000	child-RMEG	0
Chloroform	6	6	MW-9S	Jan-88	1/4	6	CREG	0
1,1-Dichloroethane	2 J	2 J	MW-8ES	Jan-88	1/4	800	RBC-N	0
Semivolatile Organic Compounds (SVOCs)								
Di-n-Octyl Phthalate	1 J	1 J	MW93-3	Mar-93	1/5	730	RBC-N	0
4-Methylphenol	1 J	1 J	MW93-1	Mar-93	1/5	180	RBC-N	0
Pesticides/Polychlorinated Biphenyls								
Methoxychlor	0.009 J, P	0.009 J, P	MW93-3	Mar-93	1/5	40	LTHA, MCL, MCLG	0
Inorganics-Metals								
Aluminum (Al)	19.8 B	140,000	SC-TW-16	Jan-88	287/367	37,000	RBC-N	12
Antimony (Sb)	2	210	MW-8ES	Oct-88	77/361	4	child-RMEG	57
Arsenic (As)	1	980	MW93-3	Mar-93	209/370	0.02	CREG	209
Barium (Ba)	1	550	MW93-3	Mar-93	152/361	700	child-RMEG	0
Beryllium (Be)	0.1	6	SC-TW-01	Jan-88	43/142	20	child-RMEG	0
Boron (B)	27	2,400	MW-8ES	Oct-88	155/211	600	LTHA	42
Cadmium (Cd)	0.1 B	150	MW93-3	Mar-93	34/116	5	child-RMEG, LTHA	11
Calcium (Ca)	12,000	2,300,000	SC-MW-3ES	Jan-88	116/116	NA	NA	

Table 7. On-Site Groundwater Monitoring Summary Data, Surficial Aquifer (continued)

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Chromium (Cr)	0.72 B	560	MW-8ES	Jul-89	66/367	30	child-RMEG	24
Cobalt (Co)	0.85 B	21 X	MW-9S	Mar-93	9/107	730	RBC-N	0
Copper (Cu)	0.87 B	260	MW93-3	Mar-93	44/116	1,300	MCLG	0
Iron (Fe)	0.00	45,000	SC-TW-01	Jan-88	336/370	11,000	RBC-N	12
Lead (Pb)	2.1 B	680	MW93-3	Mar-93	23/107	15	EPA AL	9
Lithium (Li)	10	1,000	MW-5ES	Jul-90	45/246	730	RBC-N	2
Magnesium (Mg)	511 B	130,000	MW-8ES	Dec-98	113/116	NA	NA	
Manganese (Mn)	2	1,700	SC-MW-3ES	Jan-88	290/370	500	child-RMEG	2
Mercury (Hg)	0.075 J	0.7 JN	SC-TW-01	Jan-88	14/84	2	LTHA (Inorganic Hg)	0
Nickel (Ni)	1	160	MW93-3	Mar-93	63/361	100	LTHA	3
Potassium (K)	302 B	480,000	MW-8ES	Jun-99	110/116	NA	NA	
Selenium (Se)	1.7 X	140	MW93-3	Mar-93	23/107	50	child RMEG, LTHA	1
Silver (Ag)	4.1 J	9.6 J	MW-02-6S	Jul-02	3/75	50	child-RMEG	0
Sodium (Na)	1,700	690,000	MW-7S	Jan-88	116/116	NA	NA	
Thallium (Tl)	2.1	240	MW-96	Mar-93	21/107	0.5	LTHA	13
Vanadium (V)	1 B	340	SC-MW-3ES	Jan-88	56/107	260	RBC-N	5
Zinc (Zn)	1.3 B	6,500	MW-02-10S	Jul-02	47/107	2,000	LTHA	1

Table 7. On-Site Groundwater Monitoring Summary Data, Surficial Aquifer (continued)

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Inorganics-Other								
Cyanide	2.2 B	76	MW-93-4	Jan-95	14/92	200	child-RMEG, LTHA	0
Fluoride	120	75,000	MW-02-10S	Jul-02	338/350	4,000	MCL	161
Ortho-P	0.00	72,000	MW-8ES	Jul-96	219/237			
Phosphorus (Elemental)	0.00003 J	0.880 D	MW-02-8S	Jul-02	8/68			
Phosphorus (Total)	42 B	380,000	MW-8ES	Sep-98	88/92			
Sulfate (SO_4)	1,000	2,400,000	MW-8ES	Oct-88	255/271	250,000	NSDWRs	84

Radiologic Parameters	Minimum (pCi/L)	Confidence	Mximum (pCi/L)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
								Value (pCi/L)	Source	
Gross Alpha	-22.0000	±12.0	366.3	NA	MW93-3	Mar-93	276/353	15	MCL	44
Gross Beta	0.4000	±0.9	689.5	NA	MW93-3	Mar-93	329/353			
Polonium-210	-1	±6	314.9	NA	MW93-3	Mar-93	127/328			
Radium-226	-0.4000	±0.4	15.4	NA	MW-7S	Mar-93	234/328	5	MCL	6
Radon-222	0.15	±108	11,600.0	±300	SC-MW-03ES	Jan-90	334/338	300	MCL	129

Sources: Flow 2001; NUS Corp 1989, 1991; Parsons 1999; Parsons 2004; SMC 2002; Weston 1993.

Table 7. On-Site Groundwater Monitoring Summary Data, Surficial Aquifer (continued)

Key:

B	Detected in the associated laboratory blank and in the sample
D	Sample diluted due to abundance of analyte in sample
CREG	cancer risk evaluation guide
EPA AL	U.S. Environmental Protection Agency action level
J	estimated quantity below the quantitation limit
LTHA	lifetime health advisory (U.S. Environmental Protection Agency)
MCL	maximum contaminant level (U.S. Environmental Protection Agency)
MCLG	maximum contaminant level goal (U.S. Environmental Protection Agency)
N	presumptive evidence of presence of material
NA	not available
NSDWRs	National Secondary Drinking Water Regulations (U.S. Environmental Protection Agency)
P	the percent difference between the results from the two gas chromatograph columns is > 25%; the lower of the two is reported
pCI/L	picocuries per liter
ppb	parts per billion
RBC-N	risk-based concentration, for noncancer effects
RMEG	reference dose media evaluation guide
X	result in less than the contract required detection limit, but greater than or equal to the instrument detection limit

Notes:

* Negative radiological readings represent samples in which the amount of radioactivity in the sample blank was larger than that in the sample.

Table 8. On-Site Groundwater Monitoring Summary Data, Floridan Aquifer

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Volatile Organic Compounds (VOCs)								
Chloroform	1 J	1 J	MW-2F	Jan-88	1/2	6	CREG	0
Dibromochloromethane	1 J	1 J	MW-2F	Jan-88	1/2	0.13	RBC-C	1
1,1-Dichloroethane	1 J	1 J	MW-2F	Jan-88	1/2	800	RBC-N	0
Pesticides/Polychlorinated Biphenyls (PCBs)								
Methoxychlor	0.003 J,P	0.003 J,P	MW-2F	Mar-93	1/1	40	LTHA, MCL, MCLG	0
Inorganics-Metals								
Aluminum (Al)	34	6,900	MW-3F	Mar-93	17/20	37,000	RBC-N	0
Arsenic (As)	4 J,N	39.6	MW-02-11F	Jul-02	12/22	0.02	CREG	12
Barium (Ba)	10	37 B	MW-02-2F	Jul-02	15/20	700	child-RMEG	0
Cadmium (Cd)	0.4	29	MW-3F	Jan-88	4/20	5	child-RMEG, LTHA	1
Calcium (Ca)	7,600	292,000	MW-02-2F	Jul-02	22/22	NA		
Chromium (Cr)	16	16	MW-3F	Mar-93	2/20	30	child-RMEG	0
Copper (Cu)	0.87 B	320	MW-3F	Jan-88	12/20	1,300	MCLG	0
Iron (Fe)	71	15,000	MW-02-7F	Sep-02	19/22	11,000	RBC-N	1
Lead (Pb)	1.6 X	1.6 X	MW-3F	Mar-93	1/20	15	EPA AL	0
Magnesium (Mg)	2,000	110,000	MW-2F	Jan-88	22/22	NA		
Manganese (Mn)	17	117	MW-02-2F	Jul-02	17/22	500	child-RMEG	0

Table 8. On-Site Groundwater Monitoring Summary Data, Floridan Aquifer (continued)

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Mercury (Hg)	0.11 J	0.11 J	MW-02-1F	Aug-02	1/20	2	LTHA (Inorganic Hg)	0
Nickel (Ni)	1.6 B	12	MW-3F	Jan-88	3/20	100	LTHA	0
Potassium (K)	1,600	83,000	MW-2F	Aug-02	21/22	NA		
Sodium (Na)	11,000	690,000	MW-2F	Jan-88	22/22	NA		
Thallium (Tl)	2 J,N	2 J,N	MW-3F	Jan-88	1/20	0.5	LTHA	1
Vanadium (V)	2.3 B	14	MW-3F	Jan-88	6/20	260	RBC-N	0
Zinc (Zn)	2.8 B	13 X	MW-3F	Mar-93	5/20	2,000	LTHA	0
Inorganics-Other								
Cyanide	1.4 B	2.5 B	MW-02-11F	Jul-02	5/18	200	child-RMEG, LTHA	0
Fluoride	240	12,000	MW-03-2F MW-03-3F	Feb-03	16/20	4,000	MCL	2
Phosphorus (Elemental)	0.14 J	0.14 J	MW-02-4F	Sep-02	1/16			
Phosphorus (Total)	150	14,000	MW-02-12F MW-03-3F	Sep-02Feb-03	14/19			
Sulfate (SO_4)	14,000	650,000	MW-02-2F	Jul-02	15/16	250,000	NSDWRs	2

Table 8. On-Site Groundwater Monitoring Summary Data, Floridan Aquifer (continued)

Radiologic Parameters	Minimum (pCi/L)	Confidence	Maximum (pCi/L)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
								Value (pCi/L)	Source	
Gross Alpha	-3	±6	20	±20	MW-2F	Jan-88	20/20	15	MCL	1
Gross Beta	2.6	±0.5	121	±5.4	MW-2F	Aug-02	20/20			
Polonium-210	-0.0439	±.249	2.2	±0.744	MW-2F	Aug-02	11/18			
Radium-226	0.00	±0.07	2.6	±0.2	MW-2F	Aug-02	18/18	5	MCL	0
Radon-222	92.10	±33.7	1,220	±68.4	MW-03-5F	Feb-03	19/20	300	MCL	13

Sources: Flow 2001; NUS Corp 1989, 1991; Parsons 1999; Parsons 2004; SMC 2002; Weston 1993.

Key:

CREG	cancer risk evaluation guide
EPA AL	U.S. Environmental Protection Agency action level
J	estimated quantity below the quantitation limit
LTHA	lifetime health advisory (U.S. Environmental Protection Agency)
MCL	maximum contaminant level (U.S. Environmental Protection Agency)
MCLG	maximum contaminant level goal (U.S. Environmental Protection Agency)
N	presumptive evidence of presence of material
NSDWRs	National Secondary Drinking Water Regulations (U.S. Environmental Protection Agency)
P	the percent difference between the results from the two gas chromatograph columns is > 25%; the lower of the two is reported
ppb	parts per billion
RBC-C	risk-based concentration, for cancer effects
RBC-N	risk-based concentration, for noncancer effects
RMEG	reference dose media evaluation guide
X	result in less than the contract required detection limit, but greater than or equal to the instrument detection limit

Notes:

* Negative radiological readings represent samples in which the amount of radioactivity in the sample blank was larger than that in the sample.

Table 9. Maximum Contaminant Levels Detected in Potable Water Wells (Wells 5, 12, 13, and 15) at Stauffer Chemical Company, Tarpon Springs, Florida, Before 1979 (When Use of These Wells Ceased)

Contaminant	Minimum Detected	Maximum Detected	Location of Maximum	Date of Maximum	Comparison Value (CV)	
					Value	*Source*
Fluoride	50 ppb	350 ppb	Well 5	6/11/74	4,000 ppb	MCL
Phosphorus	ND	2,240 ppb	Well 15	10/30/78	0.1 ppb[a]	LTHA
Sulfate	<5,000 ppb	80,000 ppb	Well 15	8/31/77	250,000 ppb	NSDWR
Iron	ND	600 ppb	Well 15	10/30/78	11,000 ppb	EPA RBC

Table 10. Maximum Contaminant Levels Detected in Backup Potable Water Wells (Wells 7, 10, and 14) at Stauffer Chemical Company, Tarpon Springs, Florida, Before 1979 (When Use of Potable Wells Ceased)

Contaminant	Minimum Detected	Maximum Detected	Location of Maximum	Date of Maximum	Comparison Value (CV)	
					Value	*Source*
Fluoride	100 ppb	1,340 ppb	Well 10	5/20/74	4,000 ppb	MCL
Phosphorus	60 ppb	2,020 ppb	Well 10	10/30/78	0.1 ppb*	LTHA
Sulfate	10,000 ppb	307,000 ppb	Well 10	3/30/77	250,000 ppb	NSDWR
Iron	<50 ppb	4,000 ppb	Well 14	3/30/77	11,000 ppb	EPA RBC

Key:

EPA	U.S. Environmental Protection Agency
LTHA	lifetime health advisory for drinking water (EPA)
MCL	maximum contaminant level (EPA)
ND	not detected
NSDWR	National Secondary Drinking Water Regulations (EPA)
ppb	parts per billion
RBC	risk-based concentration

Note:
*CV is for elemental (white) phosphorus.

Table 11. Off-Site Soil Monitoring Summary Data, Gulfside Elementary School Surface Soils

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Volatile Organic Compounds (VOCs)								
No GES samples were analyzed for VOCs.								
Semivolatile Organic Compounds (SVOCs)								
No GES samples were analyzed for SVOCs.								
Pesticides/Polychlorinated Biphenyls (PCBs)								
No GES samples were analyzed for pesticides/PCBs.								
Inorganics-Metals								
Aluminum (Al)	310	5,760	SC96-9	Feb-96	16/16	100,000	child-I-EMEG	0
Antimony (Sb)	1.7	13.2	SC93-1	Jul-93	3/14	20	child-RMEG	0
Arsenic (As)	0.13	0.6	SC93-1	Jul-93	9/14	0.5	CREG	1
Barium (Ba)	1.5	14.8	SC93-1	Jul-93	14/14	4,000	child-RMEG	0
Beryllium (Be)	0.16	0.16	SC93-1	Jul-93	2/14	50	child-C-EMEG	0
Cadmium (Cd)	0.59	0.59	SC93-1	Jul-93	1/14	10	child-C-EMEG	0
Calcium (Ca)	251	16,400	SC93-1	Jul-93	15/16	NA	NA	NA
Chromium (Cr)	0.83	23.9	SC93-1	Jul-93	16/16	200	child-RMEG	0
Cobalt (Co)	0.29	0.38	SC96-9	Feb-96	3/14	500	child-I-EMEG	0
Copper (Cu)	0.27	4.8	SC96-9	Feb-96	10/14	3,100	RBC-N	0
Iron (Fe)	220	1,430	SC93-1	Jul-93	16/16	23,000	RBC-N	0

Table 11. Off-Site Soil Monitoring Summary Data, Gulfside Elementary School Surface Soils (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppm)	Source	
Lead (Pb)	1.2	6.3	SC93-3	Jul-93	15/16	400	EPA AL	0
Magnesium (Mg)	19.6	634	SC93-1	Jul-93	14/14	NA	NA	NA
Manganese (Mn)	6.0	22.9	SC96-3	Feb-96	16/16	3,000	child-RMEG	0
Nickel (Ni)	1.1	4.2	SC93-3	Jul-93	13/14	1,000	child-RMEG	0
Potassium (K)	66.7	265	SC93-1	Jul-93	7/14	NA	NA	NA
Selenium (Se)	0.12	0.35	SC93-3	Jul-93	7/14	300	child-C-EMEG	0
Sodium (Na)	7.2	57.1	SC93-1	Jul-93	14/14	NA	NA	NA
Vanadium (V)	2.4	17.2	SC93-1	Jul-93	14/14	200	child-I-EMEG	0
Zinc (Zn)	1.2	16	SC96-8	Feb-96	14/14	20,000	child-C-EMEG	0
Inorganics-Other								
Cyanide	0.85	0.85	SC96-2	Feb-96	1/14	1,000	child-RMEG	0
Fluoride	2.4	14.3	SC93-1	Jul-93	4/14	3,000	child-C-EMEG, FNa	0
ortho-Phosphorus	6.9	7.3	S-2	Aug-97	2/14	NA	NA	NA
Phosphorus (Total)	5.4	1,100	SC93-1	Jul-93	27/28	NA	NA	NA

Table 11. Off-Site Soil Monitoring Summary Data, Gulfside Elementary School Surface Soils (continued)

Radiologic Parameters	Minimum (Bq/kg)	Confidence	Maximum (Bq/kg)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
								Value (Bq/kg)	Source	
Gross Alpha	27.4	± 201	740	NA	SC93-1	Jul-93	15/15	NA	NA	NA
Gross Beta	7.03	± 246	1,050	NA	SC93-1	Jul-93	15/15	NA	NA	NA
Polonium-210	10	± 7.0	107	NA	SC93-1	Jul-93	16/16	210	NCRP screening limit (residential)	0
Radium-226	15.5	NA	59.2	NA	SC93-1	Jul-93	15/15	5.4	NCRP screening limit (residential)	15
Radon-222	4.4	± 1.8	59	NA	SS93-1	Jul-93	15/15	NA	NA	NA

NOTE: One additional radiologic sampling was performed on roadways bordering GES on the east and northeast, as well as on the roofing material (EE&G 1997a). All parameters were below or within the ranges of the surface soil samples listed above. The concentrations of radium-266 found in both samples were above the comparison value.

