APPENDIX N
TABLE 1
Selection of Potentially Complete Exposure Pathways
St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future (cont.)	Groundwater	On-Site Groundwater (Area Downgradient of Former Building 220)	On-site Tap Water	Resident	Adult/Child	Ingestion/ Dermal Absorption/ Inhalation	Quant	
			On-Site Indoor Air	Resident	Adult/Child	Inhalation	Qual	Site groundwater is too shallow (i.e., somes areas are <1 ft bgs) to evaluate the indoor air vapor intrusion pathway using the Johnson and Ettinger Model
			On-Site Groundwater in Excavations	Construction Worker	Adult	Dermal Absorption/ Inhalation	Quant	
		On-Site Groundwater (Sitewide Excluding Area Downgradient of Building 220)	On-site Tap Water	Resident	Adult/Child	Ingestion/ Dermal Absorption/ Inhalation	Quant	
		Off-Site Groundwater	Off-Site Tap Water	Resident	Adult/Child	Ingestion/ Dermal Absorption/ Inhalation	Quant	
			Off-Site Groundwater in Excavations	Construction Worker	Adult	Dermal Absorption/ Inhalation	Quant	

Notes
[1]Exposure evaluated sitewide.
[2]Exposure to subsurface soil evaluated separately for Exposure Units A through L, locations are presented in Figure 7-1.
Qual = Qualitative, Quant = Quantitative

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_10	CSS-001	2005	0	1	N	CSS-001_2005_0_1
SO_Onsite_0_10	CSS-002	2005	0	1	N	CSS-002_2005_0_1
SO_Onsite_0_10	CSS-003	2005	0	1	N	CSS-003_2005_0_1
SO_Onsite_0_10	CSS-004	2005	0	1	N	CSS-004_2005_0_1
SO_Onsite_0_10	CSS-005	2005	0	1	N	CSS-005_2005_0_1
SO_Onsite_0_10	CSS-006	2005	0	1	N	CSS-006_2005_0_1
SO_Onsite_0_10	CSS-007	2005	0	1	N	CSS-007_2005_0_1
SO_Onsite_0_10	CSS-008	2005	0	1	N	CSS-008_2005_0_1
SO_Onsite_0_10	CSS-009	2005	0	1	N	CSS-009_2005_0_1
SO_Onsite_0_10	CSS-010	2005	0	1	N	CSS-010_2005_0_1
SO_Onsite_0_10	CSS-011	2005	0	1	N	CSS-011_2005_0_1
SO_Onsite_0_10	CSS-012	2005	0	1	N	CSS-012_2005_0_1
SO_Onsite_0_10	CSS-013	2005	0	1	N	CSS-013_2005_0_1
SO_Onsite_0_10	CSS-014	2005	0	1	N	CSS-014_2005_0_1
SO_Onsite_0_10	CSS-015	2005	0	1	N	CSS-015_2005_0_1
SO_Onsite_0_10	HA-01	5/13/2008	0	2	N	HA-01-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-02	5/13/2008	0	2	N	HA-02-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-03	5/13/2008	0	2	N	HA-03-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-04	5/13/2008	0	2	N	HA-04-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-05	5/13/2008	0	2	N	HA-05-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-06	5/13/2008	0	2	N	HA-06-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-07	5/13/2008	0	2	N	HA-07-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-08	5/13/2008	0	2	N	HA-08-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-09	5/13/2008	0	2	N	HA-09-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-10	5/13/2008	0	0.25	N	HA-10-S-00_5/13/2008_0_0.25
SO_Onsite_0_10	HA-11	5/13/2008	0	2	N	HA-11-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-12	5/13/2008	0	2	N	HA-12-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-13	5/13/2008	0	2	N	HA-13-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-14	5/13/2008	0	2	N	HA-14-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-15	5/13/2008	0	2	N	HA-15-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-16	5/13/2008	0	2	N	HA-16-S-00_5/13/2008_0_2
SO_Onsite_0_10	HA-20	5/14/2008	0	2	N	HA-20-S-00_5/14/2008_0_2
SO_Onsite_0_10	HA-21	5/14/2008	0	2	N	HA-21-S-00_5/14/2008_0_2
SO_Onsite_0_10	HA-22	5/14/2008	0	2	N	HA-22-S-00_5/14/2008_0_2
SO_Onsite_0_10	NS02A	1998	0	1	N	NS02A_1998_0_1
SO_Onsite_0_10	NS02B	1998	1	2	N	NS02B_1998_1_2
SO_Onsite_0_10	NS03B	1998	1	2	N	NS03B_1998_1_2
SO_Onsite_0_10	NS05A	1998	0	1	N	NS05A_1998_0_1
SO_Onsite_0_10	NS05B	1998	1	2	N	NS05B_1998_1_2
SO_Onsite_0_10	NS07A	1998	0	1	N	NS07A_1998_0_1
SO_Onsite_0_10	NS07B	1998	1	2	N	NS07B_1998_1_2
SO_Onsite_0_10	NS08B	1998	1	2	N	NS08B_1998_1_2
SO_Onsite_0_10	NS09A	1998	0	1	N	NS09A_1998_0_1
SO_Onsite_0_10	NS09B	1998	1	2	N	NS09B_1998_1_2
SO_Onsite_0_10	NS11A	1998	0	1	N	NS11A_1998_0_1
SO_Onsite_0_10	NS11B	1998	1	2	N	NS11B_1998_1_2
SO_Onsite_0_10	NS12A	1998	0	1	N	NS12A_1998_0_1
SO_Onsite_0_10	NS12B	1998	1	2	N	NS12B_1998_1_2
SO_Onsite_0_10	NS13A	1998	0	1	N	NS13A_1998_0_1
SO_Onsite_0_10	NS13B	1998	1	2	N	NS13B_1998_1_2
SO_Onsite_0_10	NS14A	1998	6	8	N	NS14A_1998_6_8
SO_Onsite_0_10	PW12	2001	7	8	N	PW12_2001_7_8
SO_Onsite_0_10	PW13	2001	7	8	N	PW13_2001_7_8

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_10	SB-001	2005	NA1	NA1	N	SB-001_2005_NA_NA
SO_Onsite_0_10	SB-002	2005	3	4	N	SB-002_2005_3_4
SO_Onsite_0_10	SB-002	2005	NA1	NA1	N	SB-002_2005_NA_NA
SO_Onsite_0_10	SB-003	2005	0	1	N	SB-003_2005_0_1
SO_Onsite_0_10	SB-003	2005	NA1	NA1	N	SB-003_2005_NA_NA
SO_Onsite_0_10	SB-005	2005	NA1	NA1	N	SB-005_2005_NA_NA
SO_Onsite_0_10	SB-006	2005	0	1	N	SB-006_2005_0_1
SO_Onsite_0_10	SB-006	2005	NA1	NA1	N	SB-006_2005_NA_NA
SO_Onsite_0_10	SB-008	2005	NA1	NA1	N	SB-008_2005_NA_NA
SO_Onsite_0_10	SB-009	2005	NA1	NA1	N	SB-009_2005_NA_NA
SO_Onsite_0_10	SB-010	2005	0	1	N	SB-010_2005_0_1
SO_Onsite_0_10	SB-010	2005	NA1	NA1	N	SB-010_2005_NA_NA
SO_Onsite_0_10	SB-011	2005	NA1	NA1	N	SB-011_2005_NA_NA
SO_Onsite_0_10	SB-012	2005	NA1	NA1	N	SB-012_2005_NA_NA
SO_Onsite_0_10	SB-013	2005	NA1	NA1	N	SB-013_2005_NA_NA
SO_Onsite_0_10	SB-014	2005	NA1	NA1	N	SB-014_2005_NA_NA
SO_Onsite_0_10	SB-015	2005	NA1	NA1	N	SB-015_2005_NA_NA
SO_Onsite_0_10	SB-016	2005	NA1	NA1	N	SB-016_2005_NA_NA
SO_Onsite_0_10	SB-017	2005	3	4	N	SB-017_2005_3_4
SO_Onsite_0_10	SB-017	2005	NA1	NA1	N	SB-017_2005_NA_NA
SO_Onsite_0_10	SB-018	2005	NA1	NA1	N	SB-018_2005_NA_NA
SO_Onsite_0_10	SB-019	2005	3	4	N	SB-019_2005_3_4
SO_Onsite_0_10	SB-019	2005	NA1	NA1	N	SB-019_2005_NA_NA
SO_Onsite_0_10	SB-020	2005	8	9	N	SB-020_2005_8_9
SO_Onsite_0_10	SB-021	2005	NA1	NA1	N	SB-021_2005_NA_NA
SO_Onsite_0_10	SB-022	2005	NA1	NA1	N	SB-022_2005_NA_NA
SO_Onsite_0_10	SB-023	2007	1.7	2 2	N	SB-023_2007_1 7_2 2
SO_Onsite_0_10	SB-023	2007	5	6	N	SB-023_2007_5_6
SO_Onsite_0_10	SB-024	2007	0 5	1	N	SB-024_2007_0 5_1
SO_Onsite_0_10	SB-024	2007	5	6	N	SB-024_2007_5_6
SO_Onsite_0_10	SB-025	2007	0 5	1	N	SB-025_2007_0 5_1
SO_Onsite_0_10	SB-025	2007	5	6	N	SB-025_2007_5_6
SO_Onsite_0_10	SB-026	2007	0 5	1	N	SB-026_2007_0.5_1
SO_Onsite_0_10	SB-026	2007	5	6	N	SB-026_2007_5_6
SO_Onsite_0_10	SB-027	2007	0 5	1	N	SB-027_2007_0 5_1
SO_Onsite_0_10	SB-027	2007	5	6	N	SB-027_2007_5_6
SO_Onsite_0_10	SB-028	2007	0 5	1	N	SB-028_2007_0.5_1
SO_Onsite_0_10	SB-028	2007	5	6	N	SB-028_2007_5_6
SO_Onsite_0_10	SB-029	2007	0 5	1	N	SB-029_2007_0 5_1
SO_Onsite_0_10	SB-029	2007	5	6	N	SB-029_2007_5_6
SO_Onsite_0_10	SB-033	2007	0 5	1	N	SB-033_2007_0 5_1
SO_Onsite_0_10	SB-033	2007	5	6	N	SB-033_2007_5_6
SO_Onsite_0_10	SB-034	2007	0 5	1	N	SB-034_2007_0 5_1
SO_Onsite_0_10	SB-034	2007	5	6	N	SB-034_2007_5_6
SO_Onsite_0_10	SS-218A-1	2001	0	1	N	SS-218A-1_2001_0_1
SO_Onsite_0_10	SS-218A-3	2001	0	1	N	SS-218A-3_2001_0_1
SO_Onsite_0_10	SS-218B-1	2001	0	1	N	SS-218B-1_2001_0_1
SO_Onsite_0_10	SS-218B-2	2001	0	1	N	SS-218B-2_2001_0_1
SO_Onsite_0_10	SS-218C-1	2001	0	1	N	SS-218C-1_2001_0_1
SO_Onsite_0_10	SS-218C-2	2001	0	1	N	SS-218C-2_2001_0_1
SO_Onsite_0_10	SS-218C-3	2001	0	1	N	SS-218C-3_2001_0_1
SO_Onsite_0_10	SS-219A-1	2001	0	1	N	SS-219A-1_2001_0_1
SO_Onsite_0_10	SS-219A-2	2001	0	1	N	SS-219A-2_2001_0_1

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_10	SS-219A-3	2001	0	1	N	SS-219A-3_2001_0_1
SO_Onsite_0_10	SS-219D-1	2001	0	1	N	SS-219D-1_2001_0_1
SO_Onsite_0_10	SS-219D-2	2001	0	1	N	SS-219D-2_2001_0_1
SO_Onsite_0_10	SS-219D-3	2001	0	1	N	SS-219D-3_2001_0_1
SO_Onsite_0_10	SS-219E	2001	0	1	N	SS-219E_2001_0_1
SO_Onsite_0_10	SS-219G-1	2001	0	1	N	SS-219G-1_2001_0_1
SO_Onsite_0_10	SS-219G-2	2001	0	1	N	SS-219G-2_2001_0_1
SO_Onsite_0_10	SS-219G-3	2001	0	1	N	SS-219G-3_2001_0_1
SO_Onsite_0_10	SS-219H	2001	0	1	N	SS-219H_2001_0_1
SO_Onsite_0_10	SS-219J-1	2001	0	1	N	SS-219J-1_2001_0_1
SO_Onsite_0_10	SS-220-1	2001	0	1	N	SS-220-1_2001_0_1
SO_Onsite_0_10	SS-220-2	2001	0	1	N	SS-220-2_2001_0_1
SO_Onsite_0_10	SS-220-3	2001	0	1	N	SS-220-3_2001_0_1
SO_Onsite_0_10	SS-220-4	2001	0	1	N	SS-220-4_2001_0_1
SO_Onsite_0_10	SS-227A-1	2001	0	1	N	SS-227A-1_2001_0_1
SO_Onsite_0_10	SS-227B-1	2001	0	1	N	SS-227B-1_2001_0_1
SO_Onsite_0_10	SS-227J-1	2001	0	1	N	SS-227J-1_2001_0_1
SO_Onsite_0_10	SS-227M-1	2001	0	1	N	SS-227M-1_2001_0_1
SO_Onsite_0_10	SS-227O-1	2001	0	1	N	SS-227O-1_2001_0_1
SO_Onsite_0_10	SS-228A-1	2001	0	1	N	SS-228A-1_2001_0_1
SO_Onsite_0_10	SS-228B-1	2001	0	1	N	SS-228B-1_2001_0_1
SO_Onsite_0_10	SS-228C-1	2001	0	1	N	SS-228C-1_2001_0_1
SO_Onsite_0_10	SS-228D-1	2001	0	1	N	SS-228D-1_2001_0_1
SO_Onsite_0_10	SS-228E-1	2001	0	1	N	SS-228E-1_2001_0_1
SO_Onsite_0_10	SS-228F-1	2001	0	1	N	SS-228F-1_2001_0_1
SO_Onsite_0_10	SS-228G-1	2001	0	1	N	SS-228G-1_2001_0_1
SO_Onsite_0_10	SS-228M-1	2001	0	1	N	SS-228M-1_2001_0_1
SO_Onsite_0_10	SS-228WX-1	2001	0	1	N	SS-228WX-1_2001_0_1
SO_Onsite_0_10	SS-228YZ-1	2001	0	1	N	SS-228YZ-1_2001_0_1
SO_Onsite_0_10	SS-236-1	2001	0	1	N	SS-236-1_2001_0_1
SO_Onsite_0_10	SS41A	1991	0	1	N	SS41A_1991_0_1
SO_Onsite_0_10	SS42A	1991	0	1	N	SS42A_1991_0_1
SO_Onsite_0_10	SS43A	1991	0	1	N	SS43A_1991_0_1
SO_Onsite_0_10	SS43B	1991	1	2	N	SS43B_1991_1_2
SO_Onsite_0_10	SS44A	1991	0	1	N	SS44A_1991_0_1
SO_Onsite_0_10	SS44B	1991	1	2	N	SS44B_1991_1_2
SO_Onsite_0_10	SS45A	1991	0	1	N	SS45A_1991_0_1
SO_Onsite_0_10	SS45B	1991	1	2	N	SS45B_1991_1_2
SO_Onsite_0_10	SS46A	1991	0	1	N	SS46A_1991_0_1
SO_Onsite_0_10	SS46B	1991	1	2	N	SS46B_1991_1_2
SO_Onsite_0_10	SS47A	1991	0	1	N	SS47A_1991_0_1
SO_Onsite_0_10	SS47B	1991	1	2	N	SS47B_1991_1_2
SO_Onsite_0_10	SS48A	1991	0	1	N	SS48A_1991_0_1
SO_Onsite_0_10	SS48B	1991	1	2	N	SS48B_1991_1_2
SO_Onsite_0_10	SS49A	1991	0	1	N	SS49A_1991_0_1
SO_Onsite_0_10	SS49B	1991	1	2	N	SS49B_1991_1_2
SO_Onsite_0_10	SS50A	1991	0	1	N	SS50A_1991_0_1
SO_Onsite_0_10	SS50B	1991	1	2	N	SS50B_1991_1_2
SO_Onsite_0_10	SS51A	1991	0	1	N	SS51A_1991_0_1
SO_Onsite_0_10	SS51B	1991	1	2	N	SS51B_1991_1_2
SO_Onsite_0_10	SS52A	1991	0	1	N	SS52A_1991_0_1
SO_Onsite_0_10	SS52B	1991	1	2	N	SS52B_1991_1_2
SO_Onsite_0_10	SS-DPILE-1	2001	NA1	NA1	N	SS-DPILE-1_2001_NA_NA

APPENDIX N

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Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_10_A	CSS-001	2005	0	1	N	CSS-001_2005_0_1
SO_Onsite_0_10_A	CSS-002	2005	0	1	N	CSS-002_2005_0_1
SO_Onsite_0_10_A	HA-20	5/14/2008	0	2	N	HA-20-S-00_5/14/2008_0_2
SO_Onsite_0_10_A	SB-001	2005	NA1	NA1	N	SB-001_2005_NA_NA
SO_Onsite_0_10_A	SB-003	2005	0	1	N	SB-003_2005_0_1
SO_Onsite_0_10_A	SB-003	2005	NA1	NA1	N	SB-003_2005_NA_NA
SO_Onsite_0_10_A	SS-228G-1	2001	0	1	N	SS-228G-1_2001_0_1
SO_Onsite_0_10_A	SS-228M-1	2001	0	1	N	SS-228M-1_2001_0_1
SO_Onsite_0_10_A	SS-228WX-1	2001	0	1	N	SS-228WX-1_2001_0_1
SO_Onsite_0_10_A	SS-228YZ-1	2001	0	1	N	SS-228YZ-1_2001_0_1
SO_Onsite_0_10_A	SS41A	1991	0	1	N	SS41A_1991_0_1
SO_Onsite_0_10_B	HA-21	5/14/2008	0	2	N	HA-21-S-00_5/14/2008_0_2
SO_Onsite_0_10_B	SB-002	2005	3	4	N	SB-002_2005_3_4
SO_Onsite_0_10_B	SB-002	2005	NA1	NA1	N	SB-002_2005_NA_NA
SO_Onsite_0_10_B	SS-228A-1	2001	0	1	N	SS-228A-1_2001_0_1
SO_Onsite_0_10_B	SS-228B-1	2001	0	1	N	SS-228B-1_2001_0_1
SO_Onsite_0_10_B	SS-228C-1	2001	0	1	N	SS-228C-1_2001_0_1
SO_Onsite_0_10_B	SS-228D-1	2001	0	1	N	SS-228D-1_2001_0_1
SO_Onsite_0_10_B	SS-228E-1	2001	0	1	N	SS-228E-1_2001_0_1
SO_Onsite_0_10_B	SS-228F-1	2001	0	1	N	SS-228F-1_2001_0_1
SO_Onsite_0_10_B	SS42A	1991	0	1	N	SS42A_1991_0_1
SO_Onsite_0_10_C	CSS-003	2005	0	1	N	CSS-003_2005_0_1
SO_Onsite_0_10_C	SB-005	2005	NA1	NA1	N	SB-005_2005_NA_NA
SO_Onsite_0_10_C	SS-227A-1	2001	0	1	N	SS-227A-1_2001_0_1
SO_Onsite_0_10_C	SS-227B-1	2001	0	1	N	SS-227B-1_2001_0_1
SO_Onsite_0_10_D	CSS-004	2005	0	1	N	CSS-004_2005_0_1
SO_Onsite_0_10_D	PW12	2001	7	8	N	PW12_2001_7_8
SO_Onsite_0_10_D	SS-218C-1	2001	0	1	N	SS-218C-1_2001_0_1
SO_Onsite_0_10_D	SS-227J-1	2001	0	1	N	SS-227J-1_2001_0_1
SO_Onsite_0_10_D	SS43A	1991	0	1	N	SS43A_1991_0_1
SO_Onsite_0_10_D	SS43B	1991	1	2	N	SS43B_1991_1_2
SO_Onsite_0_10_E	NS09A	1998	0	1	N	NS09A_1998_0_1
SO_Onsite_0_10_E	NS09B	1998	1	2	N	NS09B_1998_1_2
SO_Onsite_0_10_E	SB-006	2005	0	1	N	SB-006_2005_0_1
SO_Onsite_0_10_E	SB-006	2005	NA1	NA1	N	SB-006_2005_NA_NA
SO_Onsite_0_10_E	SS-227M-1	2001	0	1	N	SS-227M-1_2001_0_1
SO_Onsite_0_10_E	SS-227O-1	2001	0	1	N	SS-227O-1_2001_0_1
SO_Onsite_0_10_E	SS-236-1	2001	0	1	N	SS-236-1_2001_0_1
SO_Onsite_0_10_E	SS44A	1991	0	1	N	SS44A_1991_0_1
SO_Onsite_0_10_E	SS44B	1991	1	2	N	SS44B_1991_1_2
SO_Onsite_0_10_E	SS-DPILE-1	2001	NA1	NA1	N	SS-DPILE-1_2001_NA_NA
SO_Onsite_0_10_F	CSS-005	2005	0	1	N	CSS-005_2005_0_1
SO_Onsite_0_10_F	CSS-006	2005	0	1	N	CSS-006_2005_0_1
SO_Onsite_0_10_F	NS02A	1998	0	1	N	NS02A_1998_0_1
SO_Onsite_0_10_F	NS02B	1998	1	2	N	NS02B_1998_1_2
SO_Onsite_0_10_F	NS12A	1998	0	1	N	NS12A_1998_0_1
SO_Onsite_0_10_F	NS12B	1998	1	2	N	NS12B_1998_1_2
SO_Onsite_0_10_F	NS14A	1998	6	8	N	NS14A_1998_6_8
SO_Onsite_0_10_F	SB-008	2005	NA1	NA1	N	SB-008_2005_NA_NA
SO_Onsite_0_10_F	SB-021	2005	NA1	NA1	N	SB-021_2005_NA_NA
SO_Onsite_0_10_F	SS-218C-2	2001	0	1	N	SS-218C-2_2001_0_1
SO_Onsite_0_10_F	SS-219H	2001	0	1	N	SS-219H_2001_0_1
SO_Onsite_0_10_F	SS-219J-1	2001	0	1	N	SS-219J-1_2001_0_1

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_10_F	SS45A	1991	0	1	N	SS45A_1991_0_1
SO_Onsite_0_10_F	SS45B	1991	1	2	N	SS45B_1991_1_2
SO_Onsite_0_10_F	SS48A	1991	0	1	N	SS48A_1991_0_1
SO_Onsite_0_10_F	SS48B	1991	1	2	N	SS48B_1991_1_2
SO_Onsite_0_10_G	PW13	2001	7	8	N	PW13_2001_7_8
SO_Onsite_0_10_G	SB-009	2005	NA1	NA1	N	SB-009_2005_NA_NA
SO_Onsite_0_10_G	SB-010	2005	0	1	N	SB-010_2005_0_1
SO_Onsite_0_10_G	SB-010	2005	NA1	NA1	N	SB-010_2005_NA_NA
SO_Onsite_0_10_G	SS-218C-3	2001	0	1	N	SS-218C-3_2001_0_1
SO_Onsite_0_10_G	SS-219G-1	2001	0	1	N	SS-219G-1_2001_0_1
SO_Onsite_0_10_G	SS-219G-2	2001	0	1	N	SS-219G-2_2001_0_1
SO_Onsite_0_10_G	SS-219G-3	2001	0	1	N	SS-219G-3_2001_0_1
SO_Onsite_0_10_G	SS46A	1991	0	1	N	SS46A_1991_0_1
SO_Onsite_0_10_G	SS46B	1991	1	2	N	SS46B_1991_1_2
SO_Onsite_0_10_G	SS47A	1991	0	1	N	SS47A_1991_0_1
SO_Onsite_0_10_G	SS47B	1991	1	2	N	SS47B_1991_1_2
SO_Onsite_0_10_H	CSS-007	2005	0	1	N	CSS-007_2005_0_1
SO_Onsite_0_10_H	CSS-008	2005	0	1	N	CSS-008_2005_0_1
SO_Onsite_0_10_H	CSS-015	2005	0	1	N	CSS-015_2005_0_1
SO_Onsite_0_10_H	HA-10	5/13/2008	0	0.25	N	HA-10-S-00_5/13/2008_0_0.25
SO_Onsite_0_10_H	HA-11	5/13/2008	0	2	N	HA-11-S-00_5/13/2008_0_2
SO_Onsite_0_10_H	HA-12	5/13/2008	0	2	N	HA-12-S-00_5/13/2008_0_2
SO_Onsite_0_10_H	HA-13	5/13/2008	0	2	N	HA-13-S-00_5/13/2008_0_2
SO_Onsite_0_10_H	HA-14	5/13/2008	0	2	N	HA-14-S-00_5/13/2008_0_2
SO_Onsite_0_10_H	HA-15	5/13/2008	0	2	N	HA-15-S-00_5/13/2008_0_2
SO_Onsite_0_10_H	HA-16	5/13/2008	0	2	N	HA-16-S-00_5/13/2008_0_2
SO_Onsite_0_10_H	NS03B	1998	1	2	N	NS03B_1998_1_2
SO_Onsite_0_10_H	NS05A	1998	0	1	N	NS05A_1998_0_1
SO_Onsite_0_10_H	NS05B	1998	1	2	N	NS05B_1998_1_2
SO_Onsite_0_10_H	NS11A	1998	0	1	N	NS11A_1998_0_1
SO_Onsite_0_10_H	NS11B	1998	1	2	N	NS11B_1998_1_2
SO_Onsite_0_10_H	SB-011	2005	NA1	NA1	N	SB-011_2005_NA_NA
SO_Onsite_0_10_H	SB-022	2005	NA1	NA1	N	SB-022_2005_NA_NA
SO_Onsite_0_10_H	SS-218B-1	2001	0	1	N	SS-218B-1_2001_0_1
SO_Onsite_0_10_H	SS-219E	2001	0	1	N	SS-219E_2001_0_1
SO_Onsite_0_10_I	SB-012	2005	NA1	NA1	N	SB-012_2005_NA_NA
SO_Onsite_0_10_I	SB-013	2005	NA1	NA1	N	SB-013_2005_NA_NA
SO_Onsite_0_10_I	SS-218B-2	2001	0	1	N	SS-218B-2_2001_0_1
SO_Onsite_0_10_I	SS-219D-1	2001	0	1	N	SS-219D-1_2001_0_1
SO_Onsite_0_10_I	SS-219D-2	2001	0	1	N	SS-219D-2_2001_0_1
SO_Onsite_0_10_I	SS-219D-3	2001	0	1	N	SS-219D-3_2001_0_1
SO_Onsite_0_10_I	SS49A	1991	0	1	N	SS49A_1991_0_1
SO_Onsite_0_10_I	SS49B	1991	1	2	N	SS49B_1991_1_2
SO_Onsite_0_10_J	CSS-009	2005	0	1	N	CSS-009_2005_0_1
SO_Onsite_0_10_J	CSS-010	2005	0	1	N	CSS-010_2005_0_1
SO_Onsite_0_10_J	CSS-011	2005	0	1	N	CSS-011_2005_0_1
SO_Onsite_0_10_J	CSS-012	2005	0	1	N	CSS-012_2005_0_1
SO_Onsite_0_10_J	CSS-013	2005	0	1	N	CSS-013_2005_0_1
SO_Onsite_0_10_J	HA-01	5/13/2008	0	2	N	HA-01-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	HA-02	5/13/2008	0	2	N	HA-02-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	HA-03	5/13/2008	0	2	N	HA-03-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	HA-04	5/13/2008	0	2	N	HA-04-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	HA-05	5/13/2008	0	2	N	HA-05-S-00_5/13/2008_0_2

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_10_J	HA-06	5/13/2008	0	2	N	HA-06-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	HA-07	5/13/2008	0	2	N	HA-07-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	HA-08	5/13/2008	0	2	N	HA-08-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	HA-09	5/13/2008	0	2	N	HA-09-S-00_5/13/2008_0_2
SO_Onsite_0_10_J	NS07A	1998	0	1	N	NS07A_1998_0_1
SO_Onsite_0_10_J	NS07B	1998	1	2	N	NS07B_1998_1_2
SO_Onsite_0_10_J	NS08B	1998	1	2	N	NS08B_1998_1_2
SO_Onsite_0_10_J	NS13A	1998	0	1	N	NS13A_1998_0_1
SO_Onsite_0_10_J	NS13B	1998	1	2	N	NS13B_1998_1_2
SO_Onsite_0_10_J	SB-014	2005	NA1	NA1	N	SB-014_2005_NA_NA
SO_Onsite_0_10_J	SB-017	2005	3	4	N	SB-017_2005_3_4
SO_Onsite_0_10_J	SB-017	2005	NA1	NA1	N	SB-017_2005_NA_NA
SO_Onsite_0_10_J	SS-218A-1	2001	0	1	N	SS-218A-1_2001_0_1
SO_Onsite_0_10_K	SB-015	2005	NA1	NA1	N	SB-015_2005_NA_NA
SO_Onsite_0_10_K	SB-016	2005	NA1	NA1	N	SB-016_2005_NA_NA
SO_Onsite_0_10_K	SB-018	2005	NA1	NA1	N	SB-018_2005_NA_NA
SO_Onsite_0_10_K	SB-019	2005	3	4	N	SB-019_2005_3_4
SO_Onsite_0_10_K	SB-019	2005	NA1	NA1	N	SB-019_2005_NA_NA
SO_Onsite_0_10_K	SS-218A-3	2001	0	1	N	SS-218A-3_2001_0_1
SO_Onsite_0_10_K	SS-219A-1	2001	0	1	N	SS-219A-1_2001_0_1
SO_Onsite_0_10_K	SS-219A-2	2001	0	1	N	SS-219A-2_2001_0_1
SO_Onsite_0_10_K	SS-219A-3	2001	0	1	N	SS-219A-3_2001_0_1
SO_Onsite_0_10_K	SS50A	1991	0	1	N	SS50A_1991_0_1
SO_Onsite_0_10_K	SS50B	1991	1	2	N	SS50B_1991_1_2
SO_Onsite_0_10_K	SS51A	1991	0	1	N	SS51A_1991_0_1
SO_Onsite_0_10_K	SS51B	1991	1	2	N	SS51B_1991_1_2
SO_Onsite_0_10_L	CSS-014	2005	0	1	N	CSS-014_2005_0_1
SO_Onsite_0_10_L	HA-22	5/14/2008	0	2	N	HA-22-S-00_5/14/2008_0_2
SO_Onsite_0_10_L	SB-020	2005	8	9	N	SB-020_2005_8_9
SO_Onsite_0_10_L	SB-023	2007	1 7	2 2	N	SB-023_2007_1 7_2.2
SO_Onsite_0_10_L	SB-023	2007	5	6	N	SB-023_2007_5_6
SO_Onsite_0_10_L	SB-024	2007	0 5	1	N	SB-024_2007_0.5_1
SO_Onsite_0_10_L	SB-024	2007	5	6	N	SB-024_2007_5_6
SO_Onsite_0_10_L	SB-025	2007	0 5	1	N	SB-025_2007_0.5_1
SO_Onsite_0_10_L	SB-025	2007	5	6	N	SB-025_2007_5_6
SO_Onsite_0_10_L	SB-026	2007	0 5	1	N	SB-026_2007_0.5_1
SO_Onsite_0_10_L	SB-026	2007	5	6	N	SB-026_2007_5_6
SO_Onsite_0_10_L	SB-027	2007	0 5	1	N	SB-027_2007_0 5_1
SO_Onsite_0_10_L	SB-027	2007	5	6	N	SB-027_2007_5_6
SO_Onsite_0_10_L	SB-028	2007	0 5	1	N	SB-028_2007_0.5_1
SO_Onsite_0_10_L	SB-028	2007	5	6	N	SB-028_2007_5_6
SO_Onsite_0_10_L	SB-029	2007	0 5	1	N	SB-029_2007_0 5_1
SO_Onsite_0_10_L	SB-029	2007	5	6	N	SB-029_2007_5_6
SO_Onsite_0_10_L	SB-033	2007	0 5	1	N	SB-033_2007_0 5_1
SO_Onsite_0_10_L	SB-033	2007	5	6	N	SB-033_2007_5_6
SO_Onsite_0_10_L	SB-034	2007	0 5	1	N	SB-034_2007_0.5_1
SO_Onsite_0_10_L	SB-034	2007	5	6	N	SB-034_2007_5_6
SO_Onsite_0_10_L	SS-220-1	2001	0	1	N	SS-220-1_2001_0_1
SO_Onsite_0_10_L	SS-220-2	2001	0	1	N	SS-220-2_2001_0_1
SO_Onsite_0_10_L	SS-220-3	2001	0	1	N	SS-220-3_2001_0_1
SO_Onsite_0_10_L	SS-220-4	2001	0	1	N	SS-220-4_2001_0_1
SO_Onsite_0_10_L	SS52A	1991	0	1	N	SS52A_1991_0_1
SO_Onsite_0_10_L	SS52B	1991	1	2	N	SS52B_1991_1_2

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_2	CSS-001	2005	0	1	N	CSS-001_2005_0_1
SO_Onsite_0_2	CSS-002	2005	0	1	N	CSS-002_2005_0_1
SO_Onsite_0_2	CSS-003	2005	0	1	N	CSS-003_2005_0_1
SO_Onsite_0_2	CSS-004	2005	0	1	N	CSS-004_2005_0_1
SO_Onsite_0_2	CSS-005	2005	0	1	N	CSS-005_2005_0_1
SO_Onsite_0_2	CSS-006	2005	0	1	N	CSS-006_2005_0_1
SO_Onsite_0_2	CSS-007	2005	0	1	N	CSS-007_2005_0_1
SO_Onsite_0_2	CSS-008	2005	0	1	N	CSS-008_2005_0_1
SO_Onsite_0_2	CSS-009	2005	0	1	N	CSS-009_2005_0_1
SO_Onsite_0_2	CSS-010	2005	0	1	N	CSS-010_2005_0_1
SO_Onsite_0_2	CSS-011	2005	0	1	N	CSS-011_2005_0_1
SO_Onsite_0_2	CSS-012	2005	0	1	N	CSS-012_2005_0_1
SO_Onsite_0_2	CSS-013	2005	0	1	N	CSS-013_2005_0_1
SO_Onsite_0_2	CSS-014	2005	0	1	N	CSS-014_2005_0_1
SO_Onsite_0_2	CSS-015	2005	0	1	N	CSS-015_2005_0_1
SO_Onsite_0_2	HA-01	5/13/2008	0	2	N	HA-01-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-02	5/13/2008	0	2	N	HA-02-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-03	5/13/2008	0	2	N	HA-03-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-04	5/13/2008	0	2	N	HA-04-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-05	5/13/2008	0	2	N	HA-05-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-06	5/13/2008	0	2	N	HA-06-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-07	5/13/2008	0	2	N	HA-07-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-08	5/13/2008	0	2	N	HA-08-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-09	5/13/2008	0	2	N	HA-09-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-10	5/13/2008	0	0 25	N	HA-10-S-00_5/13/2008_0_0.25
SO_Onsite_0_2	HA-11	5/13/2008	0	2	N	HA-11-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-12	5/13/2008	0	2	N	HA-12-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-13	5/13/2008	0	2	N	HA-13-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-14	5/13/2008	0	2	N	HA-14-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-15	5/13/2008	0	2	N	HA-15-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-16	5/13/2008	0	2	N	HA-16-S-00_5/13/2008_0_2
SO_Onsite_0_2	HA-20	5/14/2008	0	2	N	HA-20-S-00_5/14/2008_0_2
SO_Onsite_0_2	HA-21	5/14/2008	0	2	N	HA-21-S-00_5/14/2008_0_2
SO_Onsite_0_2	HA-22	5/14/2008	0	2	N	HA-22-S-00_5/14/2008_0_2
SO_Onsite_0_2	NS02A	1998	0	1	N	NS02A_1998_0_1
SO_Onsite_0_2	NS02B	1998	1	2	N	NS02B_1998_1_2
SO_Onsite_0_2	NS03B	1998	1	2	N	NS03B_1998_1_2
SO_Onsite_0_2	NS05A	1998	0	1	N	NS05A_1998_0_1
SO_Onsite_0_2	NS05B	1998	1	2	N	NS05B_1998_1_2
SO_Onsite_0_2	NS07A	1998	0	1	N	NS07A_1998_0_1
SO_Onsite_0_2	NS07B	1998	1	2	N	NS07B_1998_1_2
SO_Onsite_0_2	NS08B	1998	1	2	N	NS08B_1998_1_2
SO_Onsite_0_2	NS09A	1998	0	1	N	NS09A_1998_0_1
SO_Onsite_0_2	NS09B	1998	1	2	N	NS09B_1998_1_2
SO_Onsite_0_2	NS11A	1998	0	1	N	NS11A_1998_0_1
SO_Onsite_0_2	NS11B	1998	1	2	N	NS11B_1998_1_2
SO_Onsite_0_2	NS12A	1998	0	1	N	NS12A_1998_0_1
SO_Onsite_0_2	NS12B	1998	1	2	N	NS12B_1998_1_2
SO_Onsite_0_2	NS13A	1998	0	1	N	NS13A_1998_0_1
SO_Onsite_0_2	NS13B	1998	1	2	N	NS13B_1998_1_2
SO_Onsite_0_2	SB-003	2005	0	1	N	SB-003_2005_0_1
SO_Onsite_0_2	SB-006	2005	0	1	N	SB-006_2005_0_1
SO_Onsite_0_2	SB-010	2005	0	1	N	SB-010_2005_0_1

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_2	SB-023	2007	1.7	2.2	N	SB-023_2007_1.7_2.2
SO_Onsite_0_2	SB-024	2007	0.5	1	N	SB-024_2007_0 5_1
SO_Onsite_0_2	SB-025	2007	0.5	1	N	SB-025_2007_0.5_1
SO_Onsite_0_2	SB-026	2007	0.5	1	N	SB-026_2007_0.5_1
SO_Onsite_0_2	SB-027	2007	0.5	1	N	SB-027_2007_0.5_1
SO_Onsite_0_2	SB-028	2007	0 5	1	N	SB-028_2007_0.5_1
SO_Onsite_0_2	SB-029	2007	0 5	1	N	SB-029_2007_0 5_1
SO_Onsite_0_2	SB-033	2007	0.5	1	N	SB-033_2007_0.5_1
SO_Onsite_0_2	SB-034	2007	0.5	1	N	SB-034_2007_0.5_1
SO_Onsite_0_2	SS-218A-1	2001	0	1	N	SS-218A-1_2001_0_1
SO_Onsite_0_2	SS-218A-3	2001	0	1	N	SS-218A-3_2001_0_1
SO_Onsite_0_2	SS-218B-1	2001	0	1	N	SS-218B-1_2001_0_1
SO_Onsite_0_2	SS-218B-2	2001	0	1	N	SS-218B-2_2001_0_1
SO_Onsite_0_2	SS-218C-1	2001	0	1	N	SS-218C-1_2001_0_1
SO_Onsite_0_2	SS-218C-2	2001	0	1	N	SS-218C-2_2001_0_1
SO_Onsite_0_2	SS-218C-3	2001	0	1	N	SS-218C-3_2001_0_1
SO_Onsite_0_2	SS-219A-1	2001	0	1	N	SS-219A-1_2001_0_1
SO_Onsite_0_2	SS-219A-2	2001	0	1	N	SS-219A-2_2001_0_1
SO_Onsite_0_2	SS-219A-3	2001	0	1	N	SS-219A-3_2001_0_1
SO_Onsite_0_2	SS-219D-1	2001	0	1	N	SS-219D-1_2001_0_1
SO_Onsite_0_2	SS-219D-2	2001	0	1	N	SS-219D-2_2001_0_1
SO_Onsite_0_2	SS-219D-3	2001	0	1	N	SS-219D-3_2001_0_1
SO_Onsite_0_2	SS-219E	2001	0	1	N	SS-219E_2001_0_1
SO_Onsite_0_2	SS-219G-1	2001	0	1	N	SS-219G-1_2001_0_1
SO_Onsite_0_2	SS-219G-2	2001	0	1	N	SS-219G-2_2001_0_1
SO_Onsite_0_2	SS-219G-3	2001	0	1	N	SS-219G-3_2001_0_1
SO_Onsite_0_2	SS-219H	2001	0	1	N	SS-219H_2001_0_1
SO_Onsite_0_2	SS-219J-1	2001	0	1	N	SS-219J-1_2001_0_1
SO_Onsite_0_2	SS-220-1	2001	0	1	N	SS-220-1_2001_0_1
SO_Onsite_0_2	SS-220-2	2001	0	1	N	SS-220-2_2001_0_1
SO_Onsite_0_2	SS-220-3	2001	0	1	N	SS-220-3_2001_0_1
SO_Onsite_0_2	SS-220-4	2001	0	1	N	SS-220-4_2001_0_1
SO_Onsite_0_2	SS-227A-1	2001	0	1	N	SS-227A-1_2001_0_1
SO_Onsite_0_2	SS-227B-1	2001	0	1	N	SS-227B-1_2001_0_1
SO_Onsite_0_2	SS-227J-1	2001	0	1	N	SS-227J-1_2001_0_1
SO_Onsite_0_2	SS-227M-1	2001	0	1	N	SS-227M-1_2001_0_1
SO_Onsite_0_2	SS-227O-1	2001	0	1	N	SS-227O-1_2001_0_1
SO_Onsite_0_2	SS-228A-1	2001	0	1	N	SS-228A-1_2001_0_1
SO_Onsite_0_2	SS-228B-1	2001	0	1	N	SS-228B-1_2001_0_1
SO_Onsite_0_2	SS-228C-1	2001	0	1	N	SS-228C-1_2001_0_1
SO_Onsite_0_2	SS-228D-1	2001	0	1	N	SS-228D-1_2001_0_1
SO_Onsite_0_2	SS-228E-1	2001	0	1	N	SS-228E-1_2001_0_1
SO_Onsite_0_2	SS-228F-1	2001	0	1	N	SS-228F-1_2001_0_1
SO_Onsite_0_2	SS-228G-1	2001	0	1	N	SS-228G-1_2001_0_1
SO_Onsite_0_2	SS-228M-1	2001	0	1	N	SS-228M-1_2001_0_1
SO_Onsite_0_2	SS-228WX-1	2001	0	1	N	SS-228WX-1_2001_0_1
SO_Onsite_0_2	SS-228YZ-1	2001	0	1	N	SS-228YZ-1_2001_0_1
SO_Onsite_0_2	SS-236-1	2001	0	1	N	SS-236-1_2001_0_1
SO_Onsite_0_2	SS41A	1991	0	1	N	SS41A_1991_0_1
SO_Onsite_0_2	SS42A	1991	0	1	N	SS42A_1991_0_1
SO_Onsite_0_2	SS43A	1991	0	1	N	SS43A_1991_0_1
SO_Onsite_0_2	SS43B	1991	1	2	N	SS43B_1991_1_2
SO_Onsite_0_2	SS44A	1991	0	1	N	SS44A_1991_0_1

APPENDIX N

TABLE 2.1

Soil Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missour.

Sample Group	Station ID	Sample Date	Upper Depth	Lower Depth	Sample Type	Sample ID
SO_Onsite_0_2	SS44B	1991	1	2	N	SS44B_1991_1_2
SO_Onsite_0_2	SS45A	1991	0	1	N	SS45A_1991_0_1
SO_Onsite_0_2	SS45B	1991	1	2	N	SS45B_1991_1_2
SO_Onsite_0_2	SS46A	1991	0	1	N	SS46A_1991_0_1
SO_Onsite_0_2	SS46B	1991	1	2	N	SS46B_1991_1_2
SO_Onsite_0_2	SS47A	1991	0	1	N	SS47A_1991_0_1
SO_Onsite_0_2	SS47B	1991	1	2	N	SS47B_1991_1_2
SO_Onsite_0_2	SS48A	1991	0	1	N	SS48A_1991_0_1
SO_Onsite_0_2	SS48B	1991	1	2	N	SS48B_1991_1_2
SO_Onsite_0_2	SS49A	1991	0	1	N	SS49A_1991_0_1
SO_Onsite_0_2	SS49B	1991	1	2	N	SS49B_1991_1_2
SO_Onsite_0_2	SS50A	1991	0	1	N	SS50A_1991_0_1
SO_Onsite_0_2	SS50B	1991	1	2	N	SS50B_1991_1_2
SO_Onsite_0_2	SS51A	1991	0	1	N	SS51A_1991_0_1
SO_Onsite_0_2	SS51B	1991	1	2	N	SS51B_1991_1_2
SO_Onsite_0_2	SS52A	1991	0	1	N	SS52A_1991_0_1
SO_Onsite_0_2	SS52B	1991	1	2	N	SS52B_1991_1_2
SO_Onsite_0_2	SS-DPILE-1	2001	NA2	NA2	N	SS-DPILE-1_2001_NA_NA

Note:

N = Normal

NA = Not Available

1) Assumed to be collected from 2-10 feet bgs.

2) Assumed to be collected from 0-2 feet bgs.

Sample group designations are as follows:

SO_Onsite_0_2 = Sitewide Analysis, Soil (0-2 feet)
SO_Onsite_0_10 = Sitewide Analysis, Soil (0-10 feet)
SO_Onsite_0_10_A = Exposure Unit A, Soil (0-10 feet)
SO_Onsite_0_10_B = Exposure Unit B, Soil (0-10 feet)
SO_Onsite_0_10_C = Exposure Unit C, Soil (0-10 feet)
SO_Onsite_0_10_D = Exposure Unit D, Soil (0-10 feet)
SO_Onsite_0_10_E = Exposure Unit E, Soil (0-10 feet)
SO_Onsite_0_10_F = Exposure Unit F, Soil (0-10 feet)
SO_Onsite_0_10_G = Exposure Unit G, Soil (0-10 feet)
SO_Onsite_0_10_H = Exposure Unit H, Soil (0-10 feet)
SO_Onsite_0_10_I = Exposure Unit I, Soil (0-10 feet)
SO_Onsite_0_10_J = Exposure Unit J, Soil (0-10 feet)
SO_Onsite_0_10_K = Exposure Unit K, Soil (0-10 feet)
SO_Onsite_0_10_L = Exposure Unit L, Soil (0-10 feet)

APPENDIX N

TABLE 2.2

Groundwater Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample_Group	Station ID	Sample Date	Sample ID	Sample Type
GW_220_Down_Residential	CB-01	5/22/2008	CB-01-W-30	N
GW_220_Down_Residential	CB-04	5/23/2008	CB-04-W-27.5	N
GW_220_Down_Residential	CB-06	5/23/2008	CB-06-W-20.5	N
GW_220_Down_Residential	MW-108	2007	MW-108	N
GW_220_Down_Residential	MW-108	6/4/2008	MW-108-W-00	N
GW_220_Down_Residential	MW-109	2007	MW-109	N
GW_220_Down_Residential	MW-109	6/4/2008	MW-109-W-00	N
GW_220_Down_Residential	MW-110	2007	MW-110	N
GW_220_Down_Residential	MW-110	6/5/2008	MW-110-W-00	N
GW_220_Down_Residential	MW-111	2007	MW-111	N
GW_220_Down_Residential	MW-111	6/6/2008	MW-111-W-00	N
GW_220_Down_Residential	MW-112	2007	MW-112	N
GW_220_Down_Residential	MW-112	6/5/2008	MW-112-W-00	N
GW_220_Down_Residential	MW-113	2007	MW-113	N
GW_220_Down_Residential	MW-113	6/4/2008	MW-113-W-00	N
GW_220_Down_Residential	MW-114	2007	MW-114	N
GW_220_Down_Residential	MW-114	6/3/2008	MW-114-W	N
GW_220_Down_Residential	MW-116	6/4/2008	MW-116-W-00	N
GW_220_Down_Residential	MW-117	6/12/2008	MW-117-W-00	N
GW_220_Down_Residential	SLOP-6317	3/31/2008	SLOP-6317-5-25	N
GW_220_Down_Residential	SLOP-6321	3/31/2008	SLOP-6321-5-24	N
GW_Offsite	MW-107	2007	MW-107	N
GW_Offsite	MW-107	6/5/2008	MW-107-W-00	N
GW_Offsite	MW-108	2007	MW-108	N
GW_Offsite	MW-108	6/4/2008	MW-108-W-00	N
GW_Offsite	MW-109	2007	MW-109	N
GW_Offsite	MW-109	6/4/2008	MW-109-W-00	N
GW_Offsite	MW-110	2007	MW-110	N
GW_Offsite	MW-110	6/5/2008	MW-110-W-00	N
GW_Offsite	MW-116	6/4/2008	MW-116-W-00	N
GW_Offsite	SLOP-4701	3/31/2008	SLOP-4701-5-22	N
GW_Offsite	SLOP-6317	3/31/2008	SLOP-6317-5-25	N
GW_Offsite	SLOP-6321	3/31/2008	SLOP-6321-5-24	N
GW_Onsite	CB-02	5/22/2008	CB-02-W-30	N
GW_Onsite	MW-106	2007	MW-106	N
GW_Onsite	MW-106	6/3/2008	MW-106-W-00	N
GW_Onsite	MW-115	6/5/2008	MW-115-W-00	N
GW_Res4701	SLOP-4701	3/31/2008	SLOP-4701-5-22	N
GW_Res6317	SLOP-6317	3/31/2008	SLOP-6317-5-25	N
GW_Res6321	SLOP-6321	3/31/2008	SLOP-6321-5-24	N
GW_220_Down_On-site Excavations	CB-01	5/22/2008	CB-01-W-30	N
GW_220_Down_On-site Excavations	CB-04	5/23/2008	CB-04-W-27 5	N
GW_220_Down_On-site Excavations	CB-06	5/23/2008	CB-06-W-20.5	N
GW_220_Down_On-site Excavations	MW-111	2007	MW-111	N
GW_220_Down_On-site Excavations	MW-111	6/6/2008	MW-111-W-00	N
GW_220_Down_On-site Excavations	MW-112	2007	MW-112	N

APPENDIX N

TABLE 2.2

Groundwater Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample_Group	Station ID	Sample Date	Sample ID	Sample Type
GW_220_Down_On-site Excavations	MW-112	6/5/2008	MW-112-W-00	N
GW_220_Down_On-site Excavations	MW-113	2007	MW-113	N
GW_220_Down_On-site Excavations	MW-113	6/4/2008	MW-113-W-00	N
GW_220_Down_On-site Excavations	MW-114	2007	MW-114	N
GW_220_Down_On-site Excavations	MW-114	6/3/2008	MW-114-W	N
GW_220_Down_On-site Excavations	MW-117	6/12/2008	MW-117-W-00	N

Note:

N = Normal

Sample group designations are as follows:

GW_Offsite = Groundwater Off-site

GW_Onsite = Groundwater On-site

GW_220_Down_Residential = Groundwater downgradient of former Building 220 for future residential use

GW_220_Down_On-site Excavations = Groundwater downgradient of former Building 220 for future on-site excavations

GW_Res4701 = Groundwater at 4701 Stratford Ave. residence

GW_Res6317 = Groundwater at 6317 Stratford Ave. residence

GW_Res6321 = Groundwater at 6321 Stratford Ave. residence

APPENDIX N

TABLE 2.3

Indoor Air Samples Used in the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Station ID	Sample Date	Sample ID	Sample Type
SLOP-6317-IA-NE	3/18/2008	SLOP-6317-IA-NE	N
SLOP-6317-IA-NE	5/29/2008	SLOP-6317-IA-NE_20080529	N
SLOP-6317-IA-SW	3/18/2008	SLOP-6317-IA-SW	N
SLOP-6317-IA-SW	5/29/2008	SLOP-6317-IA-SW_20080529	N

Note:

N = Normal

APPENDIX N
TABLE 3.1
Summary of On-Site Soil Data Collected from 0-2 feet Depth Interval - Sitewide Analysis
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL
Metals	7429-90-5	Aluminum	4192.7	12900	8219.684615	78	78	100%	100000	
Metals	7440-36-0	Antimony	1.2	14.1	3.955264917	12	49	24%	45	
Metals	7440-38-2	Arsenic	4	36.3	9.498305267	75	96	78%	13.2	Yes
Metals	7440-39-3	Barium	0	723	167.8195957	94	94	100%	100000	
Metals	7440-41-7	Beryllium	0.3	0.632	0.483622642	53	75	71%	220	
Metals	7440-43-9	Cadmium	0.3	3.17	0.949392857	56	94	60%	56	
Metals	7440-70-2	Calcium	2544	80321	18512.66962	79	79	100%	-	
Metals	7440-47-3	Chromium	3.8462	57.7	15.124	75	95	79%	500	
Metals	7440-48-4	Cobalt	5.0503	12.4	8.523963158	57	64	89%	2100	
Metals	7440-50-8	Copper	11.975	410.2	45.43415789	57	79	72%	4200	
Metals	7439-89-6	Iron	4600	21855	14670.96456	79	79	100%	100000	
Metals	7439-92-1	Lead	11.9	1416	137.7945657	99	99	100%	800	Yes
Metals	7439-95-4	Magnesium	1398.7	20570	5260.082278	79	79	100%	-	
Metals	7439-96-5	Manganese	336.26	1120	680.1411392	79	79	100%	3500	
Metals	7439-97-6	Mercury	0.05	0.57	0.096	15	78	19%	34	
Metals	7440-02-0	Nickel	9.8616	32.2	19.72867895	76	79	96%	2300	
Metals	7440-09-7	Potassium	382.9	10923	1206.538861	79	79	100%	-	
Metals	7782-49-2	Selenium	0.5	12.4	2.212142857	14	74	19%	570	
Metals	7440-22-4	Silver	0.65	82.6	11.473	10	78	13%	570	
Metals	7440-23-5	Sodium	17.5	678	161.9452278	79	79	100%	-	
Metals	7440-28-0	Thallium	0.2	8.64	3.999166667	12	48	25%	79	
Metals	7440-62-2	Vanadium	13.856	51.2	25.77101563	64	64	100%	570	
Metals	7440-66-6	Zinc	48.918	1305	162.9671266	79	79	100%	100000	
PAHs	83-32-9	Acenaphthene	0.0035	0.1152	0.02687	10	11	91%	3300	
PAHs	208-96-8	Acenaphthylene	0.00579	0.00579	0.00579	1	2	50%	0.0305	
PAHs	120-12-7	Anthracene	0 0109	35.53	3.042758333	12	17	71%	100000	
PAHs	56-55-3	Benzo(a)anthracene	0.059	0.7295	0.254518182	12	17	69%	2.3	
PAHs	50-32-8	Benzo(a)pyrene	0.0472	0.5053	0.188129412	17	17	100%	0.23	Yes
PAHs	205-99-2	Benzo(b)fluoranthene	0.0172	0.8186	0.314152941	17	22	77%	2.3	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.044	0.3555	0.156346154	13	13	100%	0.478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0191	0.3967	0 1404375	16	21	76%	23	
PAHs	218-01-9	Chrysene	0.0516	0.5776	0.264664286	14	17	82%	230	
PAHs	53-70-3	Dibenz(a,h)anthracene	0 0109	0.0811	0.040481818	11	11	100%	0.23	

APPENDIX N
TABLE 3.1
Summary of On-Site Soil Data Collected from 0-2 feet Depth Interval - Sitewide Analysis
St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL
PAHs	206-44-0	Fluoranthene	0.11	1.5901	0.55569375	16	18	89%	2400	
PAHs	86-73-7	Fluorene	0.0034	0.0602	0.01992	10	11	91%	2600	
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0483	0.3387	0.151584615	13	13	100%	2.3	
PAHs	91-20-3	Naphthalene	0.0031	0.0145	0.007966667	6	13	46%	21	
PAHs	85-01-8	Phenanthrene	0.0538	0.9221	0.313842857	14	17	82%	1.04	
PAHs	129-00-0	Pyrene	0.0889	1.2396	0.39650625	16	18	89%	3200	
VOCs	75-35-4	1,1-Dichloroethene	0.00086	0.00086	0.00086	1	7	14%	47	
VOCs	120-82-1	1,2,4-Trichlorobenzene	0.0021	0.0021	0.0021	1	7	14%	26	
VOCs	95-63-6	1,2,4-Trimethylbenzene	0.011	0.011	0 011	1	7	14%	19	
VOCs	95-50-1	1,2-Dichlorobenzene	0.0055	0.0055	0.0055	1	7	14%	370	
VOCs	108-67-8	1,3,5-Trimethylbenzene	0.0051	0.0051	0.0051	1	7	14%	7.8	
VOCs	541-73-1	1,3-Dichlorobenzene	0.00078	0.00078	0.00078	1	7	14%	14	
VOCs	99-87-6	4-Isopropyltoluene	0.0015	0.0015	0.0015	1	7	14%	-	
VOCs	156-59-2	cis-1,2-Dichloroethene	0.00067	0.7	0.138011667	6	9	67%	16	
VOCs	104-51-8	n-Butylbenzene	0.0025	0.0025	0.0025	1	7	14%	240	
VOCs	127-18-4	Tetrachloroethene	0.0012	6.4	0.776933333	9	9	100%	1.7	Yes
VOCs	108-88-3	Toluene	0.00066	0.001	0.00078	3	7	43%	520	
VOCs	156-60-5	trans-1,2-Dichloroethene	0.0016	0.036	0.013166667	3	9	33%	20	
VOCs	79-01-6	Trichloroethene	0.0011	0.81	0.237716667	6	9	67%	0.1	Yes

Note:
Concentrations presented in mg/kg
PAH - Polycyclic Aromatic Hydrocarbon
VOC - Volatile Organic Compound
FOD - Frequency of Detection

Screening Level (SL)
SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)
The following Screening Levels were used to develop the final SLs used for this comparison.
MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for industrial outdoor worker.
MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.
SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20
Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.2

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Sitewide Analysis

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

CAS	Chemical Group	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL
7429-90-5	Metals	Aluminum	4192.7	14655	8034.881443	97	97	100%	100000	
7440-36-0	Metals	Antimony	1.2	14.1	3.437545267	15	54	28%	45	
7440-38-2	Metals	Arsenic	4	36.3	8.955898319	94	116	81%	13.2	Yes
7440-39-3	Metals	Barium	0	723	162.6290965	114	114	100%	100000	
7440-41-7	Metals	Beryllium	0.3	0.986	0.468362083	72	94	77%	220	
7440-43-9	Metals	Cadmium	0.3	3.17	0.887267123	73	112	65%	56	
7440-70-2	Metals	Calcium	2364	80321	17468.33265	98	98	100%	-	
7440-47-3	Metals	Chromium	3.8462	57.7	14.69642526	95	115	83%	500	
7440-48-4	Metals	Cobalt	5.0503	12.6	8.443097368	76	83	92%	2100	
7440-50-8	Metals	Copper	9.03	410.2	40.44119737	76	98	78%	4200	
7439-89-6	Metals	Iron	4600	23197	14860.04242	99	99	100%	100000	
7439-92-1	Metals	Lead	7.37	1416	123.4835126	119	119	100%	800	Yes
7439-95-4	Metals	Magnesium	1398.7	20570	4889.407143	98	98	100%	-	
7439-96-5	Metals	Manganese	306	1120	668.9858163	98	98	100%	3500	
7439-97-6	Metals	Mercury	0.05	0.57	0.096	15	81	19%	34	
7440-02-0	Metals	Nickel	9.8616	32.2	19.04361684	95	98	97%	2300	
7440-09-7	Metals	Potassium	265.2	10923	1101.070714	98	98	100%	-	
7782-49-2	Metals	Selenium	0.5	12.4	2.212142857	14	77	18%	570	
7440-22-4	Metals	Silver	0.5	82.6	8.359285714	14	85	16%	570	
7440-23-5	Metals	Sodium	16.379	678	138.2686224	98	98	100%	-	
7440-28-0	Metals	Thallium	0.2	8.64	3.394117647	17	53	32%	79	
7440-62-2	Metals	Vanadium	13.856	51.2	25.371	83	83	100%	570	
7440-66-6	Metals	Zinc	29.2	1305	148.8498265	98	98	100%	100000	
83-32-9	PAHs	Acenaphthene	0.0023	0.1152	0.0236	23	24	96%	3300	
208-96-8	PAHs	Acenaphthylene	0 0022	0.009	0.004815	6	7	86%	0.0305	
120-12-7	PAHs	Anthracene	0.0024	35.53	1.392144444	27	33	82%	100000	
56-55-3	PAHs	Benzo(a)anthracene	0.0058	0.7295	0.182318519	28	33	84%	2.3	
50-32-8	PAHs	Benzo(a)pyrene	0.0039	0.5053	0.144583333	36	36	100%	0.23	Yes
205-99-2	PAHs	Benzo(b)fluoranthene	0.0079	0.8186	0.248315152	33	38	87%	2.3	
191-24-2	PAHs	Benzo(g,h,i)perylene	0.0039	0.3555	0.112013793	29	29	100%	0.478	
207-08-9	PAHs	Benzo(k)fluoranthene	0.0021	0.3967	0.097309688	32	37	86%	23	
218-01-9	PAHs	Chrysene	0.0053	0.5776	0.19159	30	33	91%	230	
53-70-3	PAHs	Dibenz(a,h)anthracene	0.003	0.0811	0.02695	26	26	100%	0.23	
206-44-0	PAHs	Fluoranthene	0.0101	1.5901	0.43109375	32	34	94%	2400	

APPENDIX N

TABLE 3.2

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Sitewide Analysis

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

CAS	Chemical Group	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL
86-73-7	PAHs	Fluorene	0.002	0 0613	0.018438095	21	24	88%	2600	
193-39-5	PAHs	Indeno(1,2,3-cd)pyrene	0.0034	0.3387	0.105955172	29	29	100%	2.3	
91-20-3	PAHs	Naphthalene	0.00209	0.0145	0.005569375	16	30	53%	21	
85-01-8	PAHs	Phenanthrene	0.0049	0.9221	0.231216667	30	33	91%	1.04	
129-00-0	PAHs	Pyrene	0.0085	1.2396	0.3150875	32	34	94%	3200	
75-35-4	VOCs	1,1-Dichloroethene	0.00086	0.00086	0.00086	1	14	7%	47	
120-82-1	VOCs	1,2,4-Trichlorobenzene	0 0021	0.0021	0.0021	1	14	7%	26	
95-63-6	VOCs	1,2,4-Trimethylbenzene	0.011	0.011	0.011	1	14	7%	19	
95-50-1	VOCs	1,2-Dichlorobenzene	0.0055	0.0055	0.0055	1	14	7%	370	
108-67-8	VOCs	1,3,5-Trimethylbenzene	0.00089	0.0051	0.002995	2	14	14%	7.8	
541-73-1	VOCs	1,3-Dichlorobenzene	0.00078	0.00078	0.00078	1	14	7%	14	
99-87-6	VOCs	4-Isopropyltoluene	0.0015	0.0015	0.0015	1	14	7%	-	
56-23-5	VOCs	Carbon tetrachloride	0.003	0.0043	0.00365	2	16	13%	0.58	
156-59-2	VOCs	cis-1,2-Dichloroethene	0.00067	0.7	0.12149	13	18	72%	16	
104-51-8	VOCs	n-Butylbenzene	0.0025	0.0025	0.0025	1	14	7%	240	
127-18-4	VOCs	Tetrachloroethene	0.00046	6.4	0.770521176	17	18	94%	1.7	Yes
108-88-3	VOCs	Toluene	0.00066	0.001	0.00078	3	14	21%	520	
156-60-5	VOCs	trans-1,2-Dichloroethene	0.00062	0.036	0.0084525	8	18	44%	20	
79-01-6	VOCs	Trichloroethene	0.0011	0.81	0.172369231	13	18	72%	0.1	Yes
108-38-3/1	VOCs	Xylene, m-, p-	0.0026	0.0026	0.0026	1	15	7%	210	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for industrial outdoor worker.