Sources: EE&G 1997a (14 sampling points analyzed for other inorganics); NUS 1991 (two sampling points analyzed for metals); Weston 1993 (four sampling points analyzed for radionuclides, metals, and other inorganics); Weston 1996 (10 sampling points analyzed for metals and other inorganics, 12 sampling points analyzed for radionuclides.)

Key:
- Bq/kg — Becquerel per kilogram
- CREG — cancer risk evaluation guide
- C-EMEG — chronic environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
- EPA AL — U.S. Environmental Protection Agency action level
- GES — Gulfside Elementary School
- I-EMEG — intermediate environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
- NA — not available
- NCRP — National Council on Radiation Protection and Measurements
- ppm — parts per million
- RBC-N — risk-based concentration, for noncancer effects
- RMEG — reference dose media evaluation guide

Table 12. Private well sample locations and dates sampled

Map No.	Address	Well Type	Sampling Events (No.)	Year
1	1151 Savannah Avenue	Residential-potable	2	1999, 2000
2	1503 Savannah Avenue	Commercial-potable	3	1999, 2000
3	1502 Savannah Avenue	Commercial-potable	7	1997, 1999, 2000, 2001
4	822 Anclote Road	Commercial-potable	6	1990, 1997, 2000, 2001
5	1599 Rainville Road	Commercial-potable	6	1990, 1997, 1999, 2000, 2001
6	1456 Savannah Avenue	Commercial-potable	2	2000
7	1553 Savannah Avenue	Commercial-potable	7	1988, 1990, 1997, 2000, 2001
8	1525 Rainville Road	Commercial-potable	2	2000
9	1232 N. Florida Avenue	Residential-potable	2	2000, 2001
10	1222 N. Florida Avenue	Residential-potable	5	2000, 2001
11	1218 N. Florida Avenue	Residential-potable	1	2000
12	1210 N. Florida Avenue	Residential-potable	4	2000, 2001
13	1234 N. Florida Avenue	Residential-potable	2	2000
14	905 Riverside Drive	Residential-potable	6	2000, 2001
15	3020 Buff Boulevard	Residential-potable	3	1999, 2000, 2001
16	1328 Calvary Road	Residential-potable	2	2000, 2001
17	1421 Calvary Road	Residential-potable	1	2000
18	1132 Hickory Lane	Residential-potable	3	2000, 2001
19	1916 Geronimo Drive	Residential-potable	2	2000, 2001
20	1681 Wilmar Drive	Residential-potable	1	1999
21	1124 Hickory Lane	Residential-potable	1	1990
22	252 Jeru Boulevard	Residential-potable	3	2000, 2001
23	204 Jeru Boulevard	Residential-potable	3	2000, 2001

Table 12. Private well sample locations and dates sampled (continued)

Map No.	Address	Well Type	Sampling Events (No.)	Year
24	1771 Meyers Cove Drive	Irrigation	1	2001
25	1749 Meyers Cove Drive	Irrigation	1	2001
26	1727 Meyers Cove Drive	Irrigation	1	2001
27	800 Anclote Road	Commercial-potable	2	1990, 1997
28	1140 Anclote Road	Irrigation	1	1990
29	701 Anclote Road	Irrigation	1	1990
30	1253 N. Florida Avenue	Irrigation	1	1997
31	1202 Hickory Lane	Residential-potable	1	1997
32	2105 Wallace Boulevard	Residential-potable	1	1997
33	507 Anclote Road	Community public	1	1997
34	764 Chesapeake Drive	Irrigation	1	1997
35	1389 Rainville Road	Residential-potable	1	1997
36	374 Jeru Boulevard	Irrigation	1	1997
37	1138 Hickory Lane	Residential-potable	1	1988
38	2113 Cemetery Road	Residential-potable	1	1988

Table 13. Private Well Summary Data—Contaminants Detected at Levels Above Comparison Values, Residential Wells

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Semivolatile Organic Compounds (SVOCs)								
bis(2-Ethylhexyl)phthalate	3.1	7.6	S	Mar-00	3/12	3	CREG	3
Inorganics-Metals								
Arsenic (As)	0.65	24	NW	Mar-00	36/37	0.02	CREG	36
Calcium (Ca)	18,000	100,000	NW	Feb-97	6/6	NA		NA
Chromium (Cr)	1	44	NW	Jun-00	32/37	30	child RMEG	1
Lead (Pb)	0.12	270	S	Mar-01	24/38	15	EPA AL	4
Magnesium (Mg)	4,700	21,000	NW	Feb-97	6/6	NA		NA
Nickel (Ni)	0.62	120	NW	Mar-00	18/36	100	LTHA	1
Potassium (K)	1,100	2,200	NW	Jan-88	2/2	NA		NA
Sodium (Na)	9,100	510,000	NW	Jun-00	40/40	NA		NA
Thallium (Tl)	0.097	1.6	S	Mar-01	4/36	0.5	LTHA	1
Inorganic-Other								
Chloride (Cl)	25,400	420,000	NW	Feb-97	4/4	250,000	NSDWR	1

Radiologic Parameters	Minimum (pCi/L)	Confidence	Maximum (pCi/L)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
								Value (pCi/L)	Source	
Gross Alpha	0.00	±0.40	26.20	±5.00	S	Mar-00	27/36	15	MCL	1
Gross Beta	0.90	±0.20	10.10	±1.00	E	Apr-99	5/5	NA		NA

Sources: Flow 2001; Pinellas County Health Department 1990, 2002; FDOH 1997.

Key:

CREG	cancer risk evaluation guide	NA	not available
E	east of site	NSDWR	National Secondary Drinking Water Regulation (U.S. Environmental Protection Agency)
EPA AL	U.S. Environmental Protection Agency action level	NW	northwest of site
LTHA	lifetime health advisory (U.S. Environmental Protection Agency)	pCi/L	picocuries per liter
MCL	maximum contaminant level (U.S. Environmental Protection Agency)	ppb	parts per billion
		RMEG	reference dose media evaluation guide
		S	south of Anclote River

Table 14. Private Well Summary Data—Contaminants Detected at Levels Above Comparison Values, Commercial Wells

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Semivolatile Organic Compounds (SVOCs)								
bis(2-Ethylhexyl)phthalate	2	4.4	E	Mar-00	3/6	6	CREG	1
Inorganics-Metals								
Arsenic (As)	0.14	26	E	Mar-00	30/33	0.02	CREG	30
Calcium (Ca)	58,000	357,000	E	Jul-90	10/10	NA		NA
Iron (Fe)	20 I	18,000	E	Mar-00	28/35	11,000	RBC-N	1
Magnesium (Mg)	5,300	48,000	E	Feb-97	9/9	NA		NA
Nickel (Ni)	0.2	290	E	Mar-00	17/30	100	LTHA	1
Potassium (K)	2,300	2,300	E	Jan-88	1/1	NA		NA
Sodium (Na)	21,000	350,000	E	Feb-97	33/33	NA		NA
Thallium (Tl)	0.19	3.1	E	Mar-00	4/30	0.5	LTHA	2
Zinc (Zn)	50	3,700	E	Mar-01	23/33	2,000	LTHA	1
Inorganics-Other								
Chloride (Cl)	50,000	760,000	E	Feb-97	9/9	250,000	NSDWR	2
Sulfate (SO_4)	7,600	650,000	E	Jul-90	9/9	250,000	NSDWR	2

Radiologic Parameters	Minimum (pCi/L)	Confidence	Maximum (pCi/L)	Confidence	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
								Value (pCi/L)	Source	
Gross Alpha	0.00	±0.70	23.00	±6.00	E	Jan-88	19/22	15	MCL	1
Gross Beta	0.70	±0.20	13.00	±1.00	E	Apr-99	4/4	NA		NA
Radium-226	0.20	±0.10	8.60	±0.20	E[a]	Mar-00	21/21	5	MCL	1

Sources: Flow 2001; Pinellas County Health Department 1990, 2002; FDOH 1997.
Note: [a]At this location, radium-226 plus radium-228 was 10.20±0.50 pCi/L.

Key:
CREG cancer risk evaluation guide
E east of site
I approximate value between the detection level and quantitation level
LTHA lifetime health advisory (U.S. EPA)
MCL maximum contaminant level (U.S. EPA)
NA not available
NSDWR National Secondary Drinking Water Regulation (U.S. EPA)
pCi/L picocuries per liter
ppb parts per billion
RBC-N risk-based concentration, for noncancer effects

Table 15. Private Well Summary Data—Contaminants Detected at Levels Above Comparison Values, Irrigation Wells

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (CV)		Number Above CV
						Value (ppb)	Source	
Inorganics-Metals								
Arsenic (As)	1.1	4.4	E	Feb-97	6/8	0.02	CREG	6
Calcium (Ca)	50,000	95,000	NW	Jul-90	5/5	NA		NA
Magnesium (Mg)	21,000	44,000	S	Feb-97	5/5	NA		NA
Sodium (Na)	34,000	280,000	S	Feb-97	8/8	NA		NA
Zinc (Zn)	24	2,820	E	Jul-90	6/8	2,000	LTHA	1
Inorganics-Other								
Chloride (Cl)	265,000	580,000	S	Feb-97	5/5	250,000	NSDWR	5

Sources: Flow 2001; Pinellas County Health Department 1990, 2002; FDOH 1997.

Key:

E	east of site
CREG	cancer risk evaluation guide
LTHA	lifetime health advisory (U.S. Environmental Protection Agency)
NA	not available
NSDWR	National Secondary Drinking Water Regulation (U.S. Environmental Protection Agency)
ppb	parts per billion
NW	northwest of site
S	south of Anclote River

Table 16. Surface Water Summary Data, Anclote River, Upstream

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Inorganics-Metals								
Aluminum (Al)	40	600	upstream	Apr-89	3/50	37,000	RBC-N	0
Antimony (Sb)	9	850	upstream	Jan-89	5/50	4	child RMEG	5
Arsenic (As)	1.3 X	5.3 X	SW-2	Mar-93	9/50	0.02	CREG	9
Barium (Ba)	7 X	280	upstream	May-91	20/50	700	child RMEG	0
Boron (B)	990	5,800	upstream	Apr-89	38/38	600	LTHA	38
Calcium (Ca)	80,700	290,000	SW-06	Jan-88	12/12	NA		
Chromium (Cr)	6.5 X	46	upstream	Jan-87	3/50	30	child RMEG	0
Copper (Cu)	2.5 X	18.3 X	SW-3	Mar-93	10/12	1,300	MCLG	0
Iron (Fe)	10	1,800	upstream	Aug-01	41/49	11,000	RBC-N	0
Lead (Pb)	1.2 X	4	SW-1	Mar-93	4/12	15	EPA AL	0
Lithium (Li)	41	370	upstream	Apr-89	34/38	730	RBC-N	0
Magnesium (Mg)	184,000	1,110,000	SW-5	Mar-93	12/12	NA		
Manganese (Mn)	3	30	upstream	Oct-88	11/50	500	child RMEG	0
Mercury (Hg)	0.17 X	1	SW-4A	Mar-93	7/12	2	LTHA, Inorganic Hg	0
Nickel (Ni)	2	100	upstream	Jul-90	8/50	100	LTHA	0
Potassium (K)	73,200	398,000	SW-5	Mar-93	12/12	NA		
Selenium (Se)	7.2 X	23.2 X	SW-2	Mar-93	2/12	50	child RMEG, LTHA	0
Sodium (Na)	1,590,000	8,910,000	SW-3	Mar-93	12/12	NA		

Table 16. Surface Water Summary Data, Anclote River, Upstream (continued)

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Inorganics-Other								
Fluoride (F)	370	81,000	upstream	May-91	40/49	4,000	MCL	12
Phosphate-phosphorus	50	140	SW-2	Mar-93	5/10	NA		
Ortho-P (O-P)	10	610	upstream	Oct-88	17/38	NA		
Sulfate (SO_4)	500,000	5,200,000	upstream	Jan-89	38/38	250,000	NSDWRs	38
Radiologic Parameters (pCi/L)								
Gross Alpha	-100±200	199±122	upstream	Jul-94	22/40	15	MCL	15
Gross Beta	3.5±0.3	583±114	upstream	Jul-94	38/40	4	MCL	38
Radium-226	0.00±0.4	5.4±0.5	upstream	Jul-97	34/38	5	MCL	33
Radon-222	-80±40	120±70	upstream	Jan-89	21/38	300	MCL	0
Polonium-210	0.1±0.9	14.1±3	upstream	Jun-93	14/37	NA		

Sources: NUS 1989; SMC 1987-present; Weston 1993.

Key:

CREG	cancer risk evaluation guide
EPA AL	U.S. Environmental Protection Agency action level
LTHA	lifetime health advisory (U.S. Environmental Protection Agency)
MCL	maximum contaminant level (U.S. Environmental Protection Agency)
MCLG	maximum contaminant level goal (U.S. Environmental Protection Agency)
NA	not available
NSDWRs	National Secondary Drinking Water Regulations (U.S. Environmental Protection Agency)
pCi/L	picocuries per liter
ppb	parts per billion
RBC-N	risk-based concentration, for noncancer effects (U.S. Environmental Protection Agency)
RMEG	reference dose media evaluation guide
SMC	Stauffer Management Company
X	result in less than the contract-required detection limit, but greater than or equal to the instrument detection limit

Table 16. Surface Water Summary Data, Anclote River, Upstream (continued)

Notes:

- Upstream sample was taken as part of the ongoing SMC Groundwater Monitoring Program. SMC's upstream samples are collected immediately upstream of the Stauffer site in the Anclote River directly in line with the eastern property boundary.
- Duplicate samples, collected primarily by SMC as part of its groundwater monitoring program, are counted as individual samples in these summary statistics.
- Negative radiologic readings represent samples in which the amount of radioactivity in the sample blank was larger than that in the sample.

Table 17. Surface Water Summary Data, Anclote River, Adjacent

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Inorganics-Metals								
Aluminum (Al)	39.7 X	29,000	SW-05	Jan-88	6/6	37,000	RBC-N	0
Arsenic (As)	1.1 X	48 J,N	SW-05	Jan-88	5/6	0.02	CREG	5
Barium (Ba)	8 X	84	SW-05	Jan-88	5/6	700	child RMEG	0
Calcium (Ca)	290	280,000	SW-05	Jan-88	6/6	NA		
Chromium (Cr)	80	80	SW-05	Jan-88	1/6	30	child RMEG	1
Copper (Cu)	2.8 X	10.7 X	SW-6C	Mar-93	3/6	1,300	MCLG	0
Iron (Fe)	60.6 X	28,000	SW-05	Jan-88	5/6	11,000	RBC-N	1
Lead (Pb)	1.2 X	150	SW-05	Jan-88	4/6	15	EPA AL	1
Magnesium (Mg)	160,000	996,000	SW-6B	Mar-93	6/6	NA		
Manganese (Mn)	180	180	SW-05	Jan-88	1/6	500	child RMEG	0
Mercury (Hg)	0.22 X	0.22 X	SW-6A	Mar-93	1/6	2	LTHA	0
Nickel (Ni)	89	89	SW-05	Jan-88	1/6	100	LTHA	0
Potassium (K)	68,000	335,000	SW-6B	Mar-93	6/6	NA		
Sodium (Na)	1,200,000	8,540,000	SW-6C	Mar-93	6/6	NA		
Vanadium (V)	370	370	SW-05	Jan-88	1/6	260	RBC-N	1
Zinc (Zn)	470 J	470 J	SW-05	Jan-88	1/6	2,000	LTHA	0
Inorganics-Other								
Fluoride (F)	510	17,000 J	SW-07	Jan-88	6/6	4,000	MCL	2
Phosphate-phosphorus	50	50	SW-6C	Mar-93	1/4	NA		
Total Phosphorus	40,000 J	40,000 J	SW-05	Jan-88	½	NA		

Table 17. Surface Water Summary Data, Anclote River, Adjacent (continued)

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Radiologic parameters (pCi/L)								
Gross Alpha	1±1	30±30	SW-05	Jan-88	2/2	15	MCL	2
Gross Beta	15±2	110±30	SW-05	Jan-88	2/2	4	MCL	2

Sources: Sources: NUS 1989; SMC 1987-present, Weston 1993.

Key:

CREG cancer risk evaluation guide
EPA AL U.S. Environmental Protection Agency action level
J estimated quantity below the quantitation limit
LTHA lifetime health advisory (U.S. Environmental Protection Agency)
MCL maximum contaminant level (U.S. Environmental Protection Agency)
MCLG maximum contaminant level goal (U.S. Environmental Protection Agency)
N presumptive evidence of presence of material
NA not available
pCi/L picocuries per liter
ppb parts per billion
RBC-N risk-based concentration, for noncancer effects (EPA)
RMEG reference dose media evaluation guide
X result in less than the contract-required detection limit, but greater than or equal to the instrument detection limit

Note: Duplicate samples are counted as individual samples in these summary statistics.

Table 18. Surface Water Summary Data, Anclote River, Meyers Cove

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Inorganics-Metals								
Aluminum (Al)	50	500	downstream	Jul-88	38/60	37,000	RBC-N	0
Antimony (Sb)	8	860	downstream	Jan-89	8/60	4	child RMEG	8
Arsenic (As)	1 X	6 X	SW-7B	Mar-93	12/60	0.02	CREG	12
Barium (Ba)	7 X	200	downstream	Jul-92	14/60	700	child RMEG	0
Boron (B)	970	4,500	downstream	Aug-01	55/55	600	LTHA	55
Calcium (Ca)	228,000	318,000	SW-7C	Mar-93	5/5	NA		
Chromium (Cr)	20	20	downstream	Jan-89	1/59	30	child RMEG	0
Copper (Cu)	2.1 X	10.4 X	SW-7A	Mar-93	4/5	1,300	MCLG	0
Iron (Fe)	20	14,000	downstream	Apr-89	49/60	11,000	RBC-N	1
Lead (Pb)	1.4 X	1.5 X	SW-7B	Mar-93	2/5	15	EPA AL	0
Lithium (Li)	36	370	downstream	Jan-92	51/55	730	RBC-N	0
Magnesium (Mg)	830,000	1,300,000	SW-7C	Mar-93	5/5	NA		
Manganese (Mn)	2	100	downstream	Jul-90	26/60	500	child RMEG	0
Mercury (Hg)	0.15 X	0.36	SW-7A	Mar-93	3/5	2	LTHA, Inorganic	0
Nickel (Ni)	1	100	downstream	Jul-90	12/60	100	LTHA	0
Potassium (K)	240,000	588,000	SW-7C	Mar-93	5/5	NA		
Sodium (Na)	6,700,000	10,900,000	SW-7C	Mar-93	5/5	NA		
Inorganics-Other								
Fluoride (F)	420	80,000	downstream	May-91	48/60	4,000	MCL	27

Table 18. Surface Water Summary Data, Anclote River, Meyers Cove (continued)

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Phosphate-phosphorus	60	240	SW-7B	Mar-93	3/4	NA		
Ortho-P (O-P)	10	1,300	downstream	Jan-95	31/55	NA		
Sulfate (SO4)	200,000	2,980,000	downstream	Aug-00	55/55	250,000	NSDWRs	53
Radiologic parameters (pCi/L)								
Gross Alpha	-120±90	400±200	downstream	May-87	32/55	15	MCL	11
Gross Beta	3.6±0.3	500±200	downstream	Jan-87	51/57	4	MCL	56
Radium-226	-0.03±0.08	26±0.7	downstream	Apr-90	53/56	5	MCL	1
Radon-222	-80±40	240±0	downstream	Jan-92	33/53	300	MCL	0
Polonium-210	-3±2	62±13	downstream	Jan-88	14/54	NA		

Sources: NUS 1989; SMC 1987-present; Weston 1993.

Key:

CREG	cancer risk evaluation guide
EPA AL	U.S. Environmental Protection Agency action level
LTHA	lifetime health advisory (U.S. Environmental Protection Agency)
MCL	maximum contaminant level (U.S. Environmental Protection Agency)
MCLG	maximum contaminant level goal (U.S. Environmental Protection Agency)
NA	not available
NSDWRs	National Secondary Drinking Water Regulations (U.S. Environmental Protection Agency)
ppb	parts per billion
pCi/L	picocuries per liter
RBC-N	risk-based concentration, for noncancer effects (U.S. Environmental Protection Agency)
RMEG	reference dose media evaluation guide
X	result in less than the contract-required detection limit, but greater than or equal to the instrument detection limit

Notes:

- Downstream samples were taken as part of the SMC ongoing groundwater sampling program. Each semiannual sampling event takes one sample upstream and one downstream in Meyers Cove. Downstream samples are generally taken downstream of the calcium fluoride sludge ponds, 75 to 150 feet off the north shoreline. This sampling site fits into Meyers Cove designation.
- Negative radiologic readings represent samples in which the amount of radioactivity in the sample blank was larger than that in the sample.
- Duplicate samples, collected primarily by SMC as part of its groundwater monitoring program, are counted as individual samples in these summary statistics.

Table 19. Surface Water Summary Data, Anclote River, Downstream

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Inorganics-Metals								
Aluminum (Al)	22.9 X	640	SW-08	Jan-88	9/9	37,000	RBC-N	0
Arsenic (As)	500 J,N	500 J,N	SW-10	Jan-88	1/9	0.02	CREG	1
Barium (Ba)	6.2 X	7 X	SW-9	Mar-93	7/9	700	child RMEG	0
Calcium (Ca)	237,000	310,000	SW-10	Jan-88	9/9	NA		
Copper (Cu)	9.7 X	12 X	SW-10	Mar-93	4/9	1,300	MCLG	0
Iron (Fe)	17 X	290	SW-08	Jan-88	9/9	11,000	RBC-N	0
Lead (Pb)	1.1 X	2.8 X	SW-9	Mar-93	4/9	15	EPA AL	0
Magnesium (Mg)	810,000	1,210,000	SW-9	Mar-93	9/9	NA		
Mercury (Hg)	0.13 X	0.25 X	SW-11	Mar-93	5/9	2	LTHA, Inorganic	0
Potassium (K)	24,000	442,000	SW-12	Mar-93	9/9	NA		
Selenium (Se)	1.8 X	1.8 X	SW-9	Mar-93	1/9	50	child RMEG	0
Sodium (Na)	6,400,000	9,950,000	SW-10	Mar-93	9/9	NA		
Thallium (Tl)	16.8 X	300 J,N	SW-10	Jan-88	2/9	0.5	LTHA	2
Vanadium (V)	40	40	SW-10	Jan-88	1/9	260	RBC-N	0
Zinc (Zn)	10.1 X	30 J	SW-10	Jan-88	2/9	2,000	LTHA	0
Inorganics-Other								
Fluoride (F)	500	3,000 J	SW-10	Jan-88	8/9	4,000	MCL	0
Phosphate-phosphorus	60	60	SW-11	Mar-93	1/7	NA		
Total Phosphorus	210 J	210 J	SW-08	Jan-88	½	NA		

Table 19. Surface Water Summary Data, Anclote River, Downstream (continued)

Chemical	Minimum Detected (ppb)	Maximum Detected (ppb)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppb)	Comparison Value Source	Number Above CV
Radiologic Parameters (pCi/L)								
Gross Alpha	-30±60	50±100	SW-08	Jan-88	2/2	15	MCL	1
Gross Beta	190±96	280±60	SW-10	Jan-88	2/2	4	MCL	2

Sources: NUS 1989; SMC 1987-present; Weston 1993.

Key:

CREG cancer risk evaluation guide
EPA AL U.S. Environmental Protection Agency action level
J estimated quantity below the quantitation limit
LTHA lifetime health advisory (U.S. Environmental Protection Agency)
MCL maximum contaminant level (U.S. Environmental Protection Agency)
MCLG maximum contaminant level goal (U.S. Environmental Protection Agency)
N presumptive evidence of presence of material
NA not available
ppb parts per billion
pCi/L picocuries per liter
RBC-N risk-based concentration, for noncancer effects
RMEG reference dose media evaluation guide
X result in less than the contract-required detection limit, but greater than or equal to the instrument detection limit

Notes:

- Negative radiologic readings represent samples in which the amount of radioactivity in the sample blank was larger than that in the sample.
- Duplicate samples are counted as individual samples in these summary statistics.

Table 20. Sediment Summary Data, Anclote River, Upstream

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Inorganics-Metals								
Aluminum (Al)	120	2,160	SED1	Apr-91	12/12	100,000	child i-EMEG	0
Arsenic (As)	0.4	1.6	SED5	Apr-91	5/7	0.5	CREG	4
Barium (Ba)	1.3	6.5	SED1	Apr-91	5/7	4,000	child RMEG	0
Calcium (Ca)	1,200	13,300	SED3	Apr-91	8/12	NA		
Chromium (Cr)	1.3	7.1	SED1	Apr-91	11/12	200	child RMEG	0
Cobalt (Co)	1	1	SED5	Apr-91	1/7	500	child i-EMEG	0
Copper (Cu)	8.2	32.6	SED1	Apr-91	6/12	3,100	RBC-N	0
Iron (Fe)	180	2,020	SED1	Apr-91	12/12	23,000	RBC-N	0
Lead (Pb)	1.4 J	19.9	SED1	Apr-91	8/12	400	EPA AL	0
Magnesium (Mg)	500	1,700	SED5	Apr-91	11/12	NA		
Manganese (Mn)	1.9	19.8	SED3	Apr-91	6/12	3,000	child RMEG	0
Nickel (Ni)	2.5	3	SED5	Apr-91	2/7	1,000	child RMEG	0
Potassium (K)	280	850	SED3	Apr-91	6/12	NA		
Selenium (Se)	0.34	0.34	SED1	Apr-91	1/7	300	child c-EMEG	0
Sodium (Na)	3,400	8,940	SED3	Apr-91	10/11	NA		
Vanadium (V)	1.6	8.2	SED1	Apr-91	6/7	200	child i-EMEG	0
Zinc (Zn)	5.5	33.3	SED1	Apr-91	5/12	20,000	child c-EMEG	0
Inorganics-Other								
Fluoride (F)	2.98	18,000 J	SD-09	Jan-88	17/18	3,000	child c-EMEG	1
Phosphate-phosphorus	19.4	439	SD-4C	Mar-93	11/11	NA		

Table 20. Sediment Summary Data, Anclote River, Upstream (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Total Phosphorus	72 J	435	SED1	Apr-91	6/6	NA		
TOC	924	34,800	SD-4C	Mar-93	11/11	NA		
Radiologic parameters (pCi/g)								
Gross Alpha	0.3±0.1	0.6±0.2	SD-09	Jan-88	2/2	NA		
Gross Beta	0.1±0.1	0.3±0.2	SD-09	Jan-88	2/2	NA		

Sources: NUS 1989, 1991; Weston 1991, 1993.

Key:

CREG	cancer risk evaluation guide
EPA AL	U.S. Environmental Protection Agency action level
c-EMEG	chronic environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
i-EMEG	Intermediate environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
J	estimated quantity below the quantitation limit
NA	not available
ppm	parts per million
pCi/g	picocuries per gram
RBC-N	risk-based concentration, for noncancer effects (EPA)
RMEG	reference dose media evaluation guide
TOC	total organic carbon

Note: Duplicate samples are counted as individual samples in these summary statistics.

Table 21. Sediment Summary Data, Anclote River, Adjacent

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Inorganics-Metals								
Aluminum (Al)	358	3,300	SED8	Apr-91	17/17	100,000	child i-EMEG	0
Arsenic (As)	0.49	3.4	SED8	Apr-91	11/14	0.5	CREG	10
Barium (Ba)	0.88	6.4	SED8	Apr-91	12/14	4,000	child RMEG	0
Cadmium (Cd)	1.4	1.4	SD-15C	Mar-93	1/14	10	child c-EMEG	0
Calcium (Ca)	1,650	23,200	SED8	Apr-91	17/17	NA		
Chromium (Cr)	1.7	11.6	SED8	Apr-91	17/17	200	child RMEG	0
Cobalt (Co)	1.2	1.2	SED9	Apr-91	1/14	500	child i-EMEG	0
Copper (Cu)	3.2	33.7	SED8	Apr-91	15/17	3,100	RBC-N	0
Iron (Fe)	370	3,850	SED8	Apr-91	17/17	23,000	RBC-N	0
Lead (Pb)	1.4J	8.4J	SD-07	Jan-88	16/17	400	AL	0
Magnesium (Mg)	357	3,330	SED8	Apr-91	17/17	NA		
Manganese (Mn)	1.4	17.9	SED9	Apr-91	16/17	3,000	child RMEG	0
Mercury (Hg)	0.098	0.098	SD-16B	Mar-93	1/14	20	child RMEG,	0
Nickel (Ni)	1.5	4.6	SED8	Apr-91	3/14	1,000	child RMEG	0
Potassium (K)	204	1,630	SED8	Apr-91	12/17	NA		
Selenium (Se)	0.54	0.54	SED8	Apr-91	1/14	300	child c-EMEG	0
Sodium (Na)	1,740	14,900	SED8	Apr-91	16/17	NA		
Vanadium (V)	1.8	12.8	SED8	Apr-91	14/14	200	child i-EMEG	0
Zinc (Zn)	3.8	36.7	SED8	Apr-91	12/17	20,000	child c-EMEG	0

Table 21. Sediment Summary Data, Anclote River, Adjacent (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Inorganics-Other								
Fluoride (F)	3.45	9,100J	SD-07	Jan-88	18/18	3,000	child c-EMEG	1
Phosphate-phosphorus	37.2	1,000	SD-15C	Mar-93	11/11	NA		
Total Phosphorus	217	1,700J	SD-07	Jan-88	7/7	NA		
TOC	4,610	14,100	SD-6A	Mar-93	4/4	NA		
Radiological parameters (pCi/g)								
Gross Alpha	0.7±0.3	13.5±1	SD-15B	Mar-93	9/9	NA		
Gross Beta	0.2±0.2	29.8±0.4	SD-16B	Mar-93	9/9	NA		
Radium-226	0.25*	0.79*	SD-15A	Mar-93	6/7	0.15	NCRP	6
Radon-222	0.2*	0.72*	SD-15A	Mar-93	6/7	NA		
Polonium-210	0.49*	2*	SD-15A	Mar-93	6/7	5.7	NCRP	0

Sources: NUS Corp 1989, NUS Corp 1991, Weston 1991, Weston 1993.