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St Louis, Missouri.*

APPENDIX N

TABLE 3.3

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit A

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	5748.2	7845	6,708	9	9	100.00%	7700	Yes
Metals	7440-36-0	Antimony	1.2	5.293179	2.6	3	8	37.50%	3.1	Yes
Metals	7440-38-2	Arsenic	5.646396	8.92	6.7	5	9	55.56%	13.2	
Metals	7440-39-3	Barium	101.74	127	113	9	9	100.00%	1600	
Metals	7440-41-7	Beryllium	0.3	0.64007	0.46	7	8	87.50%	16	
Metals	7440-43-9	Cadmium	0.53	3.17	1.4	6	8	75.00%	3.9	
Metals	7440-70-2	Calcium	21400	63774	45,921	9	9	100.00%	-	
Metals	7440-47-3	Chromium	8.2	19.7	14	8	9	88.89%	38	
Metals	7440-48-4	Cobalt	6.9277	9.8	8.1	8	9	88.89%	900	
Metals	7440-50-8	Copper	16.083	150	44	8	9	88.89%	290	
Metals	7439-89-6	Iron	10700	21855	13,971	9	9	100.00%	5500	Yes
Metals	7439-92-1	Lead	28.345	1022.9	236	10	10	100.00%	400	Yes
Metals	7439-95-4	Magnesium	5266.4	15724	10,530	9	9	100.00%	-	
Metals	7439-96-5	Manganese	440	601	526	9	9	100.00%	350	Yes
Metals	7439-97-6	Mercury	0.058	0.08	0.069	2	5	40.00%	2.3	
Metals	7440-02-0	Nickel	13.7	19.7	16	8	9	88.89%	130	
Metals	7440-09-7	Potassium	616.7	1679	1,004	9	9	100.00%	-	
Metals	7782-49-2	Selenium	12.4	12.4	12	1	5	20.00%	5	Yes
Metals	7440-23-5	Sodium	39.31	508	114	9	9	100.00%	-	
Metals	7440-62-2	Vanadium	20	33.3	23	9	9	100.00%	39	
Metals	7440-66-6	Zinc	48.918	1001	290	9	9	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0.0033	0.0033	0.0033	1	1	100.00%	370	
PAHs	208-96-8	Acenaphthylene	0.0022	0.0022	0.0022	1	1	100.00%	0.0305	
PAHs	120-12-7	Anthracene	0.0042	0.0114	0.0078	2	3	66.67%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.0307	0.0801	0.055	2	3	66.67%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.0295	0.0757	0.053	2	2	100.00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.0467	0.1228	0.085	2	3	66.67%	0.626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.0258	0.0658	0.046	2	2	100.00%	0.478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0143	0.0375	0.026	2	3	66.67%	1.5	
PAHs	218-01-9	Chrysene	0.0342	0.09	0.062	2	3	66.67%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0.0048	0.0121	0.0085	2	2	100.00%	0.303	
PAHs	206-44-0	Fluoranthene	0.0632	0.1724	0.12	3	3	100.00%	230	
PAHs	86-73-7	Fluorene	0.0038	0.0038	0.0038	1	1	100.00%	260	

APPENDIX N

TABLE 3.3

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit A

St Louis Ordnance Plant, Former Hanley Area. St Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0223	0.0581	0.040	2	2	100.00%	0.415	
PAHs	91-20-3	Naphthalene	0.00209	0.00209	0.0021	1	1	100.00%	12	
PAHs	85-01-8	Phenanthrene	0.0213	0.0652	0.043	2	3	66.67%	1.04	
PAHs	129-00-0	Pyrene	0.0542	0.1435	0.099	3	3	100.00%	230	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.4

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit B

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	5500	11600	7,243	8	8	100.00%	7700	Yes
Metals	7440-36-0	Antimony	2.76	3.15	2.9	3	6	50.00%	3.1	Yes
Metals	7440-38-2	Arsenic	7.280546	18.9	14	5	7	71.43%	13.2	Yes
Metals	7440-39-3	Barium	80	194	115	8	8	100.00%	1600	
Metals	7440-41-7	Beryllium	0.416	0.509	0.46	7	8	87.50%	16	
Metals	7440-43-9	Cadmium	0.916	1.09	1.0	4	7	57.14%	3.9	
Metals	7440-70-2	Calcium	18073	80321	41,616	8	8	100.00%	-	
Metals	7440-47-3	Chromium	10.6	14.5	13	7	8	87.50%	38	
Metals	7440-48-4	Cobalt	6.61	7.49	7.1	7	7	100.00%	900	
Metals	7440-50-8	Copper	17.528	30.8	24	7	8	87.50%	290	
Metals	7439-89-6	Iron	10659	17630	12,833	8	8	100.00%	5500	Yes
Metals	7439-92-1	Lead	31	1416	268	9	9	100.00%	400	Yes
Metals	7439-95-4	Magnesium	4531	20570	9,301	8	8	100.00%	-	
Metals	7439-96-5	Manganese	435.2	708	524	8	8	100.00%	350	Yes
Metals	7439-97-6	Mercury	0.05	0.055	0.053	2	7	28.57%	2.3	
Metals	7440-02-0	Nickel	14	27.1	17	8	8	100.00%	130	
Metals	7440-09-7	Potassium	502.1	1410	1,045	8	8	100.00%	-	
Metals	7440-22-4	Silver	0.6	0.6	0.60	1	8	12.50%	34	
Metals	7440-23-5	Sodium	53.2	475	133	8	8	100.00%	-	
Metals	7440-62-2	Vanadium	15.9	22.7	19	7	7	100.00%	39	
Metals	7440-66-6	Zinc	64.936	337	188	8	8	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0.0132	0.0132	0.013	1	1	100.00%	370	
PAHs	208-96-8	Acenaphthylene	0.0037	0.0037	0.0037	1	1	100.00%	0.0305	
PAHs	120-12-7	Anthracene	0.0024	0.0024	0.0024	1	1	100.00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.024	0.024	0.024	1	1	100.00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.0198	0.121	0.070	2	2	100.00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.0284	0.0284	0.028	1	1	100.00%	0.626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.0155	0.0155	0.016	1	1	100.00%	0.478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.00961	0.00961	0.0096	1	1	100.00%	1.5	
PAHs	218-01-9	Chrysene	0.018	0.018	0.018	1	1	100.00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0.003	0.003	0.0030	1	1	100.00%	0.303	
PAHs	206-44-0	Fluoranthene	0.037	0.037	0.037	1	1	100.00%	230	
PAHs	86-73-7	Fluorene	0.0107	0.0107	0.011	1	1	100.00%	260	

APPENDIX N

TABLE 3.4

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit B

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0148	0 0148	0.015	1	1	100.00%	0.415	
PAHs	91-20-3	Naphthalene	0.00712	0.00712	0.0071	1	1	100.00%	12	
PAHs	85-01-8	Phenanthrene	0.0132	0.0132	0.013	1	1	100.00%	1.04	
PAHs	129-00-0	Pyrene	0.0355	0.0355	0.036	1	1	100.00%	230	
VOCs	108-38-3/1	Xylene, m-, p-	0.0026	0.0026	0.0026	1	1	100.00%	210	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004 *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St Louis, Missouri.*

APPENDIX N

TABLE 3.5

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit C

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	6382.4	8259	7,322	4	4	100.00%	7700	Yes
Metals	7440-36-0	Antimony	4.24	4.24	4.2	1	2	50.00%	3.1	Yes
Metals	7440-38-2	Arsenic	4	11.7	7.0	3	4	75.00%	13.2	
Metals	7440-39-3	Barium	87.9	129.42	103	4	4	100.00%	1600	
Metals	7440-41-7	Beryllium	0.5	0.615	0.55	3	3	100.00%	16	
Metals	7440-43-9	Cadmium	0.5	0.898	0.70	2	3	66.67%	3.9	
Metals	7440-70-2	Calcium	5234.3	49170	36,037	4	4	100.00%	-	
Metals	7440-47-3	Chromium	13.814	16.8	15	4	4	100.00%	38	
Metals	7440-48-4	Cobalt	7.08	9.68	8.7	4	4	100.00%	900	
Metals	7440-50-8	Copper	17.094	30.2	21	4	4	100.00%	290	
Metals	7439-89-6	Iron	13258	17675	15,185	4	4	100.00%	5500	Yes
Metals	7439-92-1	Lead	44.7	143.3	89	4	4	100.00%	400	
Metals	7439-95-4	Magnesium	1987.2	8637	6,424	4	4	100.00%	-	
Metals	7439-96-5	Manganese	423.08	611	511	4	4	100.00%	350	Yes
Metals	7440-02-0	Nickel	15.5	19.9	18	4	4	100.00%	130	
Metals	7440-09-7	Potassium	481.8	1080	763	4	4	100.00%	-	
Metals	7440-22-4	Silver	0.6	0.6	0.60	1	3	33.33%	34	
Metals	7440-23-5	Sodium	32.636	66.6	51	4	4	100.00%	-	
Metals	7440-62-2	Vanadium	21.9	26.992	24	4	4	100.00%	39	
Metals	7440-66-6	Zinc	42.791	1305	375	4	4	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0.0091	0.0091	0.0091	1	1	100.00%	370	
PAHs	120-12-7	Anthracene	0.0041	0.0041	0.0041	1	1	100.00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.0214	0.0214	0.021	1	1	100.00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.0197	0.0197	0.020	1	1	100.00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.0278	0.0278	0.028	1	1	100.00%	0.626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.0143	0.0143	0.014	1	1	100.00%	0.478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0885	0.0885	0.089	1	1	100.00%	1.5	
PAHs	218-01-9	Chrysene	0.022	0.022	0.022	1	1	100.00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0.003	0.003	0.0030	1	1	100.00%	0.303	
PAHs	206-44-0	Fluoranthene	0.0421	0.0421	0.042	1	1	100.00%	230	
PAHs	86-73-7	Fluorene	0.0096	0.0096	0.0096	1	1	100.00%	260	
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0131	0.0131	0.013	1	1	100.00%	0.415	

APPENDIX N

TABLE 3.5

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit C

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	85-01-8	Phenanthrene	0 0182	0.0182	0.018	1	1	100.00%	1.04	
PAHs	129-00-0	Pyrene	0.0409	0.0409	0.041	1	1	100.00%	230	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri*

APPENDIX N

TABLE 3.6

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit D

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	6987	12900	9,170	6	6	100.00%	7700	Yes
Metals	7440-38-2	Arsenic	6.65	8.59	7.2	4	4	100.00%	13 2	
Metals	7440-39-3	Barium	93.6	394	180	6	6	100 00%	1600	
Metals	7440-41-7	Beryllium	0.3	0.476	0.39	4	6	66 67%	16	
Metals	7440-43-9	Cadmium	0.3	0.976	0.66	4	6	66.67%	3.9	
Metals	7440-70-2	Calcium	2364	53900	18,921	6	6	100 00%	-	
Metals	7440-47-3	Chromium	5.7	24.6	14	5	6	83.33%	38	
Metals	7440-48-4	Cobalt	5.13	8.7	7.1	4	4	100.00%	900	
Metals	7440-50-8	Copper	9.03	29.1	21	4	6	66.67%	290	
Metals	7439-89-6	Iron	11678	19100	15,879	6	6	100.00%	5500	Yes
Metals	7439-92-1	Lead	7.37	126	61	6	6	100 00%	400	
Metals	7439-95-4	Magnesium	1927	12698	5,479	6	6	100.00%	-	
Metals	7439-96-5	Manganese	306	1040	629	6	6	100.00%	350	Yes
Metals	7440-02-0	Nickel	11.1	28.5	19	6	6	100.00%	130	
Metals	7440-09-7	Potassium	482	1540	1,121	6	6	100 00%	-	
Metals	7782-49-2	Selenium	0 5	0.5	0.50	1	4	25.00%	5	
Metals	7440-23-5	Sodium	28 3	484	172	6	6	100.00%	-	
Metals	7440-28-0	Thallium	2.74	4.66	3.7	3	3	100.00%	0 7	Yes
Metals	7440-62-2	Vanadium	19.6	24.1	22	4	4	100 00%	39	
Metals	7440-66-6	Zinc	29.2	197	113	6	6	100.00%	2300	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St Louis, Missouri*

APPENDIX N
TABLE 3.7
Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit E
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	6292	10600	8,026	7	7	100.00%	7700	Yes
Metals	7440-36-0	Antimony	14.1	14.1	14	1	5	20.00%	3 1	Yes
Metals	7440-38-2	Arsenic	5.12	16 5	10	7	7	100.00%	13.2	Yes
Metals	7440-39-3	Barium	110.12	249	165	9	9	100.00%	1600	
Metals	7440-41-7	Beryllium	0.4	0.581	0.50	5	7	71.43%	16	
Metals	7440-43-9	Cadmium	0.693	1.63	0.97	5	9	55.56%	3.9	
Metals	7440-70-2	Calcium	4757	40449	16,606	7	7	100 00%	-	
Metals	7440-47-3	Chromium	13	57.7	22	8	9	88.89%	38	Yes
Metals	7440-48-4	Cobalt	7 95	11.6	9.4	5	6	83.33%	900	
Metals	7440-50-8	Copper	22	77.2	38	5	7	71 43%	290	
Metals	7439-89-6	Iron	5800	17300	13,810	7	7	100.00%	5500	Yes
Metals	7439-92-1	Lead	17 4	304 2	94	9	9	100.00%	400	
Metals	7439-95-4	Magnesium	2177	7786	4,980	7	7	100.00%	-	
Metals	7439-96-5	Manganese	509	1060	689	7	7	100.00%	350	Yes
Metals	7439-97-6	Mercury	0.054	0.075	0.062	3	8	37.50%	2.3	
Metals	7440-02-0	Nickel	15.4	32.2	21	7	7	100 00%	130	
Metals	7440-09-7	Potassium	552.07	10923	2,331	7	7	100.00%	-	
Metals	7440-22-4	Silver	0.65	0.67	0.66	2	8	25.00%	34	
Metals	7440-23-5	Sodium	42.6	678	207	7	7	100.00%	-	
Metals	7440-28-0	Thallium	5 07	5.07	5 1	1	5	20.00%	0.7	Yes
Metals	7440-62-2	Vanadium	20.3	44.1	27	6	6	100.00%	39	Yes
Metals	7440-66-6	Zinc	98.3	323	158	7	7	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0.0023	0.0023	0.0023	1	1	100.00%	370	
PAHs	120-12-7	Anthracene	0.0052	0.0052	0.0052	1	2	50.00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.0545	0.0545	0.055	1	2	50.00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.0485	0.0485	0.049	1	1	100.00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0 0802	0.0802	0 080	1	2	50.00%	0.626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.0362	0.0362	0.036	1	1	100.00%	0 478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0197	0.0197	0.020	1	2	50.00%	1.5	
PAHs	218-01-9	Chrysene	0.0502	0.0502	0.050	1	2	50 00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0.0074	0.0074	0.0074	1	1	100.00%	0 303	
PAHs	206-44-0	Fluoranthene	0.096	0.11	0.10	2	2	100.00%	230	
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0313	0.0313	0.031	1	1	100.00%	0.415	

APPENDIX N
TABLE 3.7
Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit E
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	91-20-3	Naphthalene	0.0024	0.0024	0.0024	1	1	100.00%	12	
PAHs	85-01-8	Phenanthrene	0.0227	0 0227	0.023	1	2	50.00%	1.04	
PAHs	129-00-0	Pyrene	0.0791	0.09	0.085	2	2	100.00%	230	

Note:
Concentrations presented in mg/kg
PAH - Polycyclic Aromatic Hydrocarbon
VOC - Volatile Organic Compound
FOD - Frequency of Detection

Screening Level (SL)
SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)
The following Screening Levels were used to develop the final SLs used for this comparison.
MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use
MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ
SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20
Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.8

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit F

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	6464.2	11100	8,486	11	11	100 00%	7700	Yes
Metals	7440-36-0	Antimony	2.2	5 73	4.0	2	4	50.00%	3 1	Yes
Metals	7440-38-2	Arsenic	4.93	14.5	7.8	11	14	78.57%	13.2	Yes
Metals	7440-39-3	Barium	114	286	178	16	16	100.00%	1600	
Metals	7440-41-7	Beryllium	0.3	0.532	0 41	7	11	63.64%	16	
Metals	7440-43-9	Cadmium	0.314	1.72	0.88	8	16	50.00%	3.9	
Metals	7440-70-2	Calcium	2528.9	24800	12,858	11	11	100.00%	-	
Metals	7440-47-3	Chromium	6 3593	21 2	14	12	16	75 00%	38	
Metals	7440-48-4	Cobalt	7.8498	9.48	8 7	7	8	87.50%	900	
Metals	7440-50-8	Copper	14.758	129	51	7	11	63 64%	290	
Metals	7439-89-6	Iron	13429	18600	15,736	11	11	100 00%	5500	Yes
Metals	7439-92-1	Lead	11.9	1118	136	16	16	100 00%	400	Yes
Metals	7439-95-4	Magnesium	2057	5870	3,918	11	11	100.00%	-	
Metals	7439-96-5	Manganese	516	1025.3	694	11	11	100.00%	350	Yes
Metals	7439-97-6	Mercury	0.06	0.068	0.064	2	12	16.67%	2.3	
Metals	7440-02-0	Nickel	15.169	28.3	21	10	11	90.91%	130	
Metals	7440-09-7	Potassium	325 8	1530	866	11	11	100 00%	-	
Metals	7782-49-2	Selenium	0.5	0.6	0.55	2	11	18.18%	5	
Metals	7440-22-4	Silver	0.5	0.9	0.70	3	13	23 08%	34	
Metals	7440-23-5	Sodium	27.977	444	170	11	11	100.00%	-	
Metals	7440-28-0	Thallium	0.3	2.18	1.2	2	5	40.00%	0.7	Yes
Metals	7440-62-2	Vanadium	22.045	46.1	26	8	8	100.00%	39	Yes
Metals	7440-66-6	Zinc	45.899	379	162	11	11	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0 0035	0.0234	0.016	3	3	100.00%	370	
PAHs	208-96-8	Acenaphthylene	0.00579	0.00579	0.0058	1	1	100.00%	0 0305	
PAHs	120-12-7	Anthracene	0.0049	0.0694	0.028	3	4	75.00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.0374	0.201	0.10	3	4	75 00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.0321	0.1428	0.086	4	4	100.00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.0557	0.2461	0.13	4	5	80.00%	0.626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.0264	0 1125	0.076	3	3	100.00%	0 478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0172	0.3967	0.13	4	5	80.00%	1.5	
PAHs	218-01-9	Chrysene	0 0381	0.27	0.13	4	4	100.00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0.0051	0.0301	0.015	3	3	100.00%	0.303	

APPENDIX N

TABLE 3.8

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit F

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	206-44-0	Fluoranthene	0.0657	0.4708	0.26	4	4	100.00%	230	
PAHs	86-73-7	Fluorene	0.0041	0.025	0 015	2	2	100.00%	260	
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0233	0.1291	0.067	4	4	100.00%	0.415	
PAHs	91-20-3	Naphthalene	0.0063	0.0063	0.0063	1	1	100.00%	12	
PAHs	85-01-8	Phenanthrene	0.0223	0.2965	0.13	4	4	100.00%	1.04	
PAHs	129-00-0	Pyrene	0.0575	0.3208	0.19	4	4	100.00%	230	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004 *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.9

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit G

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	6837.1	14655	9,528	11	11	100.00%	7700	Yes
Metals	7440-36-0	Antimony	1.5	1.5	1.5	1	8	12.50%	3 1	
Metals	7440-38-2	Arsenic	5.1	8.44	7.0	6	9	66 67%	13.2	
Metals	7440-39-3	Barium	141	431	213	11	11	100 00%	1600	
Metals	7440-41-7	Beryllium	0.4	0.986	0.57	7	11	63 64%	16	
Metals	7440-43-9	Cadmium	0.618	0 9	0.74	6	11	54 55%	3 9	
Metals	7440-70-2	Calcium	2544	15900	6,521	11	11	100 00%	-	
Metals	7440-47-3	Chromium	11 648	20 3	15	7	11	63 64%	38	
Metals	7440-48-4	Cobalt	8.52	12.6	9.6	7	9	77.78%	900	
Metals	7440-50-8	Copper	17 4	192	51	7	11	63.64%	290	
Metals	7439-89-6	Iron	6000	22519	16,224	11	11	100 00%	5500	Yes
Metals	7439-92-1	Lead	11	983	133	12	12	100.00%	400	Yes
Metals	7439-95-4	Magnesium	2137	10200	3,850	11	11	100 00%	-	
Metals	7439-96-5	Manganese	601	1070	814	11	11	100.00%	350	Yes
Metals	7440-02-0	Nickel	18.421	31.2	23	11	11	100 00%	130	
Metals	7440-09-7	Potassium	686.31	1400	1,134	11	11	100.00%	-	
Metals	7440-22-4	Silver	0.6	0 6	0 60	1	10	10.00%	34	
Metals	7440-23-5	Sodium	27.247	609	194	11	11	100.00%	-	
Metals	7440-28-0	Thallium	1.94	5.19	3.6	2	7	28.57%	0.7	Yes
Metals	7440-62-2	Vanadium	22.2	50.2	31	9	9	100.00%	39	Yes
Metals	7440-66-6	Zinc	52.1	177	98	11	11	100 00%	2300	
PAHs	83-32-9	Acenaphthene	0.0291	0.1152	0.072	2	2	100.00%	370	
PAHs	208-96-8	Acenaphthylene	0.009	0.009	0.0090	1	1	100.00%	0.0305	
PAHs	120-12-7	Anthracene	0.0444	0 1737	0.11	2	3	66.67%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.1113	0.7295	0.42	2	3	66.67%	0 887	
PAHs	50-32-8	Benzo(a)pyrene	0.08	0.5053	0.29	2	2	100.00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.1298	0.8186	0.47	2	3	66 67%	0 626	Yes
PAHs	191-24-2	Benzo(g,h,i)perylene	0.0523	0.3555	0.20	2	2	100.00%	0 478	
PAHs	207-08-9	Benzo(k)fluoranthene	0 0402	0.28	0.16	2	3	66 67%	1.5	
PAHs	218-01-9	Chrysene	0.0906	0 562	0.33	2	3	66.67%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0.0114	0.0811	0.046	2	2	100.00%	0.303	
PAHs	206-44-0	Fluoranthene	0.2517	1.4615	0.86	2	4	50 00%	230	
PAHs	86-73-7	Fluorene	0.0155	0.0532	0.034	2	2	100.00%	260	

APPENDIX N

TABLE 3.9

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit G

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0462	0.3387	0.19	2	2	100.00%	0.415	
PAHs	91-20-3	Naphthalene	0.0042	0.012	0.0081	2	2	100.00%	12	
PAHs	85-01-8	Phenanthrene	0.164	0 8081	0.49	2	3	66.67%	1 04	
PAHs	129-00-0	Pyrene	0.199	1 2396	0.72	2	4	50 00%	230	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St Louis, Missouri.*

APPENDIX N

TABLE 3.10

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	5395.6	8960	7,182	7	7	100.00%	7700	Yes
Metals	7440-38-2	Arsenic	4.035499	23.5	9.4	18	19	94.74%	13.2	Yes
Metals	7440-39-3	Barium	79.3	196	130	12	12	100 00%	1600	
Metals	7440-41-7	Beryllium	0.3	0.538	0.41	6	6	100 00%	16	
Metals	7440-43-9	Cadmium	0.3	2.1	0.89	10	12	83.33%	3.9	
Metals	7440-70-2	Calcium	2431	48589	14,555	7	7	100 00%	-	
Metals	7440-47-3	Chromium	7 2	22.5	15	12	12	100 00%	38	
Metals	7440-48-4	Cobalt	7 3251	10.462	8.5	7	7	100 00%	900	
Metals	7440-50-8	Copper	11.088	143	40	7	7	100.00%	290	
Metals	7439-89-6	Iron	12114	15913	14,146	7	7	100.00%	5500	Yes
Metals	7439-92-1	Lead	13.539	335	125	12	12	100.00%	400	
Metals	7439-95-4	Magnesium	2043.1	4417	2,790	7	7	100.00%	-	
Metals	7439-96-5	Manganese	530	656.17	585	7	7	100.00%	350	Yes
Metals	7439-97-6	Mercury	0 068	0.57	0.32	2	7	28.57%	2 3	
Metals	7440-02-0	Nickel	12.137	18	15	7	7	100.00%	130	
Metals	7440-09-7	Potassium	265.2	1403	800	7	7	100.00%	-	
Metals	7782-49-2	Selenium	0 6	0 7	0 67	3	10	30.00%	5	
Metals	7440-22-4	Silver	0.72	82.6	22	5	7	71 43%	34	Yes
Metals	7440-23-5	Sodium	17.5	54.8	30	7	7	100.00%	-	
Metals	7440-28-0	Thallium	4.52	4.52	4.5	1	2	50 00%	0.7	Yes
Metals	7440-62-2	Vanadium	21.585	26.774	24	7	7	100.00%	39	
Metals	7440-66-6	Zinc	33 715	277	110	7	7	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0.0086	0.0273	0.015	3	3	100.00%	370	
PAHs	120-12-7	Anthracene	0.0285	0.6617	0.33	3	3	100.00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.2152	0.3252	0.25	3	3	100.00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.0659	0.2641	0.15	5	5	100 00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.104	0.4697	0.31	4	4	100.00%	0 626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.1523	0.2008	0.17	3	3	100.00%	0 478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0792	0.1259	0.094	4	4	100 00%	1.5	
PAHs	218-01-9	Chrysene	0.1871	0.3296	0.24	3	3	100.00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0 0357	0 0411	0.038	3	3	100.00%	0.303	
PAHs	206-44-0	Fluoranthene	0.51	0.83	0.62	3	3	100.00%	230	
PAHs	86-73-7	Fluorene	0.0076	0.0253	0.014	3	3	100.00%	260	

APPENDIX N

TABLE 3.10

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.1766	0.1779	0.18	3	3	100.00%	0.415	
PAHs	91-20-3	Naphthalene	0.0038	0.0038	0 0038	1	1	100.00%	12	
PAHs	85-01-8	Phenanthrene	0.1529	0.4365	0 25	3	3	100 00%	1.04	
PAHs	129-00-0	Pyrene	0.3053	0.6045	0.41	3	3	100 00%	230	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St Louis, Missouri.*

APPENDIX N

TABLE 3.11

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit I

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	7161 8	9440	8,180	8	8	100 00%	7700	Yes
Metals	7440-36-0	Antimony	2.14	2 14	2 1	1	4	25 00%	3 1	
Metals	7440-38-2	Arsenic	7 009738	8 952692	8.0	2	6	33.33%	13.2	
Metals	7440-39-3	Barium	114	293	186	8	8	100 00%	1600	
Metals	7440-41-7	Beryllium	0.3	0 629	0.46	6	8	75 00%	16	
Metals	7440-43-9	Cadmium	0.43	1.16	0.69	6	8	75 00%	3 9	
Metals	7440-70-2	Calcium	2797	12800	6,423	8	8	100.00%	-	
Metals	7440-47-3	Chromium	9.4574	19 2	14	6	8	75 00%	38	
Metals	7440-48-4	Cobalt	7.3	9 64	8 6	6	6	100 00%	900	
Metals	7440-50-8	Copper	14 5	35 6	22	6	8	75 00%	290	
Metals	7439-89-6	Iron	13876	17800	15,669	8	8	100 00%	5500	Yes
Metals	7439-92-1	Lead	23.4	165	66	8	8	100.00%	400	
Metals	7439-95-4	Magnesium	1852	5930	3,040	8	8	100 00%	-	
Metals	7439-96-5	Manganese	562	1120	790	8	8	100 00%	350	Yes
Metals	7439-97-6	Mercury	0.054	0 054	0.054	1	6	16 67%	2.3	
Metals	7440-02-0	Nickel	15 2	30.5	20	8	8	100 00%	130	
Metals	7440-09-7	Potassium	921 89	2220	1,349	8	8	100 00%	-	
Metals	7440-23-5	Sodium	20.483	461	140	8	8	100 00%	-	
Metals	7440-28-0	Thallium	5.78	5.78	5.8	1	4	25 00%	0 7	Yes
Metals	7440-62-2	Vanadium	21.995	28 2	24	6	6	100 00%	39	
Metals	7440-66-6	Zinc	58.526	164	99	8	8	100 00%	2300	
PAHs	120-12-7	Anthracene	0.0044	0.0044	0.0044	1	2	50.00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.0058	0 0761	0.041	2	2	100.00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.0039	0 0507	0.027	2	2	100.00%	0 735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.0079	0.1117	0.060	2	2	100 00%	0 626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0 0039	0 0481	0.026	2	2	100.00%	0.478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0021	0.0273	0.015	2	2	100.00%	1 5	
PAHs	218-01-9	Chrysene	0.0053	0.07	0.038	2	2	100 00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0 0099	0 0099	0.0099	1	1	100.00%	0.303	
PAHs	206-44-0	Fluoranthene	0 0101	0.1284	0 069	2	2	100 00%	230	
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.0034	0.0423	0.023	2	2	100.00%	0.415	

APPENDIX N

TABLE 3.11

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit I

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	85-01-8	Phenanthrene	0.0049	0 0298	0.017	2	2	100 00%	1 04	
PAHs	129-00-0	Pyrene	0.0085	0 1057	0.057	2	2	100.00%	230	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS May 2004 *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St Louis, Missouri*

APPENDIX N

TABLE 3.12

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit J

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	4192.7	9733.4	7,377	8	8	100.00%	7700	Yes
Metals	7440-38-2	Arsenic	5.729168	36.3	10	22	22	100.00%	13.2	Yes
Metals	7440-39-3	Barium	86.202	723	196	13	13	100 00%	1600	
Metals	7440-41-7	Beryllium	0.4	0 592	0 47	7	7	100.00%	16	
Metals	7440-43-9	Cadmium	0.4	1.8	0 81	9	13	69 23%	3.9	
Metals	7440-70-2	Calcium	3434.9	18438	8,846	8	8	100.00%	-	
Metals	7440-47-3	Chromium	3 8462	22 1	13	13	13	100.00%	38	
Metals	7440-48-4	Cobalt	5 0503	12 4	8.7	8	8	100.00%	900	
Metals	7440-50-8	Copper	11.975	410.2	77	8	8	100.00%	290	Yes
Metals	7439-89-6	Iron	9094 2	18123	15,353	8	8	100.00%	5500	Yes
Metals	7439-92-1	Lead	20 5	206	58	13	13	100.00%	400	
Metals	7439-95-4	Magnesium	1398 7	5925	2,627	8	8	100 00%	-	
Metals	7439-96-5	Manganese	336.26	938 2	623	8	8	100.00%	350	Yes
Metals	7440-02-0	Nickel	9.8616	19.6	17	8	8	100 00%	130	
Metals	7440-09-7	Potassium	382 9	1326	703	8	8	100 00%	-	
Metals	7782-49-2	Selenium	0.5	0.6	0.58	4	10	40.00%	5	
Metals	7440-22-4	Silver	0 68	0 68	0 68	1	6	16 67%	34	
Metals	7440-23-5	Sodium	21 13	79 018	37	8	8	100 00%	-	
Metals	7440-28-0	Thallium	0.2	8.64	2 4	4	4	100 00%	0.7	Yes
Metals	7440-62-2	Vanadium	13.856	30.5	25	8	8	100.00%	39	
Metals	7440-66-6	Zinc	51.36	127	78	8	8	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0 0062	0.0756	0.034	7	7	100.00%	370	
PAHs	120-12-7	Anthracene	0.011	35.53	5.1	7	7	100.00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.059	0.5515	0 28	7	7	100.00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0 0472	0 4343	0.20	11	11	100.00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.0172	0.7669	0 33	10	10	100 00%	0 626	Yes
PAHs	191-24-2	Benzo(g,h,i)perylene	0 044	0 3388	0 15	9	9	100.00%	0 478	
PAHs	207-08-9	Benzo(k)fluoranthene	0 0243	0.31	0 12	9	9	100 00%	1 5	
PAHs	218-01-9	Chrysene	0.0516	0.5776	0.26	7	7	100.00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0.0229	0.0693	0.039	7	7	100.00%	0.303	
PAHs	206-44-0	Fluoranthene	0.1394	1.5901	0.72	7	7	100.00%	230	

APPENDIX N

TABLE 3.12

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit J

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	86-73-7	Fluorene	0.0034	0.0613	0.029	7	7	100.00%	260	
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0 0483	0.3144	0 15	8	8	100 00%	0 415	
PAHs	91-20-3	Naphthalene	0 0031	0.0145	0 0060	5	5	100 00%	12	
PAHs	85-01-8	Phenanthrene	0 0538	0.9221	0.40	7	7	100 00%	1 04	
PAHs	129-00-0	Pyrene	0.0889	1 0396	0.49	7	7	100.00%	230	
VOCs	56-23-5	Carbon tetrachloride	0 0043	0.0043	0.0043	1	1	100.00%	0 07	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004 *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St. Louis, Missouri*

APPENDIX N

TABLE 3.13

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit K

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	5136 1	10700	8,546	12	12	100 00%	7700	Yes
Metals	7440-36-0	Antimony	1 4	2 59	2 0	2	6	33.33%	3 1	
Metals	7440-38-2	Arsenic	4.93	7 24647	6.3	7	9	77 78%	13 2	
Metals	7440-39-3	Barium	0	279	163	12	12	100 00%	1600	
Metals	7440-41-7	Beryllium	0 4	0 538	0 46	8	12	66.67%	16	
Metals	7440-43-9	Cadmium	0.409	1.52	0.81	8	12	66 67%	3 9	
Metals	7440-70-2	Calcium	3519	52527	9,675	12	12	100 00%	-	
Metals	7440-47-3	Chromium	11.067	15 8	14	8	12	66 67%	38	
Metals	7440-48-4	Cobalt	6 6634	9.82	8.1	8	9	88 89%	900	
Metals	7440-50-8	Copper	14 542	115.32	39	8	12	66 67%	290	
Metals	7439-89-6	Iron	4600	17500	14,698	12	12	100 00%	5500	Yes
Metals	7439-92-1	Lead	17.816	154	58	12	12	100 00%	400	
Metals	7439-95-4	Magnesium	1828 5	12303	3,955	12	12	100 00%	-	
Metals	7439-96-5	Manganese	539.37	1050	748	12	12	100.00%	350	Yes
Metals	7439-97-6	Mercury	0 056	0.057	0.057	2	8	25 00%	2.3	
Metals	7440-02-0	Nickel	14 419	29.5	20	12	12	100 00%	130	
Metals	7440-09-7	Potassium	463.6	1530	1,120	12	12	100 00%	-	
Metals	7440-23-5	Sodium	16.379	495	180	12	12	100.00%	-	
Metals	7440-28-0	Thallium	7.67	7.67	7.7	1	5	20.00%	0 7	Yes
Metals	7440-62-2	Vanadium	18.389	48 7	27	9	9	100.00%	39	Yes
Metals	7440-66-6	Zinc	49 103	208.24	108	12	12	100.00%	2300	
PAHs	83-32-9	Acenaphthene	0.0032	0.0145	0 0096	4	4	100 00%	370	
PAHs	208-96-8	Acenaphthylene	0 0039	0.0043	0.0041	2	2	100 00%	0.0305	
PAHs	120-12-7	Anthracene	0 0072	0.1	0.034	5	5	100 00%	2200	
PAHs	56-55-3	Benzo(a)anthracene	0.0488	0.29	0.15	5	5	100.00%	0 887	
PAHs	50-32-8	Benzo(a)pyrene	0 0438	0.1878	0.10	5	5	100.00%	0 735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.0773	0.48	0.24	5	5	100.00%	0 626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.035	0.1538	0.081	4	4	100 00%	0 478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.0198	0 15	0 069	5	5	100.00%	1.5	
PAHs	218-01-9	Chrysene	0.0568	0 53	0.21	5	5	100 00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0 0066	0 032	0.017	4	4	100 00%	0 303	

APPENDIX N

TABLE 3.13

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit K

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	206-44-0	Fluoranthene	0.1058	0.91	0.39	5	5	100.00%	230	
PAHs	86-73-7	Fluorene	0.002	0.0094	0 0059	4	4	100.00%	260	
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0 0327	0.1488	0.074	4	4	100 00%	0 415	
PAHs	91-20-3	Naphthalene	0 0025	0.0072	0.0041	3	3	100 00%	12	
PAHs	85-01-8	Phenanthrene	0.04	0.6	0 21	5	5	100.00%	1.04	
PAHs	129-00-0	Pyrene	0.0926	0.65	0 30	5	5	100.00%	230	
VOCs	56-23-5	Carbon tetrachloride	0.003	0 003	0 0030	1	1	100 00%	0.07	

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004 *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St Louis, Missouri*

APPENDIX N
TABLE 3.14
Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit L
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
Metals	7429-90-5	Aluminum	5510.8	8681	7,523	6	6	100 00%	7700	Yes
Metals	7440-36-0	Antimony	1 2	1.2	1.2	1	5	20 00%	3 1	
Metals	7440-38-2	Arsenic	4 38	10 3	8 2	4	6	66.67%	13 2	
Metals	7440-39-3	Barium	122	216	149	6	6	100.00%	1600	
Metals	7440-41-7	Beryllium	0 3	0.603	0.49	5	7	71 43%	16	
Metals	7440-43-9	Cadmium	0 7	1.32	0 96	5	7	71 43%	3 9	
Metals	7440-70-2	Calcium	4067	10060	5,497	7	7	100 00%	-	
Metals	7440-47-3	Chromium	9 1	20.8	15	5	7	71 43%	38	
Metals	7440-48-4	Cobalt	7 2	9.42	8 4	5	6	83 33%	900	
Metals	7440-50-8	Copper	18 8	38	29	5	7	71 43%	290	
Metals	7439-89-6	Iron	4900	23197	14,364	8	8	100 00%	5500	Yes
Metals	7439-92-1	Lead	14 9	510	137	8	8	100 00%	400	Yes
Metals	7439-95-4	Magnesium	1806	4510	2,682	7	7	100 00%	-	
Metals	7439-96-5	Manganese	528 3	1050	720	7	7	100 00%	350	Yes
Metals	7439-97-6	Mercury	0.079	0.079	0.079	1	6	16 67%	2.3	
Metals	7440-02-0	Nickel	13 5	29.2	18	6	7	85.71%	130	
Metals	7440-09-7	Potassium	454 5	1240	994	7	7	100.00%	-	
Metals	7782-49-2	Selenium	0 6	6.42	4 2	3	6	50 00%	5	Yes
Metals	7440-23-5	Sodium	32 3	412	141	7	7	100.00%	-	
Metals	7440-28-0	Thallium	2.23	2.36	2 3	2	5	40 00%	0 7	Yes
Metals	7440-62-2	Vanadium	19.7	51 2	28	6	6	100 00%	39	Yes
Metals	7440-66-6	Zinc	86.5	213	120	7	7	100 00%	2300	
PAHs	120-12-7	Anthracene	0.103	0.103	0 10	1	2	50 00%	2200	
PAHs	56-55-3	Benz(a)anthracene	0.505	0.505	0.51	1	1	100 00%	0.887	
PAHs	50-32-8	Benzo(a)pyrene	0.475	0.475	0.48	1	1	100 00%	0.735	
PAHs	205-99-2	Benzo(b)fluoranthene	0.604	0 604	0.60	1	2	50 00%	0 626	
PAHs	191-24-2	Benzo(g,h,i)perylene	0.242	0.242	0.24	1	1	100.00%	0 478	
PAHs	207-08-9	Benzo(k)fluoranthene	0.238	0.238	0.24	1	2	50 00%	1.5	
PAHs	218-01-9	Chrysene	0.22	0.512	0 37	2	2	100.00%	15	
PAHs	53-70-3	Dibenz(a,h)anthracene	0 0652	0.0652	0 065	1	1	100.00%	0 303	
PAHs	206-44-0	Fluoranthene	0.29	1.14	0.72	2	2	100.00%	230	

APPENDIX N

TABLE 3.14

Summary of On-Site Soil Data Collected from 0-10 feet Depth Interval - Exposure Unit L

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical Group	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	Max Detect Exceeds SL?
PAHs	193-39-5	Indeno(1,2,3-cd)pyrene	0.211	0 211	0.21	1	1	100.00%	0 415	
PAHs	91-20-3	Naphthalene	0.0087	0.0087	0.0087	1	15	6 67%	12	
PAHs	85-01-8	Phenanthrene	0 13	0.527	0 33	2	2	100 00%	1 04	
PAHs	129-00-0	Pyrene	0 22	0 901	0.56	2	2	100 00%	230	
VOCs	75-35-4	1,1-Dichloroethene	0.00086	0.00086	8.60E-04	1	14	7 14%	0 06	
VOCs	120-82-1	1,2,4-Trichlorobenzene	0.0021	0.0021	0.0021	1	14	7 14%	5	
VOCs	95-63-6	1,2,4-Trimethylbenzene	0 011	0 011	0 011	1	14	7.14%	5 7	
VOCs	95-50-1	1,2-Dichlorobenzene	0 0055	0.0055	0 0055	1	14	7 14%	17	
VOCs	108-67-8	1,3,5-Trimethylbenzene	0 00089	0.0051	0 0030	2	14	14.29%	2.1	
VOCs	541-73-1	1,3-Dichlorobenzene	0 00078	0 00078	7.80E-04	1	14	7 14%	6.9	
VOCs	99-87-6	4-Isopropyltoluene	0.0015	0.0015	0 0015	1	14	7 14%	-	
VOCs	156-59-2	cis-1,2-Dichloroethene	0 00067	0.7	0 12	13	18	72 22%	0 4	Yes
VOCs	104-51-8	n-Butylbenzene	0.0025	0.0025	0.0025	1	14	7 14%	14	
VOCs	127-18-4	Tetrachloroethene	0 00046	6 4	0.77	17	18	94 44%	0.06	Yes
VOCs	108-88-3	Toluene	0 00066	0 001	7 80E-04	3	14	21.43%	12	
VOCs	156-60-5	trans-1,2-Dichloroethene	0.00062	0.036	0.0085	8	18	44 44%	0.7	
VOCs	79-01-6	Trichloroethene	0 0011	0 81	0 17	13	18	72 22%	0 043	Yes

Note:

Concentrations presented in mg/kg

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St Louis, Missouri.*

APPENDIX N

TABLE 3.15

Summary of Groundwater Data Collected Downgradient of Former Building 220 - Residential

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

MethodType	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL?
Metals	7439-89-6	Iron	6 62	6.62	6.6	1	2	50 00%	2600	
Metals	7439-96-5	Manganese	14 5	283	149	2	2	100.00%	170	Yes
PAHs	91-20-3	Naphthalene	10.1	10.1	10	1	14	7.14%	0 62	Yes
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	16	16	16	1	21	4 76%	0 43	Yes
VOCs	79-34-5	1,1,2,2-Tetrachloroethane	0 58	0.58	0.58	1	21	4 76%	0 055	Yes
VOCs	79-00-5	1,1,2-Trichloroethane	2 3	2.3	2 3	1	14	7 14%	0.2	Yes
VOCs	75-35-4	1,1-Dichloroethene	0.52	3 8	1 8	3	21	14 29%	34	
VOCs	107-06-2	1,2-Dichloroethane (EDC)	3.3	189	111	4	21	19 05%	0 12	Yes
VOCs	67-64-1	Acetone	4 6	9 3	6 6	3	14	21.43%	550	
VOCs	71-43-2	Benzene	0 22	4	2.1	2	21	9 52%	0.35	Yes
VOCs	75-15-0	Carbon disulfide	0.57	2.9	1 4	3	14	21.43%	100	
VOCs	56-23-5	Carbon tetrachloride	2 7	4160	2,081	2	21	9 52%	0 17	Yes
VOCs	67-66-3	Chloroform	0 35	790	209	4	21	19 05%	0.17	Yes
VOCs	74-87-3	Chloromethane	0 45	0.46	0 46	2	21	9 52%	19	
VOCs	156-59-2	cis-1,2-Dichloroethene	1 5	281	85	8	21	38 10%	6 1	Yes
VOCs	100-41-4	Ethylbenzene	0 28	0 39	0 33	3	21	14 29%	130	
VOCs	74-88-4	Iodomethane	1 2	1.2	1 2	1	14	7 14%	-	
VOCs	1634-04-4	Methyl tert-butyl ether (MTBE)	1.1	1.1	1.1	1	14	7 14%	10.6	
VOCs	127-18-4	Tetrachloroethene	0.64	34900	9,006	9	21	42 86%	0.1	Yes
VOCs	108-88-3	Toluene	3 7	3 7	3.7	1	14	7 14%	230	
VOCs	156-60-5	trans-1,2-Dichloroethene	0 54	12	3 5	4	21	19.05%	11	Yes
VOCs	79-01-6	Trichloroethene	0 41	1620	393	11	21	52 38%	0.028	Yes
VOCs	75-01-4	Vinyl chloride	0 32	0 32	0.32	1	21	4.76%	0 015	Yes
VOCs	108-38-3/1	Xylene, m-, p-	0 72	10 6	4 1	3	21	14 29%	21	
VOCs	95-47-6	Xylene, o-	0 23	13 2	6 7	2	14	14 29%	20	

Note:

Concentrations presented in µg/L

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.16

Summary of Groundwater Data Collected Downgradient of Former Building 220 - On-Site Excavations

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

MethodType	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL?
Metals	7439-89-6	Iron	6.6	6.6	6.6	1	1	100 00%	2600	
Metals	7439-96-5	Manganese	14 5	14.5	14.5	1	1	100.00%	170	
PAHs	91-20-3	Naphthalene	10.1	10.1	10 1	1	4	25.00%	0 62	Yes
VOCs	630-20-6	1,1,1,2-Tetrachloroethane	16	16	16.0	1	5	20 00%	0.43	Yes
VOCs	79-34-5	1,1,2,2-Tetrachloroethane	0.58	0.58	0 6	1	4	25.00%	0 055	Yes
VOCs	79-00-5	1,1,2-Trichloroethane	2.3	2.3	2 3	1	4	25 00%	0 2	Yes
VOCs	75-35-4	1,1-Dichloroethene	3.8	3.8	3.8	1	4	25.00%	34	
VOCs	107-06-2	1,2-Dichloroethane (EDC)	3.3	189	96 2	2	6	33.33%	0 12	Yes
VOCs	67-64-1	Acetone	6	6	6 0	1	5	20.00%	550	
VOCs	71-43-2	Benzene	0.22	4	2.1	2	6	33 33%	0 35	Yes
VOCs	75-15-0	Carbon disulfide	0 53	2 9	1.1	4	7	57.14%	100	
VOCs	56-23-5	Carbon tetrachloride	2 7	4160	2081.0	2	6	33.33%	0.17	Yes
VOCs	67-66-3	Chloroform	20	790	277.9	3	5	60 00%	0 17	Yes
VOCs	74-87-3	Chloromethane	0.45	0.45	0.5	1	5	20.00%	19	
VOCs	156-59-2	cis-1,2-Dichloroethene	250	281	265.5	2	5	40 00%	6 1	Yes
VOCs	100-41-4	Ethylbenzene	0 28	0 39	0 3	2	5	40.00%	130	
VOCs	127-18-4	Tetrachloroethene	0 64	34900	10651.0	6	8	75 00%	0 1	Yes
VOCs	108-88-3	Toluene	3 7	3.7	3.7	1	3	33 33%	230	
VOCs	156-60-5	trans-1,2-Dichloroethene	12	12	12.0	1	5	20.00%	11	Yes
VOCs	79-01-6	Trichloroethene	0 41	1620	812.2	5	7	71 43%	0.028	Yes
VOCs	75-01-4	Vinyl chloride	0 32	0.32	0 3	1	1	100.00%	0.015	Yes
VOCs	108-38-3/1	Xylene, m-, p-	0 72	10 6	4 1	3	7	42 86%	21	
VOCs	95-47-6	Xylene, o-	0 23	13.2	6.7	2	5	40 00%	20	

Note:

Concentrations presented in µg/L

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N
TABLE 3.17
Summary of Off-site Groundwater Data
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