Key:

ppm	parts per million
pCi/g	picoCuries per gram
CREG	Cancer Risk Evaluation Guide
EPA AL	EPA Action Level
c-EMEG	chronic Environmental Media Evaluation Guide (ATSDR)
i-EMEG	Intermediate Environmental Media Evaluation Guide (ATSDR)
J	estimated quantity below the quantitation limit
NA	Not available
NCRP	National Council on Radiation Protection and Measurements
RBC-N	Risk-Based Concentration, for non-cancer effects (EPA)
RMEG	Reference Dose Media Evaluation Guide
*	Uncertainty/confidence terms not available

Table 22. Sediment Summary Data, Anclote River, Meyers Cove

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Inorganics-Metals								
Aluminum (Al)	2,130	9,500	SD-04	Jan-88	9/9	100,000	child i-EMEG	0
Arsenic (As)	1.7	8.5 J,N	SD-04	Jan-88	8/8	0.5	CREG	8
Barium (Ba)	3.4	16	SD-04	Jan-88	8/8	4,000	child RMEG	0
Beryllium (Be)	0.26	0.29	SD-14C	Mar-93	4/8	50	child c-EMEG	0
Cadmium (Cd)	0.95	0.95	SD-14C	Mar-93	1/8	10	child c-EMEG	0
Calcium (Ca)	11,600	60,000 J	SD-04	Jan-88	9/9	NA		
Chromium (Cr)	7.1	30	SD-04	Jan-88	9/9	200	child RMEG	0
Copper (Cu)	6.4	25	SC-SD-09	Apr-89	8/9	3,100	RBC-N	0
Iron (Fe)	2,280	8,500	SD-04	Jan-88	9/9	23,000	RBC-N	0
Lead (Pb)	5.6	17.1	SD-13A	Mar-93	9/9	400	EPA AL	0
Magnesium (Mg)	1,180	6,300	SD-04	Jan-88	9/9	NA		
Manganese (Mn)	8.1	36	SD-04	Jan-88	9/9	3,000	child RMEG	0
Mercury (Hg)	0.18	0.18	SD-13A	Mar-93	2/8	20	child RMEG	0
Nickel (Ni)	5.9	14	SD-04	Jan-88	3/8	1,000	child RMEG	0
Potassium (K)	309	2,100	SD-04	Jan-88	9/9	NA		
Selenium (Se)	0.26	1.2 J,N	SD-04	Jan-88	4/8	300	child c-EMEG	0
Silver (Ag)	2.4 J	2.4 J	SD-04	Jan-88	1/8	300	child RMEG	0
Sodium (Na)	3,600	21,000 J	SD-04	Jan-88	9/9	NA		
Vanadium (V)	6.9	32	SD-04	Jan-88	8/8	200	child i-EMEG	0
Zinc (Zn)	12.2	62 J	SD-04	Jan-88	9/9	20,000	child c-EMEG	0

Table 22. Sediment Summary Data, Anclote River, Meyers Cove (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Inorganics-Other								
Fluoride (F)	9.11	6,900 J	SD-04	Jan-88	12/12	3,000	child c-EMEG	1
Phosphate-phosphorus	51.9	3,750	SD-13A	Mar-93	11/11	NA		
Total Phosphorus	4,600 J	4,600 J	SD-04	Jan-88	1/1	NA		
TOC	14,200	120,000	SD-7A	Mar-93	4/4	NA		
Radiologic Parameters (pCi/g)								
Gross Alpha	14±3	30.2	SD-13A	Mar-93	7/8	NA		
Gross Beta	8±1	55.5	SD-13A	Mar-93	8/8	NA		
Radium-226	1.1*	2.4*	SD-13A	Mar-93	7/7	0.15	NCRP residential	7
Radon-222	0.99*	2.2*	SD-13A	Mar-93	7/7	NA		
Polonium-210	2.3*	7.7*	SD-13A	Mar-93	7/7	5.7	NCRP residential	1

Sources: NUS 1989, 1991, Weston 1991, 1993.

Key:
- CREG — cancer risk evaluation guide
- EPA AL — U.S. Environmental Protection Agency action level
- c-EMEG — chronic environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
- i-EMEG — Intermediate environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
- J — estimated quantity below the quantitation limit
- N — presumptive evidence of presence of material
- NA — not available
- NCRP — National Council on Radiation Protection and Measurements
- ppm — parts per million
- pCi/g — picocuries per gram
- RBC-N — risk-based concentration, for noncancer effects (EPA)
- RMEG — reference dose media evaluation guide
- TOC — total organic carbon
- * — Uncertainty/confidence terms were not available.

Table 23. Sediment Summary Data, Anclote River, Downstream

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Volatile Organic Compounds								
Methylethyl ketone	99,000 J	99,000 J	SD-08	Jan-88	1/1	30,000	child RMEG	1
Toluene	160,000	160,000	SD-08	Jan-88	1/1	1,000	child i-EMEG	1
Inorganics-Metals								
Aluminum (Al)	190	2,190	SED11	Apr-91	11/11	100,000	child i-EMEG	0
Arsenic (As)	0.42	1.9	SED11	Apr-91	4/6	0.5	CREG	3
Barium (Ba)	1.1	3.9	SED11	Apr-91	4/6	4,000	child RMEG	0
Calcium (Ca)	940	10,200	SED11	Apr-91	8/11	NA		
Chromium (Cr)	1.3	9.7	SED11	Apr-91	6/11	200	child RMEG	0
Cobalt (Co)	1.8	1.8	SED11	Apr-91	1/6	500	child i-EMEG	0
Copper (Cu)	5.8	21.8	SED11	Apr-91	4/11	3,100	RBC-N	0
Iron (Fe)	100	2,420	SED11	Apr-91	11/11	23,000	RBC-N	0
Lead (Pb)	2.2	16 J	SD-08	Jan-88	6/11	400	EPA AL	0
Magnesium (Mg)	660	2,190	SED11	Apr-91	8/11	NA		
Manganese (Mn)	2	7.6	SED11	Apr-91	5/11	3,000	child RMEG	0
Nickel (Ni)	0.9	2.7	SED11	Apr-91	3/6	1,000	child RMEG	0
Potassium (K)	351	785	SED11	Apr-91	5/11	NA		
Selenium (Se)	0.44	0.44	SED11	Apr-91	1/6	300	child c-EMEG	0
Sodium (Na)	2,200	10,200	SED11	Apr-91	9/11	NA		
Thallium (Tl)	7,800	7,800	SC-SD-14	Apr-89	1/11	4	child RMEG	1
Vanadium (V)	2.1	10	SED11	Apr-91	6/6	200	child i-EMEG	0
Zinc (Zn)	4.7	22.5	SED11	Apr-91	4/11	20,000	child c-EMEG	0

Table 23. Sediment Summary Data, Anclote River, Downstream (continued)

Chemical	Minimum Detected (ppm)	Maximum Detected (ppm)	Location of Maximum	Date of Maximum	Frequency of Detection	Comparison Value (ppm)	Comparison Value Source	Number Above CV
Inorganics-Other								
Fluoride (F)	2.77	360 J	SD-08	Jan-88	12/13	3,000	child c-EMEG	0
Phosphate-phosphorus	38.8	211	SD-11	Mar-93	7/7	NA		
Total Phosphorus	31 J	620	SED10	Apr-91	6/6	NA		
TOC	1,160	17,900	SD-11	Mar-93	7/7	NA		
Radiologic Parameters (pCi/g)								
Gross Alpha	0.2±0.1	10±1	SD-10	Jan-88	2/2	NA		
Gross Beta	0.1±0.1	4±0.4	SD-10	Jan-88	2/2	NA		

Sources: NUS 1989, 1991; Weston 1991, 1993.

Key:

CREG	cancer risk evaluation guide
EPA AL	U.S. Environmental Protection Agency action level
c-EMEG	chronic environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
i-EMEG	Intermediate environmental media evaluation guide (Agency for Toxic Substances and Disease Registry)
J	estimated quantity below the quantitation limit
NA	not available
ppm	parts per million
pCi/g	picocuries per gram
RBC-N	risk-based concentration, for noncancer effects (EPA)
RMEG	reference dose media evaluation guide
TOC	total organic carbon

Table 24. Surface Water Sampling Location Designations

Study	Date	Location Designation	Sample ID/Location[a]
Expanded site investigation (NUS 1989)	January 1988	Upstream	SW-06 SW-09
		Adjacent	SW-05 SW-07
		Meyers Cove	SW-04
		Downstream	SW-08 SW-10
Remedial investigation (Weston 1993)	March 1993	Upstream	SW-1 SW-2 SW-3 SW-4A SW-4B SW-4C SW-5
		Adjacent	SW-6A SW-6B SW-6C
		Meyers Cove	SW-7A SW-7B SW-7C
		Downstream	SW-8 SW-9 SW-10 SW-11 SW-12
Stauffer Management Company ongoing groundwater monitoring program	1987–present	Upstream	Upstream
		Adjacent	None
		Meyers Cove	Downstream
		Downstream	None

Notes:
[a]Sample IDs were changed slightly in some cases to distinguish samples from different studies taken from different locations, but given the same identifier in the original studies.

Table 25. Sediment Sampling Location Designations

Study	Date	ERG Designation	Sample ID/Location[a]
Expanded site investigation (NUS 1989)	January 1988	Upstream	SD-06 SD-09
		Adjacent	SD-05 SD-07
		Meyers Cove	SD-04
		Downstream	SD-08 SD-10
Sediment sampling program (Weston 1991)	April 1991	Upstream	SED 1 SED 2 SED 3 SED 4 SED 5
		Adjacent	SED 6 SED 7 SED 8 SED 9
		Meyers Cove	NONE
		Downstream	SED 10 SED 11 SED 12 SED 13
Listing site inspection (NUS 1991)	April 1989	Upstream	SC-SD-01 SC-SD-02 SC-SD-03 SC-SD-04 SC-SD-05
		Adjacent	SC-SD-06 SC-SD-07 SC-SD-08
		Meyers Cove	SC-SD-09
		Downstream	SC-SD-10 SC-SD-11 SC-SD-12 SC-SD-13 SC-SD-14

Table 25. Sediment Sampling Location Designations (continued)

Study	Date	ERG Designation	Sample ID/Location[a]
Remedial investigation (Weston 1993)	March 1993	Upstream	SD-1 SD-2 SD-3 SD-4A SD-4B SD-4C SD-5
		Adjacent	SD-6A SD-6B SD-6C SD-15A SD-15B SD-15C SD-16A SD-16B SD-16C
		Meyers Cove	SD-7A SD-7B SD-7C SD-13A SD-13B SD-13C SD-14A SD-14B SD-14C
		Downstream	SD-8 SD-9 SD-10 SD-11 SD-12

Notes:
[a]Sample IDs were changed slightly in some cases to distinguish samples from different studies taken from different location, but given the same identifier in the original studies.

Table 26. Meteorologic Data for the Stauffer Chemical Company Site

Parameter	Location of Meteorologic Station		
	PCDEM's Anclote Road Station	St. Petersburg/ Clearwater Airport	Tampa International Airport
Source of data	PCDEM 2002	NCDC 2002	NCDC 2002
Period of record	1979–1996	1973–2002	1948–2002
Summary for the Common Period of Record (1979–1996)			
Total possible hours	157,800	157,800	157,800
Calm hours	8,276	9,108	12,184
Missing hours	17,213	4,265	408
Completeness	89.1%	97.3%	99.7%
Summary for the Period of Interest (January 1978–May 1981, School Hours Only)			
Total possible hours	7,056	9,976	9,976
Calm hours	96	164	134
Missing hours	719	458	0
Completeness	89.8%	95.4%	100.0%

Key:

PCDEM Pinellas County Department of Environmental Management

Note:

- A "missing hour" was defined as an hour that did not have a valid observation of wind speed or wind direction.
- For the period of interest, the PCDEM has a lower number of "total possible hours" because the station did not start operating until January 1979.

Table 27. Contaminant Emission Rates for Air Dispersion Model Inputs

Contaminant	Source	Emission Rate		Comments
		Grams/ Second	Tons/ Year	
Sulfur dioxide	Rotary kiln	41.4	1,436	Rate based on results from five stack tests, whose range of emission rates was 34.7 to 47.8 grams per second. The state of Florida used an emission rate of 41.2 grams per second in the dispersion modeling analysis done when preparing the state implementation plan for the nonattainment area.
	Boilers	1.28	44	Rate based on data reported in annual disclosure statements of boiler emissions. The data assumed that all sulfur present in the fuel converts to sulfur dioxide, which is essentially the same approach the U.S. Environmental Protection Agency EPA outlines in AP-42 (EPA 1995b) for sulfur dioxide emissions from boilers. This emission rate reflects SCC's emissions after 1975, when the facility changed to low-sulfur fuels.
Particulate matter (size fraction not specified)	Rotary kiln	5.33	185	SCC has questioned whether these emissions data were accurate. SCC believed that sulfur dioxide gases collected by the sampling impingers converted to sulfate and were measured as particulate, rather than gaseous, emissions. In short, SCC suspected these emissions data include a positive measurement bias.
	Boilers	0.42	14.6	Rate based on data from a single stack test.
	Nodule cooler	0.28	9.6	Rate is an average of six stack tests.
	Coke dryer	0.45	15.6	Rate based on data SCC reported in its 1977 annual emissions disclosure statement.
	Furnace	0.23	8.1	Rate is an average of two of SCC's 1973 and 1974 emissions disclosure statements.
	Condenser	0.18	6.4	Rate is an average of two of SCC's 1973 and 1974 emissions disclosure statements.
	Materials handling	0.08	2.8	Rate is based on data SCC reported in its 1977 annual emissions disclosure statement.

Table 27. Contaminant Emission Rates for Air Dispersion Model Inputs (continued)

Contaminant	Source	Emission Rate		Comments
		Grams/ Second	Tons/ Year	
Fluorides	Rotary kiln	0.165	5.7	Rate based on SCC's 1973 and 1974 emissions disclosure statements.
	Nodule cooler	0.0072	0.25	Average of six stack test results.
	Condenser	0.0012	0.041	Rate based on SCC's 1973 and 1974 emissions disclosure statements.
	Furnace	0.0016	0.054	Rate based on SCC's 1973 and 1974 emissions disclosure statements, which account for emissions through the tap hole scrubber and not fugitive emissions that occur during furnace tapping.

Key: SCC Stauffer Chemical Company

Table 28. Stack Parameters for Air Dispersion Modeling Analysis

Source	Stack Height (feet)	Stack Diameter (feet)	Exit Temperature (°F)	Flow Rate or Velocity
Boilers	20	2	417	5,430 ACFM
Rotary kiln (before May 1979)	85	22	134	0.2 m/s
Rotary kiln (after May 1979)	160	4	134	4.2 m^3/s
Nodule cooler scrubber	85	4	123	56,400 ACFM
Coke dryer	50	2.5	122	12,600 ACFM
Materials handling "burden bin"	100	1.8	97	8,120 ACFM
Phosphorus condenser	112	1	80	1,500 ACFM
Furnace tap hole scrubber	21	3	120	20,800 ACFM

Key:

ACFM	actual cubic feet per minute
m/s	meters per second
m^3/s	cubic meters per second

Table 29. Descriptions and Coordinates for Locations Included in the Air Dispersion Modeling Analysis

Location Number*	Description	Coordinates	
		Latitude	Longitude
1	North-northwest of SCC, in Pasco County	28.175558	-82.780278
2	Gulfside Elementary School	28.173058	-82.774167
3	Residential neighborhood in southern Pasco County, northeast of SCC	28.173058	-82.763889
4	Residential neighborhood west of SCC	28.168336	-82.781111
5	Industrial complex east of SCC	28.166669	-82.771944
6	Piney Point, on shore of Gulf of Mexico	28.161947	-82.797500
7	Residential neighborhood southwest of SCC, and in prevailing downwind direction	28.163891	-82.783056
8	Area near Anclote Road monitoring station and Flaherty Marina	28.163058	-82.773889
9	Residential neighborhood south of SCC	26.160280	-82.778056
10	Residential neighborhood south-southwest and further downwind of SCC	28.155836	-82.784167
11	Howard Park, on shore of Gulf of Mexico	28.153891	-82.793333
12	Residential neighborhood southeast of SCC	28.158613	-82.771944

Key:
SCC Stauffer Chemical Company

*See Figure 19 for a map of these 12 locations.

Table 30. Predicted and Observed Sulfur Dioxide Concentrations: Anclote Road Monitoring Station

Averaging Time	Before or After Stack Reconfiguration	Sulfur Dioxide Concentration (parts per billion)	
		Predicted	Observed
Annual average	Before	9.2	14.3
Highest 24-hour average	Before	170	311
Highest 1-hour average	Before	1,144	840
Annual average	After	1.6	4.9
Highest 24-hour average	After	45	77
Highest 1-hour average	After	415	290

Notes:

- The Stauffer Chemical Company (SCC) reconfigured the rotary kiln stack in May 1979. The emission rate for this source was not changed, but the increase in stack height and decrease in stack diameter facilitated the atmospheric dispersion in the emissions, thus resulting in a notable decrease in sulfur dioxide levels at the Anclote Road monitoring station after May 1979.

- The predicted concentration estimates the incremental effect that SCC's air emissions have on actual ambient air concentrations. The observed concentration reflects the contributions from all sulfur dioxide emissions sources in the Tarpon Springs area.

- For the predicted concentrations, the "annual average" value is the average concentration observed over 5 years of meteorologic conditions; the "highest 24-hour average" and "highest 1-hour average" concentrations are the peak levels observed over this same time frame.

- The observed concentrations for the time before the stack reconfiguration are computed from all measurements made between July 1977 and May 1979; the observed concentrations for the time after the stack reconfiguration are computed from all measurements made between June 1979 and November 1981, when SCC reportedly shut down its furnace permanently. The "annual average" concentration shown is the average of all observations collected during the two time frames. **The average sulfur dioxide concentration at the Anclote Road monitoring station after SCC shut down was 1.42 ppb.**

Table 31. Predicted Percent Decrease in Sulfur Dioxide Concentrations after the 1979 Rotary Kiln Stack Modification

Location Number (see Table 29)	Percent Decrease in Predicted Sulfur Dioxide Levels, by Averaging Period		
	Annual Average	Highest 24-Hour Average	Highest 1-Hour Average
1	59%	66%	59%
2	61%	70%	62%
3	48%	48%	57%
4	81%	82%	65%
5	68%	67%	62%
6	61%	52%	48%
7	71%	73%	52%
8	83%	74%	64%
9	70%	74%	57%
10	61%	60%	53%
11	60%	38%	46%
12	66%	67%	51%

Note:

- The table presents the predicted percent decrease in *SCC's contribution to* the measured concentrations. The actual percent decreases observed will differ slightly because of relatively small contributions from other sulfur dioxide emissions sources in the area.

Table 32. Predicted Annual Average Concentrations of "Total Particulates" Resulting from Stauffer Chemical Company's Air Emissions

Location Number	Estimated Concentrations (µg/m^3) Before 1979		Estimated Concentrations (µg/m^3) After May 1979	
	Lower Kiln Emissions	Higher Kiln Emissions	Lower Kiln Emissions	Higher Kiln Emissions
1	1.2	1.9	0.8	1.1
2	2.3	3.4	1.6	1.9
3	0.8	1.2	0.6	0.8
4	3.7	5.8	1.9	2.2
5	7.3	10.9	4.6	5.6
6	1.7	2.5	1.1	1.4
7	4.5	6.6	2.8	3.3
8	2.9	4.4	1.6	1.8
9	2.5	3.7	1.6	1.9
10	2.4	3.7	1.6	2.1
11	1.3	2.00	0.9	1.1
12	1.4	2.24	0.9	1.1

Key:

µg/m^3 micrograms per cubic meter
SCC Stauffer Chemical Company

Note:

- Predictions were made for two different time frames (before May 1979 and after May 1979) to evaluate air quality impacts from SCC's reconfiguring the rotary kiln stack.

- The representativeness of the "total particulate" emissions data for the rotary kiln stack has been questioned. SCC site documents suggest that sulfur dioxide gases collected by the sampling impingers used in the stack tests converted to sulfate and were measured as particulate, rather than gaseous, emissions. In short, SCC suspected the rotary kiln emissions data have a positive measurement bias. The "lower kiln emissions" reflect air quality impacts if the measurement bias is assumed to be double the emission rate, as SCC estimates.

Table 33. Predicted Highest 24-Hour Average Concentrations of "Total Particulates" Resulting from Stauffer Chemical Company's Air Emissions

Location Number	Estimated Concentrations (µg/m^3) Before May 1979		Estimated Concentrations (µg/m^3) After May 1979	
	Lower Kiln Emissions	Higher Kiln Emissions	Lower Kiln Emissions	Higher Kiln Emissions
1	18.1	29.4	11.4	14.9
2	41.9	62.8	25.8	30.6
3	15.6	23.1	12.0	15.9
4	53.1	87.5	24.1	29.4
5	82.7	121.6	51.6	60.4
6	21.1	29.7	15.0	17.3
7	55.5	84.0	32.9	38.9
8	48.7	75.6	27.5	33.3
9	49.5	75.8	27.8	32.4
10	33.3	53.2	23.9	30.0
11	13.8	21.0	10.7	15.0
12	26.5	40.2	16.8	20.8

Key:

µg/m^3 micrograms per cubic meter
SCC Stauffer Chemical Company

Note:

- Predictions were made for two different time frames (before May 1979 and after May 1979) to evaluate air quality impacts from SCC's reconfiguring the rotary kiln stack.

- The representativeness of the "total particulate" emissions data for the rotary kiln stack has been questioned. SCC site documents suggest that sulfur dioxide gases collected by the sampling impingers used in the stack tests converted to sulfate and were measured as particulate, rather than gaseous, emissions. In short, SCC suspected the rotary kiln emissions data have a positive measurement bias. The "lower kiln emissions" reflect air quality impacts if the measurement bias is assumed to be double the emission rate, as SCC has estimated.

Table 34. Index of Air Sampling Studies Conducted While the Stauffer Chemical Company Facility Operated (1948–1981)

Party That Initiated Sampling	Purpose of Sampling	Sampling Dates	Sampling Locations	Contaminants Measured	Overview of Sampling Results
PCDEM	Evaluate attainment status with EPA's National Ambient Air Quality Standards.	1977–2002	Two locations: one immediately southeast of SCC on Anclote Road, the other roughly 7 miles southeast of SCC ("East Lake Tarpon").	Sulfur dioxide	Ambient air concentrations of sulfur dioxide at the Anclote Road monitoring station exceeded EPA's National Ambient Air Quality Standards in 1977, 1978, and 1979. The elevated concentrations have been attributed to emissions from SCC's rotary kiln stack. Annual average concentrations before a stack modification in 1979 were more than ten times higher than those measured after SCC shut down. One-hour average concentrations at the Anclote Road station exceeded 100 ppb several hundred times per year before the stack modification. Annual average sulfur dioxide concentrations at the East Lake Tarpon station in 1980–1981 were not considerably different from those measured since SCC shut down, suggesting that SCC's emissions had minimal air quality impacts at locations 7 miles from the facility.
PCDEM	Evaluate attainment status with EPA's National Ambient Air Quality Standards.	1976–1990	Two locations: one immediately southeast of SCC on Anclote Road, the other roughly 7 miles southeast of SCC ("East Lake Tarpon").	TSP	At the Anclote Road monitoring station, annual geometric mean TSP concentrations ranged from 60.2 to 73.2 $\mu g/m^3$ during years when SCC operated, and ranged from 40.7 to 51.2 $\mu g/m^3$ after the facility shut down. On average (based on arithmetic means), TSP levels decreased by 24 $\mu g/m^3$ after SCC shut down. Several measurements exceeded Florida's air quality standards, but none exceeded EPA's former TSP standards. At the East Lake Tarpon monitoring station, annual geometric mean TSP concentrations in 1979 and 1980 were 37.4 and 38.4 $\mu g/m^3$, respectively.

Table 34. Index of Air Sampling Studies Conducted While the Stauffer Chemical Company Facility Operated (1948–1981) (continued)

Party That Initiated Sampling	Purpose of Sampling	Sampling Dates	Sampling Locations	Contaminants Measured	Overview of Sampling Results
PCDEM	Analyze characteristics of particles collected on TSP filters.	1979	PCDEM's Anclote Road station, located immediately southeast of SCC	Filters were inspected for contributions from different source categories.	PCDEM hired an EPA contractor to examine the characteristics (e.g., particle types) of airborne particulate matter collected on at least 14 TSP filters from the Anclote Road monitoring station. In most of the samples considered, Stauffer's emissions were identified as the "cause" of the elevated TSP levels; in some samples, however, Stauffer's emissions were reportedly "a relatively minor source" of the measured TSP levels. Emissions sources other than SCC (e.g., mobile sources, the Anclote Power Plant) contributed, in varying amounts, to the airborne particles detected on the TSP filters.
SCC	The reasons for sampling were not always specified. One reason was to detect air quality impacts before they reached off-site locations.	1975–1982	The number and locations of sampling stations changed from year to year. In general, SCC measured sulfur dioxide levels at various locations along the perimeter of the facility property.	Sulfur dioxide	Limited inferences can be drawn from SCC's sulfur dioxide monitoring results, because the data are of questionable quality and because the data provided to date are incomplete. Several site documents acknowledge that SCC field personnel experienced problems operating the Philips Instruments sulfur dioxide monitors—problems that persisted for more than 2 years. Most site documents provide limited insights on quality control and quality assurance. The data quality concerns notwithstanding, SCC's monitoring results are reasonably consistent with PCDEM's. For instance, a monitoring summary indicated that 1-hour average sulfur dioxide concentrations in 1977 exceeded 100 ppb roughly one out of every 4 days along the facility boundary.

Table 34. Index of Air Sampling Studies Conducted While the Stauffer Chemical Company Facility Operated (1948–1981) (continued)

Party That Initiated Sampling	Purpose of Sampling	Sampling Dates	Sampling Locations	Contaminants Measured	Overview of Sampling Results
SCC	Sampling was conducted for many reasons, but generally to characterize air quality impacts from SCC.	Periodically between 1964 and 1981.	Sampling locations varied from one survey to the next; in each survey, up to 10 sampling locations were employed.	Fluorides	SCC measured ambient air concentrations of fluorides in hundreds of samples collected before the facility shut down. Out of all SCC's field surveys, only a single 24-hour average fluoride concentration (32.2 $\mu g/m^3$) exceeded Agency for Toxic Substances and Disease Registry's minimal risk level for acute inhalation exposures (20 $\mu g/m^3$). The quality of the fluoride measurements is not known and cannot be assessed from the available information, because the site documents reviewed provide no insights on accuracy, precision, or quality assurance measures. As a result, drawing firm conclusions based solely on SCC's measurements is not advised.
SCC	Sampling was conducted for many reasons, but generally to characterize air quality impacts from SCC and from other local sources.	Periodically between 1964 and 1976; routinely in 1981; and possibly during other time frames not identified in the site documents.	Sampling locations varied from one survey to the next; in each survey, up to 10 sampling locations were employed.	Particulate matter. Most air quality surveys reported concentrations of "total particulates," without indicating the particle size fraction of this metric.	Since 1964, SCC has collected hundreds of particulate air samples. In the majority of samples, concentrations were reported as "total particulates," without specifying any information on particle size distribution. One sampling station was located in immediate proximity of PCDEM's Anclote Road monitoring station, but the "total particulate" concentrations reported for SCC's stations were consistently lower than the TSP concentrations reported by PCDEM. Almost every air quality survey that measured particulate matter concentrations lacks important details on study design and quality assurance measures, which greatly limit the inferences (if any) that can be drawn from these sampling results.

Table 34. Index of Air Sampling Studies Conducted While the Stauffer Chemical Company Facility Operated (1948–1981) (continued)

Party That Initiated Sampling	Purpose of Sampling	Sampling Dates	Sampling Locations	Contaminants Measured	Overview of Sampling Results
SCC	Sampling was conducted for many reasons, but generally to characterize air quality impacts from SCC.	1964 and 1975	Ten off-site sampling locations at varying distance from the SCC facility.	Phosphorus pentoxide	The two air quality surveys measured phosphorus pentoxide concentrations at 10 offsite sampling locations. Average concentrations during the surveys ranged from 0.45 to 3.30 µg/m^3, and the highest concentration measured was 18.03 µg/m^3. Results are based on a particulate sampling method, which likely did not capture gaseous phosphorus pentoxide. It is not clear whether the methods used characterize particle-bound phosphoric acid or phosphorus pentoxide. Neither field survey provides data quality observations and it is unclear whether the surveys followed air sampling plans or quality assurance plans. For these and other reasons, drawing firm conclusions based solely on SCC's measurements is not advised.
Florida Power Corp.	To characterize air quality in the vicinity of the Anclote Plant.	1980. Monitoring was done in other years, but the results have not been located.	Four stations in northern Pinellas and southern Pasco Counties. One station was adjacent to PCDEM's Anclote Road monitoring station.	TSP	Florida Power Corporation operated an ambient air monitoring network as early as 1977. That network operated routinely, with some periods of inactivity, through 1998. However, the only results available for review are from 1980. Geometric mean TSP concentrations during this year ranged from 36 to 62 µg/m^3, with the highest levels detected adjacent to PCDEM's Anclote Road monitoring station. The highest 24-hour average concentration at this station was 185 µg/m^3. Although this ambient air monitoring network followed extensive quality control procedures in future years (1994–1998), it is unclear from the site documents whether these measures were in place in 1980. Therefore, the 1980 monitoring results from this network are of unknown quality.