MethodType	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL?
Metals	7439-96-5	Manganese	283	2010	1,147	2	2	100 00%	170	Yes
VOCs	75-35-4	1,1-Dichloroethene	0 52	0.96	0 74	2	12	16.67%	34	
VOCs	107-06-2	1,2-Dichloroethane (EDC)	3	150	84	3	12	25.00%	0 12	Yes
VOCs	67-64-1	Acetone	4 6	9 3	7.0	2	8	25 00%	550	
VOCs	67-66-3	Chloroform	0.35	0 35	0.35	1	12	8 33%	0 17	Yes
VOCs	74-87-3	Chloromethane	0.46	0 46	0 46	1	12	8.33%	19	
VOCs	156-59-2	cis-1,2-Dichloroethene	1 5	82 2	25	6	12	50.00%	6 1	Yes
VOCs	100-41-4	Ethylbenzene	0 31	0 68	0.50	2	12	16.67%	130	
VOCs	74-88-4	Iodomethane	1.2	1 2	1 2	1	8	12 50%	-	
VOCs	1634-04-4	Methyl tert-butyl ether (MTBE)	1 1	1 1	1.1	1	8	12 50%	10 6	
VOCs	127-18-4	Tetrachloroethene	2 9	9440	4,287	4	12	33 33%	0 1	Yes
VOCs	156-60-5	trans-1,2-Dichloroethene	0.54	0.93	0.69	3	12	25 00%	11	
VOCs	79-01-6	Trichloroethene	5 1	129	43	6	12	50.00%	0 028	Yes
VOCs	108-38-3/1	Xylene, m-, p-	1 4	1 4	1.4	1	12	8.33%	21	

Note:
Concentrations presented in µg/L
PAH - Polycyclic Aromatic Hydrocarbon
VOC - Volatile Organic Compound
FOD - Frequency of Detection

Screening Level (SL)
SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)
The following Screening Levels were used to develop the final SLs used for this comparison
EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$
MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water
MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.18

Summary of On-site Groundwater Data (Excluding Samples Collected Downgradient of Former Building 220)

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

MethodType	CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL?
VOCs	107-06-2	1,2-Dichloroethane (EDC)	3.3	4.4	4	2	4	50.00%	0.12	Yes
VOCs	67-64-1	Acetone	8.8	8.8	8.8	1	3	33.33%	550	
VOCs	56-23-5	Carbon tetrachloride	0.38	0.38	0.38	1	4	25.00%	0.17	Yes

Note:

Concentrations presented in µg/L

PAH - Polycyclic Aromatic Hydrocarbon

VOC - Volatile Organic Compound

FOD - Frequency of Detection

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.19

Summary of Indoor Air Data Collected from Off-site Residence

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

CAS	Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Average Concentration	No. of Detection	No. of Samples	FOD	SL	MaxDet Exceeds SL?
107-06-2	1,2-Dichloroethane (EDC)	0.062	0.088	0.071	4	4	100%	0.074	Yes
156-59-2	cis-1,2-Dichloroethene	0.044	0.18	0.11	4	4	100%	37	
127-18-4	Tetrachloroethene	0.1	0.91	0.38	3	4	75%	0.33	Yes
156-60-5	trans-1,2-Dichloroethene	0.012	0.013	0.013	2	4	50%	63	
79-01-6	Trichloroethene	0.13	1.1	0.45	4	4	100%	0.017	Yes
75-01-4	Vinyl chloride	0.0047	0.0047	0.0047	1	4	25%	0.16	

Note:

Concentrations presented in $\mu g/m^3$

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for ambient air

APPENDIX N

TABLE 3.20

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Sitewide Analysis

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_2	630-20-6	1,1,1,2-Tetrachloroethane	7	7	mg/kg	0%	0.006	0.0065	7.6	No
SO_Onsite_0_2	71-55-6	1,1,1-Trichloroethane	9	9	mg/kg	0%	0.006	0.0065	1400	No
SO_Onsite_0_2	79-34-5	1,1,2,2-Tetrachloroethane	7	7	mg/kg	0%	0.006	0.0065	0.97	No
SO_Onsite_0_2	79-00-5	1,1,2-Trichloroethane	7	7	mg/kg	0%	0.006	0.0065	2.1	No
SO_Onsite_0_2	75-35-4	1,1-Dichloroethene	6	6	mg/kg	0%	0.006	0.0065	47	No
SO_Onsite_0_2	120-82-1	1,2,4-Trichlorobenzene	6	6	mg/kg	0%	0.006	0.0065	26	No
SO_Onsite_0_2	95-63-6	1,2,4-Trimethylbenzene	6	6	mg/kg	0%	0.00093	0.0064	19	No
SO_Onsite_0_2	95-50-1	1,2-Dichlorobenzene	6	6	mg/kg	0%	0.006	0.0065	370	No
SO_Onsite_0_2	107-06-2	1,2-Dichloroethane (EDC)	2	2	mg/kg	0%	0.0063	0.0064	0.84	No
SO_Onsite_0_2	108-67-8	1,3,5-Trimethylbenzene	6	6	mg/kg	0%	0.006	0.0065	7.8	No
SO_Onsite_0_2	541-73-1	1,3-Dichlorobenzene	6	6	mg/kg	0%	0.006	0.0065	14	No
SO_Onsite_0_2	90-12-0	1-Methylnaphthalene	1	1	mg/kg	0%	0.243	0.243	21	No
SO_Onsite_0_2	91-57-6	2-Methylnaphthalene	1	1	mg/kg	0%	0.243	0.243	21	No
SO_Onsite_0_2	99-87-6	4-Isopropyltoluene	6	6	mg/kg	0%	0.006	0.0065	58	No
SO_Onsite_0_2	83-32-9	Acenaphthene	1	1	mg/kg	0%	0.243	0.243	3300	No
SO_Onsite_0_2	208-96-8	Acenaphthylene	1	1	mg/kg	0%	0.243	0.243	0.0305	Yes
SO_Onsite_0_2	120-12-7	Anthracene	5	5	mg/kg	0%	0.03	0 03	100000	No
SO_Onsite_0_2	7440-36-0	Antimony	37	37	mg/kg	0%	3.8	3.8	45	No
SO_Onsite_0_2	7440-38-2	Arsenic	21	21	mg/kg	0%	0.25	0.25	13.2	No
SO_Onsite_0_2	56-55-3	Benzo(a)anthracene	5	5	mg/kg	0%	0.17	0.17	2.3	No
SO_Onsite_0_2	205-99-2	Benzo(b)fluoranthene	5	5	mg/kg	0%	0.21	0.21	2.3	No
SO_Onsite_0_2	207-08-9	Benzo(k)fluoranthene	5	5	mg/kg	0%	0.07	0.07	23	No
SO_Onsite_0_2	7440-41-7	Beryllium	22	22	mg/kg	0%	1.8	1.8	220	No
SO_Onsite_0_2	7440-43-9	Cadmium	38	38	mg/kg	0%	3.05	3.05	56	No
SO_Onsite_0_2	56-23-5	Carbon tetrachloride	7	7	mg/kg	0%	0.006	0.0065	0.58	No
SO_Onsite_0_2	67-66-3	Chloroform	7	7	mg/kg	0%	0.006	0.0065	0.58	No
SO_Onsite_0_2	7440-47-3	Chromium	20	20	mg/kg	0%	12.7	12 7	500	No
SO_Onsite_0_2	218-01-9	Chrysene	3	3	mg/kg	0%	0.12	0.12	230	No
SO_Onsite_0_2	156-59-2	cis-1,2-Dichloroethene	3	3	mg/kg	0%	0.0062	0.0065	16	No
SO_Onsite_0_2	7440-48-4	Cobalt	7	7	mg/kg	0%	15	15	2100	No
SO_Onsite_0_2	7440-50-8	Copper	22	22	mg/kg	0%	58.6	58.6	4200	No

APPENDIX N

TABLE 3.20

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Sitewide Analysis

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_2	57-12-5	Cyanide	7	7	mg/kg	0%	0.92	0.92	1400	No
SO_Onsite_0_2	100-41-4	Ethylbenzene	7	7	mg/kg	0%	0.006	0.0065	230	No
SO_Onsite_0_2	206-44-0	Fluoranthene	2	2	mg/kg	0%	0.07	0.07	2400	No
SO_Onsite_0_2	86-73-7	Fluorene	1	1	mg/kg	0%	0.243	0.243	2600	No
SO_Onsite_0_2	87-68-3	Hexachlorobutadiene	7	7	mg/kg	0%	0 006	0.0065	2.5	No
SO_Onsite_0_2	98-82-8	Isopropylbenzene	7	7	mg/kg	0%	0.006	0 0065	58	No
SO_Onsite_0_2	7439-97-6	Mercury	63	63	mg/kg	0%	0.05	0.05	34	No
SO_Onsite_0_2	91-20-3	Naphthalene	7	7	mg/kg	0%	0.0012	0.243	21	No
SO_Onsite_0_2	104-51-8	n-Butylbenzene	6	6	mg/kg	0%	0.006	0.0065	240	No
SO_Onsite_0_2	7440-02-0	Nickel	3	3	mg/kg	0%	12 6	12.6	2300	No
SO_Onsite_0_2	85-01-8	Phenanthrene	3	3	mg/kg	0%	0.03	0.03	1.04	No
SO_Onsite_0_2	129-00-0	Pyrene	2	2	mg/kg	0%	0.03	0.03	3200	No
SO_Onsite_0_2	135-98-8	sec-Butylbenzene	7	7	mg/kg	0%	0.006	0.0065	220	No
SO_Onsite_0_2	7782-49-2	Selenium	60	60	mg/kg	0%	0.25	0.25	570	No
SO_Onsite_0_2	7440-22-4	Silver	68	68	mg/kg	0%	2.5	2 5	570	No
SO_Onsite_0_2	7440-28-0	Thallium	36	36	mg/kg	0%	31.3	31.3	79	No
SO_Onsite_0_2	108-88-3	Toluene	4	4	mg/kg	0%	0.006	0.0065	520	No
SO_Onsite_0_2	156-60-5	trans-1,2-Dichloroethene	6	6	mg/kg	0%	0.0062	0.0065	20	No
SO_Onsite_0_2	79-01-6	Trichloroethene	3	3	mg/kg	0%	0.006	0.0065	0.1	No
SO_Onsite_0_2	108-38-3/1	Xylene, m-, p-	7	7	mg/kg	0%	0.006	0.0065	210	No
SO_Onsite_0_2	95-47-6	Xylene, o-	7	7	mg/kg	0%	0.006	0.0065	280	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for industrial outdoor worker.

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St Louis, Missouri*

SL for Naphthalene used as a surrogate for 1-Methylnaphthalene and 2-Methylnaphthalene.

SL for Isopropylbenzene used as a surrogate for 4-isopropyltoluene.

APPENDIX N

TABLE 3.21

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-10 ft) - Sitewide Analysis

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10	630-20-6	1,1,1,2-Tetrachloroethane	14	14	0%	mg/kg	0.006	0.0065	7.6	No
SO_Onsite_0_10	71-55-6	1,1,1-Trichloroethane	18	18	0%	mg/kg	0.006	0.0065	1400	No
SO_Onsite_0_10	79-34-5	1,1,2,2-Tetrachloroethane	14	14	0%	mg/kg	0.006	0.0065	0.97	No
SO_Onsite_0_10	79-00-5	1,1,2-Trichloroethane	14	14	0%	mg/kg	0.006	0.0065	2.1	No
SO_Onsite_0_10	75-35-4	1,1-Dichloroethene	13	13	0%	mg/kg	0.006	0.0065	47	No
SO_Onsite_0_10	120-82-1	1,2,4-Trichlorobenzene	13	13	0%	mg/kg	0.006	0.0065	26	No
SO_Onsite_0_10	95-63-6	1,2,4-Trimethylbenzene	13	13	0%	mg/kg	0.00093	0.0065	19	No
SO_Onsite_0_10	95-50-1	1,2-Dichlorobenzene	13	13	0%	mg/kg	0.006	0.0065	370	No
SO_Onsite_0_10	107-06-2	1,2-Dichloroethane (EDC)	4	4	0%	mg/kg	0.0063	0.0065	0.84	No
SO_Onsite_0_10	108-67-8	1,3,5-Trimethylbenzene	12	12	0%	mg/kg	0.00083	0.0065	7.8	No
SO_Onsite_0_10	541-73-1	1,3-Dichlorobenzene	13	13	0%	mg/kg	0.006	0.0065	14	No
SO_Onsite_0_10	90-12-0	1-Methylnaphthalene	1	1	0%	mg/kg	0.243	0.243	21	No
SO_Onsite_0_10	91-57-6	2-Methylnaphthalene	1	1	0%	mg/kg	0.243	0.243	21	No
SO_Onsite_0_10	99-87-6	4-Isopropyltoluene	13	13	0%	mg/kg	0.006	0.0065	58	No
SO_Onsite_0_10	83-32-9	Acenaphthene	1	1	0%	mg/kg	0.243	0.243	3300	No
SO_Onsite_0_10	208-96-8	Acenaphthylene	1	1	0%	mg/kg	0.243	0.243	0.0305	Yes
SO_Onsite_0_10	120-12-7	Anthracene	6	6	0%	mg/kg	0.03	0.03	100000	No
SO_Onsite_0_10	7440-36-0	Antimony	39	39	0%	mg/kg	3.8	3.8	45	No
SO_Onsite_0_10	7440-38-2	Arsenic	22	22	0%	mg/kg	0.25	0.25	13.2	No
SO_Onsite_0_10	56-55-3	Benzo(a)anthracene	5	5	0%	mg/kg	0.17	0.17	2.3	No
SO_Onsite_0_10	205-99-2	Benzo(b)fluoranthene	5	5	0%	mg/kg	0.21	0.21	2.3	No
SO_Onsite_0_10	207-08-9	Benzo(k)fluoranthene	5	5	0%	mg/kg	0.07	0.07	23	No
SO_Onsite_0_10	7440-41-7	Beryllium	22	22	0%	mg/kg	1.8	1.8	220	No
SO_Onsite_0_10	7440-43-9	Cadmium	39	39	0%	mg/kg	3.05	3.05	56	No
SO_Onsite_0_10	56-23-5	Carbon tetrachloride	14	14	0%	mg/kg	0.006	0.0065	0.58	No
SO_Onsite_0_10	67-66-3	Chloroform	14	14	0%	mg/kg	0.006	0.0065	0.58	No
SO_Onsite_0_10	7440-47-3	Chromium	20	20	0%	mg/kg	12.7	12.7	500	No
SO_Onsite_0_10	218-01-9	Chrysene	3	3	0%	mg/kg	0.12	0.12	230	No
SO_Onsite_0_10	156-59-2	cis-1,2-Dichloroethene	5	5	0%	mg/kg	0.0062	0.0065	16	No
SO_Onsite_0_10	7440-48-4	Cobalt	7	7	0%	mg/kg	15	15	2100	No
SO_Onsite_0_10	7440-50-8	Copper	22	22	0%	mg/kg	58.6	58.6	4200	No

APPENDIX N

TABLE 3.21

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-10 ft) - Sitewide Analysis

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10	57-12-5	Cyanide	7	7	0%	mg/kg	0.92	0.92	1400	No
SO_Onsite_0_10	100-41-4	Ethylbenzene	14	14	0%	mg/kg	0.006	0.0065	230	No
SO_Onsite_0_10	206-44-0	Fluoranthene	2	2	0%	mg/kg	0.07	0.07	2400	No
SO_Onsite_0_10	86-73-7	Fluorene	3	3	0%	mg/kg	0.243	0.243	2600	No
SO_Onsite_0_10	87-68-3	Hexachlorobutadiene	14	14	0%	mg/kg	0.006	0.0065	2.5	No
SO_Onsite_0_10	98-82-8	Isopropylbenzene	14	14	0%	mg/kg	0.006	0.0065	58	No
SO_Onsite_0_10	7439-97-6	Mercury	66	66	0%	mg/kg	0.05	0.05	34	No
SO_Onsite_0_10	91-20-3	Naphthalene	14	14	0%	mg/kg	0.0012	0.243	21	No
SO_Onsite_0_10	104-51-8	n-Butylbenzene	13	13	0%	mg/kg	0.006	0.0065	240	No
SO_Onsite_0_10	7440-02-0	Nickel	3	3	0%	mg/kg	12.6	12.6	2300	No
SO_Onsite_0_10	85-01-8	Phenanthrene	3	3	0%	mg/kg	0.03	0.03	1.04	No
SO_Onsite_0_10	129-00-0	Pyrene	2	2	0%	mg/kg	0.03	0.03	3200	No
SO_Onsite_0_10	135-98-8	sec-Butylbenzene	14	14	0%	mg/kg	0.006	0.0065	220	No
SO_Onsite_0_10	7782-49-2	Selenium	63	63	0%	mg/kg	0.25	0.25	570	No
SO_Onsite_0_10	7440-22-4	Silver	71	71	0%	mg/kg	2.5	2.5	570	No
SO_Onsite_0_10	127-18-4	Tetrachloroethene	1	1	0%	mg/kg	0.0063	0.0063	1.7	No
SO_Onsite_0_10	7440-28-0	Thallium	36	36	0%	mg/kg	31.3	31.3	79	No
SO_Onsite_0_10	108-88-3	Toluene	11	11	0%	mg/kg	0.006	0.0065	520	No
SO_Onsite_0_10	156-60-5	trans-1,2-Dichloroethene	10	10	0%	mg/kg	0.0062	0.0065	20	No
SO_Onsite_0_10	79-01-6	Trichloroethene	5	5	0%	mg/kg	0.006	0.0065	0.1	No
SO_Onsite_0_10	108-38-3/1	Xylene, m-, p-	14	14	0%	mg/kg	0.006	0.0065	210	No
SO_Onsite_0_10	95-47-6	Xylene, o-	14	14	0%	mg/kg	0.006	0.0065	280	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for industrial outdoor worker.

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

SL for Naphthalene used as a surrogate for 1-Methylnaphthalene and 2-Methylnaphthalene.

SL for Isopropylbenzene used as a surrogate for 4-isopropyltoluene.

APPENDIX N

TABLE 3.22

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit A

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_A	120-12-7	Anthracene	1	1	0%	mg/kg	0.03	0.03	2200	No
SO_Onsite_0_10_A	7440-36-0	Antimony	5	5	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_A	7440-38-2	Arsenic	4	4	0%	mg/kg	0.25	1.376	13.2	No
SO_Onsite_0_10_A	56-55-3	Benzo(a)anthracene	1	1	0%	mg/kg	0.17	0.17	0.887	No
SO_Onsite_0_10_A	205-99-2	Benzo(b)fluoranthene	1	1	0%	mg/kg	0.21	0.21	0.626	No
SO_Onsite_0_10_A	207-08-9	Benzo(k)fluoranthene	1	1	0%	mg/kg	0.07	0.07	1.5	No
SO_Onsite_0_10_A	7440-41-7	Beryllium	1	1	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_A	7440-43-9	Cadmium	2	2	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_A	7440-47-3	Chromium	1	1	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_A	218-01-9	Chrysene	1	1	0%	mg/kg	0.12	0.12	15	No
SO_Onsite_0_10_A	7440-48-4	Cobalt	1	1	0%	mg/kg	15	15	900	No
SO_Onsite_0_10_A	7440-50-8	Copper	1	1	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_A	57-12-5	Cyanide	1	1	0%	mg/kg	0.92	0.92	120	No
SO_Onsite_0_10_A	7439-97-6	Mercury	3	3	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_A	7440-02-0	Nickel	1	1	0%	mg/kg	12.6	12.6	130	No
SO_Onsite_0_10_A	85-01-8	Phenanthrene	1	1	0%	mg/kg	0.03	0.03	1.04	No
SO_Onsite_0_10_A	7782-49-2	Selenium	4	4	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_A	7440-22-4	Silver	5	5	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_A	7440-28-0	Thallium	5	5	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004 *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.23

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit B

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_B	7440-36-0	Antimony	3	3	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_B	7440-38-2	Arsenic	2	2	0%	mg/kg	0.25	1.376	13.2	No
SO_Onsite_0_10_B	7440-41-7	Beryllium	1	1	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_B	7440-43-9	Cadmium	3	3	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_B	7440-47-3	Chromium	1	1	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_B	7440-50-8	Copper	1	1	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_B	7439-97-6	Mercury	5	5	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_B	7782-49-2	Selenium	6	6	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_B	7440-22-4	Silver	7	7	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_B	7440-28-0	Thallium	6	6	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.24

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit C

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_C	7440-36-0	Antimony	1	1	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_C	7440-38-2	Arsenic	1	1	0%	mg/kg	0.25	1.376	13.2	No
SO_Onsite_0_10_C	7440-43-9	Cadmium	1	1	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_C	7439-97-6	Mercury	2	2	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_C	7782-49-2	Selenium	2	2	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_C	7440-22-4	Silver	2	2	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_C	7440-28-0	Thallium	2	2	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.25

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit D

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_D	7440-36-0	Antimony	3	3	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_D	7440-41-7	Beryllium	2	2	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_D	7440-43-9	Cadmium	2	2	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_D	7440-47-3	Chromium	1	1	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_D	7440-50-8	Copper	2	2	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_D	7439-97-6	Mercury	5	5	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_D	7782-49-2	Selenium	3	3	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_D	7440-22-4	Silver	5	5	0%	mg/kg	2.5	2.5	34	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.26

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit E

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_E	120-12-7	Anthracene	1	1	0%	mg/kg	0.03	0.03	2200	No
SO_Onsite_0_10_E	7440-36-0	Antimony	4	4	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_E	56-55-3	Benzo(a)anthracene	1	1	0%	mg/kg	0.17	0.17	0.887	No
SO_Onsite_0_10_E	205-99-2	Benzo(b)fluoranthene	1	1	0%	mg/kg	0.21	0.21	0.626	No
SO_Onsite_0_10_E	207-08-9	Benzo(k)fluoranthene	1	1	0%	mg/kg	0.07	0.07	1.5	No
SO_Onsite_0_10_E	7440-41-7	Beryllium	2	2	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_E	7440-43-9	Cadmium	4	4	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_E	7440-47-3	Chromium	1	1	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_E	218-01-9	Chrysene	1	1	0%	mg/kg	0.12	0.12	15	No
SO_Onsite_0_10_E	7440-48-4	Cobalt	1	1	0%	mg/kg	15	15	900	No
SO_Onsite_0_10_E	7440-50-8	Copper	2	2	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_E	57-12-5	Cyanide	1	1	0%	mg/kg	0.92	0.92	120	No
SO_Onsite_0_10_E	7439-97-6	Mercury	5	5	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_E	85-01-8	Phenanthrene	1	1	0%	mg/kg	0.03	0.03	1.04	No
SO_Onsite_0_10_E	7782-49-2	Selenium	7	7	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_E	7440-22-4	Silver	6	6	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_E	7440-28-0	Thallium	4	4	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.27

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit F

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_F	120-12-7	Anthracene	1	1	0%	mg/kg	0.03	0.03	2200	No
SO_Onsite_0_10_F	7440-36-0	Antimony	2	2	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_F	7440-38-2	Arsenic	3	3	0%	mg/kg	0.25	0.25	13.2	No
SO_Onsite_0_10_F	56-55-3	Benzo(a)anthracene	1	1	0%	mg/kg	0.17	0.17	0.887	No
SO_Onsite_0_10_F	205-99-2	Benzo(b)fluoranthene	1	1	0%	mg/kg	0.21	0.21	0.626	No
SO_Onsite_0_10_F	207-08-9	Benzo(k)fluoranthene	1	1	0%	mg/kg	0.07	0.07	1.5	No
SO_Onsite_0_10_F	7440-41-7	Beryllium	4	4	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_F	7440-43-9	Cadmium	8	8	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_F	7440-47-3	Chromium	4	4	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_F	7440-48-4	Cobalt	1	1	0%	mg/kg	15	15	900	No
SO_Onsite_0_10_F	7440-50-8	Copper	4	4	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_F	57-12-5	Cyanide	1	1	0%	mg/kg	0.92	0.92	120	No
SO_Onsite_0_10_F	7439-97-6	Mercury	10	10	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_F	7440-02-0	Nickel	1	1	0%	mg/kg	12.6	12.6	130	No
SO_Onsite_0_10_F	7782-49-2	Selenium	9	9	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_F	7440-22-4	Silver	10	10	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_F	7440-28-0	Thallium	3	3	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.28

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit G

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Detection Limit for NDs	Detection Limit for NDs	SL	Exceed Standard?
SO_Onsite_0_10_G	120-12-7	Anthracene	1	1	0%	mg/kg	0.03	0.03	2200	No
SO_Onsite_0_10_G	7440-36-0	Antimony	7	7	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_G	7440-38-2	Arsenic	3	3	0%	mg/kg	0.25	0.25	13.2	No
SO_Onsite_0_10_G	56-55-3	Benzo(a)anthracene	1	1	0%	mg/kg	0.17	0.17	0.887	No
SO_Onsite_0_10_G	205-99-2	Benzo(b)fluoranthene	1	1	0%	mg/kg	0.21	0.21	0.626	No
SO_Onsite_0_10_G	207-08-9	Benzo(k)fluoranthene	1	1	0%	mg/kg	0.07	0.07	1.5	No
SO_Onsite_0_10_G	7440-41-7	Beryllium	4	4	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_G	7440-43-9	Cadmium	5	5	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_G	7440-47-3	Chromium	4	4	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_G	218-01-9	Chrysene	1	1	0%	mg/kg	0.12	0.12	15	No
SO_Onsite_0_10_G	7440-48-4	Cobalt	2	2	0%	mg/kg	15	15	900	No
SO_Onsite_0_10_G	7440-50-8	Copper	4	4	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_G	57-12-5	Cyanide	2	2	0%	mg/kg	0.92	0.92	120	No
SO_Onsite_0_10_G	206-44-0	Fluoranthene	2	2	0%	mg/kg	0.07	0.07	230	No
SO_Onsite_0_10_G	7439-97-6	Mercury	9	9	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_G	85-01-8	Phenanthrene	1	1	0%	mg/kg	0.03	0.03	1.04	No
SO_Onsite_0_10_G	129-00-0	Pyrene	2	2	0%	mg/kg	0.03	0.03	230	No
SO_Onsite_0_10_G	7782-49-2	Selenium	7	7	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_G	7440-22-4	Silver	9	9	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_G	7440-28-0	Thallium	5	5	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.29

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit H

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_H	7440-36-0	Antimony	2	2	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_H	7440-38-2	Arsenic	1	1	0%	mg/kg	0.25	1.376	13.2	No
SO_Onsite_0_10_H	7440-43-9	Cadmium	2	2	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_H	7439-97-6	Mercury	5	5	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_H	7782-49-2	Selenium	7	7	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_H	7440-22-4	Silver	2	2	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_H	7440-28-0	Thallium	1	1	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.30

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit I

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_I	120-12-7	Anthracene	1	1	0%	mg/kg	0.03	0.1966	2200	No
SO_Onsite_0_10_I	7440-36-0	Antimony	3	3	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_I	7440-38-2	Arsenic	4	4	0%	mg/kg	0.25	1.376	13.2	No
SO_Onsite_0_10_I	7440-41-7	Beryllium	2	2	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_I	7440-43-9	Cadmium	2	2	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_I	7440-47-3	Chromium	2	2	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_I	7440-50-8	Copper	2	2	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_I	86-73-7	Fluorene	2	2	0%	mg/kg	0.1966	0.1966	260	No
SO_Onsite_0_10_I	7439-97-6	Mercury	5	5	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_I	7782-49-2	Selenium	4	4	0%	mg/kg	0 25	0.25	5	No
SO_Onsite_0_10_I	7440-22-4	Silver	6	6	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_I	7440-28-0	Thallium	3	3	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.31

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit J

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_J	7440-36-0	Antimony	1	1	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_J	7440-43-9	Cadmium	4	4	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_J	7439-97-6	Mercury	6	6	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_J	7782-49-2	Selenium	6	6	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_J	7440-22-4	Silver	5	5	0%	mg/kg	2.5	2.5	34	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St. Louis, Missouri.*

APPENDIX N

TABLE 3.32

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit K

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_K	7440-36-0	Antimony	4	4	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_K	7440-38-2	Arsenic	2	2	0%	mg/kg	0.25	0.25	13.2	No
SO_Onsite_0_10_K	7440-41-7	Beryllium	4	4	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_K	7440-43-9	Cadmium	4	4	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_K	7440-47-3	Chromium	4	4	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_K	7440-48-4	Cobalt	1	1	0%	mg/kg	15	15	900	No
SO_Onsite_0_10_K	7440-50-8	Copper	4	4	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_K	57-12-5	Cyanide	1	1	0%	mg/kg	0.92	0.92	120	No
SO_Onsite_0_10_K	7439-97-6	Mercury	6	6	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_K	7782-49-2	Selenium	5	5	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_K	7440-22-4	Silver	8	8	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_K	7440-28-0	Thallium	4	4	0%	mg/kg	31.3	31.3	0.7	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St. Louis Army Ammunition Plant St Louis, Missouri.*

APPENDIX N

TABLE 3.33

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit L

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_L	630-20-6	1,1,1,2-Tetrachloroethane	14	14	0%	mg/kg	0.006	0.0065	3	No
SO_Onsite_0_10_L	71-55-6	1,1,1-Trichloroethane	18	18	0%	mg/kg	0.006	0.0065	2	No
SO_Onsite_0_10_L	79-34-5	1,1,2,2-Tetrachloroethane	14	14	0%	mg/kg	0.006	0.0065	0.003	Yes
SO_Onsite_0_10_L	79-00-5	1,1,2-Trichloroethane	14	14	0%	mg/kg	0.006	0.0065	0.02	No
SO_Onsite_0_10_L	75-35-4	1,1-Dichloroethene	13	13	0%	mg/kg	0.006	0.0065	0.06	No
SO_Onsite_0_10_L	120-82-1	1,2,4-Trichlorobenzene	13	13	0%	mg/kg	0.006	0.0065	5	No
SO_Onsite_0_10_L	95-63-6	1,2,4-Trimethylbenzene	13	13	0%	mg/kg	0.00093	0.0065	5.7	No
SO_Onsite_0_10_L	95-50-1	1,2-Dichlorobenzene	13	13	0%	mg/kg	0.006	0.0065	17	No
SO_Onsite_0_10_L	107-06-2	1,2-Dichloroethane (EDC)	4	4	0%	mg/kg	0.0063	0.0065	0.02	No
SO_Onsite_0_10_L	108-67-8	1,3,5-Trimethylbenzene	12	12	0%	mg/kg	0.00083	0.0065	2.1	No
SO_Onsite_0_10_L	541-73-1	1,3-Dichlorobenzene	13	13	0%	mg/kg	0.006	0.0065	6.9	No
SO_Onsite_0_10_L	90-12-0	1-Methylnaphthalene	1	1	0%	mg/kg	0.243	0.243	21	No
SO_Onsite_0_10_L	91-57-6	2-Methylnaphthalene	1	1	0%	mg/kg	0.243	0.243	21	No
SO_Onsite_0_10_L	99-87-6	4-Isopropyltoluene	13	13	0%	mg/kg	0.006	0.0065	58	No
SO_Onsite_0_10_L	83-32-9	Acenaphthene	1	1	0%	mg/kg	0.243	0.243	370	No
SO_Onsite_0_10_L	208-96-8	Acenaphthylene	1	1	0%	mg/kg	0.243	0.243	0.0305	Yes
SO_Onsite_0_10_L	120-12-7	Anthracene	1	1	0%	mg/kg	0.03	0.03	2200	No
SO_Onsite_0_10_L	7440-36-0	Antimony	4	4	0%	mg/kg	3.8	3.8	3.1	Yes
SO_Onsite_0_10_L	7440-38-2	Arsenic	2	2	0%	mg/kg	0.25	1.376	13.2	No
SO_Onsite_0_10_L	56-55-3	Benzo(a)anthracene	1	1	0%	mg/kg	0.17	0.17	0 887	No
SO_Onsite_0_10_L	205-99-2	Benzo(b)fluoranthene	1	1	0%	mg/kg	0.21	0.21	0.626	No
SO_Onsite_0_10_L	207-08-9	Benzo(k)fluoranthene	1	1	0%	mg/kg	0.07	0.07	1.5	No
SO_Onsite_0_10_L	7440-41-7	Beryllium	2	2	0%	mg/kg	1.8	1.8	16	No
SO_Onsite_0_10_L	7440-43-9	Cadmium	2	2	0%	mg/kg	3.05	3.05	3.9	No
SO_Onsite_0_10_L	56-23-5	Carbon tetrachloride	14	14	0%	mg/kg	0.006	0.0065	0.07	No
SO_Onsite_0_10_L	67-66-3	Chloroform	14	14	0%	mg/kg	0.006	0.0065	0.25	No
SO_Onsite_0_10_L	7440-47-3	Chromium	2	2	0%	mg/kg	12.7	12.7	38	No
SO_Onsite_0_10_L	156-59-2	cis-1,2-Dichloroethene	5	5	0%	mg/kg	0.0062	0.0065	0.4	No
SO_Onsite_0_10_L	7440-48-4	Cobalt	1	1	0%	mg/kg	15	15	900	No

APPENDIX N

TABLE 3.33

Evaluation of Reporting Limits for Compounds that were Not Detected for Soil (0-2 ft) - Exposure Unit L

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	Units	FOD	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
SO_Onsite_0_10_L	7440-50-8	Copper	2	2	0%	mg/kg	58.6	58.6	290	No
SO_Onsite_0_10_L	57-12-5	Cyanide	1	1	0%	mg/kg	0.92	0.92	120	No
SO_Onsite_0_10_L	100-41-4	Ethylbenzene	14	14	0%	mg/kg	0.006	0.0065	13	No
SO_Onsite_0_10_L	86-73-7	Fluorene	1	1	0%	mg/kg	0.243	0.243	260	No
SO_Onsite_0_10_L	87-68-3	Hexachlorobutadiene	14	14	0%	mg/kg	0.006	0.0065	2	No
SO_Onsite_0_10_L	98-82-8	Isopropylbenzene	14	14	0%	mg/kg	0.006	0.0065	37	No
SO_Onsite_0_10_L	7439-97-6	Mercury	5	5	0%	mg/kg	0.05	0.05	2.3	No
SO_Onsite_0_10_L	91-20-3	Naphthalene	14	14	0%	mg/kg	0.0012	0.243	12	No
SO_Onsite_0_10_L	104-51-8	n-Butylbenzene	13	13	0%	mg/kg	0.006	0.0065	14	No
SO_Onsite_0_10_L	7440-02-0	Nickel	1	1	0%	mg/kg	12.6	12.6	130	No
SO_Onsite_0_10_L	135-98-8	sec-Butylbenzene	14	14	0%	mg/kg	0.006	0.0065	11	No
SO_Onsite_0_10_L	7782-49-2	Selenium	3	3	0%	mg/kg	0.25	0.25	5	No
SO_Onsite_0_10_L	7440-22-4	Silver	6	6	0%	mg/kg	2.5	2.5	34	No
SO_Onsite_0_10_L	127-18-4	Tetrachloroethene	1	1	0%	mg/kg	0.0063	0.0063	0.06	No
SO_Onsite_0_10_L	7440-28-0	Thallium	3	3	0%	mg/kg	31.3	31.3	0.7	Yes
SO_Onsite_0_10_L	108-88-3	Toluene	11	11	0%	mg/kg	0.006	0.0065	12	No
SO_Onsite_0_10_L	156-60-5	trans-1,2-Dichloroethene	10	10	0%	mg/kg	0.0062	0.0065	0.7	No
SO_Onsite_0_10_L	79-01-6	Trichloroethene	5	5	0%	mg/kg	0.006	0.0065	0.043	No
SO_Onsite_0_10_L	108-38-3/1	Xylene, m-, p-	14	14	0%	mg/kg	0.006	0.0065	210	No
SO_Onsite_0_10_L	95-47-6	Xylene, o-	14	14	0%	mg/kg	0.006	0.0065	210	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential land use

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

SSL = USEPA Region 6 Soil Screening Levels (SSLs) for protection of migration to groundwater using a dilution-attenuation factor (DAF) of 20

Background = Data taken from URS. May 2004. *Site-Specific Environmental Baseline Survey St Louis Army Ammunition Plant St Louis, Missouri.*

SL for Naphthalene used as a surrogate for 1-Methylnaphthalene and 2-Methylnaphthalene.

SL for Isopropylbenzene used as a surrogate for 4-isopropyltoluene

APPENDIX N

TABLE 3.34

Evaluation of Reporting Limits for Compounds that were Not Detected in Groundwater Downgradient of Former Building 220 - Residential

St Louis Ordnance Plant, Former Hanley Area, St Louis. Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_220_Down_Residential	630-20-6	1,1,1,2-Tetrachloroethane	20	20	0%	µg/L	1	50	0.43	Yes
GW_220_Down_Residential	71-55-6	1,1,1-Trichloroethane	14	14	0%	µg/L	1	50	910	No
GW_220_Down_Residential	79-34-5	1,1,2,2-Tetrachloroethane	20	20	0%	µg/L	1	50	0.055	Yes
GW_220_Down_Residential	79-00-5	1,1,2-Trichloroethane	13	13	0%	µg/L	1	50	0.2	Yes
GW_220_Down_Residential	75-34-3	1,1-Dichloroethane	14	14	0%	µg/L	1	50	120	No
GW_220_Down_Residential	75-35-4	1,1-Dichloroethene	18	18	0%	µg/L	1	50	34	Yes
GW_220_Down_Residential	563-58-6	1,1-Dichloropropene	14	14	0%	µg/L	1	50	NA	NA
GW_220_Down_Residential	87-61-6	1,2,3-Trichlorobenzene	14	14	0%	µg/L	1	50	NA	NA
GW_220_Down_Residential	96-18-4	1,2,3-Trichloropropane	14	14	0%	µg/L	1	50	0.034	Yes
GW_220_Down_Residential	120-82-1	1,2,4-Trichlorobenzene	14	14	0%	µg/L	1	50	0.82	Yes
GW_220_Down_Residential	95-63-6	1,2,4-Trimethylbenzene	14	14	0%	µg/L	1	50	1.5	Yes
GW_220_Down_Residential	96-12-8	1,2-Dibromo-3-chloropropane	14	14	0%	µg/L	2	100	0.0002	Yes
GW_220_Down_Residential	106-93-4	1,2-Dibromoethane (EDB)	14	14	0%	µg/L	1	50	0.0056	Yes
GW_220_Down_Residential	95-50-1	1,2-Dichlorobenzene	14	14	0%	µg/L	1	50	4.9	Yes
GW_220_Down_Residential	107-06-2	1,2-Dichloroethane (EDC)	17	17	0%	µg/L	1	50	0.12	Yes
GW_220_Down_Residential	78-87-5	1,2-Dichloropropane	14	14	0%	µg/L	1	50	0.16	Yes
GW_220_Down_Residential	108-67-8	1,3,5-Trimethylbenzene	14	14	0%	µg/L	1	50	1.2	Yes
GW_220_Down_Residential	541-73-1	1,3-Dichlorobenzene	14	14	0%	µg/L	1	50	1.4	Yes
GW_220_Down_Residential	142-28-9	1,3-Dichloropropane	14	14	0%	µg/L	1	50	12	Yes
GW_220_Down_Residential	106-46-7	1,4-Dichlorobenzene	14	14	0%	µg/L	1	50	0.47	Yes
GW_220_Down_Residential	594-20-7	2,2-Dichloropropane	14	14	0%	µg/L	1	50	NA	NA
GW_220_Down_Residential	78-93-3	2-Butanone (MEK)	13	13	0%	µg/L	10	200	710	No
GW_220_Down_Residential	95-49-8	2-Chlorotoluene	14	14	0%	µg/L	1	50	12	Yes
GW_220_Down_Residential	591-78-6	2-Hexanone	14	14	0%	µg/L	5	250	NA	NA
GW_220_Down_Residential	106-43-4	4-Chlorotoluene	14	14	0%	µg/L	1	50	12	Yes
GW_220_Down_Residential	99-87-6	4-Isopropyltoluene	14	14	0%	µg/L	1	50	NA	NA
GW_220_Down_Residential	108-10-1	4-Methyl-2-pentanone	14	14	0%	µg/L	5	250	NA	NA
GW_220_Down_Residential	67-64-1	Acetone	11	11	0%	µg/L	10	500	550	No
GW_220_Down_Residential	107-02-8	Acrolein	14	14	0%	µg/L	10	500	0.0042	Yes

APPENDIX N

TABLE 3.34

Evaluation of Reporting Limits for Compounds that were Not Detected in Groundwater Downgradient of Former Building 220 - Residential

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_220_Down_Residential	107-13-1	Acrylonitrile	14	14	0%	µg/L	4	200	0.0389	Yes
GW_220_Down_Residential	71-43-2	Benzene	19	19	0%	µg/L	1	50	0.35	Yes
GW_220_Down_Residential	108-86-1	Bromobenzene	14	14	0%	µg/L	1	50	2.3	Yes
GW_220_Down_Residential	74-97-5	Bromochloromethane	14	14	0%	µg/L	1	50	NA	NA
GW_220_Down_Residential	75-27-4	Bromodichloromethane	14	14	0%	µg/L	1	50	0.18	Yes
GW_220_Down_Residential	75-25-2	Bromoform	14	14	0%	µg/L	1	50	8.3	Yes
GW_220_Down_Residential	74-83-9	Bromomethane	14	14	0%	µg/L	1	50	0.87	Yes
GW_220_Down_Residential	75-15-0	Carbon disulfide	11	11	0%	µg/L	1	50	100	No
GW_220_Down_Residential	56-23-5	Carbon tetrachloride	19	19	0%	µg/L	1	50	0.17	Yes
GW_220_Down_Residential	108-90-7	Chlorobenzene	14	14	0%	µg/L	1	50	9.1	Yes
GW_220_Down_Residential	75-00-3	Chloroethane	14	14	0%	µg/L	1	50	3.9	Yes
GW_220_Down_Residential	67-66-3	Chloroform	17	17	0%	µg/L	1	20	0.17	Yes
GW_220_Down_Residential	74-87-3	Chloromethane	19	19	0%	µg/L	1	50	19	Yes
GW_220_Down_Residential	156-59-2	cis-1,2-Dichloroethene	13	13	0%	µg/L	1	5	6.1	No
GW_220_Down_Residential	10061-01-5	cis-1,3-Dichloropropene	14	14	0%	µg/L	1	50	NA	NA
GW_220_Down_Residential	124-48-1	Dibromochloromethane	14	14	0%	µg/L	1	50	0.13	Yes
GW_220_Down_Residential	74-95-3	Dibromomethane	14	14	0%	µg/L	1	50	6.1	Yes
GW_220_Down_Residential	75-71-8	Dichlorodifluoromethane	14	14	0%	µg/L	1	50	14	Yes
GW_220_Down_Residential	74-84-0	Ethane	2	2	0%	µg/L	1.2	1.2	NA	NA
GW_220_Down_Residential	74-85-1	Ethene	2	2	0%	µg/L	1	1	NA	NA
GW_220_Down_Residential	100-41-4	Ethylbenzene	18	18	0%	µg/L	1	50	130	No
GW_220_Down_Residential	87-68-3	Hexachlorobutadiene	14	14	0%	µg/L	1	50	0.86	Yes
GW_220_Down_Residential	74-88-4	Iodomethane	13	13	0%	µg/L	2	100	NA	NA
GW_220_Down_Residential	7439-89-6	Iron	1	1	0%	µg/L	5.5	5.5	2600	No
GW_220_Down_Residential	98-82-8	Isopropylbenzene	14	14	0%	µg/L	1	50	66	No
GW_220_Down_Residential	74-82-8	Methane	2	2	0%	µg/L	2.2	2.7	NA	NA
GW_220_Down_Residential	1634-04-4	Methyl tert-butyl ether (MTBE)	13	13	0%	µg/L	1	50	10.6	Yes
GW_220_Down_Residential	75-09-2	Methylene chloride	11	11	0%	µg/L	0.53	50	4.3	Yes
GW_220_Down_Residential	91-20-3	Naphthalene	13	13	0%	µg/L	1	50	0.62	Yes

APPENDIX N

TABLE 3.34

Evaluation of Reporting Limits for Compounds that were Not Detected in Groundwater Downgradient of Former Building 220 - Residential

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_220_Down_Residential	104-51-8	n-Butylbenzene	14	14	0%	µg/L	1	50	6.1	Yes
GW_220_Down_Residential	103-65-1	n-Propylbenzene	14	14	0%	µg/L	1	50	6.1	Yes
GW_220_Down_Residential	135-98-8	sec-Butylbenzene	14	14	0%	µg/L	1	50	6.1	Yes
GW_220_Down_Residential	100-42-5	Styrene	14	14	0%	µg/L	1	50	160	No
GW_220_Down_Residential	98-06-6	tert-Butylbenzene	14	14	0%	µg/L	1	50	6.1	Yes
GW_220_Down_Residential	127-18-4	Tetrachloroethene	12	12	0%	µg/L	1	5	0.1	Yes
GW_220_Down_Residential	108-88-3	Toluene	13	13	0%	µg/L	1	50	230	No
GW_220_Down_Residential	156-60-5	trans-1,2-Dichloroethene	17	17	0%	µg/L	1	50	11	Yes
GW_220_Down_Residential	10061-02-6	trans-1,3-Dichloropropene	14	14	0%	µg/L	1	50	NA	NA
GW_220_Down_Residential	79-01-6	Trichloroethene	10	10	0%	µg/L	1	5	0.028	Yes
GW_220_Down_Residential	75-69-4	Trichlorofluoromethane	14	14	0%	µg/L	1	50	130	No
GW_220_Down_Residential	108-05-4	Vinyl actetate	14	14	0%	µg/L	2	100	41	Yes
GW_220_Down_Residential	75-01-4	Vinyl chloride	20	20	0%	µg/L	1	50	0.015	Yes
GW_220_Down_Residential	108-38-3/1	Xylene, m-, p-	18	18	0%	µg/L	2	100	21	Yes
GW_220_Down_Residential	95-47-6	Xylene, o-	12	12	0%	µg/L	1	50	20	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.35

Evaluation of Reporting Limits for Compounds that were Not Detected in Groundwater Downgradient of Former Building 220 - On-Site Excavations

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
Excavations	630-20-6	1,1,1,2-Tetrachloroethane	11	11	0%	µg/L	1	50	0.43	Yes
Excavations	71-55-6	1,1,1-Trichloroethane	8	8	0%	µg/L	1	50	910	No
Excavations	79-34-5	1,1,2,2-Tetrachloroethane	11	11	0%	µg/L	1	50	0.055	Yes
Excavations	79-00-5	1,1,2-Trichloroethane	7	7	0%	µg/L	1	50	0.2	Yes
Excavations	75-34-3	1,1-Dichloroethane	8	8	0%	µg/L	1	50	120	No
Excavations	75-35-4	1,1-Dichloroethene	11	11	0%	µg/L	1	50	34	Yes
Excavations	563-58-6	1,1-Dichloropropene	8	8	0%	µg/L	1	50	NA	NA
Excavations	87-61-6	1,2,3-Trichlorobenzene	8	8	0%	µg/L	1	50	NA	NA
Excavations	96-18-4	1,2,3-Trichloropropane	8	8	0%	µg/L	1	50	0.034	Yes
Excavations	120-82-1	1,2,4-Trichlorobenzene	8	8	0%	µg/L	1	50	0.82	Yes
Excavations	95-63-6	1,2,4-Trimethylbenzene	8	8	0%	µg/L	1	50	1.5	Yes
Excavations	96-12-8	chloropropane	8	8	0%	µg/L	2	100	0.0002	Yes
Excavations	106-93-4	1,2-Dibromoethane (EDB)	8	8	0%	µg/L	1	50	0.0056	Yes
Excavations	95-50-1	1,2-Dichlorobenzene	8	8	0%	µg/L	1	50	4.9	Yes
Excavations	107-06-2	1,2-Dichloroethane (EDC)	10	10	0%	µg/L	1	50	0.12	Yes
Excavations	78-87-5	1,2-Dichloropropane	8	8	0%	µg/L	1	50	0.16	Yes
Excavations	108-67-8	1,3,5-Trimethylbenzene	8	8	0%	µg/L	1	50	1.2	Yes
Excavations	541-73-1	1,3-Dichlorobenzene	8	8	0%	µg/L	1	50	1.4	Yes
Excavations	142-28-9	1,3-Dichloropropane	8	8	0%	µg/L	1	50	12	Yes
Excavations	106-46-7	1,4-Dichlorobenzene	8	8	0%	µg/L	1	50	0.47	Yes
Excavations	594-20-7	2,2-Dichloropropane	8	8	0%	µg/L	1	50	NA	NA
Excavations	78-93-3	2-Butanone (MEK)	7	7	0%	µg/L	10	50	710	No
Excavations	95-49-8	2-Chlorotoluene	8	8	0%	µg/L	1	50	12	Yes
Excavations	591-78-6	2-Hexanone	8	8	0%	µg/L	5	250	NA	NA
Excavations	106-43-4	4-Chlorotoluene	8	8	0%	µg/L	1	50	12	Yes
Excavations	99-87-6	4-Isopropyltoluene	8	8	0%	µg/L	1	50	NA	NA
Excavations	108-10-1	4-Methyl-2-pentanone	8	8	0%	µg/L	5	250	NA	NA
Excavations	67-64-1	Acetone	7	7	0%	µg/L	10	500	550	No
Excavations	107-02-8	Acrolein	8	8	0%	µg/L	10	500	0.0042	Yes

APPENDIX N

TABLE 3.35

Evaluation of Reporting Limits for Compounds that were Not Detected in Groundwater Downgradient of Former Building 220 - On-Site Excavations

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
Excavations	107-13-1	Acrylonitrile	8	8	0%	µg/L	4	200	0.039	Yes
Excavations	71-43-2	Benzene	10	10	0%	µg/L	1	50	0.35	Yes
Excavations	108-86-1	Bromobenzene	8	8	0%	µg/L	1	50	2.3	Yes
Excavations	74-97-5	Bromochloromethane	8	8	0%	µg/L	1	50	NA	NA
Excavations	75-27-4	Bromodichloromethane	8	8	0%	µg/L	1	50	0.18	Yes
Excavations	75-25-2	Bromoform	8	8	0%	µg/L	1	50	8.3	Yes
Excavations	74-83-9	Bromomethane	8	8	0%	µg/L	1	50	0.87	Yes
Excavations	75-15-0	Carbon disulfide	5	5	0%	µg/L	1	50	100	No
Excavations	56-23-5	Carbon tetrachloride	10	10	0%	µg/L	1	50	0.17	Yes
Excavations	108-90-7	Chlorobenzene	8	8	0%	µg/L	1	50	9.1	Yes
Excavations	75-00-3	Chloroethane	8	8	0%	µg/L	1	50	3.9	Yes
Excavations	67-66-3	Chloroform	9	9	0%	µg/L	1	5	0.17	Yes
Excavations	74-87-3	Chloromethane	11	11	0%	µg/L	1	50	19	Yes
Excavations	156-59-2	cis-1,2-Dichloroethene	10	10	0%	µg/L	1	5	6.1	No
Excavations	10061-01-5	cis-1,3-Dichloropropene	8	8	0%	µg/L	1	50	NA	NA
Excavations	124-48-1	Dibromochloromethane	8	8	0%	µg/L	1	50	0.13	Yes
Excavations	74-95-3	Dibromomethane	8	8	0%	µg/L	1	50	6.1	Yes
Excavations	75-71-8	Dichlorodifluoromethane	8	8	0%	µg/L	1	50	14	Yes
Excavations	74-84-0	Ethane	1	1	0%	µg/L	1.2	1.2	NA	NA
Excavations	74-85-1	Ethene	1	1	0%	µg/L	1	1	NA	NA
Excavations	100-41-4	Ethylbenzene	10	10	0%	µg/L	1	50	130	No
Excavations	87-68-3	Hexachlorobutadiene	8	8	0%	µg/L	1	50	0.86	Yes
Excavations	74-88-4	Iodomethane	8	8	0%	µg/L	2	100	NA	NA
Excavations	98-82-8	Isopropylbenzene	8	8	0%	µg/L	1	50	66	No
Excavations	74-82-8	Methane	1	1	0%	µg/L	2.2	2.2	NA	NA
Excavations	1634-04-4	(MTBE)	8	8	0%	µg/L	1	50	10.6	Yes
Excavations	75-09-2	Methylene chloride	6	6	0%	µg/L	1	50	4.3	Yes
Excavations	91-20-3	Naphthalene	7	7	0%	µg/L	1	50	0.62	Yes
Excavations	104-51-8	n-Butylbenzene	8	8	0%	µg/L	1	50	6.1	Yes

APPENDIX N

TABLE 3.35

Evaluation of Reporting Limits for Compounds that were Not Detected in Groundwater Downgradient of Former Building 220 - On-Site Excavations

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
Excavations	103-65-1	n-Propylbenzene	8	8	0%	µg/L	1	50	6.1	Yes
Excavations	135-98-8	sec-Butylbenzene	8	8	0%	µg/L	1	50	6.1	Yes
Excavations	100-42-5	Styrene	8	8	0%	µg/L	1	50	160	No
Excavations	98-06-6	tert-Butylbenzene	8	8	0%	µg/L	1	50	6.1	Yes
Excavations	127-18-4	Tetrachloroethene	7	7	0%	µg/L	1	5	0.1	Yes
Excavations	108-88-3	Toluene	7	7	0%	µg/L	1	50	230	No
Excavations	156-60-5	trans-1,2-Dichloroethene	11	11	0%	µg/L	1	50	11	Yes
Excavations	10061-02-6	trans-1,3-Dichloropropene	8	8	0%	µg/L	1	50	NA	NA
Excavations	79-01-6	Trichloroethene	7	7	0%	µg/L	1	5	0.028	Yes
Excavations	75-69-4	Trichlorofluoromethane	8	8	0%	µg/L	1	50	130	No
Excavations	108-05-4	Vinyl actetate	8	8	0%	µg/L	2	100	41	Yes
Excavations	75-01-4	Vinyl chloride	11	11	0%	µg/L	1	50	0.015	Yes
Excavations	108-38-3/1	Xylene, m-, p-	9	9	0%	µg/L	2	100	21	Yes
Excavations	95-47-6	Xylene, o-	6	6	0%	µg/L	1	50	20	Yes

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.36

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Offsite	630-20-6	1,1,1,2-Tetrachloroethane	12	12	0%	µg/L	1	20	0.43	Yes
GW_Offsite	71-55-6	1,1,1-Trichloroethane	8	8	0%	µg/L	1	20	910	No
GW_Offsite	79-34-5	1,1,2,2-Tetrachloroethane	12	12	0%	µg/L	1	20	0.055	Yes
GW_Offsite	79-00-5	1,1,2-Trichloroethane	8	8	0%	µg/L	1	20	0.2	Yes
GW_Offsite	75-34-3	1,1-Dichloroethane	8	8	0%	µg/L	1	20	120	No
GW_Offsite	75-35-4	1,1-Dichloroethene	10	10	0%	µg/L	1	20	34	No
GW_Offsite	563-58-6	1,1-Dichloropropene	8	8	0%	µg/L	1	20	NA	NA
GW_Offsite	87-61-6	1,2,3-Trichlorobenzene	8	8	0%	µg/L	1	20	NA	NA
GW_Offsite	96-18-4	1,2,3-Trichloropropane	8	8	0%	µg/L	1	20	0.034	Yes
GW_Offsite	120-82-1	1,2,4-Trichlorobenzene	8	8	0%	µg/L	1	20	0.82	Yes
GW_Offsite	95-63-6	1,2,4-Trimethylbenzene	8	8	0%	µg/L	1	20	1.5	Yes
GW_Offsite	96-12-8	1,2-Dibromo-3-chloropropane	8	8	0%	µg/L	2	40	0.0002	Yes
GW_Offsite	106-93-4	1,2-Dibromoethane (EDB)	8	8	0%	µg/L	1	20	0.0056	Yes
GW_Offsite	95-50-1	1,2-Dichlorobenzene	8	8	0%	µg/L	1	20	4.9	Yes
GW_Offsite	107-06-2	1,2-Dichloroethane (EDC)	9	9	0%	µg/L	1	5	0.12	Yes
GW_Offsite	78-87-5	1,2-Dichloropropane	8	8	0%	µg/L	1	20	0.16	Yes
GW_Offsite	108-67-8	1,3,5-Trimethylbenzene	8	8	0%	µg/L	1	20	1.2	Yes
GW_Offsite	541-73-1	1,3-Dichlorobenzene	8	8	0%	µg/L	1	20	1.4	Yes
GW_Offsite	142-28-9	1,3-Dichloropropane	8	8	0%	µg/L	1	20	12	Yes
GW_Offsite	106-46-7	1,4-Dichlorobenzene	8	8	0%	µg/L	1	20	0.47	Yes
GW_Offsite	594-20-7	2,2-Dichloropropane	8	8	0%	µg/L	1	20	NA	NA
GW_Offsite	78-93-3	2-Butanone (MEK)	8	8	0%	µg/L	10	200	710	No
GW_Offsite	95-49-8	2-Chlorotoluene	8	8	0%	µg/L	1	20	12	Yes
GW_Offsite	591-78-6	2-Hexanone	8	8	0%	µg/L	5	100	NA	NA
GW_Offsite	106-43-4	4-Chlorotoluene	8	8	0%	µg/L	1	20	12	Yes
GW_Offsite	99-87-6	4-Isopropyltoluene	8	8	0%	µg/L	1	20	NA	NA
GW_Offsite	108-10-1	4-Methyl-2-pentanone	8	8	0%	µg/L	5	100	NA	NA
GW_Offsite	67-64-1	Acetone	6	6	0%	µg/L	10	200	550	No
GW_Offsite	107-02-8	Acrolein	8	8	0%	µg/L	10	200	0.0042	Yes

APPENDIX N

TABLE 3.36

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Offsite	107-13-1	Acrylonitrile	8	8	0%	µg/L	4	80	0.039	Yes
GW_Offsite	71-43-2	Benzene	12	12	0%	µg/L	1	20	0.35	Yes
GW_Offsite	108-86-1	Bromobenzene	8	8	0%	µg/L	1	20	2.3	Yes
GW_Offsite	74-97-5	Bromochloromethane	8	8	0%	µg/L	1	20	NA	NA
GW_Offsite	75-27-4	Bromodichloromethane	8	8	0%	µg/L	1	20	0.18	Yes
GW_Offsite	75-25-2	Bromoform	8	8	0%	µg/L	1	20	8.3	Yes
GW_Offsite	74-83-9	Bromomethane	8	8	0%	µg/L	1	20	0.87	Yes
GW_Offsite	75-15-0	Carbon disulfide	8	8	0%	µg/L	1	20	100	No
GW_Offsite	56-23-5	Carbon tetrachloride	12	12	0%	µg/L	1	20	0.17	Yes
GW_Offsite	108-90-7	Chlorobenzene	8	8	0%	µg/L	1	20	9.1	Yes
GW_Offsite	75-00-3	Chloroethane	8	8	0%	µg/L	1	20	3.9	Yes
GW_Offsite	67-66-3	Chloroform	11	11	0%	µg/L	1	20	0.17	Yes
GW_Offsite	74-87-3	Chloromethane	11	11	0%	µg/L	1	20	19	Yes
GW_Offsite	156-59-2	cis-1,2-Dichloroethene	6	6	0%	µg/L	1	5	6.1	No
GW_Offsite	10061-01-5	cis-1,3-Dichloropropene	8	8	0%	µg/L	1	20	NA	NA
GW_Offsite	124-48-1	Dibromochloromethane	8	8	0%	µg/L	1	20	0.13	Yes
GW_Offsite	74-95-3	Dibromomethane	8	8	0%	µg/L	1	20	6.1	Yes
GW_Offsite	75-71-8	Dichlorodifluoromethane	8	8	0%	µg/L	1	20	14	Yes
GW_Offsite	74-84-0	Ethane	2	2	0%	µg/L	1.2	1.2	NA	NA
GW_Offsite	74-85-1	Ethene	2	2	0%	µg/L	1	1	NA	NA
GW_Offsite	100-41-4	Ethylbenzene	10	10	0%	µg/L	1	20	130	No
GW_Offsite	87-68-3	Hexachlorobutadiene	8	8	0%	µg/L	1	20	0.86	Yes
GW_Offsite	74-88-4	Iodomethane	7	7	0%	µg/L	2	40	NA	NA
GW_Offsite	7439-89-6	Iron	2	2	0%	µg/L	5.5	5.5	2600	No
GW_Offsite	98-82-8	Isopropylbenzene	8	8	0%	µg/L	1	20	66	No
GW_Offsite	74-82-8	Methane	2	2	0%	µg/L	2.7	3	NA	NA
GW_Offsite	1634-04-4	Methyl tert-butyl ether (MTBE)	7	7	0%	µg/L	1	20	10.6	Yes
GW_Offsite	75-09-2	Methylene chloride	7	7	0%	µg/L	0.53	20	4.3	Yes
GW_Offsite	91-20-3	Naphthalene	8	8	0%	µg/L	1	20	0.62	Yes

APPENDIX N

TABLE 3.36

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Offsite	104-51-8	n-Butylbenzene	8	8	0%	µg/L	1	20	6.1	Yes
GW_Offsite	103-65-1	n-Propylbenzene	8	8	0%	µg/L	1	20	6.1	Yes
GW_Offsite	135-98-8	sec-Butylbenzene	8	8	0%	µg/L	1	20	6.1	Yes
GW_Offsite	100-42-5	Styrene	8	8	0%	µg/L	1	20	160	No
GW_Offsite	98-06-6	tert-Butylbenzene	8	8	0%	µg/L	1	20	6.1	Yes
GW_Offsite	127-18-4	Tetrachloroethene	8	8	0%	µg/L	1	5	0.1	Yes
GW_Offsite	108-88-3	Toluene	8	8	0%	µg/L	1	20	230	No
GW_Offsite	156-60-5	trans-1,2-Dichloroethene	9	9	0%	µg/L	1	20	11	Yes
GW_Offsite	10061-02-6	trans-1,3-Dichloropropene	8	8	0%	µg/L	1	20	NA	NA
GW_Offsite	79-01-6	Trichloroethene	6	6	0%	µg/L	1	5	0.028	Yes
GW_Offsite	75-69-4	Trichlorofluoromethane	8	8	0%	µg/L	1	20	130	No
GW_Offsite	108-05-4	Vinyl actetate	8	8	0%	µg/L	2	40	41	No
GW_Offsite	75-01-4	Vinyl chloride	12	12	0%	µg/L	1	20	0.015	Yes
GW_Offsite	108-38-3/1	Xylene, m-, p-	11	11	0%	µg/L	2	40	21	Yes
GW_Offsite	95-47-6	Xylene, o-	8	8	0%	µg/L	1	20	20	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.37

Evaluation of Reporting Limits for Compounds that were Not Detected in On-site Groundwater

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Onsite	630-20-6	1,1,1,2-Tetrachloroethane	4	4	0%	µg/L	1	5	0.43	Yes
GW_Onsite	71-55-6	1,1,1-Trichloroethane	3	3	0%	µg/L	1	1	910	No
GW_Onsite	79-34-5	1,1,2,2-Tetrachloroethane	4	4	0%	µg/L	1	5	0.055	Yes
GW_Onsite	79-00-5	1,1,2-Trichloroethane	3	3	0%	µg/L	1	1	0.2	Yes
GW_Onsite	75-34-3	1,1-Dichloroethane	3	3	0%	µg/L	1	1	120	No
GW_Onsite	75-35-4	1,1-Dichloroethene	4	4	0%	µg/L	1	5	34	No
GW_Onsite	563-58-6	1,1-Dichloropropene	3	3	0%	µg/L	1	1	NA	NA
GW_Onsite	87-61-6	1,2,3-Trichlorobenzene	3	3	0%	µg/L	1	1	NA	NA
GW_Onsite	96-18-4	1,2,3-Trichloropropane	3	3	0%	µg/L	1	1	0.034	Yes
GW_Onsite	120-82-1	1,2,4-Trichlorobenzene	3	3	0%	µg/L	1	1	0.82	Yes
GW_Onsite	95-63-6	1,2,4-Trimethylbenzene	3	3	0%	µg/L	1	1	1.5	No
GW_Onsite	96-12-8	chloropropane	3	3	0%	µg/L	2	2	0.0002	Yes
GW_Onsite	106-93-4	1,2-Dibromoethane (EDB)	3	3	0%	µg/L	1	1	0.0056	Yes
GW_Onsite	95-50-1	1,2-Dichlorobenzene	3	3	0%	µg/L	1	1	4.9	No
GW_Onsite	107-06-2	1,2-Dichloroethane (EDC)	2	2	0%	µg/L	1	1	0.12	Yes
GW_Onsite	78-87-5	1,2-Dichloropropane	3	3	0%	µg/L	1	1	0.16	Yes
GW_Onsite	108-67-8	1,3,5-Trimethylbenzene	3	3	0%	µg/L	1	1	1.2	No
GW_Onsite	541-73-1	1,3-Dichlorobenzene	3	3	0%	µg/L	1	1	1.4	No
GW_Onsite	142-28-9	1,3-Dichloropropane	3	3	0%	µg/L	1	1	12	No
GW_Onsite	106-46-7	1,4-Dichlorobenzene	3	3	0%	µg/L	1	1	0.47	Yes
GW_Onsite	594-20-7	2,2-Dichloropropane	3	3	0%	µg/L	1	1	NA	NA
GW_Onsite	78-93-3	2-Butanone (MEK)	3	3	0%	µg/L	10	10	710	No
GW_Onsite	95-49-8	2-Chlorotoluene	3	3	0%	µg/L	1	1	12	No
GW_Onsite	591-78-6	2-Hexanone	3	3	0%	µg/L	5	5	NA	NA
GW_Onsite	106-43-4	4-Chlorotoluene	3	3	0%	µg/L	1	1	12	No
GW_Onsite	99-87-6	4-Isopropyltoluene	3	3	0%	µg/L	1	1	NA	NA
GW_Onsite	108-10-1	4-Methyl-2-pentanone	3	3	0%	µg/L	5	5	NA	NA
GW_Onsite	67-64-1	Acetone	2	2	0%	µg/L	10	10	550	No
GW_Onsite	107-02-8	Acrolein	3	3	0%	µg/L	10	10	0.0042	Yes

APPENDIX N

TABLE 3.37

Evaluation of Reporting Limits for Compounds that were Not Detected in On-site Groundwater

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Onsite	107-13-1	Acrylonitrile	3	3	0%	µg/L	4	4	0.039	Yes
GW_Onsite	71-43-2	Benzene	4	4	0%	µg/L	1	5	0.35	Yes
GW_Onsite	108-86-1	Bromobenzene	3	3	0%	µg/L	1	1	2.3	No
GW_Onsite	74-97-5	Bromochloromethane	3	3	0%	µg/L	1	1	NA	NA
GW_Onsite	75-27-4	Bromodichloromethane	3	3	0%	µg/L	1	1	0.18	Yes
GW_Onsite	75-25-2	Bromoform	3	3	0%	µg/L	1	1	8.3	No
GW_Onsite	74-83-9	Bromomethane	3	3	0%	µg/L	1	1	0.87	Yes
GW_Onsite	75-15-0	Carbon disulfide	3	3	0%	µg/L	1	1	100	No
GW_Onsite	56-23-5	Carbon tetrachloride	3	3	0%	µg/L	1	5	0.17	Yes
GW_Onsite	108-90-7	Chlorobenzene	3	3	0%	µg/L	1	1	9.1	No
GW_Onsite	75-00-3	Chloroethane	3	3	0%	µg/L	1	1	3.9	No
GW_Onsite	67-66-3	Chloroform	4	4	0%	µg/L	1	5	0.17	Yes
GW_Onsite	74-87-3	Chloromethane	4	4	0%	µg/L	1	10	19	No
GW_Onsite	156-59-2	cis-1,2-Dichloroethene	4	4	0%	µg/L	1	5	6.1	No
GW_Onsite	10061-01-5	cis-1,3-Dichloropropene	3	3	0%	µg/L	1	1	NA	NA
GW_Onsite	124-48-1	Dibromochloromethane	3	3	0%	µg/L	1	1	0.13	Yes
GW_Onsite	74-95-3	Dibromomethane	3	3	0%	µg/L	1	1	6.1	No
GW_Onsite	75-71-8	Dichlorodifluoromethane	3	3	0%	µg/L	1	1	14	No
GW_Onsite	74-84-0	Ethane	1	1	0%	µg/L	1.2	1.2	NA	NA
GW_Onsite	74-85-1	Ethene	1	1	0%	µg/L	1	1	NA	NA
GW_Onsite	100-41-4	Ethylbenzene	4	4	0%	µg/L	1	5	130	No
GW_Onsite	87-68-3	Hexachlorobutadiene	3	3	0%	µg/L	1	1	0.86	Yes
GW_Onsite	74-88-4	Iodomethane	3	3	0%	µg/L	2	2	NA	NA
GW_Onsite	7439-89-6	Iron	1	1	0%	µg/L	5.5	5.5	2600	No
GW_Onsite	98-82-8	Isopropylbenzene	3	3	0%	µg/L	1	1	66	No
GW_Onsite	7439-96-5	Manganese	1	1	0%	µg/L	0.35	0.35	170	No
GW_Onsite	74-82-8	Methane	1	1	0%	µg/L	2.4	2.4	NA	NA
GW_Onsite	1634-04-4	(MTBE)	3	3	0%	µg/L	1	1	10.6	No
GW_Onsite	75-09-2	Methylene chloride	3	3	0%	µg/L	0.54	1	4.3	No

APPENDIX N

TABLE 3.37

Evaluation of Reporting Limits for Compounds that were Not Detected in On-site Groundwater

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Onsite	91-20-3	Naphthalene	3	3	0%	µg/L	1	1	0.62	Yes
GW_Onsite	104-51-8	n-Butylbenzene	3	3	0%	µg/L	1	1	6.1	No
GW_Onsite	103-65-1	n-Propylbenzene	3	3	0%	µg/L	1	1	6.1	No
GW_Onsite	135-98-8	sec-Butylbenzene	3	3	0%	µg/L	1	1	6.1	No
GW_Onsite	100-42-5	Styrene	3	3	0%	µg/L	1	1	160	No
GW_Onsite	98-06-6	tert-Butylbenzene	3	3	0%	µg/L	1	1	6.1	No
GW_Onsite	127-18-4	Tetrachloroethene	4	4	0%	µg/L	1	5	0.1	Yes
GW_Onsite	108-88-3	Toluene	3	3	0%	µg/L	1	1	230	No
GW_Onsite	156-60-5	trans-1,2-Dichloroethene	4	4	0%	µg/L	1	5	11	No
GW_Onsite	10061-02-6	trans-1,3-Dichloropropene	3	3	0%	µg/L	1	1	NA	NA
GW_Onsite	79-01-6	Trichloroethene	4	4	0%	µg/L	1	5	0.028	Yes
GW_Onsite	75-69-4	Trichlorofluoromethane	3	3	0%	µg/L	1	1	130	No
GW_Onsite	108-05-4	Vinyl actetate	3	3	0%	µg/L	2	2	41	No
GW_Onsite	75-01-4	Vinyl chloride	4	4	0%	µg/L	1	5	0.015	Yes
GW_Onsite	108-38-3/1	Xylene, m-, p-	4	4	0%	µg/L	2	5	21	No
GW_Onsite	95-47-6	Xylene, o-	3	3	0%	µg/L	1	1	20	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.38

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 6321

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res6321	630-20-6	1,1,1,2-Tetrachloroethane	1	1	0%	µg/L	1	1	0.43	Yes
GW_Res6321	71-55-6	1,1,1-Trichloroethane	1	1	0%	µg/L	1	1	910	No
GW_Res6321	79-34-5	1,1,2,2-Tetrachloroethane	1	1	0%	µg/L	1	1	0.055	Yes
GW_Res6321	79-00-5	1,1,2-Trichloroethane	1	1	0%	µg/L	1.1	1.1	0.2	Yes
GW_Res6321	75-34-3	1,1-Dichloroethane	1	1	0%	µg/L	1	1	120	No
GW_Res6321	75-35-4	1,1-Dichloroethene	1	1	0%	µg/L	1	1	34	No
GW_Res6321	563-58-6	1,1-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6321	87-61-6	1,2,3-Trichlorobenzene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6321	96-18-4	1,2,3-Trichloropropane	1	1	0%	µg/L	1.8	1.8	0.034	Yes
GW_Res6321	120-82-1	1,2,4-Trichlorobenzene	1	1	0%	µg/L	1	1	0.82	Yes
GW_Res6321	95-63-6	1,2,4-Trimethylbenzene	1	1	0%	µg/L	1	1	1.5	No
GW_Res6321	96-12-8	chloropropane	1	1	0%	µg/L	4	4	0.0002	Yes
GW_Res6321	106-93-4	1,2-Dibromoethane (EDB)	1	1	0%	µg/L	1	1	0.0056	Yes
GW_Res6321	95-50-1	1,2-Dichlorobenzene	1	1	0%	µg/L	1	1	4.9	No
GW_Res6321	107-06-2	1,2-Dichloroethane (EDC)	1	1	0%	µg/L	1	1	0.12	Yes
GW_Res6321	78-87-5	1,2-Dichloropropane	1	1	0%	µg/L	1.1	1.1	0.16	Yes
GW_Res6321	108-67-8	1,3,5-Trimethylbenzene	1	1	0%	µg/L	1	1	1.2	No
GW_Res6321	541-73-1	1,3-Dichlorobenzene	1	1	0%	µg/L	1	1	1.4	No
GW_Res6321	142-28-9	1,3-Dichloropropane	1	1	0%	µg/L	1	1	12	No
GW_Res6321	106-46-7	1,4-Dichlorobenzene	1	1	0%	µg/L	1	1	0.47	Yes
GW_Res6321	594-20-7	2,2-Dichloropropane	1	1	0%	µg/L	1.1	1.1	NA	NA
GW_Res6321	78-93-3	2-Butanone (MEK)	1	1	0%	µg/L	10	10	710	No
GW_Res6321	95-49-8	2-Chlorotoluene	1	1	0%	µg/L	1	1	12	No
GW_Res6321	591-78-6	2-Hexanone	1	1	0%	µg/L	5	5	-	No
GW_Res6321	106-43-4	4-Chlorotoluene	1	1	0%	µg/L	1	1	12	No
GW_Res6321	99-87-6	4-Isopropyltoluene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6321	108-10-1	4-Methyl-2-pentanone	1	1	0%	µg/L	5	5	NA	NA
GW_Res6321	107-02-8	Acrolein	1	1	0%	µg/L	10	10	0.0042	Yes
GW_Res6321	107-13-1	Acrylonitrile	1	1	0%	µg/L	4	4	0.039	Yes

APPENDIX N

TABLE 3.38

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 6321

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res6321	71-43-2	Benzene	1	1	0%	µg/L	1	1	0.35	Yes
GW_Res6321	108-86-1	Bromobenzene	1	1	0%	µg/L	1	1	2.3	No
GW_Res6321	74-97-5	Bromochloromethane	1	1	0%	µg/L	1.5	1.5	NA	NA
GW_Res6321	75-27-4	Bromodichloromethane	1	1	0%	µg/L	1	1	0.18	Yes
GW_Res6321	75-25-2	Bromoform	1	1	0%	µg/L	1.2	1.2	8.3	No
GW_Res6321	74-83-9	Bromomethane	1	1	0%	µg/L	1	1	0.87	Yes
GW_Res6321	75-15-0	Carbon disulfide	1	1	0%	µg/L	1	1	100	No
GW_Res6321	56-23-5	Carbon tetrachloride	1	1	0%	µg/L	1	1	0.17	Yes
GW_Res6321	108-90-7	Chlorobenzene	1	1	0%	µg/L	1	1	9.1	No
GW_Res6321	75-00-3	Chloroethane	1	1	0%	µg/L	1.9	1.9	3.9	No
GW_Res6321	67-66-3	Chloroform	1	1	0%	µg/L	1	1	0.17	Yes
GW_Res6321	74-87-3	Chloromethane	1	1	0%	µg/L	1	1	19	No
GW_Res6321	156-59-2	cis-1,2-Dichloroethene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6321	10061-01-5	cis-1,3-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6321	124-48-1	Dibromochloromethane	1	1	0%	µg/L	1	1	0.13	Yes
GW_Res6321	74-95-3	Dibromomethane	1	1	0%	µg/L	1	1	6.1	No
GW_Res6321	75-71-8	Dichlorodifluoromethane	1	1	0%	µg/L	1.1	1.1	14	No
GW_Res6321	100-41-4	Ethylbenzene	1	1	0%	µg/L	1	1	130	No
GW_Res6321	87-68-3	Hexachlorobutadiene	1	1	0%	µg/L	1.8	1.8	0.86	Yes
GW_Res6321	74-88-4	Iodomethane	1	1	0%	µg/L	2	2	NA	NA
GW_Res6321	98-82-8	Isopropylbenzene	1	1	0%	µg/L	1	1	66	No
GW_Res6321	1634-04-4	(MTBE)	1	1	0%	µg/L	1	1	10.6	No
GW_Res6321	75-09-2	Methylene chloride	1	1	0%	µg/L	1	1	4.3	No
GW_Res6321	91-20-3	Naphthalene	1	1	0%	µg/L	1	1	0.62	Yes
GW_Res6321	104-51-8	n-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6321	103-65-1	n-Propylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6321	135-98-8	sec-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6321	100-42-5	Styrene	1	1	0%	µg/L	1	1	160	No
GW_Res6321	98-06-6	tert-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No

APPENDIX N

TABLE 3.38

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 6321

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res6321	127-18-4	Tetrachloroethene	1	1	0%	µg/L	1.1	1.1	0.1	Yes
GW_Res6321	108-88-3	Toluene	1	1	0%	µg/L	1	1	230	No
GW_Res6321	156-60-5	trans-1,2-Dichloroethene	1	1	0%	µg/L	1	1	11	No
GW_Res6321	10061-02-6	trans-1,3-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6321	79-01-6	Trichloroethene	1	1	0%	µg/L	1	1	0.028	Yes
GW_Res6321	75-69-4	Trichlorofluoromethane	1	1	0%	µg/L	1	1	130	No
GW_Res6321	108-05-4	Vinyl actetate	1	1	0%	µg/L	2	2	41	No
GW_Res6321	75-01-4	Vinyl chloride	1	1	0%	µg/L	1	1	0.015	Yes
GW_Res6321	108-38-3/1	Xylene, m-, p-	1	1	0%	µg/L	2	2	21	No
GW_Res6321	95-47-6	Xylene, o-	1	1	0%	µg/L	1	1	20	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.39

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 6317

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res6317	630-20-6	1,1,1,2-Tetrachloroethane	1	1	0%	µg/L	1	1	0.43	Yes
GW_Res6317	71-55-6	1,1,1-Trichloroethane	1	1	0%	µg/L	1	1	910	No
GW_Res6317	79-34-5	1,1,2,2-Tetrachloroethane	1	1	0%	µg/L	1	1	0.055	Yes
GW_Res6317	79-00-5	1,1,2-Trichloroethane	1	1	0%	µg/L	1.1	1.1	0.2	Yes
GW_Res6317	75-34-3	1,1-Dichloroethane	1	1	0%	µg/L	1	1	120	No
GW_Res6317	75-35-4	1,1-Dichloroethene	1	1	0%	µg/L	1	1	34	No
GW_Res6317	563-58-6	1,1-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6317	87-61-6	1,2,3-Trichlorobenzene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6317	96-18-4	1,2,3-Trichloropropane	1	1	0%	µg/L	1.8	1.8	0.034	Yes
GW_Res6317	120-82-1	1,2,4-Trichlorobenzene	1	1	0%	µg/L	1	1	0.82	Yes
GW_Res6317	95-63-6	1,2,4-Trimethylbenzene	1	1	0%	µg/L	1	1	1.5	No
GW_Res6317	96-12-8	chloropropane	1	1	0%	µg/L	4	4	0.0002	Yes
GW_Res6317	106-93-4	1,2-Dibromoethane (EDB)	1	1	0%	µg/L	1	1	0.0056	Yes
GW_Res6317	95-50-1	1,2-Dichlorobenzene	1	1	0%	µg/L	1	1	4.9	No
GW_Res6317	107-06-2	1,2-Dichloroethane (EDC)	1	1	0%	µg/L	1	1	0.12	Yes
GW_Res6317	78-87-5	1,2-Dichloropropane	1	1	0%	µg/L	1.1	1.1	0.16	Yes
GW_Res6317	108-67-8	1,3,5-Trimethylbenzene	1	1	0%	µg/L	1	1	1.2	No
GW_Res6317	541-73-1	1,3-Dichlorobenzene	1	1	0%	µg/L	1	1	1.4	No
GW_Res6317	142-28-9	1,3-Dichloropropane	1	1	0%	µg/L	1	1	12	No
GW_Res6317	106-46-7	1,4-Dichlorobenzene	1	1	0%	µg/L	1	1	0.47	Yes
GW_Res6317	594-20-7	2,2-Dichloropropane	1	1	0%	µg/L	1.1	1.1	NA	NA
GW_Res6317	78-93-3	2-Butanone (MEK)	1	1	0%	µg/L	10	10	710	No
GW_Res6317	95-49-8	2-Chlorotoluene	1	1	0%	µg/L	1	1	12	No
GW_Res6317	591-78-6	2-Hexanone	1	1	0%	µg/L	5	5	NA	NA
GW_Res6317	106-43-4	4-Chlorotoluene	1	1	0%	µg/L	1	1	12	No
GW_Res6317	99-87-6	4-Isopropyltoluene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6317	108-10-1	4-Methyl-2-pentanone	1	1	0%	µg/L	5	5	NA	NA
GW_Res6317	67-64-1	Acetone	1	1	0%	µg/L	12	12	550	No
GW_Res6317	107-02-8	Acrolein	1	1	0%	µg/L	10	10	0.0042	Yes

APPENDIX N

TABLE 3.39

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 6317

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res6317	107-13-1	Acrylonitrile	1	1	0%	µg/L	4	4	0.039	Yes
GW_Res6317	71-43-2	Benzene	1	1	0%	µg/L	1	1	0.35	Yes
GW_Res6317	108-86-1	Bromobenzene	1	1	0%	µg/L	1	1	2.3	No
GW_Res6317	74-97-5	Bromochloromethane	1	1	0%	µg/L	1.5	1.5	NA	NA
GW_Res6317	75-27-4	Bromodichloromethane	1	1	0%	µg/L	1	1	0.18	Yes
GW_Res6317	75-25-2	Bromoform	1	1	0%	µg/L	1.2	1.2	8.3	No
GW_Res6317	74-83-9	Bromomethane	1	1	0%	µg/L	1	1	0.87	Yes
GW_Res6317	75-15-0	Carbon disulfide	1	1	0%	µg/L	1	1	100	No
GW_Res6317	56-23-5	Carbon tetrachloride	1	1	0%	µg/L	1	1	0.17	Yes
GW_Res6317	108-90-7	Chlorobenzene	1	1	0%	µg/L	1	1	9.1	No
GW_Res6317	75-00-3	Chloroethane	1	1	0%	µg/L	1.9	1.9	3.9	No
GW_Res6317	67-66-3	Chloroform	1	1	0%	µg/L	1	1	0.17	Yes
GW_Res6317	74-87-3	Chloromethane	1	1	0%	µg/L	1	1	19	No
GW_Res6317	156-59-2	cis-1,2-Dichloroethene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6317	10061-01-5	cis-1,3-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6317	124-48-1	Dibromochloromethane	1	1	0%	µg/L	1	1	0.13	Yes
GW_Res6317	74-95-3	Dibromomethane	1	1	0%	µg/L	1	1	6.1	No
GW_Res6317	75-71-8	Dichlorodifluoromethane	1	1	0%	µg/L	1.1	1.1	14	No
GW_Res6317	100-41-4	Ethylbenzene	1	1	0%	µg/L	1	1	130	No
GW_Res6317	87-68-3	Hexachlorobutadiene	1	1	0%	µg/L	1.8	1.8	0.86	Yes
GW_Res6317	74-88-4	Iodomethane	1	1	0%	µg/L	2	2	NA	NA
GW_Res6317	98-82-8	Isopropylbenzene	1	1	0%	µg/L	1	1	66	No
GW_Res6317	1634-04-4	(MTBE)	1	1	0%	µg/L	1	1	10.6	No
GW_Res6317	75-09-2	Methylene chloride	1	1	0%	µg/L	1	1	4.3	No
GW_Res6317	91-20-3	Naphthalene	1	1	0%	µg/L	1	1	0.62	Yes
GW_Res6317	104-51-8	n-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6317	103-65-1	n-Propylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6317	135-98-8	sec-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6317	100-42-5	Styrene	1	1	0%	µg/L	1	1	160	No

APPENDIX N

TABLE 3.39

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 6317

St Louis Ordnance Plant, Former Hanley Area, St. Louis. Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res6317	98-06-6	tert-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res6317	127-18-4	Tetrachloroethene	1	1	0%	µg/L	1.1	1.1	0.1	Yes
GW_Res6317	108-88-3	Toluene	1	1	0%	µg/L	1	1	230	No
GW_Res6317	156-60-5	trans-1,2-Dichloroethene	1	1	0%	µg/L	1	1	11	No
GW_Res6317	10061-02-6	trans-1,3-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res6317	79-01-6	Trichloroethene	1	1	0%	µg/L	1	1	0.028	Yes
GW_Res6317	75-69-4	Trichlorofluoromethane	1	1	0%	µg/L	1	1	130	No
GW_Res6317	108-05-4	Vinyl actetate	1	1	0%	µg/L	2	2	41	No
GW_Res6317	75-01-4	Vinyl chloride	1	1	0%	µg/L	1	1	0.015	Yes
GW_Res6317	108-38-3/1	Xylene, m-, p-	1	1	0%	µg/L	2	2	21	No
GW_Res6317	95-47-6	Xylene, o-	1	1	0%	µg/L	1	1	20	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.40

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 4701

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res4701	630-20-6	1,1,1,2-Tetrachloroethane	1	1	0%	µg/L	1	1	0.43	Yes
GW_Res4701	71-55-6	1,1,1-Trichloroethane	1	1	0%	µg/L	1	1	910	No
GW_Res4701	79-34-5	1,1,2,2-Tetrachloroethane	1	1	0%	µg/L	1	1	0.055	Yes
GW_Res4701	79-00-5	1,1,2-Trichloroethane	1	1	0%	µg/L	1.1	1.1	0.2	Yes
GW_Res4701	75-34-3	1,1-Dichloroethane	1	1	0%	µg/L	1	1	120	No
GW_Res4701	75-35-4	1,1-Dichloroethene	1	1	0%	µg/L	1	1	34	No
GW_Res4701	563-58-6	1,1-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res4701	87-61-6	1,2,3-Trichlorobenzene	1	1	0%	µg/L	1	1	NA	NA
GW_Res4701	96-18-4	1,2,3-Trichloropropane	1	1	0%	µg/L	1.8	1.8	0.034	Yes
GW_Res4701	120-82-1	1,2,4-Trichlorobenzene	1	1	0%	µg/L	1	1	0.82	Yes
GW_Res4701	95-63-6	1,2,4-Trimethylbenzene	1	1	0%	µg/L	1	1	1.5	No
GW_Res4701	96-12-8	chloropropane	1	1	0%	µg/L	4	4	0.0002	Yes
GW_Res4701	106-93-4	1,2-Dibromoethane (EDB)	1	1	0%	µg/L	1	1	0.0056	Yes
GW_Res4701	95-50-1	1,2-Dichlorobenzene	1	1	0%	µg/L	1	1	4.9	No
GW_Res4701	107-06-2	1,2-Dichloroethane (EDC)	1	1	0%	µg/L	1	1	0.12	Yes
GW_Res4701	78-87-5	1,2-Dichloropropane	1	1	0%	µg/L	1.1	1.1	0.16	Yes
GW_Res4701	108-67-8	1,3,5-Trimethylbenzene	1	1	0%	µg/L	1	1	1.2	No
GW_Res4701	541-73-1	1,3-Dichlorobenzene	1	1	0%	µg/L	1	1	1.4	No
GW_Res4701	142-28-9	1,3-Dichloropropane	1	1	0%	µg/L	1	1	12	No
GW_Res4701	106-46-7	1,4-Dichlorobenzene	1	1	0%	µg/L	1	1	0.47	Yes
GW_Res4701	594-20-7	2,2-Dichloropropane	1	1	0%	µg/L	1.1	1.1	NA	NA
GW_Res4701	78-93-3	2-Butanone (MEK)	1	1	0%	µg/L	10	10	710	No
GW_Res4701	95-49-8	2-Chlorotoluene	1	1	0%	µg/L	1	1	12	No
GW_Res4701	591-78-6	2-Hexanone	1	1	0%	µg/L	5	5	NA	NA
GW_Res4701	106-43-4	4-Chlorotoluene	1	1	0%	µg/L	1	1	12	No
GW_Res4701	99-87-6	4-Isopropyltoluene	1	1	0%	µg/L	1	1	NA	NA
GW_Res4701	108-10-1	4-Methyl-2-pentanone	1	1	0%	µg/L	5	5	NA	NA
GW_Res4701	67-64-1	Acetone	1	1	0%	µg/L	12	12	550	No
GW_Res4701	107-02-8	Acrolein	1	1	0%	µg/L	10	10	0.0042	Yes

APPENDIX N

TABLE 3.40

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 4701

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res4701	107-13-1	Acrylonitrile	1	1	0%	µg/L	4	4	0.039	Yes
GW_Res4701	71-43-2	Benzene	1	1	0%	µg/L	1	1	0.35	Yes
GW_Res4701	108-86-1	Bromobenzene	1	1	0%	µg/L	1	1	2.3	No
GW_Res4701	74-97-5	Bromochloromethane	1	1	0%	µg/L	1.5	1.5	NA	NA
GW_Res4701	75-27-4	Bromodichloromethane	1	1	0%	µg/L	1	1	0.18	Yes
GW_Res4701	75-25-2	Bromoform	1	1	0%	µg/L	1.2	1.2	8.3	No
GW_Res4701	74-83-9	Bromomethane	1	1	0%	µg/L	1	1	0.87	Yes
GW_Res4701	75-15-0	Carbon disulfide	1	1	0%	µg/L	1	1	100	No
GW_Res4701	56-23-5	Carbon tetrachloride	1	1	0%	µg/L	1	1	0.17	Yes
GW_Res4701	108-90-7	Chlorobenzene	1	1	0%	µg/L	1	1	9.1	No
GW_Res4701	75-00-3	Chloroethane	1	1	0%	µg/L	1.9	1.9	3.9	No
GW_Res4701	67-66-3	Chloroform	1	1	0%	µg/L	1	1	0.17	Yes
GW_Res4701	74-87-3	Chloromethane	1	1	0%	µg/L	1	1	19	No
GW_Res4701	156-59-2	cis-1,2-Dichloroethene	1	1	0%	µg/L	1	1	6.1	No
GW_Res4701	10061-01-5	cis-1,3-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res4701	124-48-1	Dibromochloromethane	1	1	0%	µg/L	1	1	0.13	Yes
GW_Res4701	74-95-3	Dibromomethane	1	1	0%	µg/L	1	1	6.1	No
GW_Res4701	75-71-8	Dichlorodifluoromethane	1	1	0%	µg/L	1.1	1.1	14	No
GW_Res4701	100-41-4	Ethylbenzene	1	1	0%	µg/L	1	1	130	No
GW_Res4701	87-68-3	Hexachlorobutadiene	1	1	0%	µg/L	1.8	1.8	0.86	Yes
GW_Res4701	74-88-4	Iodomethane	1	1	0%	µg/L	2	2	NA	NA
GW_Res4701	98-82-8	Isopropylbenzene	1	1	0%	µg/L	1	1	66	No
GW_Res4701	1634-04-4	(MTBE)	1	1	0%	µg/L	1	1	10.6	No
GW_Res4701	75-09-2	Methylene chloride	1	1	0%	µg/L	1	1	4.3	No
GW_Res4701	91-20-3	Naphthalene	1	1	0%	µg/L	1	1	0.62	Yes
GW_Res4701	104-51-8	n-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res4701	103-65-1	n-Propylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res4701	135-98-8	sec-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res4701	100-42-5	Styrene	1	1	0%	µg/L	1	1	160	No

APPENDIX N

TABLE 3.40

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Groundwater Residence 4701

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
GW_Res4701	98-06-6	tert-Butylbenzene	1	1	0%	µg/L	1	1	6.1	No
GW_Res4701	127-18-4	Tetrachloroethene	1	1	0%	µg/L	1.1	1.1	0.1	Yes
GW_Res4701	108-88-3	Toluene	1	1	0%	µg/L	1	1	230	No
GW_Res4701	156-60-5	trans-1,2-Dichloroethene	1	1	0%	µg/L	1	1	11	No
GW_Res4701	10061-02-6	trans-1,3-Dichloropropene	1	1	0%	µg/L	1	1	NA	NA
GW_Res4701	79-01-6	Trichloroethene	1	1	0%	µg/L	1	1	0.028	Yes
GW_Res4701	75-69-4	Trichlorofluoromethane	1	1	0%	µg/L	1	1	130	No
GW_Res4701	108-05-4	Vinyl actetate	1	1	0%	µg/L	2	2	41	No
GW_Res4701	75-01-4	Vinyl chloride	1	1	0%	µg/L	1	1	0.015	Yes
GW_Res4701	108-38-3/1	Xylene, m-, p-	1	1	0%	µg/L	2	2	21	No
GW_Res4701	95-47-6	Xylene, o-	1	1	0%	µg/L	1	1	20	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

The following Screening Levels were used to develop the final SLs used for this comparison.

EPA SL = Environmental Protection Agency Screening Level for protection of indoor air based on a target risk of $1x10^{-6}$

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for residential water

MSSLs adjusted downward by a factor of 10 to account for cumulative effects from multiple noncarcinogens acting on the same target organ.

APPENDIX N

TABLE 3.41

Evaluation of Reporting Limits for Compounds that were Not Detected in Off-site Resident Indoor Air

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Sample Group	CAS	Analyte	Number of Analysis	Number of Non-Detects	FOD	Units	Minimum Detection Limit for NDs	Maximum Detection Limit for NDs	SL	Does RL Exceed Standard?
Indoor Air	127-18-4	Tetrachloroethene	1	1	0%	UG/M3	0.25	0.25	0.33	No
Indoor Air	156-60-5	trans-1,2-Dichloroethene	2	2	0%	UG/M3	0.036	0.043	63	No
Indoor Air	75-01-4	Vinyl chloride	3	3	0%	UG/M3	0.023	0.043	0.16	No

Screening Level (SL)

SLs were identified as described in Section 3.1 of Work Planning Document (CH2M HILL, 2008)

MSSL = USEPA Region 6 Medium-Specific Screening Levels (MSSLs) for ambient air

APPENDIX N

TABLE 4.1

Summary of Soil Chemicals of Potential Concern - Sitewide Analysis

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

		Surface Soil On-site (0-2 feet)	Subsurface Soil On-site (0-10 feet)
CAS	**Analyte**	**MaxDet Exceeds SL?**	**MaxDet Exceeds SL?**
7440-38-2	Arsenic	Yes	Yes
7439-92-1	Lead	Yes	Yes
50-32-8	Benzo(a)pyrene	Yes	Yes
127-18-4	Tetrachloroethene	Yes	Yes
79-01-6	Trichloroethene	Yes	Yes

Note:

Average concentration of lead was less than the respective screening levels.

SL = Screening Level

APPENDIX N

TABLE 4.2

Summary of Subsurface Soil (0-10 Ft) Chemicals of Potential Concern - On-Site Exposure Units A through L

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

CAS	Analyte	Exposure Unit A MaxDet Exceeds SL?	Exposure Unit B MaxDet Exceeds SL?	Exposure Unit C MaxDet Exceeds SL?	Exposure Unit D MaxDet Exceeds SL?	Exposure Unit E MaxDet Exceeds SL?	Exposure Unit F MaxDet Exceeds SL?	Exposure Unit G MaxDet Exceeds SL?	Exposure Unit H MaxDet Exceeds SL?	Exposure Unit I MaxDet Exceeds SL?	Exposure Unit J MaxDet Exceeds SL?	Exposure Unit K MaxDet Exceeds SL?	Exposure Unit L MaxDet Exceeds SL?
7429-90-5	Aluminum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7440-36-0	Antimony	Yes	Yes	Yes		Yes	Yes						
7440-38-2	Arsenic		Yes			Yes	Yes		Yes		Yes		
7440-47-3	Chromium					Yes							
7440-50-8	Copper										Yes		
7439-89-6	Iron	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7439-92-1	Lead	Yes	Yes				Yes	Yes					Yes
7439-96-5	Manganese	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7782-49-2	Selenium	Yes											Yes
7440-22-4	Silver								Yes				
7440-28-0	Thallium				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7440-62-2	Vanadium					Yes	Yes	Yes				Yes	Yes
205-99-2	Benzo(b)fluoranthene							Yes			Yes		
156-59-2	cis-1,2-Dichloroethene												Yes
127-18-4	Tetrachloroethene												Yes
79-01-6	Trichloroethene												Yes

Note:

Average concentration of lead was less than the respective screening levels for all exposure units A through L.

SL = Screening Level

APPENDIX N

TABLE 4.3

Summary of Groundwater Chemicals of Potential Concern

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

		Downgradient of Former Building 220 (Tap Water and Indoor Air)	Downgradient of Former Building 220 (Groundwater in Excavations)	Off-Site Groundwater (Groundwater in Excavation)	On-Site Groundwater (Excluding Area Downgradient of Former Building 220) (Tap Water and Indoor Air)
CAS	**Analyte**	**MaxDet Exceeds SL?**	**MaxDet Exceeds SL?**	**MaxDet Exceeds SL?**	**MaxDet Exceeds SL?**
7439-96-5	Manganese	Yes		Yes	
91-20-3	Naphthalene	Yes	Yes		
630-20-6	1,1,1,2-Tetrachloroethane	Yes	Yes		
79-34-5	1,1,2,2-Tetrachloroethane	Yes	Yes		
79-00-5	1,1,2-Trichloroethane	Yes	Yes		
107-06-2	1,2-Dichloroethane (EDC)	Yes	Yes	Yes	Yes
71-43-2	Benzene	Yes	Yes		
56-23-5	Carbon tetrachloride	Yes	Yes		Yes
67-66-3	Chloroform	Yes	Yes	Yes	
156-59-2	cis-1,2-Dichloroethene	Yes	Yes	Yes	
127-18-4	Tetrachloroethene	Yes	Yes	Yes	
156-60-5	trans-1,2-Dichloroethene	Yes	Yes		
79-01-6	Trichloroethene	Yes	Yes	Yes	
75-01-4	Vinyl chloride	Yes	Yes		

Note:

No chemicals were detected at concentrations exceeding screening levels at three off-site residences.

SL = Screening Level

APPENDIX N

TABLE 5.1

Summary of Calculation of Soil Exposure Point Concentrations - Sitewide Analysis

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

On-site Surface Soil (0-2 feet)

Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	Method	UCL	EPC	Max Used?
Arsenic	75	3	3.85%	4	36.3	9.498	8.11	95% KM (BCA) UCL	10.33	10.33	No
Benzo(a)pyrene	17	0	0.00%	0.0472	0.505	0.188	0.143	95% KM (Chebyshev) UCL	0.347	0.347	No
Lead	99	0	0.00%	11.9	1416	137.8	65.9	95% KM (Chebyshev) UCL	239.8	239.8	No
Tetrachloroethene	9	0	0.00%	0.0012	6.4	0.777	0.052	95% KM (Chebyshev) UCL	3.844	3.844	No
Trichloroethene	6	3	33.33%	0.0011	0.81	0.238	0.0115	95% KM (BCA) UCL	0.378	0.378	No

On-site Subsurface Soil (0-10 feet)

Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	Method	UCL	EPC	Max Used?
Arsenic	94	3	3.09%	4	36.3	8.956	7.5	95% KM (BCA) UCL	9.71	9.71	No
Benzo(a)pyrene	36	0	0.00%	0.0039	0.505	0.145	0.099	Use 95% Approximate Gamma UCL	0.188	0.188	No
Lead	119	0	0.00%	7.37	1416	123.5	56.14	Use 95% H-UCL	134.5	134.5	No
Tetrachloroethene	17	1	5.56%	0.00046	6.4	0.771	0.048	95% KM (Chebyshev) UCL	2.6	2.6	No
Trichloroethene	13	5	27.78%	0.0011	0.81	0.172	0.032	95% KM (Chebyshev) UCL	0.379	0.379	No

Notes:

Units are milligram/kilogram

UCL = Upper Confidence Limit

EPC = Exposure Point Concentration

APPENDIX N

TABLE 5.2

Summary of Calculation of Soil Exposure Point Concentrations - Exposure Units A through L

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

On-site Subsurface Soil (0-10 feet)

Exposure Unit	Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	Method	UCL	EPC	Max Used?
A	Aluminum	9	0	0.00%	5748 2	7845	6708.2444	6840	Use 95% Student's-t UCL	7146.2153	7146.2153	No
	Antimony	3	5	62 50%	1.2	5.293179	2 564393	1 2	95% KM (t) UCL	2.8221844	2 8221844	No
	Iron	9	0	0.00%	10700	21855	13971 444	13306	Use 95% Approximate Gamma UCL	16025.34	16025.34	No
	Lead	10	0	0 00%	28.345	1022.9	236.0005	111 08	Use 95% Chebyshev (MVUE) UCL	563.81276	563.81276	No
	Manganese	9	0	0 00%	440	601	526 49	518	Use 95% Student's-t UCL	557.32186	557.32186	No
	Selenium	1	4	80 00%	12.4	12 4	12 4	12 4	NA	NA	12.4	Yes[2]
B	Aluminum	8	0	0.00%	5500	11600	7242.7625	6678.5	Use 95% Approximate Gamma UCL	8645.3951	8645.3951	No
	Antimony	3	3	50.00%	2.76	3.15	2.9233333	2.86	95% KM (t) UCL	3.1589973	3.15	Yes[1]
	Arsenic	5	2	28.57%	7.280546	18 9	13.996109	13 7	95% KM (Percentile Bootstrap) UCL	16.014286	16.014286	No
	Iron	8	0	0 00%	10659	17630	12833	12221 5	Use 95% Student's-t UCL	14349.429	14349.429	No
	Lead	9	0	0.00%	31	1416	267 97422	74.4	Use 95% Chebyshev (MVUE) UCL	626.68651	626 68651	No
	Manganese	8	0	0.00%	435 2	708	524.275	487	Use 95% Student's-t UCL	585.99532	585.99532	No
C	Aluminum	4	0	0.00%	6382 4	8259	7322.375	7324 05	NA	NA	8259	Yes[3]
	Antimony	1	1	50 00%	4 24	4.24	4 24	4 24	NA	NA	4.24	Yes[3]
	Iron	4	0	0 00%	13258	17675	15184.75	14903	NA	NA	17675	Yes[3]
	Manganese	4	0	0 00%	423 08	611	510 92	504.8	NA	NA	611	Yes[3]
D	Aluminum	6	0	0.00%	6987	12900	9170 4333	7841.8	Use 95% Approximate Gamma UCL	11965.236	11965 236	No
	Iron	6	0	0.00%	11678	19100	15879.167	16424	Use 95% Student's-t UCL	18185.23	18185.23	No
	Manganese	6	0	0.00%	306	1040	628.6	606.3	Use 95% Student's-t UCL	837.64849	837.64849	No
	Thallium	3	0	0 00%	2.74	4.66	3.6733333	3.62	NA	NA	4 66	Yes[3]
E	Aluminum	7	0	0 00%	6292	10600	8026 1429	7775	Use 95% Student's-t UCL	9044.4746	9044.4746	No
	Antimony	1	4	80 00%	14 1	14 1	14.1	14 1	NA	NA	14 1	Yes[2]
	Arsenic	7	0	0 00%	5 12	16.5	10.412454	11	Use 95% Student's-t UCL	13.731445	13.731445	No
	Chromium	8	1	11 11%	13	57.7	21.78425	17	95% KM (Chebyshev) UCL	41.473602	41.473602	No
	Iron	7	0	0 00%	5800	17300	13810	14793	Use 95% Student's-t UCL	16625.451	16625.451	No
	Manganese	7	0	0 00%	509	1060	688 65286	619	Use 95% Student's-t UCL	841.18169	841.18169	No
	Thallium	1	4	80 00%	5 07	5.07	5 07	5.07	NA	NA	5.07	Yes[2]
	Vanadium	6	0	0 00%	20.3	44 1	27.003667	24.75	Use 95% Approximate Gamma UCL	35.264133	35.264133	No
F	Aluminum	11	0	0.00%	6464.2	11100	8486.1455	8492	Use 95% Student's-t UCL	9311.9918	9311.9918	No
	Antimony	2	2	50.00%	2 2	5 73	3 965	3.965	NA	NA	5.73	Yes[3]
	Arsenic	11	3	21 43%	4.93	14.5	7.77696	7.4	95% KM (Percentile Bootstrap) UCL	8.4897091	8.4897091	No
	Iron	11	0	0.00%	13429	18600	15736.364	15605	Use 95% Student's-t UCL	16528.239	16528 239	No
	Lead	16	0	0 00%	11.9	1118	136.45488	50.1	Use 99% Chebyshev (Mean, Sd) UCL	835.63315	835.63315	No
	Manganese	11	0	0 00%	516	1025.3	693 59455	639	Use 95% Approximate Gamma UCL	776.39401	776.39401	No
	Thallium	2	3	60 00%	0 3	2.18	1.24	1.24	95% KM (BCA) UCL	NA	2.18	Yes
	Vanadium	8	0	0.00%	22.045	46.1	26.088875	22 9615	or 95% Modified-t UCL	32.025943	32.025943	No

APPENDIX N

TABLE 5.2

Summary of Calculation of Soil Exposure Point Concentrations - Exposure Units A through L

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

On-site Subsurface Soil (0-10 feet)

Exposure Unit	Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	Method	UCL	EPC	Max Used?
G	Aluminum	11	0	0.00%	6837.1	14655	9527.9182	8710	Use 95% Student's-t UCL	10917.844	10917 844	No
	Benzo(b)fluoranthene	2	1	33 33%	0 1298	0.8186	0.4742	0.4742	NA	NA	0.8186	Yes[3]
	Iron	11	0	0 00%	6000	22519	16224.091	16074	Use 95% Student's-t UCL	18450.278	18450.278	No
	Lead	12	0	0.00%	11	983	133.457	57.9	Use 95% Chebyshev (MVUE) UCL	274 85561	274 85561	No
	Manganese	11	0	0.00%	601	1070	814.05364	766 83	Use 95% Student's-t UCL	901.73951	901.73951	No
	Thallium	2	5	71.43%	1 94	5.19	3.565	3 565	95% KM (t) UCL	6.7226668	5.19	Yes[1]
	Vanadium	9	0	0 00%	22.2	50 2	31.372667	27 9	Use 95% Student's-t UCL	37.161342	37.161342	No
H	Aluminum	7	0	0 00%	5395 6	8960	7181.5	7440	Use 95% Student's-t UCL	8007.9937	8007.9937	No
	Arsenic	18	1	5.26%	4 035499	23.5	9 3670015	8 3	95% KM (BCA) UCL	10.762753	10.762753	No
	Iron	7	0	0 00%	12114	15913	14146.143	14421	Use 95% Student's-t UCL	15124 785	15124.785	No
	Manganese	7	0	0 00%	530	656 17	584.62429	570.17	Use 95% Student's-t UCL	619.44778	619.44778	No
	Silver	5	2	28 57%	0 72	82 6	22.226	3 85	95% KM (Chebyshev) UCL	68.029619	68.029619	No
	Thallium	1	1	50 00%	4 52	4.52	4 52	4.52	NA	NA	4 52	Yes[3]
I	Aluminum	8	0	0 00%	7161.8	9440	8180.0875	7925 5	Use 95% Student's-t UCL	8813.9509	8813.9509	No
	Iron	8	0	0 00%	13876	17800	15669.25	15503 5	Use 95% Student's-t UCL	16525.946	16525.946	No
	Manganese	8	0	0 00%	562	1120	789.63875	722.5	Use 95% Student's-t UCL	921.43907	921.43907	No
	Thallium	1	3	75 00%	5.78	5.78	5.78	5 78	NA	NA	5.78	Yes[3]
J	Aluminum	8	0	0 00%	4192.7	9733.4	7377.225	7542 3	Use 95% Student's-t UCL	8429.0056	8429.0056	No
	Arsenic	22	0	0 00%	5 729168	36.3	10.27105	8 18	or 95% Modified-t UCL	12.900648	12.900648	No
	Benzo(b)fluoranthene	10	0	0 00%	0.0172	0 7669	0.3261	0.32145	Use 95% Student's-t UCL	0.4652647	0 4652647	No
	Copper	8	0	0.00%	11.975	410 2	77 38325	19 7545	Use 95% Approximate Gamma UCL	213.1959	213.1959	No
	Iron	8	0	0 00%	9094.2	18123	15353.025	15880.5	Use 95% Student's-t UCL	17260.246	17260.246	No
	Manganese	8	0	0.00%	336.26	938.2	622.63	594.39	Use 95% Student's-t UCL	756.55501	756.55501	No
	Thallium	4	0	0.00%	0.2	8.64	2.36	0.3	NA	NA	8.64	Yes[3]
K	Aluminum	12	0	0.00%	5136 1	10700	8545.8	8974.5	Use 95% Student's-t UCL	9407.5548	9407.5548	No
	Iron	12	0	0 00%	4600	17500	14698	15758.5	Use 95% Student's-t UCL	16480.268	16480 268	No
	Manganese	12	0	0.00%	539.37	1050	748.35	669 845	Use 95% Student's-t UCL	842.13868	842.13868	No
	Thallium	1	4	80.00%	7.67	7.67	7.67	7.67	NA	NA	7.67	Yes[2]
	Vanadium	9	0	0 00%	18 389	48 7	27 405889	25.438	or 95% Modified-t UCL	32.978831	32 978831	No

APPENDIX N

TABLE 5.2

Summary of Calculation of Soil Exposure Point Concentrations - Exposure Units A through L

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

On-site Subsurface Soil (0-10 feet)

Exposure Unit	Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	Method	UCL	EPC	Max Used?
L	Aluminum	6	0	0 00%	5510.8	8681	7523 1333	8022	Use 95% Student's-t UCL	8591.4242	8591.4242	No
	cis-1,2-Dichloroethene	13	5	27.78%	0 00067	0.7	0.12149	0 032	95% KM (Chebyshev) UCL	0.2880133	0 2880133	No
	Iron	8	0	0 00%	4900	23197	14363.875	15588	Use 95% Student's-t UCL	17843.672	17843.672	No
	Lead	8	0	0 00%	14.9	510	136.8375	82 5	Use 95% Approximate Gamma UCL	305.91792	305.91792	No
	Manganese	7	0	0.00%	528 3	1050	719.61429	665	Use 95% Student's-t UCL	857.37033	857.37033	No
	Selenium	3	3	50 00%	0 6	6 42	4.2233333	5.65	95% KM (Percentile Bootstrap) UCL	6.42	6.42	No
	Tetrachloroethene	17	1	5 56%	0 00046	6.4	0.7705212	0.048	95% KM (Chebyshev) UCL	2.6000243	2.6000243	No
	Thallium	2	3	60.00%	2.23	2.36	2.295	2.295	95% KM (t) UCL	2.43357	2.36	Yes[1]
	Trichloroethene	13	5	27.78%	0 0011	0 81	0.1723692	0.032	95% KM (Chebyshev) UCL	0.3791797	0.3791797	No
	Vanadium	6	0	0 00%	19.7	51 2	28 416667	25.9	Use 95% Approximate Gamma UCL	39 934674	39.934674	No

Notes:

(1) Maximum detected concentration was used because the calculated UCL exceeds the maximum detected concentration

(2) Maximum detected concentration was used because of the small number of detected concentrations

(3) Maximum detected concentration was used because of the small number of samples.