Key:
EPA U.S. Environmental Protection Agency
µg/m^3 micrograms per cubic meter
ppb parts per billion
PCDEM Pinellas County Department of Environmental Management
SCC Stauffer Chemical Company
TSP total suspended particulates

Table 35. Sulfur Dioxide Levels Measured at the Anclote Road Monitoring Station

Year	1-Hour Average Concentrations			3-Hour Average Concentrations		24-Hour Average Concentrations		Annual Average Concentration (ppb)
	No. of Observations	No. of Hours with Levels >100 ppb	No. of Days with 1-Hour Average Levels >100 ppb	No. of Observations	No. of Days with 3-Hour Average Levels >500 ppb	No. of Observations	No. of Days with 24-Hour Average Levels >140 ppb	
1977	3,341	158	45	3,235	2	3,374	5	17.36
1978	7,384	287	77	7,040	3	7,540	8	14.64
1979	8,300	70	39	7,991	4	8,437	3	7.19
1980	7,878	54	29	7,504	0	8,041	0	5.68
1981	7,879	32	20	7,536	0	7,936	0	4.40
1982	8,030	3	2	7,638	0	8,194	0	1.47
1983	8,384	2	2	8,000	0	8,631	0	1.32
1984	8,514	0	0	8,164	0	8,722	0	1.14
1985	8,417	1	1	8,067	0	8,602	0	1.49
1986	8,538	0	0	8,335	0	8,629	0	1.68
1987	8,466	2	2	8,315	0	8,494	0	1.41
1988	8,579	0	0	8,479	0	8,620	0	1.71
1989	8,596	1	1	8,458	0	8,641	0	1.75
1990	8,502	0	0	8,348	0	8,567	0	1.46
1991	8,614	1	1	8,410	0	8,711	0	0.88
1992	8,582	0	0	8,452	0	8,593	0	1.33
1993	8,624	0	0	8,464	0	8,687	0	1.36
1994	8,637	3	1	8,469	0	8,737	0	1.13
1995	8,610	0	0	8,400	0	8,721	0	0.77
1996	6,801	1	1	6,671	0	6,881	0	0.89

Table 35. Sulfur Dioxide Levels Measured at the Anclote Road Monitoring Station (continued)

Key:

ppb parts per billion

Notes:

- Data source: EPA 2002a. All observations accessed were for continuous sulfur dioxide monitoring devices.
- The Anclote Road monitoring station began operating in July 1977 and stopped operating in October 1996. Therefore, the data presented for 1977 and 1996 are based on a partial year of ambient air monitoring data.
- Data for 1-hour average, 3-hour average, and 24-hour average are based on the raw figures for these averaging times reported to the Aerometric Information Retrieval System database (AIRS). Data for annual average concentrations were calculated from the set of 1-hour average observations. The raw data for 3-hour and 24-hour concentrations are running averages, meaning that each day sampling occurred can have as many as 24 observations for 3-hour average and 24-hour average concentrations.
- EPA's primary (or health-based) National Ambient Air Quality Standard for sulfur dioxide is 140 ppb for 24-hour average concentrations and 30 ppb for annual average concentrations (EPA 1995). EPA's secondary National Ambient Air Quality Standard for sulfur dioxide is 500 ppb for 3-hour average concentrations. This secondary air quality standard is not health-based, but rather protects against damage to property, impaired visibility, and other valued resources. A 1-hour average concentration of 100 ppb is the lowest acute exposure concentration that has been associated with adverse health effects in humans (persons with asthma), as documented in the Agency for Toxic Substances and Disease Registry's *Toxicological Profile for Sulfur Dioxide* (ATSDR 1998).

Table 36. Index of Air Sampling Studies Conducted After Stauffer Chemical Company Production Operations Ceased (1982–2002)

Party That Initiated Sampling	Purpose of Sampling	Sampling Dates	Sampling Locations	Contaminants Measured	Overview of Sampling Results
EPA	To determine whether the inactive site releases arsenic, fluorides, or radon to the air	November 1987	Five locations on SCC property; one off-site location	Arsenic Fluorides Radon TSP	TSP concentrations ranged from 22 to 30 µg/m^3; arsenic and fluorides were not detected; radon levels ranged from 0.1 to 2.2 pCi/L, and a control sample contained radon at 1.2 pCi/L.
Pasco County District School Board	To determine whether site demolition activities cause elevated levels of asbestos or phosphorus compounds in the air at Gulfside Elementary School	July and August 1987	Two outdoor and three indoor locations at the Gulfside Elementary School	Asbestos Elemental phosphorus Phosphoric acid Phosphoric pentoxide	Asbestos structures, phosphoric acid, and phosphorus pentoxide were not detected in any of the samples. Detection limits were reported as follows: asbestos, 0.005 structures per cubic centimeter; phosphoric acid, between 1 and 2 µg/m^3; and phosphorus pentoxide, between 1 and 2 µg/m^3. Elemental phosphorus was detected in only one of ten samples, and at a concentration of 11 µg/m^3.
PCDEM	Evaluate attainment status with EPA's National Ambient Air Quality Standards	1982–1989 1992–2002	Two locations: one immediately southeast of SCC, the other roughly 7 miles southeast of SCC	PM_{10} Sulfur dioxide TSP	Since 1981, all annual average and 24-hour average PM_{10}, sulfur dioxide, and TSP concentrations have been in attainment with EPA's primary air quality standards. The 3-hour average sulfur dioxide concentrations are in attainment with EPA's secondary air quality standards.

Table 36. Index of Air Sampling Studies Conducted After Stauffer Chemical Company Production Operations Ceased (1982–2002) (continued)

Party That Initiated Sampling	Purpose of Sampling	Sampling Dates	Sampling Locations	Contaminants Measured	Overview of Sampling Results
SCC	To determine whether site excavation activities release phosphorus compounds and asbestos into the air	May 28–29, 1997	One location upwind from the excavation, and one location downwind from the excavation	Asbestos Elemental phosphorus Phosphoric acid	On May 29, 1997, a single amosite asbestos structure was detected in an upwind sample (0.0033 structures per cubic centimeter), and a single chrysotile structure was detected in a downwind sample (0.0051 structures per cubic centimeter). Phosphoric acid was not detected in any sample, with detection limits ranging from 1 to 34 µg/m^3. Elemental phosphorus was detected in an upwind sample (2 µg/m^3) and in a downwind sample (3 µg/m^3).
SCC	To assess whether site remediation activities, mainly soil sampling, cause releases of asbestos into the air	March and April 1998	24 on-site locations around the perimeters of six former process areas, plus personal exposure samples	Asbestos	The highest time-weighted average asbestos level in the personal exposure sampling (determined by PCM) was 0.0073 fibers per cubic centimeter, which is less than NIOSH's recommended exposure level. No asbestos structures were identified in the personal exposure samples that were reanalyzed using TEM. The average asbestos concentration in the 24 ambient air samples was 0.00024 structures per cubic centimeter, as measured by TEM.

Table 36. Index of Air Sampling Studies Conducted After Stauffer Chemical Company Production Operations Ceased (1982–2002) (continued)

Party That Initiated Sampling	Purpose of Sampling	Sampling Dates	Sampling Locations	Contaminants Measured	Overview of Sampling Results
SCC	To ensure that the phosphorus drumming project did not cause unhealthy levels of air contamination	April to September 1997	At various on-site locations both upwind and downwind from the source areas	Dust Elemental phosphorus Phosphoric acid	Levels of "dust" (particle size fraction not specified) varied throughout the day, and 24-hour average concentrations ranged from 16 to 65 µg/m^3—lower than EPA's health-based standard for 24-hour average PM_{10} levels. Elemental phosphorus was detected in one sample, at 3 µg/m^3. Phosphoric acid was detected in roughly 40% of the samples—the highest detection was 4.62 µg/m^3.
Florida Power Corp.	To characterize air quality in the vicinity of the Anclote Plant	1994–1998	Three locations: one immediately southeast of SCC, another roughly 1 mile northeast of SCC, and another roughly 2 miles north of SCC	PM_{10} Sulfur dioxide TSP	From 1994 to 1998, all annual average and 24-hour average PMA_{10}, sulfur dioxide, and TSP concentrations have been in attainment with EPA's primary air quality standards. The 3-hour average sulfur dioxide concentrations are in attainment with EPA's secondary air quality standards.

Key:

EPA U.S. Environmental Protection Agency
µg/m^3 micrograms per cubic meter
NIOSH National Institute for Occupational Safety and Health
PCDEM Pinellas County Department of Environmental Management
pCi/L picocuries per liter
PCM phase contrast microscopy
PM_{10} particulate matter less than 10 µg in diameter
SCC Stauffer Chemical Company
TEM transmission electron microscopy
TSP total suspended particulates

Table 37. Stauffer Chemical Company Site, Completed Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME	COMMENTS
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
Air (off-site)	Emissions from the roaster and furnace gas condensers, electric arc furnace tap holes, and nodulizing kiln	Air	Residences Commercial properties Schools	Inhalation	Area residents Students	Past	Meteorologic records show that winds predominantly blew from the northeast to the southwest, although winds blowing in all directions at varying speeds were observed throughout the period of record. The least prevalent wind directions were from the south to the north, or the wind directions that would most likely blow emissions from site to the Gulfside Elementary School. During the years of plant operations, outdoor air monitoring detected primarily elevated concentrations of sulfur dioxide and particulates.
Air (on-site)	See above	Air	Work areas	Inhalation	Former Stauffer workers	Past	Workers might have been exposed to emissions during routine work activities. Some worker monitoring data, conducted by Stauffer, are available (work area or personal monitors were examined for dusts, metals, fluorides, sulfur dioxide, and phosphorus).

Table 37. Stauffer Chemical Company Site, Completed Exposure Pathways (continued)

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME	COMMENTS
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
On-site groundwater	Disposal ponds Slag processing area	Groundwater	On-site supply wells	Ingestion	Workers	Past *Future*	On-site supply wells (from the Floridan Aquifer) were used to provide potable water during the years of Stauffer's operations. Since approximately 1979, the site has been served by public water, which is unaffected by Stauffer activities. Historic sampling data from supply wells did not reveal elevated levels of contaminants. On-site groundwater within the shallow aquifer has been affected by past site activities. Monitoring data reveal elevated concentrations of metals, fluoride, phosphorus, and radionuclides. Available data indicate that the deeper Floridan aquifer has not generally been affected by site activities, though elevated fluoride and phosphorus levels were detected in the deeper wells near the karst feature identified in the southeastern portion of the site.

Table 37. Stauffer Chemical Company Site, Completed Exposure Pathways (continued)

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME	COMMENTS
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
On-site surface soil and slag	Wastes generated site operations (e.g., calcium silicate slag, metals, furnace off-gas solids, phosphorous-containing sludge)	Soil/slag	Processing and surrounding areas	Incidental (accidental) ingestion Skin contact Inhalation of surface soil dusts	Former and current site workers Remediation workers Trespassers	Past Current Future	Possible exposure to site soils is expected to be limited to on-site workers and occasional trespassers. Planned remedial actions should prevent future exposures. Historically, the majority of the site was fenced, with 24-hour security (NUS 1989). Access to the site continues to be restricted and accessible only to workers. The disposal areas between Anclote Road and Anclote Boulevard have not always been securely fenced; this disposal area is less than 2,000 feet from the Gulfside Elementary School. Past studies have shown elevated levels of contaminants in the on-site surface soils in and around the processing areas of the plant (most significantly in and around former disposal ponds, slag processing/storage areas, and production facilities).
Off-site surface soil	Plant furnace emissions Residual slag	Soil	Residences Commercial properties Schools	Incidental (accidental) ingestion Skin contact Inhalation of surface soil dusts	Area residents Employees Students	Past Current Future	Residential, commercial, and school properties are in the immediate vicinity of the Stauffer site. The Gulfside Elementary School abuts the site on the northern property boundary. The only off-site soil data collected was from the Gulfside Elementary School. No measured contaminants were detected at levels above CVs, except for radium-226. No soil sampling has occurred in areas in predominant downwind areas.

Table 37. Stauffer Chemical Company Site, Completed Exposure Pathways (continued)

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME	COMMENTS
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
Off-site slag	Wastes generated from elemental phosphorus production	"Slag"	Roadways Building materials	Incidental (accidental) ingestion Skin contact Inhalation of dusts	Area residents, employees, and students	Past Current Future	Waste slag was used in the community in constructing roads and building materials. The waste slag was first shipped to off-site storage locations before distributing it for community use. In general, testing of slag materials revealed low levels of chemical and radiologic activity.
Surface water (Anclote River and Meyers Cove)	Groundwater discharge and site drainage	Surface water	Along the banks of the Anclote River	Incidental (accidental) ingestion Skin contact	Residents of and visitors to downstream areas	Past Current Future	Site drainage flows to the Anclote River, west to the Gulf of Mexico (~1.6 miles from the site). The river is not currently used for drinking water, however, a Pasco County Park is located 0.9 miles west on the Anclote River (NUS 1989). The river is used extensively for recreational and commercial activities including swimming, boating, and fishing. The site lagoon system is situated approximately 40 feet from the Anclote River and less than 0.5 miles from a shellfish harvesting area.
Sediment (Anclote River and Meyers Cove)	Groundwater discharge and site drainage	Sediment	Along the banks of the Anclote River	Incidental (accidental) ingestion Skin contact	Residents of and visitors to downstream areas	Past Current Future	As mentioned above, the Anclote River has a variety of recreational and industrial uses. Sediments were found to have the highest concentration of many contaminants in Meyers Cove, the area directly adjacent to the site. Meyers Cove is not used for recreational purposes; further, few contaminants exceed CVs. People would not come in contact with river sediments except perhaps infrequently along the immediate shore and possibly during the collection of shellfish.

Italicized text indicate aspects of the pathway for which data are uncertain, incomplete, or unavailable.
Key: CV comparison value SMC Stauffer Management Company

Table 38. Stauffer Chemical Company Site, Potential Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME	COMMENTS
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
Off-site groundwater (Floridan aquifer)	*Not verified*	Deep groundwater	Residential and commercial potable wells	Ingestion Skin Contact	Residents Visitors	Past Current Future	Groundwater in the area of the site (in Holiday and Tarpon Springs) is used for drinking water. All drinking water wells are believed to be in the deeper Floridan aquifer. Current data suggest that discharge of contaminated groundwater to the Anclote River (in the direction of groundwater flow) prevents any impact on downgradient private wells. The nearest private potable well is believed to be 2,500 feet northwest (upgradient) of the site. Commercial potable wells exist east (cross-gradient) of the site. Arsenic, chromium, lead, nickel, thallium, zinc, chlorides, sulfate, gross alpha radiation, and radium-226 were detected above Agency for Toxic Substances and Disease Registry CVs, but at relatively low frequencies. ATSDR considers this a potential exposure pathway because people are drinking water from areas wells. Though area wells are generally not believed to be in the path of groundwater contaminant flow from the site, ATSDR evaluated this pathway to understand the potential for exposure to harmful levels of contaminants and to address specific community concerns about the safety of drinking private well water in the vicinity of the site.

Table 38. Stauffer Chemical Company Site, Potential Exposure Pathways (continued)

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME	COMMENTS
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
Off-site groundwater (Shallow aquifer)	*Not verified*	Shallow groundwater	Irrigation wells	Skin	Residents Visitors	Past Current Future	Though irrigation wells also are not believed to be in the path of groundwater contaminant flow from the site, ATSDR evaluated this pathway to understand the potential for exposure to harmful levels of contaminants. Generally, limited potential likely exists for contact with water from irrigation wells. Arsenic, zinc, and chlorides were detected in some irrigation wells above *drinking water* CVs; however, detected concentrations are not expected to be of public health concern through skin contact.
On-site subsurface soil	Wastes generated from elemental phosphorus production	Soil	Disposal areas	Incidental (accidental) ingestion Skin contact Inhalation of dusts	Remediation workers	*Future*	On-site subsurface soils include those located on and around the main processing area, beneath the slag piles, and within the former disposal ponds. No past or current exposures exists, because soils are not accessible. Site cleanup plans which are still under negotiation will be developed and implemented with the goal of preventing future exposures.
Biota (Anclote River/Gulf of Mexico)	Contaminants in surface water and sediment	Fish Shellfish	*Fish/shellfish harvested from the river/gulf*	Ingestion	Recreational fishers Consumers of commercially harvested fish	Past Current Future	No sampling data (fish tissue) are available to evaluate possible impact of site contaminants on area fish/shellfish. However, the type of, location of, and detection frequency of contaminants reported in river and Meyers Cove sediments show that accumulation of contaminants in fish/shellfish tissue is not likely.

Table 38. Stauffer Chemical Company Site, Potential Exposure Pathways (continued)

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME	COMMENTS
	Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population		
External gamma radiation	*Process waste and slag*		On-site and off-site areas Building and roadway materials		Workers Residents	Past Current Future	Community exposure to gamma radiation was the subject of a recent Agency for Toxic Substances and Disease Registry health consultation (ATSDR 2002), which concluded that doses from homes and pavement with slag are not elevated and do not pose a health threat. No conclusion can be made about the extent to which Stauffer site slag material is contained in surrounding community roads and buildings.