UCL = Upper Confidence Limit

EPC = Exposure Point Concentration

NA = Not applicable or not available

Units are milligram/kilogram

APPENDIX N

TABLE 5.3

Summary of Calculation of Groundwater Exposure Point Concentrations

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Downgradient of Former Building 220 (Residential)

Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	UCL	UCL Basis	EPC	Max Used?
1,1,1,2-Tetrachloroethane	1	20	95.24%	16	16	16	16	NA	NA	16	Yes[2]
1,1,2,2-Tetrachloroethane	1	20	95.24%	0.58	0.58	0.58	0.58	NA	NA	0.58	Yes[2]
1,1,2-Trichloroethane	1	13	92.86%	2.3	2.3	2.3	2.3	NA	NA	2.3	Yes[2]
1,2-Dichloroethane (EDC)	4	17	80.95%	3.3	189	110.575	125	46.292944	95% KM (t) UCL	46.292944	No
Benzene	2	19	90.48%	0.22	4	2.11	2.11	4.4417416	99% KM (Chebyshev) UCL	4	Yes[1]
Carbon tetrachloride	2	19	90.48%	2 7	4160	2081.35	2081.35	2919.1709	99% KM (Chebyshev) UCL	2919.1709	No
Chloroform	4	17	80.95%	0.35	790	208 5375	21.9	112.93894	95% KM (t) UCL	112.93894	No
cis-1,2-Dichloroethene	8	13	61.90%	1.5	281	85.225	28	64.704303	95% KM (t) UCL	64.704303	No
Manganese	2	0	0.00%	NA	283	NA	NA	NA	NA	283	Yes[3]
Naphthalene	1	13	92 86%	10.1	10.1	10.1	10.1	NA	NA	10.1	Yes[2]
Tetrachloroethene	9	12	57.14%	0.64	34900	9005.924	5	25733.823	99% KM (Chebyshev) UCL	25733.823	No
trans-1,2-Dichloroethene	4	17	80.95%	0.54	12	3.5175	0.765	12	95% KM (BCA) UCL	12	No
Trichloroethene	11	10	47.62%	0.41	1620	392.5136	18	419.8	95% KM (BCA) UCL	419.8	No
Vinyl chloride	1	20	95.24%	0 32	0 32	0.32	0.32	NA	NA	0.32	Yes[2]

Downgradient of Former Building 220 (On-site Excavations)

Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	UCL	UCL Basis	EPC	Max Used?
1,1,1,2-Tetrachloroethane	1	5	83.33%	16	16	16	16	NA	NA	16	Yes[2]
1,1,2,2-Tetrachloroethane	1	3	75.00%	0.58	0.58	0.58	0.58	NA	NA	0.58	Yes[3]
1,1,2-Trichloroethane	1	3	75.00%	2.3	2.3	2.3	2.3	NA	NA	2.3	Yes[3]
1,2-Dichloroethane (EDC)	2	4	66.67%	3.3	189	96.15	96.15	431.8	99% KM (Chebyshev) UCL	189	Yes[1]
Benzene	2	4	66.67%	0.22	4	2.11	2.11	12.68	99% KM (Chebyshev) UCL	4	Yes[1]
Carbon tetrachloride	2	4	66.67%	2.7	4160	2081	2081	9596	99% KM (Chebyshev) UCL	4160	Yes[1]
Chloroform	3	2	40.00%	20	790	277.9	23.8	1851	99% KM (Chebyshev) UCL	790	Yes[1]
cis-1,2-Dichloroethene	2	3	60.00%	250	281	265.5	265.5	272.9	95% KM (t) UCL	272.9	No
Naphthalene	1	3	75.00%	10.1	10.1	10.1	10.1	NA	NA	10.1	Yes[3]
Tetrachloroethene	6	2	25.00%	0.64	34900	10651	2.94	61601	99% KM (Chebyshev) UCL	34900	Yes[1]
trans-1,2-Dichloroethene	1	4	80.00%	12	12	12	12	NA	NA	12	Yes[2]
Trichloroethene	5	2	28.57%	0.41	1620	812.2	1040	1145	95% KM (t) UCL	1145	No
Vinyl chloride	1	0	0.00%	0.32	0.32	0.32	0.32	NA	NA	0.32	Yes[3]

APPENDIX N
TABLE 5.3
Summary of Calculation of Groundwater Exposure Point Concentrations
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Off-site Groundwater (Residential and Excavations)

Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	UCL	UCL Basis	EPC	Max Used?
1,2-Dichloroethane (EDC)	3	9	75.00%	3	150	84.33333	100	52.920425	95% KM (t)	52.920425	No
cis-1,2-Dichloroethene	6	6	50.00%	1.5	82.2	25.13333	9.7	26.987422	95% KM (t)	26.987422	No
Manganese	2	0	0.00%	283	2010	1147	1147	NA	NA	2010	Yes[3]
Tetrachloroethene	4	8	66.67%	2.9	9440	4286.7	3851.95	3353.8985	95% KM (t)	3353.8985	No
Trichloroethene	6	6	50.00%	5.1	129	42.78333	17.4	45.510054	95% KM (t)	45.510054	No
Chloroform	1	12	91.67%	0.35	0.35	0.35	0.35	NA	NA	0.35	Yes[2]

On-site Groundwater Excluding Area Downgradient of Former Building 220 (Residential)

Variable	Number of Detected Values	Number of Nondetected Values	% Nondetected Values	Minimum	Maximum	Mean	Median	UCL	UCL Basis	EPC	Max Used?
1,2-Dichloroethane (EDC)	2	2	50.00%	3.3	4.4	4	4	NA	NA	4.4	Yes[3]
Carbon tetrachloride	1	3	75.00%	0.38	0.38	0.38	0.38	NA	NA	0.38	Yes[3]

Notes:
[1] Maximum detected concentration was used because the calculated UCL exceeds the maximum detected concentration
[2] Maximum detected concentration was used because of the small number of detected concentrations.
[3] Maximum detected concentration was used because of the small number of samples.
Units are microgram/liter
UCL = Upper Confidence Limit
EPC = Exposure Point Concentration
NA = Not applicable or not available

APPENDIX N
TABLE 6.1
Exposure Factors for the Human Health Risk Assessment
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Route	Parameter Code	Parameter Definition	Receptor Population / Receptor Age / Units	Resident Adult Value	Resident Adult Reference	Resident Child Value	Resident Child Rationale/ Reference	Age-Adjusted Value	Intake Equation/Model Name
Ingestion (Soil)	CS	Chemical Concentration in Soil	mg/kg	EPC	Calculated	EPC	Calculated		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA 2002	200	USEPA 2002		CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT-N
	EF	Exposure Frequency	days/year	350	USEPA 2002	350	USEPA 2002		
	ED	Exposure Duration	years	24	USEPA 2002	6	USEPA 2002		
	CF1	Conversion Factor 1	kg/mg	1.0E-06	—	1.0E-06	—		
	BW	Body Weight	kg	70	USEPA 2002	15	USEPA 2002		
	AT-N	Averaging Time (Noncancer)	days	8,760	USEPA 2002	2,190	USEPA 2002		
	CF1	Conversion Factor 1	kg/mg					0 000001	CDI[a] (mg/kg-day) =
	CS	Chemical Concentration in Soil	mg/kg					EPC	CS x IR-S-Adj x EF x CF1 x 1/AT-C
	EF	Exposure Frequency	days/year					350	IR-S-Adj (mg-year/kd-day) =
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day					114.3	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	AT-C	Averaging Time (Cancer)	days					25550	
Dermal (Soil)	CS	Chemical Concentration in Soil	mg/kg	EPC	Calculated	EPC	Calculated		Dermally Absorbed Dose (DAD) (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,700	USEPA 2002	2,800	USEPA 2002		CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
	SSAF	Soil-to-Skin Adherence Factor	mg/cm^2-day	0 07	USEPA 2002	0 2	USEPA 2002		
	DABS	Dermal Absorption Factor Solids	--	chemical-specific	USEPA 2004	chemical-specific	USEPA 2004		
	CF1	Conversion Factor 1	kg/mg	1 0E-06	—	1 0E-06	—		
	EF	Exposure Frequency	days/year	350	USEPA 2002	350	USEPA 2002		
	ED	Exposure Duration	years	24	USEPA 2002	6	USEPA 2002		
	BW	Body Weight	kg	70	USEPA 2002	15	USEPA 2002		
	AT-N	Averaging Time (Noncancer)	days	8,760	USEPA 2002	2,190	USEPA 2002		
	CF1	Conversion Factor 1	kg/mg					0 000001	DAD[a] (mg/kg-day) =
	CS	Chemical Concentration in Soil	mg/kg					EPC	CS x DA-Adj x DABS x CF1 x EF x 1/AT
	EF	Exposure Frequency	days/year					350	DA-Adj (mg-year/kg-day) =
	DABS	Dermal Absorption Factor Solids	--					chemical-specific	(ED-C x SA-C x SSAF-C / BW-C) +
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day					360.8	(ED-A x SA-A x SSAF-A / BW-A)
	AT-C	Averaging Time (Cancer)	days					25550	
Inhalation (Soil)	CS	Chemical Concentration in Soil	mg/kg	EPC	- -	EPC	- -		Daily Average Concentration (DAC) (mg/m^3) =
	CA	Chemical Concentration in Air	mg/m^3	Calculated	Calculated	Calculated	Calculated		CA x EF x ED x 1/AT
	PEF	Particulate Emission Factor	m^3/kg	1.36E+09	USEPA 2002	1 36E+09	USEPA 2002		
	VF	Volatilization Factor for volatile constituents	m^3/kg	chemical-specific	USEPA 2002	chemical-specific	USEPA 2002		CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	USEPA 2002	350	USEPA 2002		
	ED	Exposure Duration	years	24	USEPA 2002	6	USEPA 2002	30	
	AT-N	Averaging Time (Non-Cancer)	days	8760	USEPA 2002	2190	USEPA 2002		
	AT-C	Averaging Time (Cancer)	days	25550	USEPA 2002	25550	USEPA 2002		

Sources
USEPA 2002 *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* OSWER 9355.4-24
USEPA 2004 *Risk Assessment Guidance for Superfund. Vol.1 Human Health Evaluation Manual* (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. USEPA/540/R/99/005.

Notes.
[a] Evaluation of carcinogenic chemicals for age-adjusted resident

APPENDIX N
TABLE 6.2
Exposure Factors for the Human Health Risk Assessment
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Exposure Route	Parameter Code	Parameter Definition	Receptor Population Units	Industrial Worker Value	Industrial Worker Rationale/ Reference	Intake Equation/Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	EPC	—	Chronic Daily Intake (CDI) (mg/kg-day) =
(Soil)	IR-S	Ingestion Rate of Soil	mg/day	50	USEPA 2002	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	USEPA 2002	
	ED	Exposure Duration	years	25	USEPA 2002	
	BW	Body Weight	kg	70	USEPA 2002	
	CF1	Conversion Factor 1	kg/mg	0.000001	—	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 2002	
	AT-N	Averaging Time (Noncancer)	days	9,125	USEPA 2002	
Dermal	CS	Chemical Concentration in Soil	mg/kg	EPC	—	Dermally Absorbed Dose (DAD) (mg/kg-day) =
(Soil)	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA 2002	CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.07	USEPA 2002	
	DABS	Dermal Absorption Factor Solids	—	chemical-specific	USEPA 2004	
	EF	Exposure Frequency	days/year	250	USEPA 2002	
	ED	Exposure Duration	years	25	USEPA 2002	
	BW	Body Weight	kg	70	USEPA 2002	
	CF1	Conversion Factor 1	kg/mg	0.000001	—	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 2002	
	AT-N	Averaging Time (Noncancer)	days	9,125	USEPA 2002	
Inhalation	CS	Chemical Concentration in Soil	mg/kg	EPC	- -	Daily Average Concentration (DAC) (mg/m^3) =
(Soil)	CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	CA x EF x ED x 1/AT
	PEF	Particulate Emission Factor	m^3/kg	1 36E+09	USEPA 2002	
	VF	Volatilization Factor for volatile constituents	m^3/kg	chemical-specific	USEPA 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	USEPA 2002	
	ED	Exposure Duration	years	25	USEPA 2002	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 2002	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA 2002	

Sources
USEPA 2002. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* OSWER 9355.4-24.
USEPA 2004 *Risk Assessment Guidance for Superfund Vol 1 Human Health Evaluation Manual* (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.USEPA/540/R/99/005.

APPENDIX N
TABLE 6.3
Exposure Factors for the Human Health Risk Assessment
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Exposure Route	Parameter Code	Parameter Definition	Receptor Population	Construction Worker		Intake Equation/Model Name
			Units	Value	Rationale/ Reference	
Ingestion	CS	Chemical Concentration in Soil	mg/kg	EPC	—	Chronic Daily Intake (CDI) (mg/kg-day) =
(Soil)	IR-S	Ingestion Rate of Soil	mg/day	330	USEPA 2002	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	USEPA 2002	
	ED	Exposure Duration	years	1	USEPA 2002	
	BW	Body Weight	kg	70	USEPA 2002	
	CF1	Conversion Factor 1	kg/mg	0 000001	—	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 2002	
	AT-N	Averaging Time (Noncancer)	days	365	USEPA 2002	
Dermal	CS	Chemical Concentration in Soil	mg/kg	EPC	—	Dermally Absorbed Dose (DAD) (mg/kg-day) =
(Soil)	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA 2002	CS x SA x SSAF x DABS x CF1 x EF x ED x 1/BW x 1/AT
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0 3	USEPA 2002	
	DABS	Dermal Absorption Factor Solids	—	chemical-specific	USEPA 2004	
	EF	Exposure Frequency	days/year	250	USEPA 2002	
	ED	Exposure Duration	years	1	USEPA 2002	
	BW	Body Weight	kg	70	USEPA 2002	
	CF1	Conversion Factor 1	kg/mg	0.000001	—	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 2002	
	AT-N	Averaging Time (Noncancer)	days	365	USEPA 2002	
Inhalation	CS	Chemical Concentration in Soil	mg/kg	EPC	- -	Daily Average Concentration (DAC) (mg/m^3) =
(Soil)	CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	CA x EF x ED x 1/AT
	PEF	Particulate Emission Factor	m^3/kg	1.36E+09	USEPA 2002	
	VF	Volatilization Factor for volatile constituents	m^3/kg	chemical-specific	USEPA 2002	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	USEPA 2002	
	ED	Exposure Duration	years	1	USEPA 2002	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 2002	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA 2002	

Sources

USEPA 2002 *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* OSWER 9355.4-24

USEPA 2004. *Risk Assessment Guidance for Superfund Vol 1 Human Health Evaluation Manual* (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.USEPA/540/R/99/005.

APPENDIX N
TABLE 6.4
Exposure Factors for the Human Health Risk Assessment
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missour

Exposure Route	Parameter Code	Parameter Definition	Receptor Population Units	Construction Worker Value	Construction Worker Rationale/ Reference	Intake Equation/Model Name
Dermal	CW	Chemical Concentration in Water	µg/l	EPC	calculated	Dermally Absorbed Dose (DAD) (mg/kg-day) =
(Groundwater)	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
	FA	Fraction absorbed water	dimensionless	chemical-specific	USEPA 2004	Inorganics DAevent (mg/cm^2-event) =
	K_p	Permeability Coefficient	cm/hr	chemical-specific	USEPA 2004	Kp x CW x t_{event} x CF2 x CF3
	τ	Lag Time	hr/event	chemical-specific	USEPA 2004	Organics
	t^*	Time to Reach Steady-state	hours	chemical-specific	USEPA 2004	$t_{event}<t^*$ DAevent (mg/cm^2-event) =
	B	Ratio of Permeability of Stratum Corneum to Epidermis	dimensionless	chemical-specific	USEPA 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
	t_{event}	Event Time	hr/event	2	[a]	x CF2 x CF3
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA 2004[b]	$t_{event}>t^*$ DAevent (mg/cm^2-event) =
	EV	Event Frequency	events/day	1	—	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
	EF	Exposure Frequency	days/year	30	[c]	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
	ED	Exposure Duration	years	0.082	[d]	
	BW	Body Weight	kg	70	USEPA 1991	
	AT-N	Averaging Time (Noncancer)	days	30	[d]	
	CF2	Conversion Factor 2	mg/µg	0.001	—	
	CF3	Conversion Factor 3	l/cm^3	0 001	—	
	DAevent-Adj	Dermally Absorbed Dose per Event - Age Adjusted	mg-year/event-kg	—	—	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 1989	
Inhalation	CW	Chemical Concentration in Water	µg/l	EPC	calculated	Daily Average Concentration (DAC) (mg/m^3) =
(Groundwater)	CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	CA x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	30	[c]	
	ED	Exposure Duration	years	0.082	[d]	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA 2002	
	AT-N	Averaging Time (Non-Cancer)	days	30	[d]	

Sources

USEPA 1989 *Risk Assessment Guidance for Superfund Vol 1 Human Health Evaluation Manual*, Part A OERR EPA/540/1-89/002

USEPA 1991 *Risk Assessment Guidance for Superfund Vol 1 Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors* Interim Final OSWER Directive 9285 6-03.

USEPA 2002 *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* OSWER 9355 4-24

USEPA 2004 *Risk Assessment Guidance for Superfund Vol 1 Human Health Evaluation Manual* (Part E, Supplemental Guidance for Dermal Risk Assessment) Final EPA/540/R/99/005

Notes

a. Professional judgment assuming 2 hrs per event.

b SA includes head, hands, and forearms

c Professional judgment assuming groundwater contact 30 days during construction

d Value based on discussion with Missouri Department of Health and Senior Services, August 27, 2008

APPENDIX N

TABLE 6.5

Exposure Factors for the Human Health Risk Assessment

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Exposure Route	Parameter Code	Parameter Definition	Receptor Population Units	Adult Value	Adult Rationale/ Reference	Child Value	Child Rationale/ Reference	Age-Adjusted Value	Intake Equation/Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	RME		RME	RME		Chronic Daily Intake (CDI) (mg/kg-day) =
(Groundwater)	IR-W	Ingestion Rate of Water (A=adult, C=child)	L/day	2	USEPA, 1989	1	USEPA, 1997		CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	USEPA, 1991	350	USEPA, 1991		
	ED	Exposure Duration (A=adult, C=child)	years	24	USEPA, 1991	6	USEPA, 1991		
	BW	Body Weight (A=adult, C=child)	kg	70	USEPA, 1989	15	USEPA, 1991		
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	2,190	USEPA, 1989		
	CF1	Conversion Factor 1	mg/µg	1.0E-03	- -	1 0E-03	- -		
	CW	Chemical Concentration in Water	µg/l					RME	CDI (mg/kg-day) =
	IR-W-Adj	Ingestion Rate of Water, Age-adjusted	liter-year/kg-day					1 1	CW x IR-W-Adj x EF x CF1 x 1/AT
	EF	Exposure Frequency	days/year					350	IR-W-Adj (liter-year/kd-day) =
	AT-C	Averaging Time (Cancer)	days					25,550	(ED-C x IR-W-C / BW-C) + (ED-A x IR-W-A / BW-A)
	CF1	Conversion Factor 1	mg/µg					1 0E-03	
Dermal	CW	Chemical Concentration in Water	µg/l	RME	RME	RME	RME		CDI (mg/kg-day) =
(Groundwater)	DAevent	Dermally Absorbed Dose per Event (A=adult, C=child)	mg/cm^2-event	calculated	calculated	calculated	calculated		DAevent x SA x EV x EF x ED-A x 1/BW x 1/AT
	FA	Fraction absorbed water	dimensionless	chem-specific	USEPA, 2004	chem-specific	USEPA, 2004		
	Kp	Permeability Coefficient	cm/hr	chem-specific	USEPA, 2004	chem-specific	USEPA, 2004		Inorganics DAevent-A (mg/cm^2-event) =
	τ	Lag Time	hr/event	chem-specific	USEPA, 2004	chem-specific	USEPA, 2004		Kp x CW x t_{event} x CF1 x CF2
	t^*	Time to Reach Steady-state	hours	chem-specific	USEPA, 2004	chem-specific	USEPA, 2004		
	B	Ratio of Permeability of Stratum Corneum to Epidermis	dimensionless	chem-specific	USEPA, 2004	chem-specific	USEPA, 2004		Organics
	t_{event}	Event Time	hr/event	0 58	USEPA, 2004	1 00	USEPA, 2004		$t_{event}<t^*$ DAevent-A (mg/cm^2-event) =
	SA	Skin Surface Area (A=adult, C-child)	cm^2	18,000	USEPA, 2004	6,600	USEPA, 2004		2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π)) x CF1 x CF2
	EV	Event Frequency	events/day	1	USEPA, 2004	1	USEPA, 2004		
	EF	Exposure Frequency	days/year	350	USEPA, 1991	350	USEPA, 1991		
	ED	Exposure Duration (A=adult, C=child)	years	24	USEPA, 1991	6	USEPA, 1991		$t_{event}>t^*$ DAevent-A (mg/cm^2-event) =
	BW	Body Weight (A=adult, C=child)	kg	70	USEPA, 1989	15	USEPA, 1991		FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	2190	USEPA, 1989		((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
	CF1	Conversion Factor 1	mg/µg	1 0E-03	- -	1 0E-03	- -		
	CF2	Conversion Factor 2	l/cm^3	1.0E-03	- -	1.0E-03	- -		
	CW	Chemical Concentration in Water	µg/l					RME	CDI (mg/kg-day) = DA-Adj x EF x EV x 1/AT
	DA-Adj	Dermally Absorbed Dose, Age-adjusted	mg-year/event-kg					calculated	DA-Adj = (DAevent-A x SA-A x ED-A x 1/BW-A)
	EV	Event Frequency	events/day					1	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
	EF	Exposure Frequency	days/year					350	
	AT-C	Averaging Time (Cancer)	days					25,550	
	CF1	Conversion Factor 1	mg/µg					1 0E-03	
Inhalation	CW	Chemical Concentration in Water	µg/l	RME	RME	RME	RME		Daily Average Concentration (DAC) (mg/m3) =
(Groundwater)	CA	Chemical Concentration in Air	mg/m^3	Calculated	Calculated	Calculated	Calculated		CA x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	350	USEPA 2002	350	USEPA 2002		
	ED	Exposure Duration	years	24	USEPA 2002	6	USEPA 2002		
	AT-N	Averaging Time (Non-Cancer)	days	8760	USEPA 2002	2190	USEPA 2002		
	CW	Chemical Concentration in Water	µg/l					RME	Daily Average Concentration (DAC) (mg/m3) =
	CA	Chemical Concentration in Air	mg/m^3					Calculated	CA x EF x ED x 1/AT
	EF	Exposure Frequency	days/year					350	
	ED	Exposure Duration	years					30	
	AT-C	Averaging Time (Cancer)	days					25550	

Sources:

USEPA, 1989. Risk Assessment Guidance for Superfund. Vol.1 Human Health Evaluation Manual, Part A OERR USEPA/540/1-89/002

USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors Interim Final. OSWER Directive 9285 6-03

USEPA, 1997 Exposure Factors Handbook USEPA/600/P-95/002Fa.

USEPA, 2004 Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual. Part E Supplemental Guidance for Dermal Risk Assessment) Final

APPENDIX N

TABLE 6.6

Calculation of Volatilization Factor

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)	Soil Saturation Concentration (C_{sat}) (mg/kg)
cis-1,2-Dichloroethene	7.36E-02	1.67E-01	1 13E-05	3.55E+01	2.13E-01	3.50E+03	1.90E-03	2.04E+03	
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	2.00E+02	2.47E-03	1.79E+03	
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	1.51E-03	2.28E+03	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (mg/kg)

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 1-acre-square source (g/m^2-s per kg/m^3)	48.9
T - Exposure interval(s)	9 5E+08
r_b - Soil bulk density (g/cm^3)	1 5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (γ/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Q/C value for 10 acre source area in Zone V, Lincoln, Nebraska from USEPA 1996, *Soil Screening Guidance: User's Guide, EPA/540/R-96/018.*

APPENDIX N
TABLE 7
Toxicity Factors for COPCs
St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

						Carcinogenic Toxicity Values				Non-Carcinogenic Toxicity Values						Dermal Toxicity Values	
Chemical	CAS #	WOE Class	Ref[a]	ABSgi	ABSd	SFo (mg/kg-day)[-1]	Ref[a]	URF (ug/m³)[-1]	Ref[a]	Chronic RfDo (mg/kg-day)	Ref[a]	RfDo Target Organ	Chronic RfC (mg/m³)	Ref[a]	RfC Target Organ	SFd (mg/kg-day)[-1]	Chronic RfDd (mg/kg-day)
Aluminum	7429-90-5			>50%	0 1%					1 0E+00	P	nervous system	5 0E-03	P	nervous system		1.0E+00
Antimony	7440-36-0			15%	0 1%					4 0E-04	I	blood					6 0E-05
Arsenic	7440-38-2	A	I	95%	3%	1 5E+00	I	4 3E-03	I	3 0E-04	I	skin	3.0E-05	C	developmental, cardiovascular system, nervous system	1 5E+00	3 0E-04
Chromium	7440-47-3	D	I	1 3%	0 1%			1 2E-02	I								
Copper	7440-50-8			>50%	0 1%					4 0E-02	H	gastrointestinal					4 0E-02
Iron	7439-89-6			>50%	0 1%					7 0E-01	P	gastrointestinal					7 0E-01
Manganese	7439-96-5	D	I	4%	0 1%					1 4E-01	I	nervous system	5 0E-05	I	nervous system		5 6E-03
Selenium	7782-49-2	D	I	30-80%	0 1%					5 0E-03	I	whole body					5.0E-03
Silver	7440-22-4	D	I	4%	0 1%					5 0E-03	I	skin					2 0E-04
Thallium	7440-28-0	D	I	>50%	0 1%					6 5E-05	S	blood					6 5E-05
Vanadium	7440-62-2			2 6%	0 1%					7 0E-03	H	kidney					1 8E-04
Benzo(a)pyrene	50-32-8	B2	I	58-89%	13%	7 3E+00	I	1 1E-03	C							7 3E+00	
Benzo(b)fluoranthene	205-99-2	B2	I	>50%	13%	7 3E-01	RSL	1 1E-04	C								
Naphthalene	91-20-3	C	I	58-89%	13%			3 4E-05	C	2 0E-02	I	whole body	3 0E-03	I	respiratory		2 0E-02
1,1,1,2-Tetrachloroethane	630-20-6	C	I	>50%		2 6E-02	I	7 4E-06	I	3 0E-02	I	kidney, liver				2 6E-02	3 0E-02
1,1,2,2-Tetrachloroethane	79-34-5	C	I	>50%		2 0E-01	I	5 8E-05	I	4.0E-03	P	liver				2 0E-01	4 0E-03
1,1,2-Trichloroethane	79-00-5	C	I	>50%		5 7E-02	I	1 6E-05	I	4 0E-03	I	blood				5 7E-02	4 0E-03
1,2-Dichloroethane (EDC)	107-06-2	B2	I	>50%		9 1E-02	I	2 6E-05	I	2 0E-02	P	kidney, liver	2.4E+00	A	kidney, liver	9 1E-02	2 0E-02
Benzene	71-43-2	A	I	>50%		5 5E-02	I	7 8E-06	I	4 0E-03	I	blood	3 0E-02	I	blood	5 5E-02	4 0E-03
Carbon tetrachloride	56-23-5	B2	I	>50%		1 3E-01	I	1 5E-05	I	7 0E-04	I	liver	1 9E-01	A	liver	1 3E-01	7 0E-04
Chloroform	67-66-3	B2	I	>50%		3 1E-02	C	2 3E-05	I	1 0E-02	I	liver	9 8E-02	A	liver	3 1E-02	1.0E-02
cis-1,2-Dichloroethene	156-59-2	D	I	>50%						1 0E-02	P	blood					1 0E-02
Tetrachloroethene	127-18-4			>50%		5 4E-01	C	5 9E-06	C	1 0E-02	I	liver	2 7E-01	A	nervous system	5.4E-01	1 0E-02
trans-1,2-Dichloroethene	156-60-5			>50%						2 0E-02	I	kidney	6 0E-02	P	kidney		2 0E-02
Trichloroethene	79-01-6			>50%		1 3E-02	C	2 0E-06	C	3 0E-04	N	liver, kidney, fetus	6 0E-01	C	nervous system, eyes	1 3E-02	3 0E-04
						4 0E-01	N	1 1E-04	N				3 5E-02	N	nervous system, liver, endocrine system	4 0E-01	
Vinyl chloride- Continuous lifetime exposure from birth	75-01-4	A	I	>50%		1 5E+00	I	8.8E-03	I	3 0E-03	I	liver	1 0E-01	I	liver	1 5E+00	3 0E-03
Vinyl chloride- Continuous lifetime exposure during adulthood	75-01-4	A	I	>50%		7 2E-01	I	4.4E-06	I	3 0E-03	I	liver	1 0E-01	I	liver	7 2E-01	3 0E-03

Reference (Ref):
ABSgi and ABSd were obtained from Supplemental Guidance to RAGS Dermal Risk Assessment (EPA, 2004)
I = Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS)
P = Provisional Peer-Reviewed Toxicity Values (PPRTV)
C = California Environmental Protection Agency
H = Health Effects Assessment Summary Table (HEAST)
S = Regional Screening Level (RSL) table
A = Agency for Toxic Substances and Disease Registry
N = National Center for Environmental Assessment
R6 = Region 6 Medium-Specific Screening Levels (MSSLs)
RSL = Regional Screening Level Table (Oak Ridge National Laboratory, 2008)

Weight of Evidence Classification Description (WOE)
A - Human carcinogen, based on evidence from epidemiological studies
B1 - Probable human carcinogen, limited human data are available
B2 - Probable human carcinogen, sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen, based on limited evidence in animals
D - Not classifiable as to human carcinogenicity

Note:
Total Chromium (1/6 ratio Cr VI/Cr III) values in R6 MSSL is used for chromium
A default ABS_d of 0 1% was used for inorganic chemicals if no chemical specific value was available

RfC - Inhalation Reference Concentration
RfDd - Dermal Reference Dose
RfDo - Oral Reference Dose
SFo - Oral Slope Factor
SFd - Dermal Slope Factor
URF - Inhalation Unit Risk Factor

Dermal toxicity factors calculated as follows
SFd If ABSgi <= 0 50, SFd = SFo/ABSgi, otherwise SFd = SFo
RfDd If ABSgi <= 0 50, RfDd = RfDo x ABSgi, otherwise RfDd = RfDo
ABSd - Dermal absorption factor
ABSgi - Gastrointestinal absorption factor

In applying vinyl chloride toxicity data, CLEfB has been applied to children and CLEdA has been applied to adults
CLEfB- Continuous Lifetime Exposure from Birth
CLEdA- Continuous Lifetime Exposure during Adulthood

Risk Assessment Guidance for Superfund: Table 8

APPENDIX N

TABLE 8.1

Potential Excess Lifetime Cancer Risk from Soil (0-2 feet) - Industrial Worker RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

								Ingestion		Dermal		Inhalation		
COPC	**WOE[a]**	**SF_o $(mg/kg\text{-}day)^{-1}$**	**SF_d $(mg/kg\text{-}day)^{-1}$**	**URF $(ug/m^3)^{-1}$**	**Soil EPC (mg/kg)**	**ABS_d**	**ABS_{gi}**	**CDI (mg/kg-day)**	**ELCR**	**DAD (mg/kg-day)**	**ELCR**	**DAC (mg/m^3)**	**ELCR**	**Total ELCR**
Arsenic	A	1.5E+00	1 5E+00	4.3E-03	1.0E+01	3 0E-02	9 5E-01	1.8E-06	2.7E-06	2 5E-07	3 8E-07	1 9E-09	8 0E-09	3 1E-06
Benzo(a)pyrene	B2	7.3E+00	7.3E+00	1.1E-03	3 5E-01	1.3E-01	1.0E+00	6 1E-08	4 4E-07	3 6E-08	2 7E-07	6 2E-11	6 9E-11	7 1E-07
Tetrachloroethene	NA	5.4E-01	5.4E-01	5 9E-06	3 8E+00	NA	1 0E+00	6 7E-07	3 6E-07	3.1E-06	1.7E-06	5 3E-04	3 1E-06	5 1E-06
Trichloroethene	NA	1 3E-02	1 3E-02	2 0E-06	3.8E-01	NA	1 0E+00	6 6E-08	8 6E-10	3 1E-07	4 0E-09	4 0E-05	8 1E-08	8 6E-08
ELCR Subtotals									3.5E-06		2 3E-06		3 2E-06	
													Estimated Total Risk =	**9.0E-06**

[a]Cancer WOE Classifications
- Group A· Human carcinogen
- Group B (B1, B2) Probable human carcinogen
- Group C Possible human carcinogen
- Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
DAC = daily average concentration
$\mu g/m^3$ = microgram per cubic meter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
CDI = chronic daily intake
DAD = dermally absorbed dose
SF_d = dermal slope factor
SF_o = oral slope factor
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.2

Potential Noncarcinogenic Risk from Soil (0-2 feet) - Industrial Worker RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Arsenic	3 0E-04	3 0E-04	3 0E-05	1 03E+01	3 0E-02	9 5E-01	skin	developmental, cardiovascular system, nervous system	5 1E-06	1 7E-02	2 5E-07	8 3E-04	5 2E-09	1 7E-04	1 8E-02
Benzo(a)pyrene	NA	NA	NA	3 47E-01	1 3E-01	1 0E+00			1 7E-07	NA	NA	NA	1 7E-10	NA	NA
Tetrachloroethene	1 0E-02	1 0E-02	2.7E-01	3 84E+00	NA	1 0E+00	liver	nervous system	1 9E-06	1 9E-04	8 7E-06	8 7E-04	1 5E-03	5 5E-03	6 5E-03
Trichloroethene	NA	NA	6 0E-01	3 78E-01	NA	1 0E+00		nervous system, eyes	1 8E-07	NA	NA	NA	1 1E-04	1 9E-04	1 9E-04
Subtotal Hazard Indices										1 7E-02		1 7E-03		5 8E-03	
														Total HI =	**2.5E-02**

[b]Chronic toxicity values were used if subchronic toxicity values were not available

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Cardiovascular	1 7E-04
Total Developmental	1 7E-04
Total Nervous System	5 8E-03
Total Eyes	1 9E-04
Total Skin	1 8E-02
Total Liver	1 1E-03

APPENDIX N

TABLE 8.3

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Construction Worker RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(ug/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Arsenic	A	1 5E+00	1 5E+00	4 3E-03	9 7E+00	3 0E-02	9 5E-01	4.5E-07	6 7E-07	4 0E-08	6 0E-08	7 0E-11	3 0E-10	7 3E-07
Benzo(a)pyrene	B2	7 3E+00	7 3E+00	1 1E-03	1 9E-01	1 3E-01	1 0E+00	8.7E-09	6 3E-08	3 4E-09	2 5E-08	1 4E-12	1 5E-12	8 8E-08
Tetrachloroethene	NA	5.4E-01	5.4E-01	5 9E-06	2 6E+00	NA	1 0E+00	1.2E-07	6.5E-08	3 6E-07	1 9E-07	1 4E-05	8 4E-08	3 4E-07
Trichloroethene	NA	1 3E-02	1.3E-02	2 0E-06	3.8E-01	NA	1 0E+00	1 7E-08	2 3E-10	5 2E-08	6 8E-10	1 6E-06	3 2E-09	4 2E-09
ELCR Subtotals									8 0E-07		2 8E-07		8 7E-08	
													Estimated Total Risk =	**1.2E-06**

[a]Cancer WOE Classifications:
- Group A: Human carcinogen
- Group B (B1, B2): Probable human carcinogen
- Group C: Possible human carcinogen
- Group D: Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
DAC = daily average concentration
$\mu g/m^3$ = microgram per cubic meter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
CDI = chronic daily intake
DAD = dermally absorbed dose
SF_d = dermal slope factor
SF_o = oral slope factor
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.4

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Construction Worker RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Arsenic	3.0E-04	3 0E-04	3 0E-05	9.71E+00	3.0E-02	9.5E-01	skin	developmental, cardiovascular system, nervous system	3 1E-05	1 0E-01	2 8E-06	9 4E-03	4 9E-09	1 6E-04	1 1E-01
Benzo(a)pyrene	NA	NA	NA	1 88E-01	1 3E-01	1 0E+00			6.1E-07	NA	NA	NA	9 5E-11	NA	NA
Tetrachloroethene	1.0E-02	1.0E-02	2 7E-01	2 60E+00	NA	1.0E+00	liver	nervous system	8 4E-06	8 4E-04	2 5E-05	2 5E-03	1 0E-03	3 7E-03	7 0E-03
Trichloroethene	NA	NA	6.0E-01	3 79E-01	NA	1 0E+00		nervous system, eyes	1 2E-06	NA	NA	NA	1 1E-04	1 9E-04	1 9E-04
Subtotal Hazard Indices										1 1E-01		1 2E-02		4 0E-03	
														Total HI =	**1 2E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Cardiovascular	1 6E-04
Total Developmental	1 6E-04
Total Nervous System.	4.0E-03
Total Eyes	1 9E-04
Total Skin	1 1E-01
Total Liver.	3 4E-03

APPENDIX N

TABLE 8.5

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area A

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	7.15E+03	1 0E-03	1.0E+00	1 1E-02	NA	NA	NA	2 2E-06	NA	NA
Antimony	NA	NA	NA	NA	2 82E+00	1.0E-03	1.5E-01	4 4E-06	NA	NA	NA	8 5E-10	NA	NA
Iron	NA	NA	NA	NA	1.60E+04	1 0E-03	1 0E+00	2 5E-02	NA	NA	NA	4 8E-06	NA	NA
Manganese	D	NA	NA	NA	5.57E+02	1 0E-03	4.0E-02	8 7E-04	NA	NA	NA	1 7E-07	NA	NA
Selenium	D	NA	NA	NA	1.24E+01	1 0E-03	1 0E+00	1 9E-05	NA	NA	NA	3 7E-09	NA	NA
ELCR Subtotals									NA		NA		NA	
												Estimated Total Risk =		**NA**

[a]Cancer WOE Classifications
- Group A Human carcinogen
- Group B (B1, B2) Probable human carcinogen
- Group C. Possible human carcinogen
- Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.6

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area A

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1.0E+00	5 0E-03	7.15E+03	1 0E-03	1 0E+00	nervous system	nervous system	9 8E-03	9 8E-03	3 9E-05	3 9E-05	5 0E-06	1 0E-03	1 1E-02
Antimony	4.0E-04	6.0E-05	NA	2 82E+00	1 0E-03	1 5E-01	blood		3 9E-06	9.7E-03	1.5E-08	2 6E-04	2 0E-09	NA	9.9E-03
Iron	7 0E-01	7 0E-01	NA	1.60E+04	1 0E-03	1 0E+00	gastrointestinal		2 2E-02	3 1E-02	8 8E-05	1 3E-04	1 1E-05	NA	3 1E-02
Manganese	1 4E-01	5.6E-03	5 0E-05	5 57E+02	1 0E-03	4.0E-02	nervous system	nervous system	7.6E-04	5 5E-03	3.0E-06	5 4E-04	3 9E-07	7.9E-03	1 4E-02
Selenium	5.0E-03	5.0E-03	NA	1.24E+01	1 0E-03	1 0E+00	whole body		1 7E-05	3 4E-03	6 8E-08	1 4E-05	8 7E-09	NA	3 4E-03
Subtotal Hazard Indices										6 0E-02		9 8E-04		8 9E-03	
														Total HI =	**7.0E-02**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	9 9E-03
Total Gastrointestinal	3 1E-02
Total Nervous System	2 5E-02
Total Whole Body	3 4E-03

APPENDIX N

TABLE 8.7

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area A

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1.0E+00	5 0E-03	7 15E+03	0 001	1 0E+00	nervous system	nervous system	9 1E-02	9 1E-02	2 6E-04	2 6E-04	5 0E-06	1 0E-03	9 3E-02
Antimony	4 0E-04	6 0E-05	NA	2 82E+00	0.001	1 5E-01	blood		3 6E-05	9 0E-02	1 0E-07	1 7E-03	2 0E-09	NA	9 2E-02
Iron	7 0E-01	7 0E-01	NA	1 60E+04	0 001	1 0E+00	gastrointestinal		2 0E-01	2 9E-01	5 7E-04	8 2E-04	1 1E-05	NA	2 9E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	5 57E+02	0 001	4 0E-02	nervous system	nervous system	7 1E-03	5 1E-02	2 0E-05	3 6E-03	3 9E-07	7 9E-03	6 2E-02
Selenium	5 0E-03	5 0E-03	NA	1 24E+01	0 001	1 0E+00	whole body		1 6E-04	3 2E-02	4 4E-07	8 9E-05	8 7E-09	NA	3 2E-02
Subtotal Hazard Indices										5 6E-01		6 4E-03		8 9E-03	
														Total HI =	**5.7E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	9 2E-02
Total Gastrointestinal	2 9E-01
Total Nervous System	1 5E-01
Total Whole Body	3 2E-02

APPENDIX N

TABLE 8.8

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area B

								Ingestion		Dermal		Inhalation		
COPC	**WOE[a]**	**SF_o $(mg/kg\text{-}day)^{-1}$**	**SF_d $(mg/kg\text{-}day)^{-1}$**	**URF $(\mu g/m^3)^{-1}$**	**Soil EPC (mg/kg)**	**ABS_d**	**ABS_{gi}**	**CDI (mg/kg-day)**	**ELCR**	**DAD (mg/kg-day)**	**ELCR**	**DAC (mg/m^3)**	**ELCR**	**Total ELCR**
Aluminum	NA	NA	NA	NA	8 65E+03	1.0E-03	1 0E+00	1 4E-02	NA	NA	NA	2 6E-06	NA	
Antimony	NA	NA	NA	NA	3 15E+00	1 0E-03	1.5E-01	4.9E-06	NA	NA	NA	9 5E-10	NA	
Arsenic	A	1.5E+00	1.5E+00	4 30E-03	1 60E+01	3 0E-02	9.5E-01	2 5E-05	4E-05	2 4E-06	4E-06	4 8E-09	2E-08	4E-05
Iron	NA	NA	NA	NA	1 43E+04	1.0E-03	1 0E+00	2 2E-02	NA	NA	NA	4 3E-06	NA	
Manganese	D	NA	NA	NA	5 86E+02	1 0E-03	4 0E-02	9 2E-04	NA	NA	NA	1 8E-07	NA	
ELCR Subtotals									4E-05		4E-06		2E-08	
												Estimated Total Risk =		**4E-05**

[a]Cancer WOE Classifications:
- Group A Human carcinogen
- Group B (B1, B2) Probable human carcinogen
- Group C Possible human carcinogen
- Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.9

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri - Area B

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1 0E+00	5 0E-03	8 65E+03	1 0E-03	1 0E+00	nervous system	nervous system	1 2E-02	1 2E-02	4 7E-05	4 7E-05	6 1E-06	1 2E-03	1 3E-02
Antimony	4 0E-04	6 0E-05	NA	3 15E+00	1 0E-03	1 5E-01	blood		4 3E-06	1 1E-02	1 7E-08	2 9E-04	2 2E-09	NA	1 1E-02
Arsenic	3 0E-04	3 0E-04	3 0E-05	1 60E+01	3 0E-02	9 5E-01	skin	developmental, cardiovascular system, nervous	2 2E-05	7 3E-02	2 6E-06	8 8E-03	1 1E-08	3 8E-04	8 2E-02
Iron	7 0E-01	7 0E-01	NA	1 43E+04	1 0E-03	1 0E+00	gastrointestinal		2 0E-02	2 8E-02	7 8E-05	1 1E-04	1 0E-05	NA	2 8E-02
Manganese	1 4E-01	5 6E-03	5 0E-05	5 86E+02	1 0E-03	4 0E-02	nervous system	nervous system	8 0E-04	5 7E-03	3 2E-06	5 7E-04	4 1E-07	8 3E-03	1 5E-02
Subtotal Hazard Indices										1 3E-01		9 8E-03		9 9E-03	
														Total HI =	**1 5E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 1E-02
Total Cardiovascular	3 8E-04
Total Developmental	3 8E-04
Total Gastrointestinal	2 8E-02
Total Nervous System	2 8E-02
Total Skin	8 2E-02

APPENDIX N

TABLE 8.10

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area B

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	8 65E+03	0 001	1 0E+00	nervous system	nervous system	1 1E-01	1 1E-01	3 1E-04	3 1E-04	6 1E-06	1 2E-03	1 1E-01
Antimony	4 0E-04	6 0E-05	NA	3 15E+00	0 001	1 5E-01	blood		4 0E-05	1 0E-01	1 1E-07	1 9E-03	2 2E-09	NA	1 0E-01
Arsenic	3 0E-04	3 0E-04	3 0E-05	1 60E+01	0 030	9 5E-01	skin	developmental, cardiovascular system, nervous system	2 0E-04	6 8E-01	1 7E-05	5 7E-02	1 1E-08	3 8E-04	7 4E-01
Iron	7 0E-01	7 0E-01	NA	1 43E+04	0 001	1 0E+00	gastrointestinal		1 8E-01	2 6E-01	5 1E-04	7 3E-04	1 0E-05	NA	2 6E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	5 86E+02	0 001	4 0E-02	nervous system	nervous system	7 5E-03	5 4E-02	2 1E-05	3 7E-03	4 1E-07	8 3E-03	6 6E-02
Subtotal Hazard Indices										1 2E+00		6 4E-02		9 9E-03	
														Total HI =	**1.3E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 0E-01
Total Cardiovascular	3 8E-04
Total Developmental	3 8E-04
Total Gastrointestinal	2 6E-01
Total Nervous System	1 8E-01
Total Skin	7 4E-01

APPENDIX N

TABLE 8.11

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area C

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SFo (mg/kg-day)$^{-1}$	SF_d (mg/kg-day)$^{-1}$	URF (mg/m^3)$^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	8 26E+03	1.0E-03	1 0E+00	1.3E-02	NA	NA	NA	2.5E-06	NA	NA
Antimony	NA	NA	NA	NA	4 24E+00	1 0E-03	1 5E-01	6 6E-06	NA	NA	NA	1 3E-09	NA	NA
Iron	NA	NA	NA	NA	1.77E+04	1 0E-03	1.0E+00	2 8E-02	NA	NA	NA	5 3E-06	NA	NA
Manganese	D	NA	NA	NA	6.11E+02	1 0E-03	4 0E-02	9 5E-04	NA	NA	NA	1 8E-07	NA	NA
ELCR Subtotals									NA		NA		NA	
												Estimated Total Risk =		**NA**

[a]Cancer WOE Classifications
Group A: Human carcinogen
Group B (B1, B2) Probable human carcinogen
Group C: Possible human carcinogen
Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
µg/m^3 = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.12

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area C

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	8 26E+03	1 0E-03	1.0E+00	nervous system	nervous system	1 1E-02	1 1E-02	4 5E-05	4 5E-05	5 8E-06	1 2E-03	1 3E-02
Antimony	4 0E-04	6.0E-05	NA	4 24E+00	1.0E-03	1 5E-01	blood		5 8E-06	1 5E-02	2 3E-08	3 9E-04	3 0E-09	NA	1 5E-02
Iron	7 0E-01	7 0E-01	NA	1.77E+04	1 0E-03	1 0E+00	gastrointestinal		2.4E-02	3.5E-02	9 7E-05	1 4E-04	1 2E-05	NA	3 5E-02
Manganese	1.4E-01	5 6E-03	5 0E-05	6 11E+02	1.0E-03	4 0E-02	nervous system	nervous system	8 4E-04	6 0E-03	3 3E-06	6.0E-04	4 3E-07	8 6E-03	1 5E-02
Subtotal Hazard Indices										6 6E-02		1 2E-03		9 8E-03	
														Total HI =	**7.7E-02**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 5E-02
Total Gastrointestinal	3 5E-02
Total Nervous System	2 8E-02

APPENDIX N

TABLE 8.13

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area C

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5.0E-03	8 26E+03	0.001	1 0E+00	nervous system	nervous system	1 1E-01	1 1E-01	3 0E-04	3 0E-04	5 8E-06	1 2E-03	1 1E-01
Antimony	4 0E-04	6 0E-05	NA	4 24E+00	0 001	1 5E-01	blood		5 4E-05	1 4E-01	1 5E-07	2 5E-03	3 0E-09	NA	1 4E-01
Iron	7 0E-01	7 0E-01	NA	1 77E+04	0 001	1 0E+00	gastrointestinal		2 3E-01	3 2E-01	6 3E-04	9 0E-04	1 2E-05	NA	3 2E-01
Manganese	1 4E-01	5 6E-03	5.0E-05	6 11E+02	0 001	4 0E-02	nervous system	nervous system	7 8E-03	5 6E-02	2 2E-05	3 9E-03	4 3E-07	8 6E-03	6 8E-02
Subtotal Hazard Indices										6 2E-01		7 6E-03		9 8E-03	
														Total HI =	**6 4E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 4E-01
Total Gastrointestinal	3 2E-01
Total Nervous System	1 8E-01

APPENDIX N

TABLE 8.14

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area D

								Ingestion		Dermal		Inhalation		
COPC	**WOE[a]**	**SF_o $(mg/kg\text{-}day)^{-1}$**	**SF_d $(mg/kg\text{-}day)^{-1}$**	**URF $(ug/m^3)^{-1}$**	**Soil EPC (mg/kg)**	**ABS_d**	**ABS_{gi}**	**CDI (mg/kg-day)**	**ELCR**	**DAD (mg/kg-day)**	**ELCR**	**DAC (mg/m^3)**	**ELCR**	**Total ELCR**
Aluminum	NA	NA	NA	NA	1.20E+04	1 0E-03	1.0E+00	1 9E-02	NA	NA	NA	3 6E-06	NA	NA
Iron	NA	NA	NA	NA	1 82E+04	1 0E-03	1.0E+00	2 8E-02	NA	NA	NA	5 5E-06	NA	NA
Manganese	D	NA	NA	NA	8 38E+02	1 0E-03	4.0E-02	1 3E-03	NA	NA	NA	2 5E-07	NA	NA
Thallium	D	NA	NA	NA	4.66E+00	1.0E-03	1.0E+00	7 3E-06	NA	NA	NA	1 4E-09	NA	NA
ELCR Subtotals									NA		NA		NA	
													Estimated Total Risk =	**NA**

[a]Cancer WOE Classifications.
Group A· Human carcinogen
Group B (B1, B2) Probable human carcinogen
Group C. Possible human carcinogen
Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
ug/m^3 = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.15

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area D

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1.0E+00	5 0E-03	1 20E+04	1.0E-03	1 0E+00	nervous system	nervous system	1.6E-02	1 6E-02	6 5E-05	6 5E-05	8 4E-06	1 7E-03	1 8E-02
Iron	7.0E-01	7.0E-01	NA	1 82E+04	1 0E-03	1 0E+00	gastrointestinal		2 5E-02	3 6E-02	9.9E-05	1 4E-04	1 3E-05	NA	3 6E-02
Manganese	1.4E-01	5 6E-03	5.0E-05	8 38E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 1E-03	8 2E-03	4 6E-06	8 2E-04	5 9E-07	1 2E-02	2.1E-02
Thallium	6.5E-05	6 5E-05	NA	4 66E+00	1 0E-03	1 0E+00	blood		6.4E-06	9 8E-02	2 5E-08	3 9E-04	3 3E-09	NA	9 9E-02
Subtotal Hazard Indices										1 6E-01		1 4E-03		1 3E-02	
														Total HI =	**1.7E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	9 9E-02
Total Gastrointestinal	3 6E-02
Total Nervous System	3 9E-02

APPENDIX N

TABLE 8.16

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missoun - Area D

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1 0E+00	5 0E-03	1 20E+04	0 001	1 0E+00	nervous system	nervous system	1 5E-01	1 5E-01	4 3E-04	4 3E-04	8 4E-06	1 7E-03	1 6E-01
Iron	7 0E-01	7 0E-01	NA	1 82E+04	0 001	1 0E+00	gastrointestinal		2 3E-01	3 3E-01	6 5E-04	9 3E-04	1 3E-05	NA	3 3E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	8 38E+02	0 001	4 0E-02	nervous system	nervous system	1 1E-02	7 6E-02	3 0E-05	5 4E-03	5 9E-07	1 2E-02	9 4E-02
Thallium	6.5E-05	6 5E-05	NA	4 66E+00	0 001	1 0E+00	blood		6 0E-05	9 2E-01	1 7E-07	2 6E-03	3 3E-09	NA	9 2E-01
Subtotal Hazard Indices										1 5E+00		9 3E-03		1 3E-02	
														Total HI =	**1.5E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	9 2E-01
Total Gastrointestinal	3 3E-01
Total Nervous System	2 5E-01

APPENDIX N

TABLE 8.17

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area E

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	9 04E+03	1 0E-03	1 0E+00	1 4E-02	NA	NA	NA	2 7E-06	NA	
Antimony	NA	NA	NA	NA	1 41E+01	1 0E-03	1 5E-01	2 2E-05	NA	NA	NA	4 3E-09	NA	
Arsenic	A	1 5E+00	1 5E+00	4 30E-03	1 37E+01	3 0E-02	9 5E-01	2 1E-05	3E-05	2 0E-06	3E-06	4 1E-09	2E-08	4E-05
Chromium	D	NA	NA	1 20E-02	4 15E+01	1 0E-03	1 3E-02	6 5E-05	NA	NA	NA	1 3E-08	2E-07	2E-07
Iron	NA	NA	NA	NA	1 66E+04	1 0E-03	1 0E+00	2 6E-02	NA	NA	NA	5 0E-06	NA	
Manganese	D	NA	NA	NA	8 41E+02	1 0E-03	4 0E-02	1 3E-03	NA	NA	NA	2 0E-07	NA	
Thallium	D	NA	NA	NA	5 07E+00	1 0E-03	1 0E+00	7 9E-06	NA	NA	NA	1 2E-09	NA	
Vanadium	NA	NA	NA	NA	3 53E+01	1 0E-03	2 6E-02	5 5E-05	NA	NA	NA	8 52E-09	NA	
ELCR Subtotals									3E-05		3E-06		2E-07	
												Estimated Total Risk =		**4E-05**

[a]Cancer WOE Classifications
- Group A. Human carcinogen
- Group B (B1, B2) Probable human carcinogen
- Group C Possible human carcinogen
- Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.18

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area E

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	9 04E+03	1 0E-03	1 0E+00	nervous system	nervous system	1 2E-02	1 2E-02	4 9E-05	4 9E-05	6 4E-06	1 3E-03	1 4E-02
Antimony	4 0E-04	6 0E-05	NA	1 41E+01	1 0E-03	1 5E-01	blood		1 9E-05	4 8E-02	7 7E-08	1 3E-03	9 9E-09	NA	5 0E-02
Arsenic	3 0E-04	3 0E-04	3 0E-05	1 37E+01	3 0E-02	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 9E-05	6 3E-02	2 3E-06	7 5E-03	9 7E-09	3 2E-04	7 1E-02
Chromium	NA	NA	NA	4 15E+01	1 0E-03	1 3E-02			5 7E-05	NA	NA	NA	2 9E-08	NA	
Iron	7 0E-01	7 0E-01	NA	1 66E+04	1 0E-03	1 0E+00	gastrointestinal		2 3E-02	3 3E-02	9 1E-05	1 3E-04	1 2E-05	NA	3 3E-02
Manganese	1 4E-01	5 6E-03	5 0E-05	8.41E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 2E-03	8 2E-03	4 6E-06	8 2E-04	5 9E-07	1 2E-02	2 1E-02
Thallium	6 5E-05	6 5E-05	NA	5 07E+00	1 0E-03	1 0E+00	blood		6 9E-06	1 1E-01	2 8E-08	4 3E-04	3 6E-09	NA	1 1E-01
Vanadium	7 0E-03	1 8E-04	NA	3 53E+01	1 0E-03	2 6E-02	kidney		4 8E-05	6 9E-03	1 9E-07	1 1E-03	2 5E-08	NA	8 0E-03
Subtotal Hazard Indices										2 8E-01		1 1E-02		1 3E-02	
														Total HI =	**3.0E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 6E-01
Total Gastrointestinal	3 3E-02
Total Nervous System	3 5E-02
Total Developmental	3 2E-04
Total Kidney	8 0E-03
Total Skin	7 0E-02
Total Cardiovascular	3 2E-04