Italicized text indicate aspects of the pathway for which data are uncertain, incomplete, or unavailable.

Key:

CV comparison value
SMC Stauffer Management Company

Table 39. Hourly Sulfur Dioxide Levels at the Anclote Road Monitoring Station When Stauffer Chemical Company Was Operating, Number of Samples Greater Than ATSDR's Acute Inhalation MRL of 10 ppb

Year	Hourly Average Concentrations		
	Number of 1-hour Samples	Number of 1-hour Samples Greater Than 10 ppb	Number of Days With Concentrations Greater Than 10 ppb
1977	3,341	507	96
1978	7,384	950	192
1979	8,300	783	194
1980	7,878	663	171
1981	7,879	564	156
Total	34,782	3,467	809

Key:
ppb parts per billion

Table 40. Summary of Studies Showing Effects to the Lung From Sulfur Dioxide Exposure in Persons With and Without Asthma. Pertinent Animal Studies Are Also Reported.

Sulfur Dioxide, ppb	Duration of Exposure, Minutes	Exposure Conditions	Effect End Point	Reference
8,000	20	Healthy persons without asthma	Redness of airways (trachea, bronchi), Increased inflammatory cells in fluids from lung	Sandstrom et al. 1989
5,000	10	Healthy persons without asthma, quiet mouth breathing	Increased air airway resistance	Lawther et al. 1975
5,000	10 to 30	Healthy persons without asthma	Cough, sense of irritation	Frank et al. 1962
4,000	20	Healthy persons without asthma	Increased number macrophages in fluid from lungs	Sandstrom et al. 1989
1,000	Not specified	Healthy persons without asthma	Increased airway resistance	Lawther et al. 1975
1,000	10	Healthy persons without asthma	Increased heart rate and breathing rate	Amdur et al. 1953
1,000	10	Mouthpiece, exercise, persons with mild asthma	Significantly increased airway resistance Wheezing and shortness of breath (symptoms of bronchoconstrictions)	Sheppard et al. 1981
1,000	30	Mouthpiece, exercise, healthy adolescents without asthma	Small changes in pulmonary function tests	Koenig et al. 1982
1,000	30	Mouthpiece, exercise, adolescents with asthma	Changes in pulmonary function tests consistent with bronchoconstriction, shortness of breath and wheezing	Koenig et al 1981
950	3 hours	Intermittent periods	Coughing	Dodge 1985
600	immediate 10 20	Mouthpiece, hyperventilation, healthy persons without asthma	increased airway resistance and significant bronchoconstriction in 13 of 26 persons	Islam et al 1992
600	5	Chamber exposure, heavy exercise, persons with asthma	Significantly increased airway resistance	Linn et al. 1983

Table 40. Summary of Studies Showing Effects to the Lung From Sulfur Dioxide Exposure in Persons With and Without Asthma. Pertinent Animal Studies Are Also Reported. (continued)

Sulfur Dioxide, ppb	Duration of Exposure, Minutes	Exposure Conditions	Effect End Point	Reference
500	10	Mouthpiece apparatus, exercise, persons mild with asthma	Significantly Increased airway resistance and bronchoconstriction in seven of seven subjects Wheezing and shortness of breath in three of seven subjects	Sheppard et al. 1981
500	10 to 75	Chamber, exercise, persons with mild asthma	Increased airway resistance, increase less significant with time, except in two subjects. One subject withdrew because of pronounced wheezing and tightness of chest	Roger et al, 1985
500	3 to 5	Mouthpiece apparatus, hyperventilation, persons with asthma	Increased airway resistance	Balmes et al. 1987
500	3	Mouthpiece apparatus, hyperventilation, persons with asthma, cold dry air	bronchoconstriction causing wheezing and shortness of breath in 6 of 7 people, 2 people requested bronchodialators after exposure	Bethel et al 1984
500	5	Mouthpiece apparatus, exercising asthmatics	bronchoconstriction at moderate and high but not low work rate	Bethel et al, 1983
500	5	Facemask (oronasal breathing), exercising asthmatic	bronchoconstriction at high work rate	Bethel et al 1983
400	5	Chamber exposure, heavy exercise, persons with asthma	Moderately increased airway resistance	Linn et al. 1983
250 (lowest exposure tested)	40 with 10 minutes as exercise	Chamber exposure, exercise, persons with asthma	Slight, but statistically significant, decrease in air flow rate	Schachter et al. 1984
250 (only exposure tested)	5	Chamber exposure, moderate exercise, persons with asthma	Increased airway resistance	Bethel et al. 1985

Table 40. Summary of Studies Showing Effects to the Lung From Sulfur Dioxide Exposure in Persons With and Without Asthma. Pertinent Animal Studies Are Also Reported. (continued)

Sulfur Dioxide, ppb	Duration of Exposure, Minutes	Exposure Conditions	Effect End Point	Reference
250	3	Mouthpiece apparatus	Increased airway resistance	Myers, 1986a, 1986b
250	10	Mouthpiece apparatus, exercise, persons with mild asthma	Significantly increased airway resistance in three of seven subjects No wheezing or shortness of breath	Sheppard et al. 1981
250 (lowest exposure tested)	10 to 75	Chamber exposure, exercise, persons with mild asthma	No increase in airway resistance	Roger et al. 1985
250 (lowest exposure tested)	10	Chamber exposure, exercise, persons with asthma	Reanalysis of Roger et al. 1985 data indicates airway effects in some subjects	Hortsman et al. 1986
200 (lowest exposure tested)	5	Chamber exposure, heavy exercise, persons with asthma	No increase in airway resistance	Linn et al. 1983, 1987
100 (only exposure tested)	40 with 10 minutes as exercise	Mouthpiece apparatus, moderate exercise, allergic adolescents (some with asthma)	No increase in airway resistance from SO_2 alone; increase observed in combination with 68 $\mu g/m^3$ sulfuric acid	Koenig et al. 1989
100	10	Mouthpiece apparatus, moderate exercise, persons with mild asthma	Increased airway resistance in two of seven subjects	Sheppard et al. 1981
100	3	Mouthpiece apparatus; hyperventilation; cold, dry air; persons with asthma	Increased airway resistance	Sheppard et al. 1984

Table 41. Hourly Sulfur Dioxide Levels at the Anclote Road Monitoring Station When Stauffer Chemical Company Was Operating, Number of Samples Greater Than 100 ppb

Year	Hourly Average Concentrations		
	Number of 1-hour Samples	Number of 1-hour Samples Greater Than 100 ppb	Number of Days With Concentrations Greater Than 100 ppb
July to December 1977[1]	3,341	158	45
all 1977[2]	6,682[3]	316	90
1978	7,384	287	77
1979	8,300	70	39
1980	7,878	54	29
1981	7,879	32	20
Total from actual sample measurements (7/1/1977 through 12/31/1981).	34,782	601	210

[1]Air monitoring began at the Anclote Road monitoring station in July 1977; therefore, the data presented in this row are actual measurements.

[2]The data presented for all of 1977 is estimated based on actual measurements from July to December 1977.

[3]Estimated.

Table 42. Frequency of Significantly Elevated Hourly Sulfur Dioxide Levels at the Anclote Road Monitoring Station in Relation to Wind Direction

Year	No. Hours Downwind at the Anclote Road Monitoring Station	No. Hours Above 100 ppb Sulfur Dioxide and Known Wind to the Southeast	Frequency in Percent
January to May 1979	720	48	6.7
1979	1,577	57	3.6
1980	1,687	50	3.0
1981	1,558	27	1.7

Table 43. Estimated Number of Hours That Hourly Sulfur Dioxide Levels Might Have Exceeded 100 ppb in Four Areas from January to May 1979.

Direction from Kiln	Geographic Area	January to May 1979		
		No. Hours Wind Blows to Each Location	Estimated Percent of Time That Levels Exceed 100 ppb	Estimated No. Hours Sulfur Dioxide Is Above 100 ppb
Southwest	Residences southwest of Stauffer who live along the shore of the Anclote River	785	6.7	52
West	Residences west of Stauffer	908	6.7	60
East	Businesses east of Stauffer	575	6.7	38
North	The slag processing area north of the kiln but still part of Stauffer[1]	463	6.7	31

[1]Gulfside Elementary School is another 1,000 feet north of the former slag processing area.

Table 44. Annual Average Sulfur Dioxide Levels From 1977 to 1982

Year	Sulfur Dioxide Level* (parts per billion)
1977	17
1978	15
1979	7
1980	6
1981	4
1982	1

*Sulfur dioxide levels are rounded to the nearest whole number. The exact level can be found in Table 35.

Table 45. Predicted Maximum Hourly Sulfur Dioxide Levels, 1977 to 1981, at Various Locations Around Tarpon Springs

Location*	Description	Predicted Maximum Hourly Sulfur Dioxide Levels (ppb)**
1	North-northwest of Stauffer facility, in Pasco County	629
2	Gulfside Elementary School	1,052
3	Residential neighborhood in southern Pasco County, northeast of Stauffer facility	526
4	Residential neighborhood west of Stauffer facility	1,052
5	Industrial complex east of Stauffer facility	1,167
6	Piney Point, on the shore of the Gulf of Mexico	412
7	Residential neighborhood southwest of Stauffer facility, and in prevailing downwind direction	824
8	**Anclote Road monitoring station near the Flaherty Marina**	1,144
9	Residential neighborhood south of Stauffer facility	847
10	Residential neighborhood south-southwest and further downwind of Stauffer facility	561
11	Howard Park, on the shore of the Gulf of Mexico	400
12	Residential neighborhood southeast of Stauffer facility	618

*See Figure 19, Appendix A
** parts per billion

Table 46. Predicted Annual Average Sulfur Dioxide Levels, 1977 to 1981, at Various Locations Around Tarpon Springs

Location*	Description	Predicated Annual Average Sulfur Dioxide Levels (ppb)**	
		1977 to April 1979	May 1979 to 1981
1	North-northwest of Stauffer facility, in Pasco County	4	2
2	Gulfside Elementary School	7	3
3	Residential neighborhood in southern Pasco County, northeast of Stauffer facility	3	1
4	Residential neighborhood west of Stauffer facility	13	3
5	Industrial complex east of Stauffer facility	23	7
6	Piney Point, on the shore of the Gulf of Mexico	6	2
7	Residential neighborhood southwest of Stauffer facility, and in prevailing downwind direction	14	4
8	**Anclote Road monitoring station near the Flaherty Marina**	9	2
9	Residential neighborhood south of Stauffer facility	8	2
10	Residential neighborhood south-southwest and further downwind of Stauffer facility	8	3
11	Howard Park, on the shore of the Gulf of Mexico	4	2
12	Residential neighborhood southeast of Stauffer facility	5	2

* See Figure 19, Appendix A
** parts per billion, levels are rounded to the nearest whole number

Table 47. Summary of Recent Important Epidemiologic/Controlled Human Particulate Matter Exposure Studies of Specific Physiologic End Points

Physiologic End Point	Observed Association With Particulate Matter Exposure	Reference
Lung function	Small declines in lung function; large risk of substantial decrements Growth of lung function in children reduced	Pope 2000 Gauderman et al. 2000
Hypoxemia	No clear associations with blood oxygen saturation	Pope et al. 1999
Plasma viscosity	Increased risk of elevated blood plasma viscosity	Peters et al. 1997
Heart rate	Increased mean heart rate and odds of substantially elevated heart rate	Pope et al. 1999 Peters et al. 1999
Heart rate variability	Changes in cardiac rhythm Decrease in overall heart rate variability	Liao et al. 1999 Pope et al. 1999 Gold et al. 2000
Pulmonary inflammation	Elevated white blood cell counts, band cells expressed as percent of polymorphonuclear leukocytes, neutrophils, platelets, lymphocytes, and/or eosinophils	Tan et al. 2000 Salvi et al. 1999 Ghio et al. 2000
RBC sequestration	Changes in hemoglobin adjusted for albumin suggest that inhalation of some component of particulate matter may cause sequestration of red cells in the circulation by changes in RBC adhesiveness	Seaton et al. 1999
Heart arrhythmia	Increased risk of implanted cardioverter-defibrillator discharges	Peters et al. 2000

Partially adapted from Pope (2000).

Table 48. Estimated Annual Average PM_{10} Levels Based on TSP Levels Measured at the Anclote Road Monitoring Station From 1977 to 1989

Year	TSP ($\mu g/m^3$)	Estimated PM_{10} ($\mu g/m^3$)	Estimated Overall Average PM_{10} ($\mu g/m^3$)
SCC Facility Open			
1977	60	30	34
1978	65	33	
1979	70	35	
1980	73	37	
1981	71	36	
SCC Facility Closed			
1982	46	23	24
1983	46	23	
1984	51	26	
1985	51	26	
1986	49	25	
1987	48	24	
1988	49	25	
1989	41	20	

Key:

$\mu g/m^3$ micrograms per cubic meter
TSP total suspended particulates
PM_{10} particulate matter less than 10 micrometers in diameter

Table 49. Estimated $PM_{2.5}$ Levels at the Anclote Road Monitoring Station From 1977 to 1989*

Year	Estimated PM_{10} ($\mu g/m^3$)	Estimated $PM_{2.5}$ ($\mu g/m^3$)	Overall Estimated Average $PM_{2.5}$ ($\mu g/m^3$)
SCC Facility Open			
1977	30	18	20
1978	33	20	
1979	35	21	
1980	37	22	
1981	36	21	
SCC Facility Closed			
1982	23	14	14
1983	23	14	
1984	26	15	
1985	26	15	
1986	25	15	
1987	24	14	
1988	25	15	
1989	20	12	

*The estimated $PM_{2.5}$ levels reported in this table were calculated based on assumed particle size distributions. Though these calculations were made using the best information available to ATSDR, the assumed distributions might not represent conditions while Stauffer operated. Therefore, the estimated $PM_{2.5}$ levels contain some uncertainty. Appendix G describes the nature of this uncertainty, and Section 5.3.2 describes how the uncertainty factored into ATSDR's overall evaluation of particulate matter exposures.

Key:

$\mu g/m^3$ micrograms per cubic meter
PM_{10} particulate matter less than 10 micrometers in diameter
$PM_{2.5}$ particulate matter less than 2.5 micrometers in diameter

Table 50. Summary of Epidemiologic Evidence of Health Effects of Acute Exposure to Particulate Matter Air Pollutants

Health End Points	Observed Association with Particulate Matter
Episodes of death and hospitalizations	Elevated respiratory and cardiovascular mortality and hospitalizations.
Mortality (death)	Elevated daily respiratory and cardiovascular mortality counts. Effects persisted with various approaches to control for time trends, seasonality, and weather. Near-linear associations with little evidence of threshold.
Hospitalization and other health-care visits	Elevated hospitalizations, emergency room visits, and clinic/outpatient visits for respiratory and cardiovascular disease. Effects generally persisted with various approaches to control for time trends, seasonality, and weather.
Symptoms/lung function	Increased occurrence of lower respiratory symptoms, cough, and exacerbation of asthma. Only relatively weak associations with respiratory symptoms. Small, often significant declines in lung function.

Adapted from Pope (2000).

Table 51. Summary of Arsenic and Lead Levels in Private Wells Near the Stauffer Chemical Company Site

Contaminant	Maximum Level in ppb	Date	Comments
Arsenic	26 and 23 (commercial)	March 2000	Levels in the remaining commercial and residential wells were less than the federal drinking water standard of 10 ppb.
	24 (residential, Pasco County)		
Lead	270 (residential)	March 2001	Other private wells contained 160, 24, and 18 ppb lead. The remaining residential and all commercial wells were below the lead drinking water standard of 15 ppb.