APPENDIX N

TABLE 8.19

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area E

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	9 04E+03	0 001	1 0E+00	nervous system	nervous system	1 2E-01	1 2E-01	3 2E-04	3 2E-04	6 4E-06	1 3E-03	1 2E-01
Antimony	4 0E-04	6 0E-05	NA	1 41E+01	0 001	1 5E-01	blood		1 8E-04	4 5E-01	5 0E-07	8 4E-03	9 9E-09	NA	4 6E-01
Arsenic	3 0E-04	3 0E-04	3 0E-05	1 37E+01	0 030	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 8E-04	5 9E-01	1 5E-05	4 9E-02	9 7E-09	3 2E-04	6 3E-01
Chromium	NA	NA	NA	4 15E+01	0 001	1 3E-02			5 3E-04	NA	NA	NA	2 9E-08	NA	
Iron	7 0E-01	7 0E-01	NA	1 66E+04	0 001	1 0E+00	gastrointestinal		2 1E-01	3 0E-01	6 0E-04	8 5E-04	1 2E-05	NA	3 0E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	8 41E+02	0 001	4 0E-02	nervous system	nervous system	1 1E-02	7 7E-02	3 0E-05	5 4E-03	5 9E-07	1 2E-02	9 4E-02
Thallium	6 5E-05	6 5E-05	NA	5 07E+00	0 001	1 0E+00	blood		6 5E-05	1 0E+00	1 8E-07	2 8E-03	3 6E-09	NA	1 0E+00
Vanadium	7 0E-03	1 8E-04	NA	3 53E+01	0 001	2 6E-02	kidney		4 5E-04	6 4E-02	1 3E-06	6 9E-03	2 5E-08	NA	7 1E-02
Subtotal Hazard Indices										2 6E+00		7 4E-02		1 3E-02	
														Total HI =	**2 7E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 5E+00
Total Gastrointestinal	3 0E-01
Total Nervous System	2 1E-01
Total Developmental	3 2E-04
Total Kidney	7 1E-02
Total Skin	6 3E-01
Total Cardiovascular	3 2E-04

APPENDIX N

TABLE 8.20

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area F

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	9 31E+03	1.0E-03	1 0E+00	1 5E-02	NA	NA	NA	2 8E-06	NA	
Antimony	NA	NA	NA	NA	5 73E+00	1 0E-03	1 5E-01	8.9E-06	NA	NA	NA	1 7E-09	NA	
Arsenic	A	1 5E+00	1 5E+00	4 30E-03	8.49E+00	3.0E-02	9.5E-01	1 3E-05	2E-05	1.3E-06	2E-06	2 6E-09	1E-08	2E-05
Iron	NA	NA	NA	NA	1 65E+04	1.0E-03	1 0E+00	2.6E-02	NA	NA	NA	5 0E-06	NA	
Manganese	D	NA	NA	NA	7 76E+02	1 0E-03	4 0E-02	1 2E-03	NA	NA	NA	2 3E-07	NA	
Thallium	D	NA	NA	NA	2 18E+00	1 0E-03	1 0E+00	3 4E-06	NA	NA	NA	5 3E-10	NA	
Vanadium	NA	NA	NA	NA	3 20E+01	1 0E-03	2 6E-02	5.0E-05	NA	NA	NA	7 7E-09	NA	
ELCR Subtotals									2E-05		2E-06		1E-08	
												Estimated Total Risk =		**2E-05**

[a]Cancer WOE Classifications:
- Group A· Human carcinogen
- Group B (B1, B2): Probable human carcinogen
- Group C. Possible human carcinogen
- Group D: Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.21

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area F

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5.0E-03	9 31E+03	1 0E-03	1.0E+00	nervous system	nervous system	1 3E-02	1 3E-02	5 1E-05	5 1E-05	6 6E-06	1 3E-03	1 4E-02
Antimony	4 0E-04	6 0E-05	NA	5 73E+00	1 0E-03	1 5E-01	blood		7 8E-06	2 0E-02	3 1E-08	5 2E-04	4 0E-09	NA	2 0E-02
Arsenic	3 0E-04	3 0E-04	3 0E-05	8 49E+00	3 0E-02	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 2E-05	3 9E-02	1 4E-06	4 6E-03	6 0E-09	2 0E-04	4 4E-02
Iron	7 0E-01	7 0E-01	NA	1 65E+04	1 0E-03	1 0E+00	gastrointestinal		2 3E-02	3 2E-02	9 0E-05	1 3E-04	1 2E-05	NA	3 2E-02
Manganese	1 4E-01	5 6E-03	5 0E-05	7.76E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 1E-03	7 6E-03	4 2E-06	7 6E-04	5 5E-07	1 1E-02	1 9E-02
Thallium	6.5E-05	6 5E-05	NA	2 18E+00	1 0E-03	1 0E+00	blood		3 0E-06	4 6E-02	1 2E-08	1 8E-04	1 5E-09	NA	4 6E-02
Vanadium	7 0E-03	1 8E-04	NA	3 20E+01	1 0E-03	2 6E-02	kidney		4 4E-05	6 3E-03	1 8E-07	9 6E-04	2 3E-08	NA	7 2E-03
Subtotal Hazard Indices										1 6E-01		7 2E-03		1 2E-02	
														Total HI =	**1 8E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	6 6E-02
Total Gastrointestinal	3 2E-02
Total Nervous System	3 4E-02
Total Developmental	2 0E-04
Total Kidney	7 2E-03
Total Skin	4 3E-02
Total Cardiovascular	2 0E-04

APPENDIX N

TABLE 8.22

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area F

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	9 31E+03	0 001	1 0E+00	nervous system	nervous system	1 2E-01	1 2E-01	3 3E-04	3 3E-04	6 6E-06	1 3E-03	1 2E-01
Antimony	4 0E-04	6 0E-05	NA	5 73E+00	0 001	1 5E-01	blood		7 3E-05	1 8E-01	2 1E-07	3 4E-03	4 0E-09	NA	1 9E-01
Arsenic	3 0E-04	3 0E-04	3 0E-05	8 49E+00	0 030	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 1E-04	3 6E-01	9 1E-06	3 0E-02	6 0E-09	2 0E-04	3 9E-01
Iron	7 0E-01	7 0E-01	NA	1 65E+04	0 001	1 0E+00	gastrointestinal		2 1E-01	3 0E-01	5 9E-04	8 5E-04	1 2E-05	NA	3 0E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	7 76E+02	0 001	4 0E-02	nervous system	nervous system	9 9E-03	7 1E-02	2 8E-05	5 0E-03	5 5E-07	1 1E-02	8 7E-02
Thallium	6 5E-05	6 5E-05	NA	2 18E+00	0 001	1 0E+00	blood		2 8E-05	4 3E-01	7 8E-08	1 2E-03	1 5E-09	NA	4 3E-01
Vanadium	7.0E-03	1 8E-04	NA	3 20E+01	0 001	2 6E-02	kidney		4 1E-04	5 8E-02	1 1E-06	6 3E-03	2 3E-08	NA	6 5E-02
Subtotal Hazard Indices										1 5E+00		4 7E-02		1 2E-02	
														Total HI =	**1.6E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	6 2E-01
Total Gastrointestinal	3 0E-01
Total Nervous System	2 1E-01
Total Developmental	2 0E-04
Total Kidney	6 5E-02
Total Skin	3 9E-01
Total Cardiovascular.	2 0E-04

APPENDIX N

TABLE 8.23

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area G

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	1 09E+04	1.0E-03	1 0E+00	1 7E-02	NA	NA	NA	3 3E-06	NA	
Benzo(b)fluoranthene	B2	7 3E-01	7 3E-01	1 10E-04	8 19E-01	1 3E-01	1 0E+00	1 3E-06	9E-07	5 3E-07	4E-07	2 5E-10	3E-11	1E-06
Iron	NA	NA	NA	NA	1 85E+04	1 0E-03	1 0E+00	2 9E-02	NA	NA	NA	5 6E-06	NA	
Manganese	D	NA	NA	NA	9 02E+02	1 0E-03	4 0E-02	1 4E-03	NA	NA	NA	2 7E-07	NA	
Thallium	D	NA	NA	NA	5 19E+00	1 0E-03	1 0E+00	8 1E-06	NA	NA	NA	1 6E-09	NA	
Vanadium	NA	NA	NA	NA	3 72E+01	1.0E-03	2 6E-02	5 8E-05	NA	NA	NA	1 1E-08	NA	
ELCR Subtotals									9E-07		4E-07		3E-11	
													Estimated Total Risk =	**1E-06**

[a]Cancer WOE Classifications:
- Group A Human carcinogen
- Group B (B1, B2) Probable human carcinogen
- Group C Possible human carcinogen
- Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.24

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area G

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	1 09E+04	1 0E-03	1 0E+00	nervous system	nervous system	1 5E-02	1 5E-02	6 0E-05	6 0E-05	7 7E-06	1 5E-03	1 7E-02
Benzo(b)fluoranthene	NA	NA	NA	8 19E-01	1 3E-01	1 0E+00			1 1E-06	NA	NA	NA	5 8E-10	NA	
Iron	7 0E-01	7 0E-01	NA	1 85E+04	1.0E-03	1 0E+00	gastrointestinal		2 5E-02	3 6E-02	1 0E-04	1 4E-04	1 3E-05	NA	3 6E-02
Manganese	1 4E-01	5 6E-03	5 0E-05	9 02E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 2E-03	8 8E-03	4 9E-06	8 8E-04	6 4E-07	1 3E-02	2 2E-02
Thallium	6 5E-05	6 5E-05	NA	5 19E+00	1 0E-03	1 0E+00	blood		7 1E-06	1 1E-01	2 8E-08	4 4E-04	3 7E-09	NA	1 1E-01
Vanadium	7 0E-03	1 8E-04	NA	3 72E+01	1 0E-03	2 6E-02	kidney		5 1E-05	7 3E-03	2 0E-07	1 1E-03	2 6E-08	NA	8 4E-03
Subtotal Hazard Indices										1 8E-01		2 6E-03		1 4E-02	
														Total HI =	**1 9E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 1E-01
Total Gastrointestinal	3 6E-02
Total Nervous System	3 9E-02
Total Kidney	8 4E-03

APPENDIX N

TABLE 8.25

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area G

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	1 09E+04	0 001	1 0E+00	nervous system	nervous system	1 4E-01	1 4E-01	3 9E-04	3 9E-04	7 7E-06	1 5E-03	1 4E-01
Benzo(b)fluoranthene	NA	NA	NA	8 19E-01	0 130	1 0E+00			1 0E-05	NA	NA	NA	5 8E-10	NA	
Iron	7 0E-01	7 0E-01	NA	1 85E+04	0 001	1 0E+00	gastrointestinal		2 4E-01	3 4E-01	6 6E-04	9 4E-04	1 3E-05	NA	3 4E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	9 02E+02	0 001	4 0E-02	nervous system	nervous system	1 2E-02	8 2E-02	3 2E-05	5.8E-03	6 4E-07	1 3E-02	1 0E-01
Thallium	6 5E-05	6 5E-05	NA	5 19E+00	0 001	1 0E+00	blood		6 6E-05	1 0E+00	1 9E-07	2 9E-03	3 7E-09	NA	1 0E+00
Vanadium	7 0E-03	1 8E-04	NA	3 72E+01	0 001	3%	kidney		4 8E-04	6 8E-02	1 3E-06	7 3E-03	2 6E-08	NA	7 5E-02
Subtotal Hazard Indices										1 6E+00		1 7E-02		1 4E-02	
														Total HI =	**1.7E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 0E+00
Total Gastrointestinal	3 4E-01
Total Nervous System	2 4E-01
Total Kidney	7 5E-02

APPENDIX N

TABLE 8.26

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area H

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	8 01E+03	1.0E-03	1 0E+00	1.3E-02	NA	NA	NA	2 4E-06	NA	
Arsenic	A	1.5E+00	1 5E+00	4 30E-03	1.08E+01	3.0E-02	9 5E-01	1 7E-05	3E-05	1 6E-06	2E-06	3 3E-09	1E-08	3E-05
Iron	NA	NA	NA	NA	1 51E+04	1 0E-03	1 0E+00	2 4E-02	NA	NA	NA	4 6E-06	NA	
Manganese	D	NA	NA	NA	6 19E+02	1.0E-03	4 0E-02	9 7E-04	NA	NA	NA	1.9E-07	NA	
Silver	D	NA	NA	NA	6 80E+01	1 0E-03	4.0E-02	1.1E-04	NA	NA	NA	2 1E-08	NA	
Thallium	D	NA	NA	NA	4 52E+00	1 0E-03	1 0E+00	7 1E-06	NA	NA	NA	1 4E-09	NA	
ELCR Subtotals									3E-05		2E-06		1E-08	
												Estimated Total Risk =		**3E-05**

[a]Cancer WOE Classifications
- Group A: Human carcinogen
- Group B (B1, B2): Probable human carcinogen
- Group C. Possible human carcinogen
- Group D· Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N
TABLE 8.27
Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario
St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missoun - Area H

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	8 01E+03	1 0E-03	1 0E+00	nervous system	nervous system	1 1E-02	1 1E-02	4 4E-05	4 4E-05	5 6E-06	1 1E-03	1 2E-02
Arsenic	3 0E-04	3 0E-04	3 0E-05	1.08E+01	3 0E-02	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 5E-05	4 9E-02	1 8E-06	5 9E-03	7 6E-09	2 5E-04	5 5E-02
Iron	7 0E-01	7 0E-01	NA	1 51E+04	1 0E-03	1 0E+00	gastrointestinal		2 1E-02	3 0E-02	8 3E-05	1 2E-04	1 1E-05	NA	3 0E-02
Manganese	1 4E-01	5 6E-03	5 0E-05	6 19E+02	1 0E-03	4 0E-02	nervous system	nervous system	8 5E-04	6 1E-03	3 4E-06	6 0E-04	4 4E-07	8 7E-03	1 5E-02
Silver	5 0E-03	2 0E-04	NA	6 80E+01	1 0E-03	4 0E-02	skin		9 3E-05	1 9E-02	3 7E-07	1 9E-03	4 8E-08	NA	2 0E-02
Thallium	6 5E-05	6 5E-05	NA	4 52E+00	1 0E-03	1 0E+00	blood		6 2E-06	9 5E-02	2 5E-08	3 8E-04	3 2E-09	NA	9 6E-02
Subtotal Hazard Indices										2 1E-01		8 9E-03		1 0E-02	
														Total HI =	**2 3E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	9 6E-02
Total Gastrointestinal	3 0E-02
Total Nervous System	2 8E-02
Total Developmental	2 5E-04
Total Skin	2 0E-02
Total Cardiovascular	2 5E-04

APPENDIX N

TABLE 8.28

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area H

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	8 01E+03	0 001	1 0E+00	nervous system	nervous system	1 0E-01	1 0E-01	2 9E-04	2 9E-04	5 6E-06	1 1E-03	1 0E-01
Arsenic	3 0E-04	3 0E-04	3 0E-05	1 08E+01	0 030	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 4E-04	4 6E-01	1 2E-05	3 9E-02	7 6E-09	2 5E-04	5 0E-01
Iron	7 0E-01	7 0E-01	NA	1 51E+04	0 001	1 0E+00	gastrointestinal		1 9E-01	2 8E-01	5 4E-04	7 7E-04	1 1E-05	NA	2 8E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	6 19E+02	0 001	4 0E-02	nervous system	nervous system	7 9E-03	5 7E-02	2 2E-05	4 0E-03	4 4E-07	8 7E-03	6 9E-02
Silver	5.0E-03	2 0E-04	NA	6 80E+01	0 001	4 0E-02	skin		8 7E-04	1 7E-01	2 4E-06	1 2E-02	4 8E-08	NA	1 9E-01
Thallium	6 5E-05	6 5E-05	NA	4 52E+00	0 001	100%	blood		5 8E-05	8 9E-01	1 6E-07	2 5E-03	3 2E-09	NA	8 9E-01
Subtotal Hazard Indices										2 0E+00		5 8E-02		1 0E-02	
														Total HI =	**2.0E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	8 9E-01
Total Gastrointestinal	2 8E-01
Total Nervous System	1 7E-01
Total Developmental	2 5E-04
Total Skin	1 9E-01
Total Cardiovascular	2 5E-04

APPENDIX N

TABLE 8.29

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri - Area I

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	8.81E+03	1 0E-03	1 0E+00	1 4E-02	NA	NA	NA	2 7E-06	NA	NA
Iron	NA	NA	NA	NA	1.65E+04	1 0E-03	1 0E+00	2 6E-02	NA	NA	NA	5 0E-06	NA	NA
Manganese	D	NA	NA	NA	9 21E+02	1 0E-03	4.0E-02	1 4E-03	NA	NA	NA	2 8E-07	NA	NA
Thallium	D	NA	NA	NA	5 78E+00	1 0E-03	1.0E+00	9 0E-06	NA	NA	NA	1 7E-09	NA	NA
ELCR Subtotals									NA		NA		NA	
												Estimated Total Risk =		**NA**

[a]Cancer WOE Classifications
Group A: Human carcinogen
Group B (B1, B2) Probable human carcinogen
Group C Possible human carcinogen
Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N

TABLE 8.30

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area I

										Ingestion		Dermal		Inhalation		
COPC	WOE[a]	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	NA	1 0E+00	1 0E+00	5 0E-03	8 81E+03	1 0E-03	1 0E+00	nervous system	nervous system	1 2E-02	1 2E-02	4 8E-05	4 8E-05	6 2E-06	1 2E-03	1 3E-02
Iron	NA	7 0E-01	7 0E-01	NA	1 65E+04	1 0E-03	1 0E+00	gastrointestinal		2 3E-02	3 2E-02	9 0E-05	1 3E-04	1 2E-05	NA	3 2E-02
Manganese	D	1 4E-01	5 6E-03	5 0E-05	9 21E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 3E-03	9 0E-03	5 0E-06	9 0E-04	6 5E-07	1 3E-02	2 3E-02
Thallium	D	6 5E-05	6 5E-05	NA	5 78E+00	1 0E-03	1 0E+00	blood		7 9E-06	1 2E-01	3 2E-08	4 9E-04	4 1E-09	NA	1 2E-01
Subtotal Hazard Indices											1 8E-01		1 6E-03		1 4E-02	
															Total HI =	**1 9E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 2E-01
Total Gastrointestinal	3 2E-02
Total Nervous System	3 6E-02

APPENDIX N
TABLE 8.31
Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario
St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun - Area I

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	8 81E+03	0 001	1 0E+00	nervous system	nervous system	1 1E-01	1 1E-01	3 2E-04	3 2E-04	6 2E-06	1 2E-03	1 1E-01
Iron	7 0E-01	7 0E-01	NA	1 65E+04	0 001	1 0E+00	gastrointestinal		2 1E-01	3 0E-01	5 9E-04	8 5E-04	1 2E-05	NA	3 0E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	9 21E+02	0 001	4 0E-02	nervous system	nervous system	1 2E-02	8 4E-02	3 3E-05	5 9E-03	6 5E-07	1 3E-02	1 0E-01
Thallium	6 5E-05	6 5E-05	NA	5 78E+00	0 001	1 0E+00	blood		7 4E-05	1 1E+00	2 1E-07	3 2E-03	4 1E-09	NA	1 1E+00
Subtotal Hazard Indices										1 6E+00		1 0E-02		1 4E-02	
														Total HI =	**1 7E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1.1E+00
Total Gastrointestinal	3 0E-01
Total Nervous System	2 2E-01

APPENDIX N

TABLE 8.32

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area J

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	8 43E+03	1.0E-03	1 0E+00	1 3E-02	NA	NA	NA	2 5E-06	NA	
Arsenic	A	1.5E+00	1 5E+00	4.30E-03	1.29E+01	3 0E-02	9 5E-01	2 0E-05	3E-05	1 9E-06	3E-06	3.9E-09	2E-08	3E-05
Benzo(b)fluoranthene	B2	7 3E-01	7 3E-01	1 10E-04	4 65E-01	1 3E-01	1 0E+00	7.3E-07	5E-07	3 0E-07	2E-07	1 4E-10	2E-11	7E-07
Copper	NA	NA	NA	NA	2 13E+02	1.0E-03	1.0E+00	3 3E-04	NA	NA	NA	6 4E-08	NA	
Iron	NA	NA	NA	NA	1 73E+04	1.0E-03	1 0E+00	2 7E-02	NA	NA	NA	5 2E-06	NA	
Manganese	D	NA	NA	NA	7 57E+02	1 0E-03	4.0E-02	1 2E-03	NA	NA	NA	1 8E-07	NA	
Thallium	D	NA	NA	NA	8 64E+00	1.0E-03	1 0E+00	1 3E-05	NA	NA	NA	2 1E-09	NA	
ELCR Subtotals									3E-05		3E-06		2E-08	
												Estimated Total Risk =		**3E-05**

[a]Cancer WOE Classifications:
- Group A Human carcinogen
- Group B (B1, B2): Probable human carcinogen
- Group C Possible human carcinogen
- Group D: Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N
TABLE 8.33
Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area J

										Ingestion		Dermal		Inhalation		
COPC	WOE[a]	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	NA	1.0E+00	1 0E+00	5.0E-03	8 43E+03	1 0E-03	1 0E+00	nervous system	nervous system	1 2E-02	1 2E-02	4 6E-05	4 6E-05	5 9E-06	1 2E-03	1 3E-02
Arsenic	A	3.0E-04	3 0E-04	3 0E-05	1.29E+01	3 0E-02	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 8E-05	5 9E-02	2 1E-06	7 1E-03	9 1E-09	3 0E-04	6 6E-02
Benzo(b)fluoranthene	B2	NA	NA	NA	4 65E-01	1 3E-01	1 0E+00			6 4E-07	NA	NA	NA	3 3E-10	NA	
Copper	NA	4 0E-02	4 0E-02	NA	2 13E+02	1 0E-03	1 0E+00	gastrointestinal		2 9E-04	7 3E-03	1 2E-06	2 9E-05	1 5E-07	NA	7 3E-03
Iron	NA	7 0E-01	7 0E-01	NA	1 73E+04	1 0E-03	1 0E+00	gastrointestinal		2 4E-02	3 4E-02	9 4E-05	1 3E-04	1 2E-05	NA	3 4E-02
Manganese	D	1 4E-01	5.6E-03	5 0E-05	7 57E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 0E-03	7 4E-03	4 1E-06	7 4E-04	5 3E-07	1 1E-02	1 9E-02
Thallium	D	6.5E-05	6 5E-05	NA	8 64E+00	1 0E-03	1 0E+00	blood		1 2E-05	1 8E-01	4 7E-08	7 3E-04	6 1E-09	NA	1 8E-01
Subtotal Hazard Indices											3 0E-01		8 7E-03		1 2E-02	
															Total HI =	**3 2E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 8E-01
Total Gastrointestinal	4 1E-02
Total Nervous System	3 2E-02
Total Skin	6 6E-02
Total Cardiovascular	3 0E-04
Total Developmental	3 0E-04

APPENDIX N

TABLE 8.34

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area J

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5.0E-03	8 43E+03	0 001	1 0E+00	nervous system	nervous system	1 1E-01	1 1E-01	3 0E-04	3 0E-04	5 9E-06	1 2E-03	1 1E-01
Arsenic	3 0E-04	3 0E-04	3 0E-05	1 29E+01	0 030	9 5E-01	skin	developmental, cardiovascular system, nervous system	1 6E-04	5 5E-01	1 4E-05	4 6E-02	9 1E-09	3 0E-04	6 0E-01
Benzo(b)fluoranthene	NA	NA	NA	4 65E-01	0 130	1 0E+00			5 9E-06	NA	NA	NA	3 3E-10	NA	
Copper	4 0E-02	4 0E-02	NA	2 13E+02	0 001	1 0E+00	gastrointestinal		2 7E-03	6 8E-02	7 6E-06	1 9E-04	1 5E-07	NA	6 8E-02
Iron	7 0E-01	7 0E-01	NA	1 73E+04	0 001	1 0E+00	gastrointestinal		2 2E-01	3 2E-01	6 2E-04	8 8E-04	1 2E-05	NA	3 2E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	7 57E+02	0 001	4 0E-02	nervous system	nervous system	9 7E-03	6 9E-02	2 7E-05	4 8E-03	5 3E-07	1 1E-02	8 5E-02
Thallium	6 5E-05	6 5E-05	NA	8 64E+00	0 001	1 0E+00	blood		1 1E-04	1 7E+00	3 1E-07	4 8E-03	6 1E-09	NA	1 7E+00
Subtotal Hazard Indices										2 8E+00		5 7E-02		1 2E-02	
														Total HI =	**2.9E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1.7E+00
Total Gastrointestinal	3 8E-01
Total Nervous System	1 9E-01
Total Skin	6 0E-01
Total Cardiovascular	3 0E-04
Total Developmental	3 0E-04

APPENDIX N

TABLE 8.35

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area K

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	9 41E+03	1 0E-03	1.0E+00	1 5E-02	NA	NA	NA	2 8E-06	NA	NA
Iron	NA	NA	NA	NA	1 65E+04	1 0E-03	1.0E+00	2 6E-02	NA	NA	NA	5 0E-06	NA	NA
Manganese	D	NA	NA	NA	8 42E+02	1 0E-03	4 0E-02	1 3E-03	NA	NA	NA	2 5E-07	NA	NA
Thallium	D	NA	NA	NA	7 67E+00	1.0E-03	1 0E+00	1 2E-05	NA	NA	NA	2 3E-09	NA	NA
Vanadium	NA	NA	NA	NA	3 30E+01	1.0E-03	2 6E-02	5 2E-05	NA	NA	NA	1 0E-08	NA	NA
ELCR Subtotals									NA		NA		NA	
												Estimated Total Risk =		**NA**

[a]Cancer WOE Classifications:
- Group A Human carcinogen
- Group B (B1, B2) Probable human carcinogen
- Group C: Possible human carcinogen
- Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N
TABLE 8 36
Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario
St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area K

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1 0E+00	1 0E+00	5 0E-03	9 41E+03	1 0E-03	1 0E+00	nervous system	nervous system	1 3E-02	1 3E-02	5 1E-05	5 1E-05	6 6E-06	1 3E-03	1 4E-02
Iron	7 0E-01	7 0E-01	NA	1 65E+04	1 0E-03	1 0E+00	gastrointestinal		2 3E-02	3 2E-02	9 0E-05	1 3E-04	1 2E-05	NA	3 2E-02
Manganese	1 4E-01	5 6E-03	5 0E-05	8 42E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 2E-03	8 2E-03	4 6E-06	8 2E-04	5 9E-07	1 2E-02	2 1E-02
Thallium	6 5E-05	6 5E-05	NA	7 67E+00	1 0E-03	1 0E+00	blood		1 1E-05	1 6E-01	4 2E-08	6 4E-04	5 4E-09	NA	1 6E-01
Vanadium	7 0E-03	1 8E-04	NA	3 30E+01	1 0E-03	2 6E-02	kidney		4 5E-05	6 5E-03	1 8E-07	9 9E-04	2 3E-08	NA	7 4E-03
Subtotal Hazard Indices										2 2E-01		2 6E-03		1 3E-02	
														Total HI =	**2.4E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	1 6E-01
Total Gastrointestinal	3 2E-02
Total Nervous System	3 5E-02
Total Kidney	7 4E-03

APPENDIX N

TABLE 8.37

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri - Area K

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1 0E+00	5 0E-03	9 41E+03	0 001	1 0E+00	nervous system	nervous system	1 2E-01	1 2E-01	3 4E-04	3 4E-04	6 6E-06	1 3E-03	1 2E-01
Iron	7 0E-01	7 0E-01	NA	1 65E+04	0 001	1 0E+00	gastrointestinal		2 1E-01	3 0E-01	5 9E-04	8 4E-04	1 2E-05	NA	3 0E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	8 42E+02	0 001	4 0E-02	nervous system	nervous system	1 1E-02	7 7E-02	3 0E-05	5 4E-03	5 9E-07	1 2E-02	9 4E-02
Thallium	6 5E-05	6 5E-05	NA	7 67E+00	0 001	1 0E+00	blood		9 8E-05	1 5E+00	2 7E-07	4 2E-03	5 4E-09	NA	1 5E+00
Vanadium	7 0E-03	1 8E-04	NA	3 30E+01	0 001	2 6E-02	kidney		4 2E-04	6 0E-02	1 2E-06	6 5E-03	2 3E-08	NA	6 7E-02
Subtotal Hazard Indices										2 1E+00		1 7E-02		1 3E-02	
														Total HI =	**2 1E+00**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	**1.5E+00**
Total Gastrointestinal	3 0E-01
Total Nervous System	2 2E-01
Total Kidney	6 7E-02

APPENDIX N

TABLE 8.38

Potential Excess Lifetime Cancer Risk from Soil (0-10 feet) - Adult/Child (Age-Adjusted) Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri - Area L

								Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAD (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
Aluminum	NA	NA	NA	NA	8 59E+03	1.0E-03	1.0E+00	1 3E-02	NA	NA	NA	2 6E-06	NA	
cis-1,2-Dichloroethene	D	NA	NA	NA	2 88E-01	NA	1.0E+00	4 5E-07	NA	NA	NA	5 8E-05	NA	
Iron	NA	NA	NA	NA	1.78E+04	1.0E-03	1.0E+00	2 8E-02	NA	NA	NA	5 4E-06	NA	
Manganese	D	NA	NA	NA	8 57E+02	1 0E-03	4 0E-02	1 3E-03	NA	NA	NA	2.6E-07	NA	
Selenium	D	NA	NA	NA	6 42E+00	1 0E-03	1 0E+00	1 0E-05	NA	NA	NA	1 9E-09	NA	
Tetrachloroethene	NA	5 4E-01	5 4E-01	5 90E-06	2 60E+00	NA	1 0E+00	4 1E-06	2E-06	1.3E-05	7E-06	6 0E-04	4E-06	1E-05
Thallium	D	NA	NA	NA	2.36E+00	1 0E-03	1.0E+00	3 7E-06	NA	NA	NA	7 1E-10	NA	
Trichloroethene	NA	1 3E-02	1 3E-02	2.00E-06	3 79E-01	NA	1 0E+00	5 9E-07	8E-09	1 9E-06	2E-08	6 8E-05	1E-07	2E-07
Vanadium	NA	NA	NA	NA	3 99E+01	1 0E-03	2 6E-02	6 2E-05	NA	NA	NA	1 2E-08	NA	
ELCR Subtotals									2E-06		7E-06		4E-06	
													Estimated Total Risk =	**1E-05**

[a]Cancer WOE Classifications:
Group A Human carcinogen
Group B (B1, B2): Probable human carcinogen
Group C: Possible human carcinogen
Group D Not classifiable

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
ELCR = excess lifetime cancer risk
EPC = exposure point concentration
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
SF_d = dermal slope factor
SF_o = oral slope factor
$\mu g/m^3$ = microgram per cubic meter
URF = Inhalation unit risk factor
WOE = weight of evidence

APPENDIX N
TABLE 8.39
Potential Noncarcinogenic Risk from Soil (0-10 feet) - Adult Resident RME Scenario
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missoun - Area L

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1 0E+00	5 0E-03	8 59E+03	1 0E-03	1 0E+00	nervous system	nervous system	1 2E-02	1 2E-02	4 7E-05	4 7E-05	6 1E-06	1 2E-03	1 3E-02
cis-1,2-Dichloroethene	1 0E-02	1 0E-02	NA	2 88E-01	NA	1 0E+00	blood		3 9E-07	3 9E-05	1 6E-06	1 6E-04	1 4E-04	NA	2 0E-04
Iron	7 0E-01	7 0E-01	NA	1 78E+04	1 0E-03	1 0E+00	gastrointestinal		2 4E-02	3 5E-02	9 8E-05	1 4E-04	1 3E-05	NA	3 5E-02
Manganese	1 4E-01	5 6E-03	5 0E-05	8 57E+02	1 0E-03	4 0E-02	nervous system	nervous system	1 2E-03	8 4E-03	4 7E-06	8 4E-04	6 0E-07	1 2E-02	2 1E-02
Selenium	5.0E-03	5 0E-03	NA	6 42E+00	1 0E-03	1 0E+00	whole body		8 8E-06	1 8E-03	3 5E-08	7 0E-06	4 5E-09	NA	1 8E-03
Tetrachloroethene	1 0E-02	1 0E-02	2 7E-01	2 60E+00	NA	1 0E+00	liver	nervous system	3 6E-06	3 6E-04	1 4E-05	1 4E-03	1 4E-03	5 2E-03	6 9E-03
Thallium	6 5E-05	6 5E-05	NA	2 36E+00	1 0E-03	1 0E+00	blood		3 2E-06	5 0E-02	1 3E-08	2 0E-04	1 7E-09	NA	5 0E-02
Trichloroethene	NA	NA	6 0E-01	3 79E-01	NA	1 0E+00		nervous system, eyes	5 2E-07	NA	NA	NA	1 6E-04	2 7E-04	2 7E-04
Vanadium	7 0E-03	1 8E-04	NA	3 99E+01	1 0E-03	2 6E-02	kidney		5 5E-05	7 8E-03	2 2E-07	1 2E-03	2 8E-08	NA	9 0E-03
Subtotal Hazard Indices										1 1E-01		4 0E-03		1 9E-02	
														Total HI =	**1 4E-01**

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	5 0E-02
Total Gastrointestinal	3 5E-02
Total Nervous System	4 0E-02
Total Whole Body	1 8E-03
Total Kidney	9 0E-03
Total Liver	1 8E-03
Total Eyes	2 7E-04

APPENDIX N

TABLE 8.40

Potential Noncarcinogenic Risk from Soil (0-10 feet) - Child Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri - Area L

									Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Soil EPC (mg/kg)	ABS_d	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAD (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
Aluminum	1.0E+00	1 0E+00	5 0E-03	8 59E+03	0 001	1 0E+00	nervous system	nervous system	1 1E-01	1 1E-01	3 1E-04	3 1E-04	6 1E-06	1 2E-03	1 1E-01
cis-1,2-Dichloroethene	1 0E-02	1.0E-02	NA	2 88E-01	NA	1 0E+00	blood		3 7E-06	3 7E-04	1 0E-05	1 0E-03	1 4E-04	NA	1 4E-03
Iron	7 0E-01	7 0E-01	NA	1 78E+04	0 001	1 0E+00	gastrointestinal		2 3E-01	3 3E-01	6 4E-04	9 1E-04	1 3E-05	NA	3 3E-01
Manganese	1 4E-01	5 6E-03	5 0E-05	8 57E+02	0.001	4 0E-02	nervous system	nervous system	1 1E-02	7 8E-02	3 1E-05	5 5E-03	6 0E-07	1 2E-02	9 6E-02
Selenium	5 0E-03	5 0E-03	NA	6 42E+00	0 001	1 0E+00	whole body		8 2E-05	1 6E-02	2 3E-07	4 6E-05	4 5E-09	NA	1 6E-02
Tetrachloroethene	1 0E-02	1 0E-02	2 7E-01	2 60E+00	NA	1 0E+00	liver	nervous system	3 3E-05	3 3E-03	9 3E-05	9 3E-03	1 4E-03	5 2E-03	1 8E-02
Thallium	6 5E-05	6 5E-05	NA	2 36E+00	0 001	1 0E+00	blood		3 0E-05	4 6E-01	8 4E-08	1 3E-03	1 7E-09	NA	4 7E-01
Trichloroethene	NA	NA	6 0E-01	3 79E-01	NA	1 0E+00		nervous system, eyes	4 8E-06	NA	NA	NA	1 6E-04	2 7E-04	2 7E-04
Vanadium	7 0E-03	1 8E-04	NA	3 99E+01	0 001	2 6E-02	kidney		5 1E-04	7 3E-02	1 4E-06	7 9E-03	2 8E-08	NA	8 1E-02
Subtotal Hazard Indices										1 1E+00		2 6E-02		1 9E-02	
														Total HI =	***1.1E+00***

ABS_d = dermal absorption factor
ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
DAC = daily average concentration
DAD = dermally absorbed dose
EPC = exposure point concentration
HI = Hazard Index
HQ = Hazard Quotient
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter
RfC = reference concentration
RfD_d = dermal reference dose
RfD_o = oral reference dose

Total Blood	4 7E-01
Total Gastrointestinal	3 3E-01
Total Nervous System	2 1E-01
Total Whole Body	1 6E-02
Total Kidney	8 1E-02
Total Liver	1 3E-02
Total Eyes	2 7E-04

Risk Assessment Guidance for Superfund: Table 9

APPENDIX N
TABLE 9.1
Potential Excess Lifetime Cancer Risk from Groundwater (Downgradient of Building 220) - Construction Worker RME Scenario
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

									Dermal		Inhalation		
COPC	WOE[a]	SF_o (mg/kg-day)$^{-1}$	SF_d (mg/kg-day)$^{-1}$	URF (µg/m^3)$^{-1}$	Groundwater EPC (mg/L)	Ambient Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	CDI (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
1,1,1,2-Tetrachloroethane	C	2 6E-02	2 6E-02	7.4E-06	1.60E-02	5.43E-04	9.35E-07	1 00E+00	4 24E-09	1.10E-10	5 23E-08	3 87E-10	4.97E-10
1,1,2,2-Tetrachloroethane	C	2 0E-01	2 0E-01	5.8E-05	5.80E-04	1 97E-05	1 52E-08	1 00E+00	6.89E-11	1.38E-11	1 89E-09	1 10E-10	1.24E-10
1,1,2-Trichloroethane	C	5.7E-02	5.7E-02	1 6E-05	2.30E-03	8.81E-05	4 70E-08	1 00E+00	2.13E-10	1.21E-11	8 48E-09	1 36E-10	1 48E-10
1,2-Dichloroethane (EDC)	B2	9 1E-02	9 1E-02	2 6E-05	1 89E-01	7 87E-03	2.18E-06	1 00E+00	9 89E-09	9.00E-10	7.58E-07	1 97E-08	2 06E-08
Benzene	A	5.5E-02	5 5E-02	7.8E-06	4 00E-03	1.69E-04	1.50E-07	1.00E+00	6 79E-10	3.74E-11	1 63E-08	1.27E-10	1 64E-10
Carbon tetrachloride	B2	1.3E-01	1 3E-01	1.5E-05	4 16E+00	1 64E-01	2 39E-04	1.00E+00	1 09E-06	1 41E-07	1.58E-05	2 37E-07	3.78E-07
Chloroform	B1	3.1E-02	3.1E-02	2.3E-05	7.90E-01	3 38E-02	1 60E-05	1 00E+00	7.26E-08	2 25E-09	3.25E-06	7.47E-08	7 70E-08
cis-1,2-Dichloroethene	D	NA	NA	NA	2 73E-01	1.26E-02	5 65E-06	1 00E+00	2.56E-08	NA	1 22E-06	NA	NA
Naphthalene	C	NA	NA	3.4E-05	1 01E-02	3 37E-04	1.41E-06	1 00E+00	6.41E-09	NA	3 24E-08	1 10E-09	1.10E-09
Tetrachloroethene	NA	5 4E-01	5 4E-01	5 9E-06	3.49E+01	1.31E+00	4 34E-03	1 00E+00	1.97E-05	1 06E-05	1 26E-04	7 46E-07	1 14E-05
trans-1,2-Dichloroethene	NA	NA	NA	NA	1 20E-02	5.77E-04	3 35E-07	1 00E+00	1.52E-09	NA	5 56E-08	NA	NA
Trichloroethene	NA	1.3E-02	1 3E-02	2 0E-06	1 15E+00	4 61E-02	4 16E-05	1 00E+00	1.89E-07	2 46E-09	4.44E-06	8 88E-09	1 13E-08
Vinyl chloride	A	7.2E-01	7.2E-01	4.4E-06	3 20E-04	3 40E-06	4.39E-09	1 00E+00	1 99E-11	1.44E-11	3 28E-10	1 44E-12	1.58E-11
Estimated Subtotal										1 08E-05		1 09E-06	
											Estimated Total Risk =		**1.19E-05**

[a]Cancer WOE Classifications
Group B (B1, B2) Probable human carcinogen

ABS_{gi} = gastrointestinal absorption factor
COPC = Chemical of Potential Concern
CDI = chronic daily intake (mg/kg-day)
ELCR = excess lifetime cancer risk
EPC = exposure point concentration (mg/L)
SF_d = dermal slope factor
SF_o = oral slope factor
URF = Inhalation unit risk factor
WOE = weight of evidence
DAevent = Absorbed dose per event
DAC = daily average concentration
mg/m^3 = microgram per cubic meter
mg/m^3 = milligrams per cubic meter
mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day

APPENDIX N

TABLE 9.2

Potential Noncarcinogenic Risk from Groundwater (Downgradient of Building 220) - Construction Worker RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

										Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Ambient Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,1,1,2-Tetrachloroethane	3.0E-02	3 0E-02	NA	1 60E-02	5 43E-04	9.35E-07	1 00E+00	kidney, liver		3 62E-06	1.21E-04	4.45E-05	NA	1 21E-04
1,1,2,2-Tetrachloroethane	4 0E-03	4.0E-03	NA	5 80E-04	1 97E-05	1 52E-08	1 00E+00	liver		5.87E-08	1 47E-05	1.61E-06	NA	1 47E-05
1,1,2-Trichloroethane	4 0E-03	4 0E-03	NA	2 30E-03	8 81E-05	4 70E-08	1 00E+00	blood		1.82E-07	4 54E-05	7.22E-06	NA	4 54E-05
1,2-Dichloroethane (EDC)	2 0E-02	2.0E-02	2 4E+00	1 89E-01	7 87E-03	2.18E-06	1 00E+00	kidney, liver	kidney, liver	8 42E-06	4 21E-04	6.45E-04	2 69E-04	6 90E-04
Benzene	4 0E-03	4 0E-03	3 0E-02	4 00E-03	1 69E-04	1.50E-07	1 00E+00	blood	blood	5.79E-07	1.45E-04	1 39E-05	4 62E-04	6 06E-04
Carbon tetrachloride	7 0E-04	7.0E-04	1.9E-01	4 16E+00	1 64E-01	2 39E-04	1 00E+00	liver	liver	9.26E-04	1 32E+00	1 35E-02	7.09E-02	1 39E+00
Chloroform	1 0E-02	1 0E-02	9 8E-02	7 90E-01	3 38E-02	1 60E-05	1.00E+00	liver	liver	6 19E-05	6 19E-03	2.77E-03	2 82E-02	3 44E-02
cis-1,2-Dichloroethene	1 0E-02	1 0E-02	NA	2 73E-01	1 26E-02	5 65E-06	1 00E+00	blood		2 18E-05	2 18E-03	1.04E-03	NA	2 18E-03
Naphthalene	2 0E-02	2 0E-02	3 0E-03	1 01E-02	3 37E-04	1 41E-06	1.00E+00	whole body	respiratory	5.46E-06	2.73E-04	2.76E-05	9 20E-03	9 48E-03
Tetrachloroethene	1 0E-02	1 0E-02	2 7E-01	3.49E+01	1 31E+00	4 34E-03	1 00E+00	liver	nervous system	1.68E-02	1 68E+00	1 08E-01	3.99E-01	2.08E+00
trans-1,2-Dichloroethene	2 0E-02	2 0E-02	6 0E-02	1 20E-02	5 77E-04	3 35E-07	1.00E+00	kidney	kidney	1.30E-06	6.48E-05	4 74E-05	7.89E-04	8 54E-04
Trichloroethene	NA	NA	6 0E-01	1 15E+00	4 61E-02	4 16E-05	1 00E+00		nervous system, eyes	1 61E-04	NA	3 78E-03	6 36E-03	6.36E-03
Vinyl chloride	3 0E-03	3 0E-03	1 0E-01	3 20E-04	3 40E-06	4 39E-09	1 00E+00	liver	liver	1 70E-08	5.66E-06	2.79E-07	2 79E-06	8.45E-06
Subtotal Hazard Indices											3 01E+00		5.15E-01	
													Total HI =	**3.53E+00**

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
HQ = hazard quotient
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney	1.7E-03
Total Liver	3.1E+00
Total Blood	2 8E-03
Total Nervous System	4.1E-01
Total Eyes	6 4E-03
Total Whole Body	2 7E-04
Total Respiratory	9 2E-03

APPENDIX N
TABLE 9.1 AND 9.2 SUPPLEMENT A
Calculation of DAevent - Construction Worker RME Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical of Potential Concern	Surface Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (t_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm²-event)	Eq
1,1,1,2-Tetrachloroethane	1.60E+01	1.6E-02	7.8E-02	9.2E-01	2.2E+00	1.0E+00	2.0	9.4E-07	2
1,1,2,2-Tetrachloroethane	5.80E-01	6.9E-03	3.5E-02	9.3E-01	2.2E+00	1.0E+00	2.0	1.5E-08	2
1,1,2-Trichloroethane	2.30E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	2.0	4.7E-08	3
1,2-Dichloroethane (EDC)	1.89E+02	4.2E-03	1.6E-02	3.8E-01	9.2E-01	1.0E+00	2.0	2.2E-06	3
Benzene	4.00E+00	1.5E-02	5.1E-02	2.9E-01	7.0E-01	1.0E+00	2.0	1.5E-07	3
Carbon tetrachloride	4.16E+03	1.6E-02	7.8E-02	7.8E-01	1.9E+00	1.0E+00	2.0	2.4E-04	3
Chloroform	7.90E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	2.0	1.6E-05	3
cis-1,2-Dichloroethene	2.73E+02	7.7E-03	2.9E-02	3.7E-01	8.8E-01	1.0E+00	2.0	5.7E-06	3
Naphthalene	1.01E+01	4.7E-02	2.0E-01	5.6E-01	1.3E+00	1.0E+00	2.0	1.4E-06	3
Tetrachloroethene	3.49E+04	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	2.0	4.3E-03	2
trans-1,2-Dichloroethene	1.20E+01	1.0E-02	3.9E-02	3.7E-01	8.8E-01	1.0E+00	2.0	3.4E-07	3
Trichloroethene	1.15E+03	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	2.0	4.2E-05	3
Vinyl chloride	3.20E-01	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	2.0	4.4E-09	3

Inorganics: DAevent (mg/cm²-event) =

DA_{event} = Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm³ (Eq 1)

Organics: DAevent (mg/cm²-event) =

DA_{event} = t_{event}<t*: DA_{event} (mg/cm²-event) =
2 x FA x Kp x Cw x (sqrt((6 x τ x t_{event}) / (3.1415))) x CF1 x CF2 (Eq 2)

t_{event}>t*: DA_{event} (mg/cm²-event) =
FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x ((1 + 3B + 3B²)/(1+B)²)) xCF1 x CF2 (Eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final)*. EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

APPENDIX N
TABLE 9.1 AND 9.2 SUPPLEMENT B
Calculation of Constituent Concentrations in Air from Standing Water - Construction Worker RME Scenario
St Louis Ordnance Plant, Former Hanley Area - St Louis, Missouri

Chemical	Concentration in Water (mg/L)	Concentration in Water (g/m³) C_L	Dimensionless Henry's Law Constant (H') K_{eq}	Diffusion coefficient in air (cm²/s) D_a	Diffusion coefficient in water (cm²/s) D_w	Schmidt Number Sc_g	Effective diameter of source (m) d_e	Liquid-phase mass transfer coef (m/s) k_L	k_G (m/s)	1/K	K (m/s)	E (g/s)	Concentration in Air (mg/m³) C_{air}
1,1,1,2-Tetrachloroethane	1 60E-02	1.60E-02	1 41E-02	7 10E-02	7 90E-06	2 12E+00	1 13E+01	2.65E-06	2 23E-03	4 09E+05	2 44E-06	3 91E-06	5 43E-04
1,1,2,2-Tetrachloroethane	5 80E-04	5 80E-04	1 41E-02	7 10E-02	7 90E-06	2 12E+00	1 13E+01	2.65E-06	2.23E-03	4 09E+05	2 44E-06	1 42E-07	1 97E-05
1,1,2-Trichloroethane	2 30E-03	2 30E-03	3.74E-02	7 80E-02	8 80E-06	1.93E+00	1 13E+01	2 85E-06	2 37E-03	3.63E+05	2 76E-06	6 34E-07	8 81E-05
1,2-Dichloroethane (EDC)	1 89E-01	1 89E-01	4 01E-02	1 04E-01	9 90E-06	1 45E+00	1 13E+01	3 08E-06	2 88E-03	3 34E+05	3 00E-06	5 67E-05	7.87E-03
Benzene	4 00E-03	4 00E-03	2 28E-01	8 80E-02	9 80E-06	1.71E+00	1 13E+01	3 06E-06	2 57E-03	3 29E+05	3.04E-06	1 22E-06	1 69E-04
Carbon tetrachloride	4 16E+00	4 16E+00	1 25E+00	7 80E-02	8 80E-06	1 93E+00	1 13E+01	2 85E-06	2 37E-03	3 52E+05	2 84E-06	1.18E-03	1 64E-01
Chloroform	7 90E-01	7.90E-01	1 50E-01	1.04E-01	1.00E-05	1 45E+00	1 13E+01	3 10E-06	2 88E-03	3 25E+05	3 08E-06	2.43E-04	3.38E-02
cis-1,2-Dichloroethene	2 73E-01	2 73E-01	1 67E-01	7 36E-02	1 13E-05	2 05E+00	1 13E+01	3 36E-06	2 28E-03	3 00E+05	3 33E-06	9 09E-05	1 26E-02
Naphthalene	1 01E-02	1 01E-02	1 98E-02	5 90E-02	7 50E-06	2 56E+00	1.13E+01	2.56E-06	1.97E-03	4 17E+05	2.40E-06	2.42E-06	3 37E-04
Tetrachloroethene	3 49E+01	3 49E+01	7 54E-01	7 20E-02	8 20E-06	2 09E+00	1 13E+01	2.71E-06	2.25E-03	3 69E+05	2 71E-06	9 46E-03	1 31E+00
trans-1,2-Dichloroethene	1 20E-02	1 20E-02	3 85E-01	7 07E-02	1 19E-05	2 13E+00	1 13E+01	3 48E-06	2 22E-03	2 89E+05	3 46E-06	4 16E-06	5 77E-04
Trichloroethene	1 15E+00	1 15E+00	4 22E-01	7 90E-02	9 10E-06	1 91E+00	1 13E+01	2 91E-06	2 39E-03	3 45E+05	2 90E-06	3 32E-04	4 61E-02
Vinyl chloride	3 20E-04	3 20E-04	1 11E+00	1 06E-01	1 23E-06	1 42E+00	1 13E+01	7 66E-07	2 92E-03	1.31E+06	7 66E-07	2.45E-08	3 40E-06

Concentration in Air (C_{air}) = (mg/m³)	$1000 * E/H * V_{wind} * L$
Emissions from Liquid surface (E) = (g/s)	$K * A * C_L$
Overall Mas Transfer Coefficient (K) = (m/s)	$1/K = 1/k_L + 1/k_G * K_{eq}$
Liquid-phase Mass Transfer Coefficient (k_L) = (m/s)	$2.78E-06 * (D_w/D_{ether})^{2/3}$
Gas-phase Mass Transfer Coefficient (k_G) = (m/g)	$4.82E-03 * U^{0.78} * Sc_G^{-0.67} * d_e^{-0.11}$
Effective Diameter of Source (d_e) = (m)	$(4 * A / \pi)^{0.5}$
Schmidt Number Calculation (Sc_G) =	$u_G/\rho_G * D_a$

Parameters		Values
C_L	Concentration in liquid phase (g/m³)	chemical specific
K	overall mass transfer coefficient (m/s)	calculated
k_L	liquid-phase mass transfer coefficient (m/s)	calculated
k_G	gas-phase mass transfer coefficient (m/s)	calculated
K_{eq}	Equilibrium constant (Henry's Law constant)	chemical specific
D_{ether}	Diffusion coefficient of ether in water (cm²/s)	8.50E-06
D_w	Diffusion coefficient in water (cm²/s)	chemical specific
U	Windspeed (m/s)	1
A	Area of the source (m²)	100
u_G	viscosity of air (g/cm-s)	1 81E-04
ρ_G	density of air (g/cm³)	1 20E-03
D_a	Diffusion coefficient in air (cm²/s)	chemical specific
H	Height of breathing zone (m)	2
Vwind	Average wind speed in breathing zone (m/s)	2 25
L	Length of breathing zone perpendicular to wind (m)	1 6

APPENDIX N
TABLE 9.3
Potential Excess Lifetime Cancer Risk from Groundwater (Off-site) - Construction Worker RME Scenario
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

									Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(\mu g/m^3)^{-1}$	Groundwater EPC (mg/L)	Ambient Air EPC (mg/m^3)	DAevent $(mg/cm^2\text{-}event)$	ABS_{gi}	CDI (mg/kg day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
1,2-Dichloroethane (EDC)	B2	9.1E-02	9 1E-02	2 6E-05	5.29E-02	2 20E-03	6 10E-07	1 00E+00	2.77E-09	2 52E-10	2 12E-07	5 52E-09	5 77E-09
cis-1,2-Dichloroethene	D	NA	NA	NA	2 70E-02	1.25E-03	5 59E-07	1 00E+00	2 54E-09	NA	1 20E-07	NA	NA
Manganese	D	NA	NA	NA	2 01E+00	NA	4.02E-06	4 00E-02	1.82E-08	NA	NA	NA	NA
Tetrachloroethene	NA	5 4E-01	5.4E-01	5.9E-06	3 35E+00	1.26E-01	4.17E-04	1 00E+00	1.89E-06	1.02E-06	1 22E-05	7.17E-08	1 09E-06
Trichloroethene	NA	1 3E-02	1.3E-02	2 0E-06	4.55E-02	1 83E-03	1.65E-06	1.00E+00	7 51E-09	9.76E-11	1 77E-07	3 53E-10	4 51E-10
Chloroform	B1	3 1E-02	3 1E-02	2 3E-05	3 50E-04	1 50E-05	7.09E-09	1.00E+00	3.22E-11	9 98E-13	1 44E-09	3 31E-11	3 41E-11
Estimated Subtotal										1 02E-06		7.76E-08	
											Estimated Total Risk =		**1.10E-06**

[a]Cancer WOE Classifications
Group B (B1, B2) Probable human carcinogen

ABS_{gi} = gastrointestinal absorption factor
COPC = Chemical of Potential Concern
CDI = chronic daily intake (mg/kg-day)
ELCR = excess lifetime cancer risk
EPC = exposure point concentration (mg/L)
SF_o = oral slope factor
URF = Inhalation unit risk factor
WOE = weight of evidence
DAevent = Absorbed dose per event
DAC = daily average concentration
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligrams per cubic meter
mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day

APPENDIX N

TABLE 9.4

Potential Noncarcinogenic Risk from Groundwater (Off-site) - Construction Worker RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

										Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Ambient Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,2-Dichloroethane (EDC)	2 0E-02	2.0E-02	2 4E+00	5 29E-02	2 20E-03	6 10E-07	1.00E+00	kidney, liver	kidney, liver	2 36E-06	1 18E-04	1.81E-04	7.53E-05	1 93E-04
cis-1,2-Dichloroethene	1 0E-02	1 0E-02	NA	2.70E-02	1.25E-03	5 59E-07	1 00E+00	blood		2 16E-06	2 16E-04	1 02E-04	NA	2.16E-04
Manganese	2 4E-02	9 6E-04	5.0E-05	2.01E+00	NA	4.02E-06	4.00E-02	nervous system	nervous system	1 55E-05	1 62E-02	NA	NA	1.62E-02
Tetrachloroethene	1.0E-02	1 0E-02	2.7E-01	3 35E+00	1 26E-01	4 17E-04	1.00E+00	liver	nervous system	1.61E-03	1.61E-01	1 04E-02	3.83E-02	2 00E-01
Trichloroethene	NA	NA	6 0E-01	4.55E-02	1 83E-03	1 65E-06	1 00E+00		nervous system, eyes	6 40E-06	NA	1 50E-04	2.53E-04	2 53E-04
Chloroform	1 0E-02	1 0E-02	9 8E-02	3 50E-04	1.50E-05	7 09E-09	1 00E+00	liver	liver	2 74E-08	2.74E-06	1 23E-06	1 25E-05	1.53E-05
Subtotal Hazard Indices											1 78E-01		3 87E-02	
													Total HI =	**2.16E-01**

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
HQ = hazard quotient
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney	1 9E-04
Total Liver	1 6E-01
Total Blood	2 2E-04
Total Nervous System	5 5E-02
Total Eyes	2 5E-04

APPENDIX N

TABLE 9.3 AND 9.4 SUPPLEMENT A

Calculation of DAevent - Construction Worker RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical of Potential Concern	Surface Water Concentration (CW) (mg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (t_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,2-Dichloroethane	5.29E+01	4.2E-03	1.6E-02	3.8E-01	9.2E-01	1.0E+00	2.0	6.1E-07	3
cis-1,2-Dichloroethene	2.70E+01	7.7E-03	2.9E-02	3.7E-01	8.8E-01	1.0E+00	2.0	5.6E-07	3
Manganese	2.01E+03	1 0E-03	NA	NA	NA	NA	2.0	4.0E-06	1
Tetrachlorethylene	3 35E+03	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	2.0	4.2E-04	2
Trichloroethylene	4.55E+01	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	2.0	1.7E-06	3
Chloroform	3.50E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	2.0	7.1E-09	3

Inorganics: DAevent (mg/cm2-event) =

DA_{event} = Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (Eq 1)

Organics: DAevent (mg/cm2-event) =

DA_{event} = $t_{event}<t^*$: DA_{event} (mg/cm^2-event) =

$2 \times FA \times Kp \times Cw \times (\mathrm{sqrt}((6 \times \tau \times t_{event}) / (3.1415))) \times CF1 \times CF2$ (Eq 2)

$t_{event}>t^*$ DA_{event} (mg/cm^2-event) =

$FA \times Kp \times CW \times (t_{event}/(1+B) + 2 \times \tau \times ((1 + 3B + 3B^2)/(1+B)^2)) \times CF1 \times CF2$ (Eq 3)

Notes

NA - Not applicable

Permeability constants from USEPA 2004, *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final)* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

t* - Time to reach steady-state

APPENDIX N

TABLE 9.3 AND 9.4 SUPPLEMENT B

Calculation of Constituent Concentrations in Air from Standing Water - Construction Worker RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Chemical	Concentration in Water (mg/L)	Concentration in Water (g/m^3) C_L	Dimensionless Henry's Law Constant (H') K_{eq}	Diffusion coefficient in air (cm^2/s) D_a	Diffusion coefficient in water (cm^2/s) D_w	Schmidt Number Sc_g	Effective diameter of source (m) d_e	Liquid-phase mass transfer coef (m/s) k_L	k_G (m/s)	1/K	K (m/s)	E (g/s)	Concentration in Air (mg/m^3) C_{air}
1,2-Dichloroethane	5.29E-02	5.29E-02	4.01E-02	1 04E-01	9 90E-06	1.45E+00	1 13E+01	3 08E-06	2.88E-03	3.34E+05	3.00E-06	1.59E-05	2 20E-03
cis-1,2-Dichloroethene	2 70E-02	2 70E-02	1 67E-01	7.36E-02	1.13E-05	2.05E+00	1.13E+01	3.36E-06	2.28E-03	3.00E+05	3.33E-06	8 99E-06	1.25E-03
Tetrachloroethene	3 35E+00	3.35E+00	7.54E-01	7.20E-02	8.20E-06	2 09E+00	1 13E+01	2.71E-06	2.25E-03	3.69E+05	2 71E-06	9.09E-04	1 26E-01
Trichloroethene	4.55E-02	4 55E-02	4.22E-01	7.90E-02	9.10E-06	1 91E+00	1.13E+01	2.91E-06	2 39E-03	3.45E+05	2 90E-06	1 32E-05	1 83E-03
Chloroform	3.50E-04	3.50E-04	1 50E-01	1.04E-01	1.00E-05	1.45E+00	1.13E+01	3.10E-06	2 88E-03	3.25E+05	3 08E-06	1.08E-07	1.50E-05

Concentration in Air (C_{air}) = (mg/m^3)	**$1000 * E/H * V_{wind} * L$**
Emissions from Liquid surface (E) = (g/s)	**$K * A * C_L$**
Overall Mas Transfer Coefficient (K) = (m/s)	**$1/K = 1/k_L + 1/k_G * K_{eq}$**
Liquid-phase Mass Transfer Coefficient (k_L) = (m/s)	**$2.78E-06 * (D_w/D_{ether})^{2/3}$**
Gas-phase Mass Transfer Coefficient (k_G) = (m/g)	**$4.82E-03 * U^{0.78} * Sc_G^{-0.67} * d_e^{-0.11}$**
Effective Diameter of Source (d_e) = (m)	**$(4 * A / \pi)^{0.5}$**
Schmidt Number Calculation (Sc_G) =	**$u_G/p_G * D_a$**

Parameters		Values
C_L	Concentration in liquid phase (g/m^3)	chemical specific
K	overall mass transfer coefficient (m/s)	calculated
k_L	liquid-phase mass transfer coefficient (m/s)	calculated
k_G	gas-phase mass transfer coefficient (m/s)	calculated
K_{eq}	Equilibrium constant (Henry's Law constant)	chemical specific
D_{ether}	Diffusion coefficient of ether in water (cm^2/s)	8 50E-06
D_w	Diffusion coefficient in water (cm^2/s)	chemical specific
U	Windspeed (m/s)	1
A	Area of the source (m^2)	100
u_G	viscosity of air (g/cm-s)	1.81E-04
p_G	density of air (g/cm^3)	1.20E-03
D_a	Diffusion coefficient in air (cm^2/s)	chemical specific
H	Height of breathing zone (m)	2
Vwind	Average wind speed in breathing zone (m/s)	2.25
L	Length of breathing zone perpendicular to wind (m)	1.6

APPENDIX N
TABLE 9.5
Potential Excess Lifetime Cancer Risk from Groundwater (On-site Excluding Downgradient of Building 220) - Adult/Child (Age-Adjusted) Resident RME Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

									Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent_adj (mg-year/kg-event)	ABS_{gi}	CDI (mg/kg-day)	ELCR	CDI (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
1,2-Dichloroethane (EDC)	B2	9 1E-02	9.1E-02	2 6E-05	4.40E-03	3 64E-02	2.34E-04	1.00E+00	6 57E-05	5 98E-06	3.21E-06	2.92E-07	1 50E-02	3.89E-04	3 95E-04
Carbon tetrachloride	B2	1 3E-01	1 3E-01	1.5E-05	3 80E-04	3 14E-03	1 11E-04	1.00E+00	5 67E-06	7 38E-07	1.52E-06	1 97E-07	1 29E-03	1.94E-05	2 03E-05
Estimated Subtotal										6 72E-06		4 89E-07		4.08E-04	
														Estimated Total Risk =	**4.16E-04**

[a]Cancer WOE Classifications
Group A Human carcinogen
Group B (B1, B2) Probable human carcinogen
Group C Possible human carcinogen
Group D Not classifiable
Group E No evidence of carcinogenicity

ABS_{gi} = gastrointestinal absorption factor
COPC = Chemical of Potential Concern
CDI = chronic daily intake (mg/kg-day)
ELCR = excess lifetime cancer risk
EPC = exposure point concentration (mg/L)
SF_d = dermal slope factor
SF_o = oral slope factor
URF = Inhalation unit risk factor
WOE = weight of evidence
DAevent = Absorbed dose per event
DAC = daily average concentration
mg/m^3 = microgram per cubic meter
mg/m^3 = milligrams per cubic meter
mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day

APPENDIX N
TABLE 9.5 SUPPLEMENT A
Calculation of DAevent
Residential Adult/Child Age Adjusted Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	EPC (µµg/L)	DA Adult (mg/cm^2-event)	DA Child (mg/cm^2-event)	DA_Age Adjusted (mg/cm2-event)
1,2-Dichloroethane (EDC)	4.40E+00	2.40E-08	3.25E-08	2.34E-04
Carbon tetrachloride	3 80E-01	1.15E-08	1.51E-08	1.11E-04

Age-Adjusted DAevent (mg-year/event-kg) =
DAevent-agr = (DAevent-$_a$ x SA_a x ED_a) / BW_a + (DAevent-$_c$ x SA_c x ED_c) / BW_c

Where:	SA_a	18,000 cm^2	SA_c	6,600 cm^2
	ED_a	24 years	ED_c	6 years
	BW_a	70 kg	BW_c	15 kg

Note· The calculation of DAevent for a residential adult is presented in Table 9.12 Supplement A and the calculation of DAevent for a child is presented in Table 9.13 Supplement A.

APPENDIX N

TABLE 9.6

Potential Noncarcinogenic Risk from Groundwater (On-site Excluding Downgradient of Building 220) - Adult Resident RME Scenario

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

										Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,2-Dichloroethane (EDC)	2.0E-02	2 0E-02	2.4E+00	4.40E-03	3 64E-02	2 40E-08	1 00E+00	kidney, liver	kidney, liver	1.21E-04	6 03E-03	5 93E-06	2 96E-04	3 49E-02	1.45E-02	**2.09E-02**
Carbon tetrachloride	7 0E-04	7.0E-04	1 9E-01	3 80E-04	3 14E-03	1 15E-08	1 00E+00	liver	liver	1 04E-05	1.49E-02	2.84E-06	4 05E-03	3.01E-03	1 59E-02	3.48E-02
Subtotal Hazard Indices											2 09E-02		4.35E-03		3 04E-02	
															Total HI =	5.57E-02

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney	2.1E-02
Total Liver	5.6E-02

APPENDIX N
TABLE 9.6 SUPPLEMENT A
Calculation of DAevent
Residential Adult Scenario
St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (t_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,2-Dichloroethane	4.40E+00	4.2E-03	1.6E-02	3.8E-01	9.2E-01	1.0E+00	0.58	2.4E-08	2
Carbon tetrachloride	3.80E-01	1.6E-02	7.8E-02	7.8E-01	1.9E+00	1.0E+00	0.58	1.1E-08	2

Inorganics: DAevent (mg/cm2-event) =

DA_{event} = Kp x CW x tevent x 0 001 mg/ug x 0.001 l/cm^3 (Eq 1)

Organics: DAevent (mg/cm2-event) =

DA_{event} = t_{event}<t*: DA_{event} (mg/cm^2-event) =
2 x FA x Kp x Cw x (sqrt((6 x t x t_{event}) / (3 1415))) x CF1 x CF2 (Eq 2)

t_{event}>t*. DA_{event} (mg/cm^2-event) =
FA x Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3B + $3B^2$)/$(1+B)^2$)) xCF1 x CF (Eq 3)

Notes·
NA - Not applicable
Permeability constants from USEPA 2004, *Risk Assessment Guidance for Superfund Volume I· Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final)* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

APPENDIX N

TABLE 9.6 SUPPLEMENT B

Bathroom Air Exposure Concentrations from Upper Alluvial Aquifer Groundwater, Andelman Model, as Modified by Schaum
Residential Adult Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Exposure Point Concentration Cwo (mg/l)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,2-Dichloroethane (EDC)	4.4E-03	4.6E-02	3.6E-02
Carbon tetrachloride	3.8E-04	4.0E-03	3.1E-03

Variables	Units	Exposure Assumptions
Ca = concentration of chemical in air	mg/m^3	Solved by Eq 1
C_{amax} = maximum concentration of chemical	mg/m^3	Solved by Eq 2
t_1 = time in shower	hr	2.5E-01
t_2 = time in bathroom after shower	hr	3.3E-01
f = fraction volatilized for chemical	unitless	**9.0E-01**
F_w = shower water flow rate	L/hr	7.5E+02
V_a = bathroom volume	m^3	1.6E+01

Equation 1:	C_a =	$((C_{amax}/2) * t_1 + C_{amax} \cdot t_2) / (t_1 + t_2)$
Equation 2:	C_{amax} =	$(C_w * f * F_w * t_1) / V_a$

Source of equations and assumptions: Schaum, J., K. Hoang, R. Kinerson, J. Moya, and R.G.M. Wang. 1994. "Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water." In: *Water Contamination and Health*. R.G.M. Wang (ed.). Marcel Dekker, Inc. New York.

APPENDIX N

TABLE 9.7

Potential Noncarcinogenic Risk from Groundwater (On-site Excluding Downgradient of Building 220) - Child Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

										Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,2-Dichloroethane (EDC)	2 00E-02	2 00E-02	2 40E+00	4 40E-03	6 47E-02	3 25E-08	1 00E+00	kidney, liver	kidney, liver	2 81E-04	1.41E-02	1 37E-05	6 86E-04	6 21E-02	2 59E-02	4 06E-02
Carbon tetrachloride	7 00E-04	7 00E-04	1 90E-01	3 80E-04	5 59E-03	1 51E-08	1.00E+00	liver	liver	2 43E-05	3 47E-02	6 37E-06	9.10E-03	5 36E-03	2 82E-02	7 20E-02
Subtotal Hazard Indices											4.88E-02		9.79E-03		5.41E-02	
															Total HI =	1 13E-01

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
HQ = hazard quotient
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney:	4.1E-02
Total Liver:	1.1E-01

APPENDIX N
TABLE 9.8
Potential Excess Lifetime Cancer Risk from Groundwater (Downgradient of Building 220) - Adult/Child (Age-Adjusted) Resident RME Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

									Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	URF $(mg/m^3)^{-1}$	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent_adj (mg-year/kg-event)	ABS_{gi}	CDI (mg/kg-day)	ELCR	CDI (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
1,1,1,2-Tetrachloroethane	C	2.6E-02	2.6E-02	7.4E-06	1.60E-02	1.32E-01	5.62E-03	1.00E+00	2.39E-04	6.21E-06	7.70E-05	2.00E-06	5.44E-02	4.03E-04	4.11E-04
1,1,2,2-Tetrachloroethane	C	2.0E-01	2.0E-01	5.8E-05	5.80E-04	4.80E-03	9.01E-05	1.00E+00	8.66E-06	1.73E-06	1.23E-06	2.47E-07	1.97E-03	1.14E-04	1.16E-04
1,1,2-Trichloroethane	C	5.7E-02	5.7E-02	1.6E-05	2.30E-03	1.90E-02	2.32E-04	1.00E+00	3.43E-05	1.96E-06	3.18E-06	1.81E-07	7.82E-03	1.25E-04	1.27E-04
1,2-Dichloroethane (EDC)	B2	9.1E-02	9.1E-02	2.6E-05	4.63E-02	3.83E-01	2.46E-03	1.00E+00	6.91E-04	6.29E-05	3.38E-05	3.07E-06	1.57E-01	4.09E-03	4.16E-03
Benzene	A	5.5E-02	5.5E-02	7.8E-06	4.00E-03	3.31E-02	6.63E-04	1.00E+00	5.97E-05	3.28E-06	9.08E-06	5.00E-07	1.36E-02	1.06E-04	1.10E-04
Carbon tetrachloride	B2	1.3E-01	1.3E-01	1.5E-05	2.92E+00	2.42E+01	8 51E-01	1.00E+00	4.36E-02	5.67E-03	1.17E-02	1.52E-03	9.93E+00	1.38E-01	1.46E-01
Chloroform	B1	3.1E-02	3.1E-02	2.3E-05	1.13E-01	9.34E-01	1.10E-02	1.00E+00	1.69E-03	5.23E-05	1.51E-04	4.69E-06	3.84E-01	8.83E-03	8.89E-03
cis-1,2-Dichloroethene	D	NA	NA	NA	6.47E-02	5.35E-01	6.17E-03	1.00E+00	9.66E-04	NA	8.45E-05	NA	2.20E-01	NA	NA
Manganese	D	NA	NA	NA	2.83E-01	NA	1.76E-03	4.00E-02	4.23E-03	NA	2.41E-05	NA	NA	NA	NA
Naphthalene	C	NA	NA	3.4E-05	1.01E-02	8.36E-02	7.13E-03	1.00E+00	1.51E-04	NA	9.77E-05	NA	3.43E-02	1.17E-03	1.17E-03
Tetrachloroethene	NA	5.4E-01	5.4E-01	5.9E-06	2.57E+01	2.13E+02	1.66E+01	1.00E+00	3.84E-01	1.87E-01	2.28E-01	1.16E-01	8.75E+01	4.03E-01	7.06E-01
trans-1,2-Dichloroethene	NA	NA	NA	NA	1.20E-02	9.93E-02	1.55E-03	1.00E+00	1.79E-04	NA	2.12E-05	NA	4.08E-02	NA	NA
Trichloroethene	NA	1.3E-02	1.3E-02	2.0E-06	3.99E-01	3.30E+00	7.19E-02	1.00E+00	5.96E-03	7.75E-05	9.84E-04	1.28E-05	1.36E+00	2.72E-03	2.81E-03
Vinyl chloride	A	7.2E-01	7.2E-01	4.4E-06	3.20E-04	2.65E-03	1.86E-05	1.00E+00	4.78E-06	3.44E-06	2.55E-07	1.84E-07	1.09E-03	4.79E-06	8.41E-06
Estimated Subtotal										**1.93E-01**		**1.17E-01**		**5.59E-01**	
													Estimated Total Risk =		**8.70E-01**

[a]Cancer WOE Classifications:
Group A: Human carcinogen
Group B (B1, B2): Probable human carcinogen
Group C: Possible human carcinogen
Group D: Not classifiable
Group E: No evidence of carcinogenicity

ABS_{gi} = gastrointestinal absorption factor
COPC = Chemical of Potential Concern
CDI = chronic daily intake (mg/kg-day)
ELCR = excess lifetime cancer risk
EPC = exposure point concentration (mg/L)
SF_o = oral slope factor
URF = Inhalation unit risk factor
WOE = weight of evidence
DAevent = Absorbed dose per event
DAC = daily average concentration
$\mu g/m^3$ = microgram per cubic meter
mg/m^3 = milligrams per cubic meter
mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day

APPENDIX N
TABLE 9.8 SUPPLEMENT A
Calculation of DAevent
Residential Adult/Child Age Adjusted Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	EPC (mg/L)	DA Adult (mg/cm^2-event)	DA Child (mg/cm^2-event)	DA_agr (mg/cm^2-event)
1,1,1,2-Tetrachloroethane	1.60E+01	6.28E-07	6.61E-07	5.62E-03
1,1,2,2-Tetrachloroethane	5.80E-01	1.00E-08	1.07E-08	9.01E-05
1,1,2-Trichloroethane	2.30E+00	2.41E-08	3.16E-08	2.32E-04
1,2-Dichloroethane (EDC)	4.63E+01	2.53E-07	3.42E-07	2.46E-03
Benzene	4.00E+00	6.76E-08	9.31E-08	6.63E-04
Carbon tetrachloride	2.92E+03	8.83E-05	1.16E-04	8.51E-01
Chloroform	1.13E+02	1.14E-06	1.50E-06	1.10E-02
cis-1,2-Dichloroethene	6.47E+01	6.33E-07	8.57E-07	6.17E-03
Manganese	2.83E+02	1.64E-07	2.83E-07	1.76E-03
Naphthalene	1.01E+01	7.40E-07	9.72E-07	7.13E-03
Tetrachloroethene	2.57E+04	1.72E-03	2.26E-03	1.66E+01
trans-1,2-Dichloroethene	1.20E+01	1.59E-07	2.15E-07	1.55E-03
Trichloroethene	3.99E+02	7.46E-06	9.79E-06	7.19E-02
Vinyl chloride	3.20E-01	1.89E-09	2.63E-09	1.86E-05

Age-Adjusted DAevent (mg-year/event-kg) =
$DAevent\text{-}agr = (DAevent\text{-}_a \times SA_a \times ED_a) / BW_a + (DAevent\text{-}_c \times SA_c \times ED_c) / BW_c$

Where:	SA_a	18,000 cm^2	SA_c	6,600 cm^2
	ED_a	24 years	ED_c	6 years
	BW_a	70 kg	BW_c	15 kg

APPENDIX N

TABLE 9.9

Potential Noncarcinogenic Risk from Groundwater (Downgradient of Building 220) - Adult Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

										Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,1,1,2-Tetrachloroethane	3.0E-02	3.0E-02	NA	1.60E-02	1.32E-01	6.28E-07	1.00E+00	kidney, liver		4.38E-04	1.46E-02	1.55E-04	5.16E-03	1.27E-01	NA	1.98E-02
1,1,2,2-Tetrachloroethane	4.0E-03	4.0E-03	NA	5.80E-04	4.80E-03	1.00E-08	1.00E+00	liver		1.59E-05	3.97E-03	2.47E-06	6.17E-04	4.60E-03	NA	4.59E-03
1,1,2-Trichloroethane	4.0E-03	4.0E-03	NA	2.30E-03	1.90E-02	2.41E-08	1.00E+00	blood		6.30E-05	1.58E-02	5.93E-06	1.48E-03	1.82E-02	NA	1.72E-02
1,2-Dichloroethane (EDC)	2.0E-02	2.0E-02	2.4E+00	4.63E-02	3.83E-01	2.53E-07	1.00E+00	kidney, liver	kidney, liver	1.27E-03	6.34E-02	6.24E-05	3.12E-03	3.67E-01	1.53E-01	2.20E-01
Benzene	4.0E-03	4.0E-03	3.0E-02	4.00E-03	3.31E-02	6.76E-08	1.00E+00	blood	blood	1.10E-04	2.74E-02	1.67E-05	4.17E-03	3.17E-02	1.06E+00	1.09E+00
Carbon tetrachloride	7.0E-04	7.0E-04	1.9E-01	2.92E+00	2.42E+01	8.83E-05	1.00E+00	liver	liver	8.00E-02	1.14E+02	2.18E-02	3.11E+01	2.32E+01	1.22E+02	2.67E+02
Chloroform	1.0E-02	1.0E-02	9.8E-02	1.13E-01	9.34E-01	1.14E-06	1.00E+00	liver	liver	3.09E-03	3.09E-01	2.82E-04	2.82E-02	8.96E-01	9.14E+00	9.48E+00
cis-1,2-Dichloroethene	1.0E-02	1.0E-02	NA	6.47E-02	5.35E-01	6.33E-07	1.00E+00	blood		1.77E-03	1.77E-01	1.56E-04	1.56E-02	5.13E-01	NA	1.93E-01
Manganese	2.4E-02	9.6E-04	5.0E-05	2.83E-01	NA	1.64E-07	4.00E-02	nervous system	nervous system	7.75E-03	3.23E-01	4.05E-05	4.22E-02	NA	NA	3.65E-01
Naphthalene	2.0E-02	2.0E-02	3.0E-03	1.01E-02	8.36E-02	7.40E-07	1.00E+00	whole body	respiratory	2.77E-04	1.38E-02	1.83E-04	9.13E-03	8.01E-02	2.67E+01	2.67E+01
Tetrachloroethene	1.0E-02	1.0E-02	2.7E-01	2.57E+01	2.13E+02	1.72E-03	1.00E+00	liver	nervous system	7.05E-01	7.05E+01	4.25E-01	4.25E+01	2.04E+02	7.56E+02	8.69E+02
trans-1,2-Dichloroethene	2.0E-02	2.0E-02	6.0E-02	1.20E-02	9.93E-02	1.59E-07	1.00E+00	kidney	kidney	3.29E-04	1.64E-02	3.92E-05	1.96E-03	9.52E-02	1.59E+00	1.61E+00
Trichloroethene	NA	NA	6.0E-01	3.99E-01	3.30E+00	7.46E-06	1.00E+00		nervous system, eyes	1.09E-02	NA	1.84E-03	NA	3.17E+00	5.32E+00	5.32E+00
Vinyl chloride	3.0E-03	3.0E-03	1.0E-01	3.20E-04	2.65E-03	1.89E-09	1.00E+00	liver	liver	8.77E-06	2.92E-03	4.66E-07	1.55E-04	2.54E-03	2.54E-02	2.85E-02
Subtotal Hazard Indices											1.86E+02		7.37E+01		9.22E+02	
															Total HI =	1.18E+03

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney:	1.8E+00
Total Liver:	3.9E+02
Total Blood:	1.3E+00
Total Nervous System:	7.6E+02
Total Whole Body:	2.3E-02
Total Respiratory:	2.7E+01
Total Eyes:	5.3E+00

APPENDIX N
TABLE 9.9 SUPPLEMENT A
Calculation of DAevent
Residential Adult Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (t_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,1,1,2-Tetrachloroethane	1.60E+01	1.6E-02	7.8E-02	9.2E-01	2.2E+00	1.0E+00	0.58	6.3E-07	2
1,1,2,2-Tetrachloroethane	5.80E-01	6.9E-03	3.5E-02	9.3E-01	2.2E+00	1.0E+00	0.58	1.0E-08	2
1,1,2-Trichloroethane	2.30E+00	6.4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	0.58	2.4E-08	2
1,2-Dichloroethane	4.63E+01	4.2E-03	1.6E-02	3.8E-01	9.2E-01	1.0E+00	0.58	2.5E-07	2
Benzene	4.00E+00	1.5E-02	5.1E-02	2.9E-01	7.0E-01	1.0E+00	0.58	6.8E-08	2
Carbon tetrachloride	2.92E+03	1.6E-02	7.8E-02	7.8E-01	1.9E+00	1.0E+00	0.58	8.8E-05	2
Chloroform	1.13E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	1.1E-06	2
cis-1,2-Dichloroethene	6.47E+01	7.7E-03	2.9E-02	3.7E-01	8.8E-01	1.0E+00	0.58	6.3E-07	2
Manganese	2.83E+02	1.0E-03	NA	NA	NA	NA	0.58	1.6E-07	1
Naphthalene	1.01E+01	4.7E-02	2.0E-01	5.6E-01	1.3E+00	1.0E+00	0.58	7.4E-07	2
Tetrachlorethylene	2.57E+04	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	0.58	1.7E-03	2
trans-1,2-Dichloroethene	1.20E+01	1.0E-02	3.9E-02	3.7E-01	8.8E-01	1.0E+00	0.58	1.6E-07	2
Trichloroethylene	3.99E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.58	7.5E-06	2
Vinyl chloride	3.20E-01	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	0.58	1.9E-09	3

Inorganics: DAevent (mg/cm2-event) =

DA_{event} = Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (Eq 1)

Organics: DAevent (mg/cm2-event) =

DA_{event} = t_{event}<t*: DA_{event} (mg/cm^2-event) =
2 x FA x Kp x Cw x (sqrt((6 x t x t_{event}) / (3.1415))) x CF1 x CF2 (Eq 2)

t_{event}>t*: DA_{event} (mg/cm^2-event) =
FA x Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3B + 3B^2)/(1+B)^2)) xCF1 x CF2 (Eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final)*. EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

APPENDIX N

TABLE 9.9 SUPPLEMENT B

Bathroom Air Exposure Concentrations from Upper Alluvial Aquifer Groundwater, Andelman Model, as Modified by Schaum
Residential Adult Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Exposure Point Concentration Cwo (mg/l)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,1,1,2-Tetrachloroethane	1.6E-02	1.7E-01	1.3E-01
1,1,2,2-Tetrachloroethane	5.8E-04	6.1E-03	4.8E-03
1,1,2-Trichloroethane	2.3E-03	2.4E-02	1.9E-02
1,2-Dichloroethane (EDC)	4.6E-02	4.9E-01	3.8E-01
Benzene	4.0E-03	4.2E-02	3.3E-02
Carbon tetrachloride	2.9E+00	3.1E+01	2.4E+01
Chloroform	1.1E-01	1.2E+00	9.3E-01
cis-1,2-Dichloroethene	6.5E-02	6.8E-01	5.4E-01
Manganese	2.8E-01	3.0E+00	2.3E+00
Naphthalene	1.0E-02	1.1E-01	8.4E-02
Tetrachloroethene	2.6E+01	2.7E+02	2.1E+02
trans-1,2-Dichloroethene	1.2E-02	1.3E-01	9.9E-02
Trichloroethene	4.0E-01	4.2E+00	3.3E+00
Vinyl chloride	3.2E-04	3.4E-03	2.6E-03

Variables	Units	Exposure Assumptions
Ca = concentration of chemical in air	mg/m^3	Solved by Eq 1
C_{amax} = maximum concentration of chemical	mg/m^3	Solved by Eq 2
t_1 = time in shower	hr	2.5E-01
t_2 = time in bathroom after shower	hr	3.3E-01
f = fraction volatilized for chemical	unitless	**9.0E-01**
F_w = shower water flow rate	L/hr	7.5E+02
V_a = bathroom volume	m^3	1.6E+01

Equation 1:	C_a =	$((C_{amax}/2) * t_1 + C_{amax} \cdot t_2) / (t_1 + t_2)$
Equation 2:	C_{amax} =	$(C_w * f * F_w * t_1) / V_a$

Source of equations and assumptions: Schaum, J., K. Hoang, R. Kinerson, J. Moya, and R.G.M. Wang. 1994. "Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water." In: *Water Contamination and Health*. R.G.M. Wang (ed.). Marcel Dekker, Inc. New York.

APPENDIX N

TABLE 9.10

Potential Noncarcinogenic Risk from Groundwater (Downgradient of Building 220) - Child Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

										Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,1,1,2-Tetrachloroethane	3.00E-02	3.00E-02	NA	1.60E-02	2.35E-01	6.61E-07	1.00E+00	kidney, liver		1.02E-03	3.41E-02	2.79E-04	9.30E-03	2.26E-01	NA	4.34E-02
1,1,2,2-Tetrachloroethane	4.00E-03	4.00E-03	NA	5.80E-04	8.53E-03	1.07E-08	1.00E+00	liver		3.71E-05	9.27E-03	4.53E-06	1.13E-03	8.18E-03	NA	1.04E-02
1,1,2-Trichloroethane	4.00E-03	4.00E-03	NA	2.30E-03	3.38E-02	3.16E-08	1.00E+00	blood		1.47E-04	3.68E-02	1.33E-05	3.33E-03	3.24E-02	NA	4.01E-02
1,2-Dichloroethane (EDC)	2.00E-02	2.00E-02	2.40E+00	4.63E-02	6.81E-01	3.42E-07	1.00E+00	kidney, liver	kidney, liver	2.96E-03	1.48E-01	1.44E-04	7.22E-03	6.53E-01	2.72E-01	4.27E-01
Benzene	4.00E-03	4.00E-03	3.00E-02	4.00E-03	5.89E-02	9.31E-08	1.00E+00	blood	blood	2.56E-04	6.39E-02	3.93E-05	9.82E-03	5.64E-02	1.88E+00	1.95E+00
Carbon tetrachloride	7.00E-04	7.00E-04	1.90E-01	2.92E+00	4.29E+01	1.16E-04	1.00E+00	liver	liver	1.87E-01	2.67E+02	4.89E-02	6.99E+01	4.12E+01	2.17E+02	5.53E+02
Chloroform	1.00E-02	1.00E-02	9.80E-02	1.13E-01	1.66E+00	1.50E-06	1.00E+00	liver	liver	7.22E-03	7.22E-01	6.34E-04	6.34E-02	1.59E+00	1.63E+01	1.70E+01
cis-1,2-Dichloroethene	1.00E-02	1.00E-02	NA	6.47E-02	9.52E-01	8.57E-07	1.00E+00	blood		4.14E-03	4.14E-01	3.62E-04	3.62E-02	9.13E-01	NA	4.50E-01
Manganese	2.40E-02	9.60E-04	5.00E-05	2.83E-01	NA	2.83E-07	4.00E-02	nervous system	nervous system	1.81E-02	7.54E-01	1.19E-04	1.24E-01	NA	NA	8.78E-01
Naphthalene	2.00E-02	2.00E-02	3.00E-03	1.01E-02	1.49E-01	9.72E-07	1.00E+00	whole body	respiratory	6.46E-04	3.23E-02	4.10E-04	2.05E-02	1.42E-01	4.75E+01	4.76E+01
Tetrachloroethene	1.00E-02	1.00E-02	2.70E-01	2.57E+01	3.79E+02	2.26E-03	1.00E+00	liver	nervous system	1.65E+00	1.65E+02	9.55E-01	9.55E+01	3.63E+02	1.34E+03	1.60E+03
trans-1,2-Dichloroethene	2.00E-02	2.00E-02	6.00E-02	1.20E-02	1.77E-01	2.15E-07	1.00E+00	kidney	kidney	7.67E-04	3.84E-02	9.08E-05	4.54E-03	1.69E-01	2.82E+00	2.86E+00
Trichloroethene	NA	NA	5.95E-01	3.99E-01	5.87E+00	9.79E-06	1.00E+00		nervous system, eyes	2.55E-02	NA	4.13E-03	NA	5.63E+00	9.47E+00	9.47E+00
Vinyl chloride	3.00E-03	3.00E-03	1.00E-01	3.20E-04	4.71E-03	2.63E-09	1.00E+00	liver	liver	2.05E-05	6.82E-03	1.11E-06	3.70E-04	4.51E-03	4.51E-02	5.23E-02
Subtotal Hazard Indices											4.33E+02		1.66E+02		1.64E+03	
															Total HI =	2.24E+03

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney:	3.3E+00
Total Liver:	8.3E+02
Total Blood:	2.4E+00
Total Nervous System:	1.4E+03
Total Whole Body:	5.3E-02
Total Respiratory:	4.7E+01
Total Eyes:	9.5E+00

APPENDIX N
TABLE 9.10 SUPPLEMENT A
Calculation of DAevent
Residential Child Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical of Potential Concern	Groundwater Concentration (CW) (mg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (t_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm²-event)	Eq
1,1,1,2-Tetrachloroethane	1.60E+01	1.6E-02	7.8E-02	9.2E-01	2.2E+00	1.0E+00	1.00	6.6E-07	2*
1,1,2,2-Tetrachloroethane	5.80E-01	6.9E-03	3.5E-02	9.3E-01	2.2E+00	1.0E+00	1.00	1.1E-08	2
1,1,2-Trichloroethane	2 30E+00	6 4E-03	2.9E-02	6.0E-01	1.4E+00	1.0E+00	1.00	3.2E-08	2
1,2-Dichloroethane	4 63E+01	4 2E-03	1.6E-02	3.8E-01	9.2E-01	1.0E+00	1.00	3.4E-07	3
Benzene	4.00E+00	1.5E-02	5.1E-02	2.9E-01	7.0E-01	1.0E+00	1.00	9.3E-08	3
Carbon tetrachloride	2 92E+03	1.6E-02	7.8E-02	7.8E-01	1 9E+00	1.0E+00	1.00	1.2E-04	2
Chloroform	1.13E+02	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1 0E+00	1.00	1.5E-06	2
cis-1,2-Dichloroethene	6.47E+01	7 7E-03	2.9E-02	3 7E-01	8.8E-01	1.0E+00	1.00	8.6E-07	3
Manganese	2 83E+02	1.0E-03	NA	NA	NA	NA	1.00	2.8E-07	1
Naphthalene	1 01E+01	4 7E-02	2.0E-01	5.6E-01	1.3E+00	1.0E+00	1.00	9 7E-07	2
Tetrachlorethylene	2.57E+04	3.3E-02	1.7E-01	9 1E-01	2 2E+00	1.0E+00	1.00	2 3E-03	2
trans-1,2-Dichloroethene	1.20E+01	1 0E-02	3.9E-02	3.7E-01	8.8E-01	1.0E+00	1.00	2.2E-07	3
Trichloroethylene	3 99E+02	1 2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	1.00	9.8E-06	2
Vinyl chloride	3 20E-01	5.6E-03	1.7E-02	2 4E-01	5 7E-01	1 0E+00	1 00	2 6E-09	3

Inorganics: DAevent (mg/cm2-event) =

DA_{event} = Kp x CW x tevent x 0 001 mg/ug x 0.001 l/cm³ (Eq 1)

Organics: DAevent (mg/cm2-event) =

DA_{event} = t_{event}<t*: DA_{event} (mg/cm²-event) =
2 x FA x Kp x Cw x (sqrt((6 x t x $_{event}$) / (3.1415))) x CF1 x CF2 (Eq 2)

t_{event}>t*: DA_{event} (mg/cm²-event) =
FA x Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3B + 3B²)/(1+B)²)) xCF1 x CF2 (Eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I. Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

APPENDIX N

TABLE 9.10 SUPPLEMENT B

Bathroom Air Exposure Concentrations from Upper Alluvial Aquifer Groundwater, Andelman Model, as Modified by Schaum
Residential Child Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Exposure Point Concentration Cwo (mg/l)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,1,1,2-Tetrachloroethane	1.6E-02	3.0E-01	2.4E-01
1,1,2,2-Tetrachloroethane	5.8E-04	1.1E-02	8.5E-03
1,1,2-Trichloroethane	2.3E-03	4.4E-02	3.4E-02
1,2-Dichloroethane (EDC)	4.6E-02	8.8E-01	6.8E-01
Benzene	4.0E-03	7.6E-02	5.9E-02
Carbon tetrachloride	2.9E+00	5.5E+01	4.3E+01
Chloroform	1.1E-01	2.1E+00	1.7E+00
cis-1,2-Dichloroethene	6.5E-02	1.2E+00	9.5E-01
Naphthalene	1.0E-02	1.9E-01	1.5E-01
Tetrachloroethene	2.6E+01	4.9E+02	3.8E+02
trans-1,2-Dichloroethene	1.2E-02	2.3E-01	1.8E-01
Trichloroethene	4.0E-01	7.6E+00	5.9E+00
Vinyl chloride	3.2E-04	6.1E-03	4.7E-03

Variables	Units	Exposure Assumptions
Ca = concentration of chemical in air	mg/m^3	Solved by Eq 1
C_{amax} = maximum concentration of chemical	mg/m^3	Solved by Eq 2
t_1 = time in bath	hr	4.5E-01
t_2 = time in bathroom after bath	hr	5.5E-01
f = fraction volatilized for chemical	unitless	**9.0E-01**
F_w = tap water flow rate	L/hr	7.5E+02
V_a = bathroom volume	m^3	1.6E+01

Equation 1:	C_a =	$((C_{amax}/2) * t_1 + C_{amax} \cdot t_2) / (t_1 + t_2)$
Equation 2:	C_{amax} =	$(C_w * f * F_w * t_1) / V_a$

Source of equations and assumptions: Schaum, J., K. Hoang, R. Kinerson, J. Moya, and R.G.M. Wang. 1994. "Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water." In: *Water Contamination and Health*. R.G.M. Wang (ed.). Marcel Dekker, Inc. New York.

APPENDIX N
TABLE 9.11
Potential Excess Lifetime Cancer Risk from Groundwater (Off-site) - Adult/Child (Age-Adjusted) Resident RME Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

									Ingestion		Dermal		Inhalation		
COPC	WOE[a]	SF_o (mg/kg-day)$^{-1}$	SF_d (mg/kg-day)$^{-1}$	URF (µg/m^3)$^{-1}$	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent_adj (mg-year/kg-event)	ABS_{gi}	CDI (mg/kg-day)	ELCR	CDI (mg/kg-day)	ELCR	DAC (mg/m^3)	ELCR	Total ELCR
1,2-Dichloroethane (EDC)	B2	9.1E-02	9.1E-02	2.6E-05	5.29E-02	4.38E-01	2.82E-03	1.00E+00	7.90E-04	7.19E-05	3.86E-05	3.51E-06	1.80E-01	4.68E-03	4.75E-03
cis-1,2-Dichloroethene	D	NA	NA	NA	2.70E-02	2.23E-01	2.57E-03	1.00E+00	4.03E-04	NA	3.53E-05	NA	9.18E-02	NA	NA
Manganese	D	NA	NA	NA	2.01E+00	NA	1.25E-02	4.00E-02	3.00E-02	NA	1.71E-04	NA	NA	NA	NA
Tetrachloroethene	NA	5.4E-01	5.4E-01	5.9E-06	3.35E+00	2.77E+01	2.17E+00	1.00E+00	5.01E-02	2.67E-02	2.97E-02	1.59E-02	1.14E+01	6.51E-02	1.08E-01
Trichloroethene	NA	1.3E-02	1.3E-02	2.0E-06	4.55E-02	3.77E-01	8.19E-03	1.00E+00	6.80E-04	8.83E-06	1.12E-04	1.46E-06	1.55E-01	3.09E-04	3.20E-04
Chloroform	B1	3.1E-02	3.1E-02	2.3E-05	3.50E-04	2.90E-03	3.42E-05	1.00E+00	5.23E-06	1.62E-07	4.68E-07	1.45E-08	1.19E-03	2.74E-05	2.75E-05
Estimated Subtotal										2.68E-02		1.59E-02		7.01E-02	
														Estimated Total Risk =	**1.13E-01**

[a]Cancer WOE Classifications:
Group A: Human carcinogen
Group B (B1, B2): Probable human carcinogen
Group C: Possible human carcinogen
Group D: Not classifiable
Group E: No evidence of carcinogenicity

ABS_{gi} = gastrointestinal absorption factor
COPC = Chemical of Potential Concern
CDI = chronic daily intake (mg/kg-day)
ELCR = excess lifetime cancer risk
EPC = exposure point concentration (mg/L)
SF_o = oral slope factor
URF = Inhalation unit risk factor
WOE = weight of evidence
DAevent = Absorbed dose per event
DAC = daily average concentration
µg/m^3 = microgram per cubic meter
mg/m^3 = milligrams per cubic meter
mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day

APPENDIX N
TABLE 9.11 SUPPLEMENT A
Calculation of DAevent
Residential Adult/Child Age Adjusted Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	EPC (mg/L)	DA Adult (mg/cm^2-event)	DA Child (mg/cm^2-event)	DA_agr (mg/cm^2-event)
1,2-Dichloroethane (EDC)	5.29E+01	2.89E-07	3.91E-07	2.82E-03
cis-1,2-Dichloroethene	2.70E+01	2.64E-07	3.58E-07	2.57E-03
Manganese	2.01E+03	1.17E-06	2.01E-06	1.25E-02
Tetrachloroethene	3.35E+03	2.25E-04	2.95E-04	2.17E+00
Trichloroethene	4.55E+01	8.50E-07	1.12E-06	8.19E-03
Chloroform	3.50E-01	3.55E-09	4.66E-09	3.42E-05

Age-Adjusted DAevent (mg-year/event-kg) =
$DAevent\text{-}agr = (DAevent\text{-}_a \times SA_a \times ED_a) / BW_a + (DAevent\text{-}_c \times SA_c \times ED_c) / BW_c$

Where:	SAa	18,000 cm^2	SAc	6,600 cm^2
	EDa	24 years	EDc	6 years
	BWa	70 kg	BWc	15 kg

APPENDIX N

TABLE 9.12

Potential Noncarcinogenic Risk from Groundwater (Off-site)- Adult Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

										Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,2-Dichloroethane (EDC)	2.0E-02	2.0E-02	2.4E+00	5.29E-02	4.38E-01	2.89E-07	1.00E+00	kidney, liver	kidney, liver	1.45E-03	7.25E-02	7.13E-05	3 56E-03	4.20E-01	1.75E-01	2.51E-01
cis-1,2-Dichloroethene	1.0E-02	1.0E-02	NA	2.70E-02	2.23E-01	2.64E-07	1.00E+00	blood		7.39E-04	7.39E-02	6.51E-05	6.51E-03	2.14E-01	NA	8.04E-02
Manganese	2.4E-02	9.6E-04	5.0E-05	2.01E+00	NA	1.17E-06	4.00E-02	nervous system	nervous system	5.51E-02	2.29E+00	2.87E-04	2 99E-01	NA	NA	2.59E+00
Tetrachloroethene	1.0E-02	1.0E-02	2.7E-01	3.35E+00	2.77E+01	2.25E-04	1.00E+00	liver	nervous system	9.19E-02	9.19E+00	5.54E-02	5 54E+00	2.66E+01	9.86E+01	1.13E+02
Trichloroethene	NA	NA	6.0E-01	4.55E-02	3.77E-01	8.50E-07	1.00E+00		nervous system, eyes	1.25E-03	NA	2.10E-04	NA	3.61E-01	6.07E-01	6.07E-01
Chloroform	1.0E-02	1.0E-02	9.8E-02	3.50E-04	2.90E-03	3.55E-09	1.00E+00	liver	liver	9.59E-06	9.59E-04	8.75E-07	8.75E-05	2.78E-03	2.83E-02	2.94E-02
Subtotal Hazard Indices											1.16E+01		5.85E+00		9.94E+01	
															Total HI =	**1.17E+02**

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney:	2.5E-01
Total Liver:	1.5E+01
Total Blood:	8.0E-02
Total Nervous System:	1.0E+02
Total Eyes:	6.1E-01

APPENDIX N
TABLE 9.12 SUPPLEMENT A
Calculation of DAevent
Residential Adult Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,2-Dichloroethane	5.29E+01	4.2E-03	1.6E-02	3.8E-01	9.2E-01	1.0E+00	0.58	2.9E-07	2
cis-1,2-Dichloroethene	2.70E+01	7.7E-03	2.9E-02	3.7E-01	8.8E-01	1.0E+00	0.58	2.6E-07	2
Manganese	2.01E+03	1.0E-03	NA	NA	NA	NA	0.58	1.2E-06	1
Tetrachlorethylene	3.35E+03	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	0.58	2.2E-04	2
Trichloroethylene	4.55E+01	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.58	8.5E-07	2
Chloroform	3.50E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	3.5E-09	2

Inorganics: DAevent (mg/cm^2-event) =

DA_{event} = Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (Eq 1)

Organics: DAevent (mg/cm^2-event) =

DA_{event} = t_{event}<t*: DA_{event} (mg/cm^2-event) =
2 x FA x Kp x Cw x (sqrt((6 x τ x t_{event}) / (3.1415))) x CF1 x CF2 (Eq 2)

t_{event}>t*: DA_{event} (mg/cm^2-event) =
FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x ((1 + 3B + 3B^2)/(1+B)^2)) xCF1 x CF2 (Eq 3)

Notes:
NA - Not applicable
Permeability constants from USEPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

APPENDIX N

TABLE 9.12 SUPPLEMENT B

Bathroom Air Exposure Concentrations from Upper Alluvial Aquifer Groundwater, Andelman Model, as Modified by Schaum
Residential Adult Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Exposure Point Concentration Cwo (mg/l)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,2-Dichloroethane (EDC)	5.3E-02	5.6E-01	4.4E-01
cis-1,2-Dichloroethene	2.7E-02	2.8E-01	2.2E-01
Manganese	2.0E+00	2.1E+01	1.7E+01
Tetrachloroethene	3.4E+00	3.5E+01	2.8E+01
Trichloroethene	4.6E-02	4.8E-01	3.8E-01
Chloroform	3.5E-04	3.7E-03	2.9E-03

Variables	Units	Exposure Assumptions
Ca = concentration of chemical in air	mg/m^3	Solved by Eq 1
C_{amax} = maximum concentration of chemical	mg/m^3	Solved by Eq 2
t_1 = time in shower	hr	2.5E-01
t_2 = time in bathroom after shower	hr	3.3E-01
f = fraction volatilized for chemical	unitless	**9.0E-01**
F_w = shower water flow rate	L/hr	7.5E+02
V_a = bathroom volume	m^3	1.6E+01

Equation 1: $C_a = ((C_{amax}/2) * t_1 + C_{amax} \cdot t_2) / (t_1 + t_2)$

Equation 2: $C_{amax} = (C_w * f * F_w * t_1) / V_a$

Source of equations and assumptions: Schaum, J., K. Hoang, R. Kinerson, J. Moya, and R.G.M. Wang. 1994. "Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water." In: *Water Contamination and Health*. R.G.M. Wang (ed.). Marcel Dekker, Inc. New York.