Key:
ppb parts per billion

Table 52. Summary of Arsenic Levels in On-Site Surface Soils, Pond Soils, and Slag

	No. Samples			Arsenic Levels, ppm	
Media	**Above ATSDR CV**	**With Detectable Arsenic**	**Collected**	**Average**	**Maximum**
Surface Soils	30	32	91	20	140
Pond Soils	48	48	59	122	340*
Slag	1	2	11	2	4.2

Key:

ATSDR Agency for Toxic Substances and Disease Registry
CV comparison value
ppm parts per million

*estimated concentration

Table 53. Estimated Dose of Arsenic in Children From Exposure to On-Site Surface Soils, Pond Soils, and Slag

Age Group	Surface Soils, µg/kg/day	Pond Soils, µg/kg/day	Slag, µg/kg/day
1-year-old child	0.28	1.7	0.028
Preschool children	0.18	1	0.017
Elementary school children	0.039	0.23	0.0039
Teenagers	0.025	0.15	0.0025
Adult men	0.02	0.12	0.002
Adult women	0.023	0.14	0.0023
Minimal risk level	0.3	0.3	0.3
Highest level not harmful	0.8	0.8	0.8
Lowest harmful level	14	14	14

Key:

µg/kg/day	milligrams per kilogram per day
MRL	minimal risk level

Note:
Average arsenic levels, in parts per million, are as follows:

- 20 ppm in surface soil
- 122 ppm in pond soil
- 2 ppm in slag.

Table 54. Theoretical Risk of Cancer from Arsenic in Soil

Media	Average Arsenic Level, Parts per Million	Estimated Number of Cancers*	Theoretically Exposed Population
Background for Florida	1	0 to 3	1,000,000
Background for eastern United States	7	0 to 20	1,000,000
On-Site Surface soils	20	0 to 50	1,000,000
On-Site Pond soils	122	0 to 300	1,000,000

*Numbers are rounded

Table 55. List of Area/Job Classification Categories for Stauffer Chemical Company, Tarpon Springs

Area Name	Job Classifications
Yard Department	Yard Labor, Diesel Equipment Operator, Switcher, Truck Driver, Janitor, Foreman
Kiln Department	Kiln Operator, Kiln Helper, Raw Materials Operator, Kiln Utility Person, Kiln Relief Operator
Furnace Department	Furnace Operator, Tapper, Utility Person, Furnace Relief Operator, Shift Foreman, Mudmill Operator (historic classification, not current)
P_4 Handling Department	P_4 A Operator, P_4 B Operator, Pond Clarifier, Drum Loader
Laboratory Department	Analyst, Sampler, Chemist
Mechanical Department	Lubrication Mechanic, Mechanic Leadmen, Mechanics, Painters, Electrical Leadmen, Electricians, Storeroom Clerk, Mechanical Foreman, Electrical Foreman, Storeroom Foreman, Pollution Mechanic
Plant (General)	Supervision, All Personnel

Key:

P_4 Phosphorus

Table 56. Worker Exposure Concentrations and Limits From Stauffer Chemical Company, Tarpon Springs, Monitoring Data

Contaminant	Concentration		Area/Job Classification or Area and Specific Location	Protect Equip. Used	Type	Year	Total Number of Samples	Date Range
	Minimum	Maximum						
Arsenic	<0.01 µg/m^3	<0.5 µg/m^3	Furnace Department, Furnace Operator	N	TWA	1978	43	1975–1978
Arsine	ND	0.05 ppm	P_4 Handling Department, Condenser Deck	N	Grab	1975	6	1975
Asbestos	ND	0.33 f/cc	Storeroom, Asbestos Room	N/S[†]	Area	1976	13	1975–1976
Carbon Monoxide	0 ppm	>700 ppm	Furnace Department, Rotoclone Collection	N	Grab	1975	96	1974–1980
Fluoride	0.00583 mg/m^3	0.5 mg/m^3	Kiln Department, Kiln Operator	N	EXC	1975	14	1975–1979
Hydrogen Sulfide	26 ppm	>60 ppm	P_4 Handling Department, P_4 Tank Car	N	Grab	1978	3	1978
Hydrogen Fluoride	0 ppm	0 ppm	Furnace Department, Furnace Building Roof	N	Grab	1977	1	1977
Iron Oxide	0.01 mg/m^3	1.82 mg/m^3	Mechanical Department, Mechanics	C	TWA	1981	12	1981
Lead	50 µg/m^3	423 µg/m^3	Mechanical Department, Painters	C	TWA	1981	4	1981
Ni (Sol/Metal)	<0.01 mg/m^3	0.26 mg/m^3	Mechanical Department, Mechanics - welding	C	TWA	1981	8	1981
Nuisance dust: silica[‡]	<0.052 mg/m^3	3.94 mg/m^3	Furnace Department, Burden Bins	N	Area	1975	3	1975
Oxygen	18.8%	21.0%	P_4 Handling Department, P_4 Tank Car	N	Grab	1978	80	1974–1980
P_2O_5/H_3PO_4	0.05 mg/m^3	4.99 mg/m^3	P_4 Handling Department, P_4 A Operator	C	TWAN	1981	31	1981
Phosphine	ND	>7 ppm	P_4 Handling Department, P_4 Tank Car	N	Grab	1978	10	1975–1978
Phosphoric Acid: "filter (leach)"	ND	4.06 mg/m^3	P_4 Handling Department, Condenser Deck	N	Grab	1979	15	1977–1979
Phosphorus (P_4)	ND	88.9 µg/m^3	P_4 Handling Department, Pond Clarifier	N	N/A	1975	16	1975–1977
Phosphorus-Yellow	3.04 µg/m^3	255.67 µg/m^3	P_4 Handling Department, P_4 B Operator	C	PAR	1979	48	1976–1981
Quartz	<6.2 µg/m^3	74.7 µg/m^3	Furnace Department, Utility Person	C	TWA	1980	56	1980
Quartz-T	220.3 µg/m^3	1,392 µg/m^3	Yard Department, Yard Labor	C	TWA	1979	7	1979–1980

Table 56. Worker Exposure Concentrations and Limits From Stauffer Chemical Company, Tarpon Springs, Monitoring Data (continued)

Contaminant	Concentration		Area/Job Classification or Area and Specific Location	Protect Equip. Used	Type	Year	Total Number of Samples	Date Range
	Minimum	Maximum						
Respirable Dust	0.03 mg/m^3	15.6 mg/m^3	P_4 Handling Department, P_4 Operator	N	Area	1975	56	1975–1980
Silica Mixt-T	103%	604%[§]	Yard Department, Yard Labor	C	TWA	1979	7	1979–1980
Silica Mixture	<1%	148%[§]	Furnace Department, Utility Person	C	TWA	1980	55	1975–1980
Sulfur Dioxide	ND	1.39 ppm	Mechanical Department, Pollution Mechanic	C	TWA	1981	59	1979–1981
Total Dust	3.05 mg/m^3	590 mg/m^3	Kiln Department, Feed End	N/S	N/A	1972	7	1972–1980
Total Chromium	<0.01 mg/m^3	0.46 mg/m^3	Mechanical Department, Mechanics - welding	C	TWA	1981	8	1981

[§]The concentration is expressed as a percentage of the PEL. OSHA's PEL when the facility operated was 100%. According to site documents, silica mixture is a combination of quartz and respirable dust exposures.
[†]Document does not give protective equipment code, but refers to the use of "OSHA-Approved Respirator."
[‡]Calculated value, based on level of nuisance dust (mg/m^3) and percent silica content.

Key:

Protect Equip. (Protective Equipment) Code
N - None
C - half-face air-purifying respirator
N/S - Not Specified

Type
The type of sample for the value given under the column Maximum Concentration. Definitions for types of sampling are provided in Appendix D.

Other Abbreviations
EXC - excursion sample, short-term breathing zone sample of 10–60 minutes
N/A - not available
ND - not detected
OSHA - Occupational Safety and Health Administration
PAR - partial shift breathing zone sample of 60–360 minutes duration

PEL - permissible exposure limit
TWA - time-weighted average
TWAN - full shift breathing zone sample that is not representative of

Concentration Units
µg/m^3 - micrograms per cubic meter
mg/m^3 - milligrams per cubic meter
ppm - parts per million
f/cc - fiber per cubic centimeter
% - percent
< or > signifies that the value was greater than or less than the limit of detection

typical plant operations

Table 57. Contaminants Exceeding an Occupational Standard or Agency for Toxic Substances and Disease Registry Comparison Value at Stauffer Chemical Company in Tarpon Springs

Contaminant	Maximum Concentration	Threshold Limit Value	Comparison Value
Arsenic	< 0.5 µg/m^3 or 0.0005 mg/m^3	0.01mg/m^3 TWA	0.0002 µg/m^3 CREG
Asbestos	0.33 f/cc or 10 µg/m^3	0.1 f/cc TWA	0.000004 µg/m^3 CREG
Carbon Monoxide	> 700 ppm	25 ppm TWA	None
Hydrogen Sulfide (H_2S)	>60 ppm or 60,000 ppb	10 ppm TWA	30 ppb EMEG I 70 ppb EMEG A
Lead	423 µg/m^3 or 0.423 mg/m^3	0.05 mg/m^3 TWA	None
Nickel (Sol/Metal)	0.26 mg/m^3 or 260 µg/m^3	0.1 mg/m^3 TWA	0.2 µg/m^3 MRL C
Phosphine	>7 ppm or 0.0009 µg/m^3	0.3 ppm TWA	0.3 µg/m^3 RFC
Phosphoric Acid: "filter (leach)"	4.06 mg/m^3 or 4,060 µg/m^3	1 mg/m^3 TWA	10 µg/m^3 RFC I
Phosphorus (P_4)	54.12 µg/m^3 or 0.054 mg/m^3	0.1 mg/m^3 TWA	20 mg/m^3 MRL A
Phosphorus-Yellow	255.67 µg/m^3 or 0.255 mg/m^3	0.1 mg/m^3 TWA	20 mg/m^3 MRL A
Quartz	74.7 µg/m^3 or 0.0747 mg/m^3	0.05 mg/m^3 TWA	None
Quartz-T	355.3 µg/m^3 or 0.3553 mg/m^3	0.05 mg/m^3 TWA	None
Respirable Dust	15.6 mg/m^3	5 mg/m^3 TWA Resp	None
Silica Mixt-T	604%†	100%†	None
Silica Mixture	148%†	100%†	None
Sulfur Dioxide (SO_2)	1.39 ppm or 1,390 ppb	2 ppm TWA Resp 5 ppm STEL	10 ppb EMEG A

Table 57. Contaminants Exceeding an Occupational Standard or Agency for Toxic Substances and Disease Registry Comparison Value at Stauffer Chemical Company in Tarpon Springs (continued)

Contaminant	Maximum Concentration	Threshold Limit Value	Comparison Value
Total Dust	590 mg/m^3	10 mg/m^3 TWA	None
Total Chromium	0.46 mg/m^3 or 460 $\mu g/m^3$	0.5 mg/m^3 TWA	0.01 $\mu g/m^3$ RfC

Key:

Concentration Units

$\mu g/m^3$ - micrograms per cubic meter
mg/m^3 - milligrams per cubic meter
ppm - parts per million
ppb - parts per billion
f/cc - fiber per cubic centimeter
% - percent
< or > signifies that the value was greater than or less than the limit of detection

Other

A - Acute
C- Chronic
CREG - cancer risk evaluation guide
EMEG - environmental media evaluation guide
I - Intermediate
MRL - Minimal Risk Level
OSHA - Occupational Safety and Health Administration
PEL - permissible exposure limit
RfC - Reference Concentration
STEL - short-term exposure limit
TWA - Time Weighted Average

[†]The concentration is expressed as a percentage of the PEL. OSHA's PEL when the facility operated was 100%. According to site documents, silica mixture is a combination of quartz and respirable dust exposures.

Table 58. Theoretical Cancer Risks from Stauffer Occupational Exposures

Contaminant	Increased Risk (Quantitative)	Increased Risk (Qualitative)	Class
Asbestos	9.9E-04	Moderate	A
Chromium	7.2E-02	Significant	A

Sample Equation: C x EF x ED x CSF
Assumptions for calculations:
Exposure frequency was 50 days per year (1 day per week, 50 weeks per year) and 8 hours per day
Exposure duration was 20 years

C air = Concentration of chemical in air (ug/m^3)
ET adjusted = Adjustment for exposure time (hours/day)
EF adjusted = Adjustment for exposure frequency (days/year)
ED adjusted = Adjustment for exposure duration (years)
UR inhalation = Inhalation Unit Risk (ug/m^3)-1:
= 2.3E-1 per f/ml for asbestos
= 1.2E-2 per ug/m^3 for chromium
C air = 0.33 f/ml for asbestos
= 0.46 mg/m^3 = 460 ug/m^3 for chromium

This equation yields a cancer risk of 9.9E-04 for asbestos and 7.2E-02 for chromium (total).

Cancer Risk Discussion

There is insufficient knowledge of cancer mechanisms to decide whether a level of exposure to a cancer-causing agent exists below which there is no risk for cancer (namely, a threshold level). Therefore, exposure to a cancer-causing compound, even at low concentrations, is assumed to be associated with some increased risk for evaluation purposes. It is assumed that as the dose of a carcinogen decreases, the chance of cancer also decreases.

The U.S. Environmental Protection Agency (EPA) classifies chemicals as Class A, Class B, Class C, Class D, or Class E. This classification defines a specific chemical's ability to cause cancer in humans and animals. This classification system been adapted from the International Agency for Research on Cancer (IARC). These EPA classifications are defined as follows:

Group A Chemicals that are known human carcinogens.
Group B Chemicals that are probable human carcinogens. Class B is further subdivided into two groups:
Group B1 Chemicals for which there is limited evidence of carcinogenicity from epidemiologic studies in humans
Group B2 Chemicals for which there is sufficient evidence of carcinogenicity in animals, but inadequate evidence or no data

Table 58. Theoretical Cancer Risks from Stauffer Occupational Exposures (continued)

	available from epidemiologic studies in humans.
Group C	Chemicals that are possible human carcinogens.
Group D	Chemicals that are not classifiable as to human carcinogenicity.
Group E	Chemicals for which there is evidence that they are not carcinogenic to humans.

ATSDR used EPA's Inhalation Unit Risk in its exposure evaluation (IRIS). The unit risks apply to residential exposure, which is assumed to occur 24 hours/day, 365 days/year, for a lifetime of 70 years. To adjust these factors for workers, who are assumed to be exposed 8 hours/day, 50 days/year, for 20 years, ATSDR used the following adjustment factors: 8/24 hours, 50/365 days, and 20/70 years. The National Toxicology Program, in its *Biennial Report on Carcinogens* classifies a chemical as a "known human carcinogen" based on sufficient human data. Its classification of a chemical as being "reasonably anticipated to be a carcinogen" is based on limited human or sufficient animal data. The Agency for Toxic Substances and Disease Registry considers the above physical and biological characteristics when developing health guidelines for cancer-causing substances.

Increased cancer risk was estimated by using information about exposure levels for the contaminant of concern and multiplying by the chemical-specific unit risks to calculate a theoretical excess cancer risk estimate. An increased excess lifetime cancer risk is not a specific estimate of expected cancers. Rather, it is an estimate of the increase in the probability that a person might get cancer sometime in his or her lifetime after exposure to that contaminant.

Because of the uncertainties regarding the mechanism of cancer, varying suggestions exist among those in the scientific community about an acceptable excess lifetime cancer risk. The recommendations of many scientists have been in the risk range of one in one million to one in ten thousand (as referred to as 1×10^{-6} to 1×10^{-4}) excess cancer cases. An increased lifetime cancer risk of one in one million or less is generally considered an insignificant increase in cancer risk. An important consideration when determining cancer risk estimates is that the risk calculations incorporate a number of very conservative assumptions that are expected to overestimate actual exposure scenarios.