APPENDIX N

TABLE 9.13

Potential Noncarcinogenic Risk from Groundwater (Off-site) - Child Resident RME Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

										Ingestion		Dermal		Inhalation		
COPC	RfD_o (mg/kg-day)	RfD_d (mg/kg-day)	RfC (mg/m^3)	Groundwater EPC (mg/L)	Bathroom Air EPC (mg/m^3)	DAevent (mg/cm^2-event)	ABS_{gi}	RfDo Target Organ	RfC Target Organ	CDI (mg/kg-day)	HQ	CDI (mg/kg-day)	HQ	DAC (mg/m^3)	HQ	Total HI
1,2-Dichloroethane (EDC)	2.00E-02	2.00E-02	2.40E+00	5.29E-02	7.79E-01	3.91E-07	1.00E+00	kidney, liver	kidney, liver	3.38E-03	1.69E-01	1.65E-04	8.25E-03	7.47E-01	3.11E-01	4.88E-01
cis-1,2-Dichloroethene	1.00E-02	1.00E-02	NA	2.70E-02	3.97E-01	3.58E-07	1.00E+00	blood		1.73E-03	1.73E-01	1.51E-04	1.51E-02	3.81E-01	NA	1.88E-01
Manganese	2.40E-02	9.60E-04	5.00E-05	2.01E+00	NA	2.01E-06	4.00E-02	nervous system	nervous system	1.28E-01	5.35E+00	8.48E-04	8.83E-01	NA	NA	6.24E+00
Tetrachloroethene	1.00E-02	1.00E-02	2.70E-01	3.35E+00	4.93E+01	2.95E-04	1.00E+00	liver	nervous system	2.14E-01	2.14E+01	1.24E-01	1.24E+01	4.73E+01	1.75E+02	2.09E+02
Trichloroethene	NA	NA	5.95E-01	4.55E-02	6.70E-01	1.12E-06	1.00E+00		nervous system, eyes	2.91E-03	NA	4.71E-04	NA	6.42E-01	1.08E+00	1.08E+00
Chloroform	1.00E-02	1.00E-02	9.80E-02	3.50E-04	5.15E-03	4.66E-09	1.00E+00	liver	liver	2.24E-05	2.24E-03	1.97E-06	1.97E-04	4.94E-03	5.04E-02	5.28E-02
Subtotal Hazard Indices											2.71E+01		1.34E+01		1.77E+02	
															Total HI =	2.17E+02

ABS_{gi} = gastrointestinal absorption factor
CDI = chronic daily intake
COPC = Chemical of Potential Concern
DAC = daily average concentration
EPC = exposure point concentration (mg/L)
HI = Hazard Index
RfD_d = dermal reference dose
RfD_o = oral reference dose
RfC = reference concentration
DAevent = Absorbed dose per event

mg/L = milligrams per liter
mg/kg-day = milligrams per kilogram per day
mg/m^3 = milligrams per cubic meter

Total Kidney:	4.9E-01
Total Liver:	3.4E+01
Total Blood:	1.9E-01
Total Nervous System:	1.8E+02
Total Eyes:	1.1E+00

APPENDIX N
TABLE 9.13 SUPPLEMENT A
Calculation of DAevent
Residential Child Scenario
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (t_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
1,2-Dichloroethane	5.29E+01	4.2E-03	1.6E-02	3.8E-01	9.2E-01	1.0E+00	1.0	3.9E-07	3
cis-1,2-Dichloroethene	2.70E+01	7.7E-03	2.9E-02	3.7E-01	8.8E-01	1.0E+00	1.0	3.6E-07	3
Manganese	2.01E+03	1.0E-03	NA	NA	NA	NA	1.0	2.0E-06	1
Tetrachlorethylene	3.35E+03	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	1.0	3.0E-04	2
Trichloroethylene	4.55E+01	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	1.0	1.1E-06	2
Chloroform	3.50E-01	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1.0	4.7E-09	2

Inorganics: DAevent (mg/cm^2-event) =

DA_{event} = Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (Eq 1)

Organics: DAevent (mg/cm^2-event) =

DA_{event} = t_{event}<t*: DA_{event} (mg/cm^2-event) =
2 x FA x Kp x Cw x (sqrt((6 x t x t_{event}) / (3.1415))) x CF1 x CF2 (Eq 2)

t_{event}>t*: DA_{event} (mg/cm^2-event) =
FA x Kp x CW x (t_{event}/(1+B) + 2 x t x ((1 + 3B + 3B^2)/(1+B)^2)) xCF1 x CF2 (Eq 3)

Notes:
NA - Not applicable
Permeability constants from USEPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

APPENDIX N

TABLE 9.13 SUPPLEMENT B

Bathroom Air Exposure Concentrations from Upper Alluvial Aquifer Groundwater, Andelman Model, as Modified by Schaum
Residential Child Scenario

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Chemical	Exposure Point Concentration Cwo (mg/l)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,2-Dichloroethane (EDC)	5.3E-02	1.0E+00	7.8E-01
cis-1,2-Dichloroethene	2.7E-02	5.1E-01	4.0E-01
Tetrachloroethene	3.4E+00	6.4E+01	4.9E+01
Trichloroethene	4.6E-02	8.6E-01	6.7E-01
Chloroform	3.5E-04	6.6E-03	5.1E-03

Variables	Units	Exposure Assumptions
Ca = concentration of chemical in air	mg/m^3	Solved by Eq 1
C_{amax} = maximum concentration of che	mg/m^3	Solved by Eq 2
t_1 = time in bath	hr	4.5E-01
t_2 = time in bathroom after bath	hr	5.5E-01
f = fraction volatilized for chemical	unitless	**9.0E-01**
F_w = tap water flow rate	L/hr	7.5E+02
V_a = bathroom volume	m^3	1.6E+01

Equation 1: $C_a = ((C_{amax}/2) * t_1 + C_{amax} \cdot t_2) / (t_1 + t_2)$

Equation 2: $C_{amax} = (C_w * f * F_w * t_1) / V_a$

Source of equations and assumptions: Schaum, J., K. Hoang, R. Kinerson, J. Moya, and R.G.M. Wang. 1994. "Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water." In: *Water Contamination and Health* . R.G.M. Wang (ed.). Marcel Dekker, Inc. New York.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit A

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	9	0	0.00%	5748.2	7845	6708.244	6840	706.5763	529.28095	-0.089277	0.1053295
Antimony (mg/kg)	3	5	62.50%	1.2	5.293179	2.564393	1.2	2.363198	0	1.7320508	0.9215428
Iron (mg/kg)	9	0	0.00%	10700	21855	13971.44	13306	3205.589	1678.2802	2.1436828	0.2294386
Lead (mg/kg)	10	0	0.00%	28.345	1022.9	236.0005	111.08	324.0846	77.242402	2.0711212	1.373237
Manganese (mg/kg)	9	0	0.00%	440	601	526 49	518	49.74089	33.787991	0.0157938	0.0944764
Selenium (mg/kg)	1	4	80.00%	12.4	12.4	12.4	12.4	N/A	0	N/A	N/A

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit A

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

General UCL Statistics for Data Sets with Non-Detects

User Selected Options			
Full Precision	ON		
Confidence Coefficient	95%		
Number of Bootstrap Operations			2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	5748.2	Minimum of Log Data	8.656642
Maximum	7845	Maximum of Log Data	8.9676317
Mean	6708.2444	Mean of log Data	8 8060904
Median	6840	SD of log Data	0.1065033
SD	706 57634		
Coefficient of Variation	0.1053295		
Skewness	-0.089277		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0 9276208	Shapiro Wilk Test Statistic	0.9196491
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0 829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	7146.2153	95% H-UCL	7190.8139
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7747.3792
95% Adjusted-CLT UCL	7088.1601	97 5% Chebyshev (MVUE) UCL	8196.9074
95% Modified-t UCL	7145 0472	99% Chebyshev (MVUE) UCL	9079.9187

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	66.822306	**Data appear Normal at 5% Significance Level**	
Theta Star	100.3893		
nu star	1202 8015		
Approximate Chi Square Value (.05)	1123.2794	**Nonparametric Statistics**	
Adjusted Level of Significance	0 02308	95% CLT UCL	7095.6493

Adjusted Chi Square Value	1107.0027	95% Jackknife UCL	7146.2153
		95% Standard Bootstrap UCL	7073.3984
Anderson-Darling Test Statistic	0.4152635	95% Bootstrap-t UCL	7124 7742
Anderson-Darling 5% Critical Value	0.71998	95% Hall's Bootstrap UCL	7086.974
Kolmogorov-Smirnov Test Statistic	0.2078738	95% Percentile Bootstrap UCL	7061 4667
Kolmogorov-Smirnov 5% Critical Value	0.27879	95% BCA Bootstrap UCL	7052 8889
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7734 8761
		97.5% Chebyshev(Mean, Sd) UCL	8179 1004
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	9051.6931
95% Approximate Gamma UCL	7183.152		
95% Adjusted Gamma UCL	7288.7686		
Potential UCL to Use		Use 95% Student's-t UCL	7146.2153

Antimony (mg/kg)

General Statistics

Number of Valid Data	8	Number of Detected Data	3
Number of Distinct Detected Data	2	Number of Non-Detect Data	5
		Percent Non-Detects	62 50%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	1.2	Minimum Detected	0.1823216
Maximum Detected	5.293179	Maximum Detected	1.666419
Mean of Detected	2.564393	Mean of Detected	0.6770207
SD of Detected	2.363198	SD of Detected	0.8568441
Minimum Non-Detect	3.8	Minimum Non-Detect	1 3350011
Maximum Non-Detect	3.8	Maximum Non-Detect	1 3350011

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit A

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.7499856	Shapiro Wilk Test Statistic	0.7499856
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2 1491474	Mean	0.6550414
SD	1.3091474	SD	0.4583639
95% DL/2 (t) UCL	3.0260597	95% H-Stat (DL/2) UCL	4.6598443
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.3989669
		SD in Log Scale	0.632964
		Mean in Original Scale	1.8267602
		SD in Original Scale	1 4864011
		95% Percentile Bootstrap UCL	2.7412911
		95% BCA Bootstrap UCL	3.1090758
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0 6190292	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	1 7116474
5% K-S Critical Value	N/A	SD	1.3536917
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.5861657
		95% KM (t) UCL	2.8221844
Assuming Gamma Distribution		95% KM (z) UCL	2.6758042
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	N/A
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	4 2666845
SD	N/A	97.5% KM (Chebyshev) UCL	5.372251
k star	N/A	99% KM (Chebyshev) UCL	7.5439225
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	2.8221844
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	N/A
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit A
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Iron (mg/kg)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	10700	Minimum of Log Data	9.277999
Maximum	21855	Maximum of Log Data	9.992185
Mean	13971 444	Mean of log Data	9 5252649
Median	13306	SD of log Data	0.200743
SD	3205.5893		
Coefficient of Variation	0.2294386		
Skewness	2.1436828		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.7673918	Shapiro Wilk Test Statistic	0 8533862
Shapiro Wilk Critical Value	0 829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	15958.427	95% H-UCL	16008.592
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	18027.846
95% Adjusted-CLT UCL	16544 862	97.5% Chebyshev (MVUE) UCL	19792.886
95% Modified-t UCL	16085 682	99% Chebyshev (MVUE) UCL	23259.967

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	17 273292	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	808 84666		
nu star	310 91926		
Approximate Chi Square Value (.05)	271.07014	**Nonparametric Statistics**	
Adjusted Level of Significance	0.02308	95% CLT UCL	15729.02
Adjusted Chi Square Value	263.20703	95% Jackknife UCL	15958.427
		95% Standard Bootstrap UCL	15694.322
Anderson-Darling Test Statistic	0.6836912	95% Bootstrap-t UCL	17770.211
Anderson-Darling 5% Critical Value	0 720883	95% Hall's Bootstrap UCL	23572.922
Kolmogorov-Smirnov Test Statistic	0.2732144	95% Percentile Bootstrap UCL	15759.444
Kolmogorov-Smirnov 5% Critical Value	0 2788268	95% BCA Bootstrap UCL	16317 889

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit A

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	18629.058
		97 5% Chebyshev(Mean, Sd) UCL	20644.411
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	24603.182
95% Approximate Gamma UCL	16025 34		
95% Adjusted Gamma UCL	16504.085		
Potential UCL to Use		Use 95% Approximate Gamma UCL	16025.34

Lead (mg/kg)

General Statistics			
Number of Valid Observations	10	Number of Distinct Observations	10
Raw Statistics		**Log-transformed Statistics**	
Minimum	28.345	Minimum of Log Data	3.3444506
Maximum	1022 9	Maximum of Log Data	6 930397
Mean	236 0005	Mean of log Data	4.8165606
Median	111.08	SD of log Data	1.129478
SD	324.08461		
Coefficient of Variation	1.373237		
Skewness	2.0711212		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.6615147	Shapiro Wilk Test Statistic	0.926276
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0 842
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	423 86626	95% H-UCL	832.92451
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	563.81276
95% Adjusted-CLT UCL	476 29326	97.5% Chebyshev (MVUE) UCL	715.38275
95% Modified-t UCL	435 05323	99% Chebyshev (MVUE) UCL	1013.1126
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.6986517	**Data appear Lognormal at 5% Significance Level**	
Theta Star	337.79423		
nu star	13.973033		
Approximate Chi Square Value (.05)	6 5528786	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	404.57259
Adjusted Chi Square Value	5.6932252	95% Jackknife UCL	423.86626
		95% Standard Bootstrap UCL	396.39126
Anderson-Darling Test Statistic	0 7572758	95% Bootstrap-t UCL	1236.2102
Anderson-Darling 5% Critical Value	0.7516513	95% Hall's Bootstrap UCL	1445.449
Kolmogorov-Smirnov Test Statistic	0 2952614	95% Percentile Bootstrap UCL	418.53

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit A

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Kolmogorov-Smirnov 5% Critical Value	0.2746167	95% BCA Bootstrap UCL	474 2505
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	682.72031
		97.5% Chebyshev(Mean, Sd) UCL	876.01633
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1255.7089
95% Approximate Gamma UCL	503 23576		
95% Adjusted Gamma UCL	579.22228		
Potential UCL to Use		Use 95% Chebyshev (MVUE) UCL	563.81276

Manganese (mg/kg)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9
Raw Statistics		**Log-transformed Statistics**	
Minimum	440	Minimum of Log Data	6.0867747
Maximum	601	Maximum of Log Data	6.3985949
Mean	526.49	Mean of log Data	6.2622272
Median	518	SD of log Data	0 0952286
SD	49.740888		
Coefficient of Variation	0.0944764		
Skewness	0.0157938		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.9418955	Shapiro Wilk Test Statistic	0.9419496
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	557.32186	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	599.39522
95% Adjusted-CLT UCL	553.85543	97.5% Chebyshev (MVUE) UCL	630 93599
95% Modified-t UCL	557 3364	99% Chebyshev (MVUE) UCL	692.89171
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	83.410635	**Data appear Normal at 5% Significance Level**	
Theta Star	6.3120249		

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit A

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

nu star	1501 3914		
Approximate Chi Square Value (.05)	1412.4086	**Nonparametric Statistics**	
Adjusted Level of Significance	0 02308	95% CLT UCL	553.76216
Adjusted Chi Square Value	1394.1247	95% Jackknife UCL	557 32186
		95% Standard Bootstrap UCL	551.77876
Anderson-Darling Test Statistic	0.3350307	95% Bootstrap-t UCL	561.67398
Anderson-Darling 5% Critical Value	0.71998	95% Hall's Bootstrap UCL	568.67805
Kolmogorov-Smirnov Test Statistic	0.1672515	95% Percentile Bootstrap UCL	552 39667
Kolmogorov-Smirnov 5% Critical Value	0.27879	95% BCA Bootstrap UCL	552.89111
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	598.76183
		97.5% Chebyshev(Mean, Sd) UCL	630.03392
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	691.46186
95% Approximate Gamma UCL	559.65928		
95% Adjusted Gamma UCL	566.99917		
Potential UCL to Use		Use 95% Student's-t UCL	557.32186

Selenium (mg/kg)

General Statistics

Number of Valid Data	5	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	4
		Percent Non-Detects	80 00%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC

The data set for variable Selenium (mg/kg) was not processed!

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	8	0	0.00%	5500	11600	7242 763	6678.5	1948.491	1289.7702	1.884802	0.269026
Antimony (mg/kg)	3	3	50.00%	2.76	3.15	2.923333	2.86	0.202567	0.148258	1.2694107	0.0692931
Arsenic (mg/kg)	5	2	28.57%	7.280546	18.9	13 99611	13 7	4.349166	4.1512231	-0.857611	0.3107411
Iron (mg/kg)	8	0	0.00%	10659	17630	12833	12221.5	2263.886	1313.5656	1.5871075	0 1764113
Lead (mg/kg)	9	0	0.00%	31	1416	267 9742	74.4	444.7745	42.449222	2.6692624	1.659766
Manganese (mg/kg)	8	0	0.00%	435.2	708	524.275	487	92.14262	57.67235	1.3016792	0 1757525

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

Full Precision	ON	
Confidence Coefficient	95%	
Number of Bootstrap Operations		2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	5500	Minimum of Log Data	8.612503
Maximum	11600	Maximum of Log Data	9.35876
Mean	7242.763	Mean of log Data	8.861135
Median	6678.5	SD of log Data	0 236725
SD	1948 491		
Coefficient of Variation	0 269026		
Skewness	1 884802		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.80749	Shapiro Wilk Test Statistic	0.885229
Shapiro Wilk Critical Value	0 818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8547 93	95% H-UCL	8660 795
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9870.475
95% Adjusted-CLT UCL	8866.413	97 5% Chebyshev (MVUE) UCL	11014.29
95% Modified-t UCL	8624.44	99% Chebyshev (MVUE) UCL	13261.09

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	11.92462	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	607.3789		
nu star	190.7939		
Approximate Chi Square Value (.05)	159 8394	**Nonparametric Statistics**	
Adjusted Level of Significance	0 01946	95% CLT UCL	8375.895

Adjusted Chi Square Value	152 6615	95% Jackknife UCL	8547.93
		95% Standard Bootstrap UCL	8305.694
Anderson-Darling Test Statistic	0.497916	95% Bootstrap-t UCL	9568.726
Anderson-Darling 5% Critical Value	0.716106	95% Hall's Bootstrap UCL	13084.83
Kolmogorov-Smirnov Test Statistic	0.203633	95% Percentile Bootstrap UCL	8486.75
Kolmogorov-Smirnov 5% Critical Value	0.293904	95% BCA Bootstrap UCL	8834.125
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10245.59
		97 5% Chebyshev(Mean, Sd) UCL	11544.92
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	14097.19
95% Approximate Gamma UCL	8645.395		
95% Adjusted Gamma UCL	9051.888		

Potential UCL to Use		Use 95% Approximate Gamma UCL	8645.395

Antimony (mg/kg)

General Statistics

Number of Valid Data	6	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	3
		Percent Non-Detects	50.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	2.76	Minimum Detected	1.015231
Maximum Detected	3.15	Maximum Detected	1.147403
Mean of Detected	2.923333	Mean of Detected	1 071152
SD of Detected	0.202567	SD of Detected	0.068391
Minimum Non-Detect	3 8	Minimum Non-Detect	1.335001
Maximum Non-Detect	3 8	Maximum Non-Detect	1.335001

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.926668	Shapiro Wilk Test Statistic	0.933709
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2 411667	Mean	0.856503
SD	0 574958	SD	0.239081
95% DL/2 (t) UCL	2 88465	95% H-Stat (DL/2) UCL	5.104422
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.071152
		SD in Log Scale	0.060149
		Mean in Original Scale	2.923161
		SD in Original Scale	0.176982
		95% Percentile Bootstrap UCL	3.035837
		95% BCA Bootstrap UCL	3.035837
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data appear Normal at 5% Significance Level**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0.343108	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	2.923333
5% K-S Critical Value	N/A	SD	0.165395
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.116952
		95% KM (t) UCL	3.158997
Assuming Gamma Distribution		95% KM (z) UCL	3.115702
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.186814
Minimum	N/A	95% KM (bootstrap t) UCL	3.570468
Maximum	N/A	95% KM (BCA) UCL	3 15
Mean	N/A	95% KM (Percentile Bootstrap) UCL	3.15
Median	N/A	95% KM (Chebyshev) UCL	3.433115
SD	N/A	97 5% KM (Chebyshev) UCL	3.653699
k star	N/A	99% KM (Chebyshev) UCL	4 086991
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	3.158997
95% Gamma Approximate UCL	N/A	95% KM (Percentile Bootstrap) UCL	3.15
95% Adjusted Gamma UCL	N/A		

Warning: Recommended UCL exceeds the maximum observation

Note: DL/2 is not a recommended method.

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Arsenic (MG/KG)

General Statistics

Number of Valid Data	7	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	2
		Percent Non-Detects	28 57%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	7.280546	Minimum Detected	1 985206
Maximum Detected	18.9	Maximum Detected	2 939162
Mean of Detected	13.99611	Mean of Detected	2 591039
SD of Detected	4.349166	SD of Detected	0.3655
Minimum Non-Detect	1.376	Minimum Non-Detect	0.319181
Maximum Non-Detect	1.376	Maximum Non-Detect	0.319181

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0 937486	Shapiro Wilk Test Statistic	0.866964
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	10.19379	Mean	1 743894
SD	7 40123	SD	1 477233
95% DL/2 (t) UCL	15 62965	95% H-Stat (DL/2) UCL	42 90173
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	13.99927	Mean in Log Scale	2.339724
SD	3.890013	SD in Log Scale	0.527817
95% MLE (t) UCL	16.8563	Mean in Original Scale	11.59183
95% MLE (Tiku) UCL	17 37883	SD in Original Scale	5.443716
		95% Percentile Bootstrap UCL	14.76857
		95% BCA Bootstrap UCL	14.72572

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	4.388219	**Data appear Normal at 5% Significance Level**	
Theta Star	3.189473		
nu star	43.88219		
A-D Test Statistic	0.404383	**Nonparametric Statistics**	
5% A-D Critical Value	0.678868	Kaplan-Meier (KM) Method	
K-S Test Statistic	0 678868	Mean	12.07738
5% K-S Critical Value	0 357563	SD	4.473539
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.890415
		95% KM (t) UCL	15.75079
Assuming Gamma Distribution		95% KM (z) UCL	15.18683
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	16 25557
Minimum	7.280546	95% KM (bootstrap t) UCL	14 99314
Maximum	18 9	95% KM (BCA) UCL	16.71429
Mean	12 81191	95% KM (Percentile Bootstrap) UCL	16.01429
Median	13.6	95% KM (Chebyshev) UCL	20.31751
SD	4.161916	97.5% KM (Chebyshev) UCL	23.88302
k star	6.043795	99% KM (Chebyshev) UCL	30.88677
Theta star	2.119845		
Nu star	84 61314	**Potential UCLs to Use**	
AppChi2	64.41154	95% KM (t) UCL	15.75079
95% Gamma Approximate UCL	16.83015	95% KM (Percentile Bootstrap) UCL	16.01429
95% Adjusted Gamma UCL	18.33836		

Note: DL/2 is not a recommended method.

Iron (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	10659	Minimum of Log Data	9.27416
Maximum	17630	Maximum of Log Data	9.777357
Mean	12833	Mean of log Data	9.447541
Median	12221.5	SD of log Data	0 162948
SD	2263 886		
Coefficient of Variation	0 176411		
Skewness	1.587108		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B
St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.848158	Shapiro Wilk Test Statistic	0.893222
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0 818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	14349.43	95% H-UCL	14446.22
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16049.54
95% Adjusted-CLT UCL	14629.45	97.5% Chebyshev (MVUE) UCL	17444 86
95% Modified-t UCL	14424 28	99% Chebyshev (MVUE) UCL	20185.67
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	25.7309	**Data appear Normal at 5% Significance Level**	
Theta Star	498.7389		
nu star	411.6944		
Approximate Chi Square Value (.05)	365.6598	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	14149.55
Adjusted Chi Square Value	354 6361	95% Jackknife UCL	14349.43
		95% Standard Bootstrap UCL	14078.92
Anderson-Darling Test Statistic	0.475363	95% Bootstrap-t UCL	16211.89
Anderson-Darling 5% Critical Value	0.715195	95% Hall's Bootstrap UCL	21988 21
Kolmogorov-Smirnov Test Statistic	0 240391	95% Percentile Bootstrap UCL	14221.13
Kolmogorov-Smirnov 5% Critical Value	0 293545	95% BCA Bootstrap UCL	14671.5
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	16321.88
		97.5% Chebyshev(Mean, Sd) UCL	17831.53
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	20796.93
95% Approximate Gamma UCL	14448.61		
95% Adjusted Gamma UCL	14897.73		
Potential UCL to Use		Use 95% Student's-t UCL	**14349.43**

Lead (mg/kg)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9
Raw Statistics		**Log-transformed Statistics**	
Minimum	31	Minimum of Log Data	3.433987
Maximum	1416	Maximum of Log Data	7.255591
Mean	267.9742	Mean of log Data	4.80302
Median	74.4	SD of log Data	1.199929
SD	444.7745		
Coefficient of Variation	1.659766		
Skewness	2 669262		

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.578637	Shapiro Wilk Test Statistic	0.885785
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	543.6674	95% H-UCL	1202.807
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	626.6865
95% Adjusted-CLT UCL	652.7885	97.5% Chebyshev (MVUE) UCL	801.3835
95% Modified-t UCL	565.653	99% Chebyshev (MVUE) UCL	1144.542
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.579832	**Data appear Lognormal at 5% Significance Level**	
Theta Star	462.1585		
nu star	10 43697		
Approximate Chi Square Value (.05)	4.216689	**Nonparametric Statistics**	
Adjusted Level of Significance	0 02308	95% CLT UCL	511.8372
Adjusted Chi Square Value	3 423307	95% Jackknife UCL	543 6674
		95% Standard Bootstrap UCL	503 1016
Anderson-Darling Test Statistic	0 910757	95% Bootstrap-t UCL	1564 281
Anderson-Darling 5% Critical Value	0.751184	95% Hall's Bootstrap UCL	1515.081
Kolmogorov-Smirnov Test Statistic	0 331364	95% Percentile Bootstrap UCL	531.8187
Kolmogorov-Smirnov 5% Critical Value	0.289198	95% BCA Bootstrap UCL	667.0111
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	914.2166
		97.5% Chebyshev(Mean, Sd) UCL	1193.846
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1743.124
95% Approximate Gamma UCL	663 2787		
95% Adjusted Gamma UCL	816.9994		
Potential UCL to Use		Use 95% Chebyshev (MVUE) UCL	626.6865

Manganese (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit B

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Raw Statistics		**Log-transformed Statistics**	
Minimum	435.2	Minimum of Log Data	6.075806
Maximum	708	Maximum of Log Data	6.562444
Mean	524.275	Mean of log Data	6.249618
Median	487	SD of log Data	0.164834
SD	92.14262		
Coefficient of Variation	0 175753		
Skewness	1 301679		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.864984	Shapiro Wilk Test Statistic	0 89567
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		***Assuming Lognormal Distribution***	
95% Student's-t UCL	585 9953	95% H-UCL	591.1364
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	657.2808
95% Adjusted-CLT UCL	593.8797	97.5% Chebyshev (MVUE) UCL	714.952
95% Modified-t UCL	588.4941	99% Chebyshev (MVUE) UCL	828.2359

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	25.39259	**Data appear Normal at 5% Significance Level**	
Theta Star	20.64677		
nu star	406.2815		
Approximate Chi Square Value (.05)	360.5584	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	577.86
Adjusted Chi Square Value	349.6141	95% Jackknife UCL	585.9953
		95% Standard Bootstrap UCL	574.2227
Anderson-Darling Test Statistic	0.47506	95% Bootstrap-t UCL	636.1731
Anderson-Darling 5% Critical Value	0.715222	95% Hall's Bootstrap UCL	656 441
Kolmogorov-Smirnov Test Statistic	0.227095	95% Percentile Bootstrap UCL	573.4
Kolmogorov-Smirnov 5% Critical Value	0 293553	95% BCA Bootstrap UCL	587 75
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	666.2763
		97.5% Chebyshev(Mean, Sd) UCL	727 7204
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	848 4154
95% Approximate Gamma UCL	590 7593		
95% Adjusted Gamma UCL	609.2523		

Potential UCL to Use	Use 95% Student's-t UCL	585.9953

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit C

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	4	0	0 00%	6382 4	8259	7322.375	7324.05	782 4824	837.5834	-0 011781	0.1068618
Antimony (mg/kg)	1	1	50.00%	4 24	4.24	4.24	4.24	N/A	0	N/A	N/A
Iron (mg/kg)	4	0	0.00%	13258	17675	15184.75	14903	2262.759	2424 7591	0.2172771	0.1490152
Manganese (mg/kg)	4	0	0.00%	423.08	611	510.92	504.8	79.07225	76.738325	0 413613	0.1547644

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit C

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options		
Full Precision	ON	
Confidence Coefficient	95%	
Number of Bootstrap Operations		2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	4	Number of Distinct Observations	4

Warning: This data set only has 4 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Aluminum (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Antimony (mg/kg)

General Statistics

Number of Valid Data	2	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	1
		Percent Non-Detects	50.00%

Warning: This data set only has 2 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Antimony (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Iron (mg/kg)

General Statistics

Number of Valid Observations	4	Number of Distinct Observations	4

Warning: This data set only has 4 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit C

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

The data set for variable Iron (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Manganese (mg/kg)

General Statistics

Number of Valid Observations	4	Number of Distinct Observations	4

Warning: This data set only has 4 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Manganese (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit D

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	6	0	0.00%	6987	12900	9170.433	7841.8	2741 9849	1219 1253	0.8599339	0.2990028
Iron (mg/kg)	6	0	0.00%	11678	19100	15879.17	16424	2803 2471	3077.0941	-0.523952	0.1765362
Manganese (mg/kg)	6	0	0.00%	306	1040	628.6	606.3	254.11903	217.19792	0.6006249	0.4042619
Thallium (mg/kg)	3	0	0.00%	2.74	4.66	3.673333	3.62	0.9611105	1.3046701	0.2489422	0.2616453

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit D

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options		
Full Precision	ON	
Confidence Coefficient	95%	
Number of Bootstrap Operations		2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	6987	Minimum of Log Data	8.8518066
Maximum	12900	Maximum of Log Data	9.4649826
Mean	9170.4333	Mean of log Data	9.0889918
Median	7841 8	SD of log Data	0 2831899
SD	2741.9849		
Coefficient of Variation	0.2990028		
Skewness	0.8599339		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.7722045	Shapiro Wilk Test Statistic	0.7918765
Shapiro Wilk Critical Value	0 788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	11426.1	95% H-UCL	12178 128
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	13770 552
95% Adjusted-CLT UCL	11431 613	97.5% Chebyshev (MVUE) UCL	15766.938
95% Modified-t UCL	11491 598	99% Chebyshev (MVUE) UCL	19688.452

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit D

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missoun

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	7.388115	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	1241.2413		
nu star	88.657379		
Approximate Chi Square Value (.05)	67.949066	**Nonparametric Statistics**	
Adjusted Level of Significance	0 01222	95% CLT UCL	11011.7
Adjusted Chi Square Value	61.433922	95% Jackknife UCL	11426.1
		95% Standard Bootstrap UCL	10887.073
Anderson-Darling Test Statistic	0.7192816	95% Bootstrap-t UCL	18977.162
Anderson-Darling 5% Critical Value	0.6977653	95% Hall's Bootstrap UCL	24959.713
Kolmogorov-Smirnov Test Statistic	0.2749839	95% Percentile Bootstrap UCL	10985 333
Kolmogorov-Smirnov 5% Critical Value	0.3321384	95% BCA Bootstrap UCL	11079.5
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	14049.831
		97.5% Chebyshev(Mean, Sd) UCL	16161.151
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	20308.429
95% Approximate Gamma UCL	11965.236		
95% Adjusted Gamma UCL	13234.164		
Potential UCL to Use		Use 95% Approximate Gamma UCL	11965.236

Iron (mg/kg)

General Statistics			
Number of Valid Observations	6	Number of Distinct Observations	6
Raw Statistics		**Log-transformed Statistics**	
Minimum	11678	Minimum of Log Data	9 365462
Maximum	19100	Maximum of Log Data	9.8574436
Mean	15879 167	Mean of log Data	9 6588949
Median	16424	SD of log Data	0.1855474
SD	2803 2471		
Coefficient of Variation	0.1765362		
Skewness	-0 523952		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit D

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.9517419	Shapiro Wilk Test Statistic	0.9352178
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	18185.23	95% H-UCL	18884.866
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	21131.519
95% Adjusted-CLT UCL	17500.005	97 5% Chebyshev (MVUE) UCL	23401.142
95% Modified-t UCL	18144 431	99% Chebyshev (MVUE) UCL	27859.377

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	18 220721	**Data appear Normal at 5% Significance Level**	
Theta Star	871.48947		
nu star	218.64866		
Approximate Chi Square Value (05)	185.42602	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01222	95% CLT UCL	17761.571
Adjusted Chi Square Value	174.32411	95% Jackknife UCL	18185.23
		95% Standard Bootstrap UCL	17596 383
Anderson-Darling Test Statistic	0.2790323	95% Bootstrap-t UCL	17741.323
Anderson-Darling 5% Critical Value	0 6969765	95% Hall's Bootstrap UCL	17402.255
Kolmogorov-Smirnov Test Statistic	0 2347145	95% Percentile Bootstrap UCL	17531
Kolmogorov-Smirnov 5% Critical Value	0.3317733	95% BCA Bootstrap UCL	17393 167
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	20867.581
		97.5% Chebyshev(Mean, Sd) UCL	23026.072
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	27266.01
95% Approximate Gamma UCL	18724.225		
95% Adjusted Gamma UCL	19916 685		

Potential UCL to Use	Use 95% Student's-t UCL	18185.23

Manganese (mg/kg)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	306	Minimum of Log Data	5 7235851
Maximum	1040	Maximum of Log Data	6.946976
Mean	628.6	Mean of log Data	6.3723727
Median	606.3	SD of log Data	0.4212758
SD	254.11903		
Coefficient of Variation	0.4042619		
Skewness	0 6006249		

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit D
St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.9806526	Shapiro Wilk Test Statistic	0.9936888
Shapiro Wilk Critical Value	0 788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	837.64849	95% H-UCL	1016.8838
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1101.7771
95% Adjusted-CLT UCL	826.4244	97 5% Chebyshev (MVUE) UCL	1305.9602
95% Modified-t UCL	841.88822	99% Chebyshev (MVUE) UCL	1707.0384
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3 70747	**Data appear Normal at 5% Significance Level**	
Theta Star	169.54959		
nu star	44.48964		
Approximate Chi Square Value (05)	30.191136	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01222	95% CLT UCL	799.24313
Adjusted Chi Square Value	26.012515	95% Jackknife UCL	837.64849
		95% Standard Bootstrap UCL	784 88694
Anderson-Darling Test Statistic	0 1413094	95% Bootstrap-t UCL	902.24349
Anderson-Darling 5% Critical Value	0.6981728	95% Hall's Bootstrap UCL	941.66284
Kolmogorov-Smirnov Test Statistic	0 1111346	95% Percentile Bootstrap UCL	783 66667
Kolmogorov-Smirnov 5% Critical Value	0 3326541	95% BCA Bootstrap UCL	798.83333
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1080.8081
		97.5% Chebyshev(Mean, Sd) UCL	1276.4789
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1660 8364
95% Approximate Gamma UCL	926.30459		
95% Adjusted Gamma UCL	1075 1051		
Potential UCL to Use		Use 95% Student's-t UCL	837 64849

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit D

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Thallium (mg/kg)

General Statistics

Number of Valid Observations	3	Number of Distinct Observations	3

Warning: This data set only has 3 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Thallium (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	7	0	0.00%	6292	10600	8026.1429	7775	1386.518	1282.431	0.9286032	0.1727502
Antimony (mg/kg)	1	4	80.00%	14.1	14.1	14.1	14.1	N/A	0	N/A	N/A
Arsenic (MG/KG)	7	0	0.00%	5.12	16.5	10.412454	11	4.518998	5.189029	-0.008032	0.4339993
Chromium (mg/kg)	8	1	11.11%	13	57.7	21.78425	17	14 75732	4.392884	2 6451847	0.6774306
Iron (mg/kg)	7	0	0.00%	5800	17300	13810	14793	3833.399	2520.386	-1.851035	0.2775814
Manganese (mg/kg)	7	0	0.00%	509	1060	688.65286	619	207.6768	108.2283	1.280718	0.3015697
Thallium (mg/kg)	1	4	80.00%	5 07	5.07	5.07	5.07	N/A	0	N/A	N/A
Vanadium (mg/kg)	6	0	0.00%	20.3	44 1	27.003667	24.75	8.672877	3.500371	2 0794264	0 3211741

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options		
Full Precision	ON	
Confidence Coefficient	95%	
Number of Bootstrap Operations		2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		**Log-transformed Statistics**	
Minimum	6292	Minimum of Log Data	8.7470343
Maximum	10600	Maximum of Log Data	9.2686093
Mean	8026 1429	Mean of log Data	8.9782344
Median	7775	SD of log Data	0.1672954
SD	1386.5175		
Coefficient of Variation	0.1727502		
Skewness	0 9286032		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.9439266	Shapiro Wilk Test Statistic	0.9727081
Shapiro Wilk Critical Value	0 803	Shapiro Wilk Critical Value	0 803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	9044.4746	95% H-UCL	9182.2811
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10237.377
95% Adjusted-CLT UCL	9084.6697	97.5% Chebyshev (MVUE) UCL	11195.041
95% Modified-t UCL	9075 1299	99% Chebyshev (MVUE) UCL	13076.187

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	23.561469	**Data appear Normal at 5% Significance Level**	
Theta Star	340 64697		
nu star	329 86056		
Approximate Chi Square Value (.05)	288.77964	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01584	95% CLT UCL	8888.1356
Adjusted Chi Square Value	277.10958	95% Jackknife UCL	9044.4746
		95% Standard Bootstrap UCL	8816.9038
Anderson-Darling Test Statistic	0.2234529	95% Bootstrap-t UCL	9337.8318
Anderson-Darling 5% Critical Value	0.7073752	95% Hall's Bootstrap UCL	9859.5219
Kolmogorov-Smirnov Test Statistic	0.1552418	95% Percentile Bootstrap UCL	8848 8571
Kolmogorov-Smirnov 5% Critical Value	0.3114179	95% BCA Bootstrap UCL	8996.5714
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10310 443
		97.5% Chebyshev(Mean, Sd) UCL	11298.861
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	13240.418
95% Approximate Gamma UCL	9167 9179		
95% Adjusted Gamma UCL	9554.0111		
Potential UCL to Use		Use 95% Student's-t UCL	9044.4746

Antimony (mg/kg)

General Statistics			
Number of Valid Data	5	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	4
		Percent Non-Detects	80.00%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC,

The data set for variable Antimony (mg/kg) was not processed!

Arsenic (MG/KG)

General Statistics			
Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		**Log-transformed Statistics**	
Minimum	5.12	Minimum of Log Data	1 6331544
Maximum	16.5	Maximum of Log Data	2.8033604
Mean	10.412454	Mean of log Data	2 2507936
Median	11	SD of log Data	0.4792244
SD	4.5189976		
Coefficient of Variation	0.4339993		
Skewness	-0.008032		

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.9167942	Shapiro Wilk Test Statistic	0.8909708
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0 803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	13.731445	95% H-UCL	17.091387
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	18.765503
95% Adjusted-CLT UCL	13.216358	97.5% Chebyshev (MVUE) UCL	22.357132
95% Modified-t UCL	13 730581	99% Chebyshev (MVUE) UCL	29 412192

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3 2859826	**Data appear Normal at 5% Significance Level**	
Theta Star	3 1687491		
nu star	46 003756		
Approximate Chi Square Value (.05)	31 442161	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01584	95% CLT UCL	13.221898
Adjusted Chi Square Value	27.856215	95% Jackknife UCL	13.731445
		95% Standard Bootstrap UCL	12.996355
Anderson-Darling Test Statistic	0 3915268	95% Bootstrap-t UCL	13.629527
Anderson-Darling 5% Critical Value	0.7096989	95% Hall's Bootstrap UCL	12.661153
Kolmogorov-Smirnov Test Statistic	0.1974979	95% Percentile Bootstrap UCL	12 969597
Kolmogorov-Smirnov 5% Critical Value	0.3128839	95% BCA Bootstrap UCL	12.969597
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	17.857543
		97.5% Chebyshev(Mean, Sd) UCL	21.079039
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	27.407044
95% Approximate Gamma UCL	15.234704		
95% Adjusted Gamma UCL	17.195876		

Potential UCL to Use	*Use 95% Student's-t UCL*	**13.731445**

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Chromium (mg/kg)

General Statistics

Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
		Percent Non-Detects	11 11%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	13	Minimum Detected	2.5649494
Maximum Detected	57.7	Maximum Detected	4.0552572
Mean of Detected	21.78425	Mean of Detected	2.9565933
SD of Detected	14 757318	SD of Detected	0.4722927
Minimum Non-Detect	12.7	Minimum Non-Detect	2 541602
Maximum Non-Detect	12.7	Maximum Non-Detect	2 541602

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.590568	Shapiro Wilk Test Statistic	0.7390917
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	20.069333	Mean	2.8334668
SD	14.731754	SD	0.5758638
95% DL/2 (t) UCL	29 200802	95% H-Stat (DL/2) UCL	21.149666
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	19.739041	Mean in Log Scale	2.8428367
SD	14.461512	SD in Log Scale	0.5582498
95% MLE (t) UCL	28.702999	Mean in Original Scale	20.131413
95% MLE (Tiku) UCL	28 195649	SD in Original Scale	14.667752
		95% Percentile Bootstrap UCL	29 272
		95% BCA Bootstrap UCL	33.300969

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**
k star (bias corrected)	2.6911067	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	8.0949038	
nu star	43.057707	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

A-D Test Statistic	1.1543561	**Nonparametric Statistics**	
5% A-D Critical Value	0 7186562	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.7186562	Mean	20.808222
5% K-S Critical Value	0 2953145	SD	13.304295
Data not Gamma Distributed at 5% Significance Level		SE of Mean	4.7409633
		95% KM (t) UCL	29.624271
Assuming Gamma Distribution		95% KM (z) UCL	28.606413
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	29.484516
Minimum	4 8356433	95% KM (bootstrap t) UCL	53.791583
Maximum	57 7	95% KM (BCA) UCL	30.938667
Mean	19 901071	95% KM (Percentile Bootstrap) UCL	29.819333
Median	15.7	95% KM (Chebyshev) UCL	41.473602
SD	14.915542	97.5% KM (Chebyshev) UCL	50.415529
k star	1.9548467	99% KM (Chebyshev) UCL	67.980212
Theta star	10.180375		
Nu star	35.18724	**Potential UCLs to Use**	
AppChi2	22 615366	95% KM (Chebyshev) UCL	41.473602
95% Gamma Approximate UCL	30 96407		
95% Adjusted Gamma UCL	34.134802		

Note: *DL/2 is not a recommended method.*

Iron (mg/kg)

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		**Log-transformed Statistics**	
Minimum	5800	Minimum of Log Data	8 6656132
Maximum	17300	Maximum of Log Data	9.7584618
Mean	13810	Mean of log Data	9.4841194
Median	14793	SD of log Data	0.3743007
SD	3833 399		
Coefficient of Variation	0 2775814		
Skewness	-1.851035		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning:* There are only *7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.815815	Shapiro Wilk Test Statistic	0 7068648
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	16625.451	95% H-UCL	19980.691
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	22590.586
95% Adjusted-CLT UCL	15110 079	97.5% Chebyshev (MVUE) UCL	26326.45
95% Modified-t UCL	16456.504	99% Chebyshev (MVUE) UCL	33664.832
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6 0163534	**Data appear Normal at 5% Significance Level**	
Theta Star	2295.4104		
nu star	84.228947		
Approximate Chi Square Value (.05)	64.076113	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01584	95% CLT UCL	16193.21
Adjusted Chi Square Value	58.793507	95% Jackknife UCL	16625.451
		95% Standard Bootstrap UCL	15973 401
Anderson-Darling Test Statistic	0.8692685	95% Bootstrap-t UCL	15777.59
Anderson-Darling 5% Critical Value	0.7084148	95% Hall's Bootstrap UCL	15443.147
Kolmogorov-Smirnov Test Statistic	0.3157855	95% Percentile Bootstrap UCL	15811
Kolmogorov-Smirnov 5% Critical Value	0.311913	95% BCA Bootstrap UCL	15466
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	20125.559
		97 5% Chebyshev(Mean, Sd) UCL	22858.307
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	28226.26
95% Approximate Gamma UCL	18153.438		
95% Adjusted Gamma UCL	19784.528		
Potential UCL to Use		Use 95% Student's-t UCL	16625.451

Manganese (mg/kg)

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		**Log-transformed Statistics**	
Minimum	509	Minimum of Log Data	6 232448
Maximum	1060	Maximum of Log Data	6.9660242
Mean	688.65286	Mean of log Data	6.5002259
Median	619	SD of log Data	0 2750588
SD	207.67682		

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Coefficient of Variation	0.3015697
Skewness	1.280718

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.8122081	Shapiro Wilk Test Statistic	0.8524582
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	841.18169	95% H-UCL	879 45874
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	999.08378
95% Adjusted-CLT UCL	858.36456	97 5% Chebyshev (MVUE) UCL	1134.0674
95% Modified-t UCL	847 51444	99% Chebyshev (MVUE) UCL	1399 2166

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	8 4681966	**Data appear Normal at 5% Significance Level**	
Theta Star	81 322256		
nu star	118 55475		
Approximate Chi Square Value (.05)	94 413606	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01584	95% CLT UCL	817.76476
Adjusted Chi Square Value	87 916408	95% Jackknife UCL	841.18169
		95% Standard Bootstrap UCL	811 87861
Anderson-Darling Test Statistic	0.6401328	95% Bootstrap-t UCL	1261.2104
Anderson-Darling 5% Critical Value	0.7076425	95% Hall's Bootstrap UCL	1799.1471
Kolmogorov-Smirnov Test Statistic	0 3258367	95% Percentile Bootstrap UCL	816.42857
Kolmogorov-Smirnov 5% Critical Value	0 3117113	95% BCA Bootstrap UCL	832 85714
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1030.8023
		97.5% Chebyshev(Mean, Sd) UCL	1178.8506
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1469.6629
95% Approximate Gamma UCL	864.73839		
95% Adjusted Gamma UCL	928.64427		

Potential UCL to Use	Use 95% Student's-t UCL	841.18169

Thallium (mg/kg)

General Statistics

Number of Valid Data	5	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	4
		Percent Non-Detects	80.00%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC,

The data set for variable Thallium (mg/kg) was not processed!

Vanadium (mg/kg)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	20.3	Minimum of Log Data	3 0106209
Maximum	44.1	Maximum of Log Data	3.7864598
Mean	27.003667	Mean of log Data	3 2610068
Median	24 75	SD of log Data	0.2751648
SD	8.6728773		
Coefficient of Variation	0 3211741		
Skewness	2 0794264		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.7408351	Shapiro Wilk Test Statistic	0.8185188
Shapiro Wilk Critical Value	0 788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit E

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	34.138323	95% H-UCL	35.433147
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	40.081622
95% Adjusted-CLT UCL	36.039286	97 5% Chebyshev (MVUE) UCL	45.78197
95% Modified-t UCL	34 639284	99% Chebyshev (MVUE) UCL	56.979198

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	7.3432913	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	3.6773247		
nu star	88.119496		
Approximate Chi Square Value (.05)	67.477896	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01222	95% CLT UCL	32.827579
Adjusted Chi Square Value	60.987143	95% Jackknife UCL	34.138323
		95% Standard Bootstrap UCL	32.389343
Anderson-Darling Test Statistic	0.6762006	95% Bootstrap-t UCL	45.407855
Anderson-Darling 5% Critical Value	0.6977764	95% Hall's Bootstrap UCL	60.167825
Kolmogorov-Smirnov Test Statistic	0 3311688	95% Percentile Bootstrap UCL	33.35
Kolmogorov-Smirnov 5% Critical Value	0 3321452	95% BCA Bootstrap UCL	34.703667
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	42 437165
		97.5% Chebyshev(Mean, Sd) UCL	49 115252
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	62.233061
95% Approximate Gamma UCL	35.264133		
95% Adjusted Gamma UCL	39 017232		

Potential UCL to Use	Use 95% Approximate Gamma UCL	35.264133

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit F

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	11	0	0 00%	6464.2	11100	8486.15	8492	1511 217	2057.376	0.267543	0.178081
Antimony (mg/kg)	2	2	50.00%	2.2	5 73	3.965	3.965	2.496087	2.616753	N/A	0.62953
Arsenic (mg/kg)	11	3	21.43%	4.93	14.5	7.77696	7.4	2.750578	2.745502	1.512119	0.353683
Iron (mg/kg)	11	0	0.00%	13429	18600	15736 4	15605	1449.054	1178.651	0.546727	0.092083
Lead (mg/kg)	16	0	0.00%	11.9	1118	136.455	50.1	281.0802	32.31134	3.300537	2.059877
Manganese (mg/kg)	11	0	0.00%	516	1025.3	693 595	639	144.9319	51.43069	1.388172	0 208958
Thallium (mg/kg)	2	3	60.00%	0.3	2.18	1.24	1.24	1.329361	1.393625	N/A	1.072065
Vanadium (mg/kg)	8	0	0 00%	22.045	46.1	26.0889	22.9615	8.173508	1.00593	2.714146	0.313295

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit F

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options			
Full Precision	ON		
Confidence Coefficient	95%		
Number of Bootstrap Operations			2000

Aluminum (mg/kg)

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	10
Raw Statistics		***Log-transformed Statistics***	
Minimum	6464 2	Minimum of Log Data	8.774035
Maximum	11100	Maximum of Log Data	9.3147
Mean	8486 146	Mean of log Data	9 031761
Median	8492	SD of log Data	0.178357
SD	1511 217		
Coefficient of Variation	0.178081		
Skewness	0.267543		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0 940219	Shapiro Wilk Test Statistic	0.940378
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	9311.992	95% H-UCL	9429.572
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10481.4
95% Adjusted-CLT UCL	9274.896	97.5% Chebyshev (MVUE) UCL	11344.7
95% Modified-t UCL	9318 118	99% Chebyshev (MVUE) UCL	13040.48
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	25.38302	**Data appear Normal at 5% Significance Level**	
Theta Star	334 3237		
nu star	558.4265		
Approximate Chi Square Value (05)	504.6168	***Nonparametric Statistics***	
Adjusted Level of Significance	0 02783	95% CLT UCL	9235.622
Adjusted Chi Square Value	496.2678	95% Jackknife UCL	9311 992
		95% Standard Bootstrap UCL	9196.946
Anderson-Darling Test Statistic	0.35089	95% Bootstrap-t UCL	9356.768
Anderson-Darling 5% Critical Value	0 728552	95% Hall's Bootstrap UCL	9289.583
Kolmogorov-Smirnov Test Statistic	0.195425	95% Percentile Bootstrap UCL	9197.136
Kolmogorov-Smirnov 5% Critical Value	0.254842	95% BCA Bootstrap UCL	9238.664
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10472.27

		97 5% Chebyshev(Mean, Sd) UCL	11331.67
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	13019.8
95% Approximate Gamma UCL	9391.063		
95% Adjusted Gamma UCL	9549.054		
Potential UCL to Use		Use 95% Student's-t UCL	9311.992

Antimony (mg/kg)

General Statistics

Number of Valid Data	4	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	2
		Percent Non-Detects	50.00%

Warning: This data set only has 4 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Antimony (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Arsenic (MG/KG)

General Statistics

Number of Valid Data	14	Number of Detected Data	11
Number of Distinct Detected Data	11	Number of Non-Detect Data	3
		Percent Non-Detects	21.43%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	4.93	Minimum Detected	1.595339
Maximum Detected	14 5	Maximum Detected	2 674149
Mean of Detected	7.77696	Mean of Detected	2.00185
SD of Detected	2.750578	SD of Detected	0.320305
Minimum Non-Detect	0.25	Minimum Non-Detect	-1 386294
Maximum Non-Detect	1.376	Maximum Non-Detect	0 319181

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	11
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	21 43%

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit F

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0 861705	Shapiro Wilk Test Statistic	0.939804
5% Shapiro Wilk Critical Value	0 85	5% Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6 217683	Mean	1.370927
SD	3.928957	SD	1.341612
95% DL/2 (t) UCL	8.077266	95% H-Stat (DL/2) UCL	13.36108
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	5.928052	Mean in Log Scale	1.838564
SD	4 325815	SD in Log Scale	0.430814
95% MLE (t) UCL	7 975468	Mean in Original Scale	6.853083
95% MLE (Tiku) UCL	8 100718	SD in Original Scale	3.034262
		95% Percentile Bootstrap UCL	8.151977
		95% BCA Bootstrap UCL	8.43868
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	7.553408	**Data appear Normal at 5% Significance Level**	
Theta Star	1.029596		
nu star	166 175		
A-D Test Statistic	0 359925	**Nonparametric Statistics**	
5% A-D Critical Value	0 72935	Kaplan-Meier (KM) Method	
K-S Test Statistic	0 72935	Mean	7 166897
5% K-S Critical Value	0 255369	SD	2.601673
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.729265
		95% KM (t) UCL	8.458376
Assuming Gamma Distribution		95% KM (z) UCL	8.366431
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	8.436351
Minimum	3.806006	95% KM (bootstrap t) UCL	9.16653
Maximum	14 5	95% KM (BCA) UCL	8 457041
Mean	7.098568	95% KM (Percentile Bootstrap) UCL	8.489709
Median	6.799823	95% KM (Chebyshev) UCL	10.34569
SD	2 780161	97 5% KM (Chebyshev) UCL	11.72115
k star	6 558083	99% KM (Chebyshev) UCL	14.42299
Theta star	1 082415		
Nu star	183 6263	**Potential UCLs to Use**	
AppChi2	153.2819	95% KM (t) UCL	8.458376
95% Gamma Approximate UCL	8 503834	95% KM (Percentile Bootstrap) UCL	8.489709
95% Adjusted Gamma UCL	8.712807		

Note: DL/2 is not a recommended method.

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit F
St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Iron (mg/kg)

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	13429	Minimum of Log Data	9.505172
Maximum	18600	Maximum of Log Data	9.830917
Mean	15736.36	Mean of log Data	9.659942
Median	15605	SD of log Data	0.090943
SD	1449.054		
Coefficient of Variation	0.092083		
Skewness	0.546727		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.973353	Shapiro Wilk Test Statistic	0.984089
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	16528.24	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	17618.17
95% Adjusted-CLT UCL	16531 97	97 5% Chebyshev (MVUE) UCL	18432.63
95% Modified-t UCL	16540.24	99% Chebyshev (MVUE) UCL	20032.47

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	96.19466	**Data appear Normal at 5% Significance Level**	
Theta Star	163.5887		
nu star	2116.283		
Approximate Chi Square Value (.05)	2010.421	**Nonparametric Statistics**	
Adjusted Level of Significance	0.02783	95% CLT UCL	16455 01
Adjusted Chi Square Value	1993.567	95% Jackknife UCL	16528 24
		95% Standard Bootstrap UCL	16444.81
Anderson-Darling Test Statistic	0.176704	95% Bootstrap-t UCL	16635 8
Anderson-Darling 5% Critical Value	0.72567	95% Hall's Bootstrap UCL	16803 2
Kolmogorov-Smirnov Test Statistic	0 124223	95% Percentile Bootstrap UCL	16443.36
Kolmogorov-Smirnov 5% Critical Value	0.25443	95% BCA Bootstrap UCL	16484.36
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	17640.79
		97.5% Chebyshev(Mean, Sd) UCL	18464 84
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	20083 52
95% Approximate Gamma UCL	16564 99		
95% Adjusted Gamma UCL	16705.03		

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit F

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missoun

Potential UCL to Use		Use 95% Student's-t UCL	16528.24

Lead (mg/kg)

General Statistics

Number of Valid Observations	16	Number of Distinct Observations	16

Raw Statistics		**Log-transformed Statistics**	
Minimum	11.9	Minimum of Log Data	2.476538
Maximum	1118	Maximum of Log Data	7.019297
Mean	136.4549	Mean of log Data	3.980103
Median	50.1	SD of log Data	1.196114
SD	281 0802		
Coefficient of Variation	2.059877		
Skewness	3.300537		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0 460115	Shapiro Wilk Test Statistic	0.871178
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	259 6418	95% H-UCL	277.9771
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	251.8315
95% Adjusted-CLT UCL	313 9937	97 5% Chebyshev (MVUE) UCL	316 5961
95% Modified-t UCL	269 3055	99% Chebyshev (MVUE) UCL	443 8135

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.571605	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	238.7222		
nu star	18.29137		
Approximate Chi Square Value (.05)	9.601767	**Nonparametric Statistics**	
Adjusted Level of Significance	0.03348	95% CLT UCL	252.0388
Adjusted Chi Square Value	8.891477	95% Jackknife UCL	259.6418
		95% Standard Bootstrap UCL	249.6164
Anderson-Darling Test Statistic	1.883007	95% Bootstrap-t UCL	1295.539
Anderson-Darling 5% Critical Value	0.783053	95% Hall's Bootstrap UCL	961.6513
Kolmogorov-Smirnov Test Statistic	0.333944	95% Percentile Bootstrap UCL	257.3088
Kolmogorov-Smirnov 5% Critical Value	0 224777	95% BCA Bootstrap UCL	341.5896
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	442.755
		97 5% Chebyshev(Mean, Sd) UCL	575.2913
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	835.6332
95% Approximate Gamma UCL	259 9466		
95% Adjusted Gamma UCL	280.7123		

Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	835 6332

Manganese (mg/kg)

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	516	Minimum of Log Data	6 246107
Maximum	1025.3	Maximum of Log Data	6.932741
Mean	693.5946	Mean of log Data	6 524099
Median	639	SD of log Data	0 192853
SD	144 9319		
Coefficient of Variation	0 208958		
Skewness	1.388172		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.849015	Shapiro Wilk Test Statistic	0.896419
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	772.7966	95% H-UCL	777.2619
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	869.2116
95% Adjusted-CLT UCL	785 0155	97.5% Chebyshev (MVUE) UCL	945.4734
95% Modified-t UCL	775.8449	99% Chebyshev (MVUE) UCL	1095 275

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	20 62262	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	33 63271		
nu star	453.6976		
Approximate Chi Square Value (.05)	405.3125	**Nonparametric Statistics**	
Adjusted Level of Significance	0.02783	95% CLT UCL	765.4724
Adjusted Chi Square Value	397.8494	95% Jackknife UCL	772.7966
		95% Standard Bootstrap UCL	763.6529
Anderson-Darling Test Statistic	0 715342	95% Bootstrap-t UCL	821.7165
Anderson-Darling 5% Critical Value	0.728617	95% Hall's Bootstrap UCL	902.0437
Kolmogorov-Smirnov Test Statistic	0.263599	95% Percentile Bootstrap UCL	765.8373
Kolmogorov-Smirnov 5% Critical Value	0.254925	95% BCA Bootstrap UCL	780.5355
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	884.0724
		97 5% Chebyshev(Mean, Sd) UCL	966.4923

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit F

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1128.39
95% Approximate Gamma UCL	776.394		
95% Adjusted Gamma UCL	790.9581		

Potential UCL to Use		Use 95% Approximate Gamma UCL	776.394

Thallium (mg/kg)

General Statistics

Number of Valid Data	5	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	3
		Percent Non-Detects	60 00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.3	Minimum Detected	-1.203973
Maximum Detected	2.18	Maximum Detected	0.779325
Mean of Detected	1.24	Mean of Detected	-0.212324
SD of Detected	1 329361	SD of Detected	1.402403
Minimum Non-Detect	31 3	Minimum Non-Detect	3.443618
Maximum Non-Detect	31 3	Maximum Non-Detect	3.443618

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.999981	Shapiro Wilk Test Statistic	0 999981
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	9.886	Mean	1.565353

SD	7.920621	SD	1.767804
95% DL/2 (t) UCL	17.43744	95% H-Stat (DL/2) UCL	44768162

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	N/A		
nu star	N/A		

A-D Test Statistic	0.357567	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	1.24
5% K-S Critical Value	N/A	SD	0.94
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.94
		95% KM (t) UCL	3.243935
Assuming Gamma Distribution		95% KM (z) UCL	2.786162
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	N/A
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	5 337365
SD	N/A	97.5% KM (Chebyshev) UCL	7.110298
k star	N/A	99% KM (Chebyshev) UCL	10 59288
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (BCA) UCL	N/A
95% Gamma Approximate UCL	N/A		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

Vanadium (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	22 045	Minimum of Log Data	3.093086
Maximum	46.1	Maximum of Log Data	3.830813

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit F

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Mean	26.08888	Mean of log Data	3.230014
Median	22.9615	SD of log Data	0.247809
SD	8.173508		
Coefficient of Variation	0.313295		
Skewness	2.714146		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0 538611	Shapiro Wilk Test Statistic	0.58458
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	31.56377	95% H-UCL	31.42516
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	35.91106
95% Adjusted-CLT UCL	33.80513	97.5% Chebyshev (MVUE) UCL	40 21415
95% Modified-t UCL	32.02594	99% Chebyshev (MVUE) UCL	48 66675
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	10.10844	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	2.580901		
nu star	161.735		
Approximate Chi Square Value (05)	133.3317	**Nonparametric Statistics**	
Adjusted Level of Significance	0 01946	95% CLT UCL	30 84213
Adjusted Chi Square Value	126.8038	95% Jackknife UCL	31.56377
		95% Standard Bootstrap UCL	30.41625
Anderson-Darling Test Statistic	1.675382	95% Bootstrap-t UCL	76.10435
Anderson-Darling 5% Critical Value	0 715737	95% Hall's Bootstrap UCL	54.91376
Kolmogorov-Smirnov Test Statistic	0 365835	95% Percentile Bootstrap UCL	31.63913
Kolmogorov-Smirnov 5% Critical Value	0 294026	95% BCA Bootstrap UCL	34.44313
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	38.6851
		97.5% Chebyshev(Mean, Sd) UCL	44 13549
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	54 84174
95% Approximate Gamma UCL	31.64651		
95% Adjusted Gamma UCL	33.2757		
Potential UCL to Use		Use 95% Student's-t UCL	31.56377
		or 95% Modified-t UCL	32.02594

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit G

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
Aluminum (mg/kg)	11	0	0.00%	6837.1	14655	9527.918	8710	2543.427	2495.182	0.850085	0.266945
Benzo(b)fluoranthene (mg/kg)	2	1	33.33%	0.1298	0 8186	0.4742	0.4742	0.487055	0.5106	N/A	1.027109
Iron (mg/kg)	11	0	0.00%	6000	22519	16224.09	16074	4073.703	1444.033	-1.384002	0 25109
Lead (mg/kg)	12	0	0.00%	11	983	133.457	57.9	270 2262	55.22609	3.343343	2.024818
Manganese (mg/kg)	11	0	0.00%	601	1070	814.0536	766.83	160.4565	124.2847	0 516657	0.197108
Thallium (mg/kg)	2	5	71.43%	1.94	5.19	3.565	3.565	2.298097	2.409192	N/A	0.644628
Vanadium (mg/kg)	9	0	0.00%	22.2	50.2	31.37267	27.9	9.338842	5.337287	1.273469	0.297675

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit G

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options			
Full Precision	ON		
Confidence Coefficient	95%		
Number of Bootstrap Operations			2000

Aluminum (mg/kg)

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	6837.1	Minimum of Log Data	8.830119
Maximum	14655	Maximum of Log Data	9.592537
Mean	9527.918	Mean of log Data	9 131621
Median	8710	SD of log Data	0.254587
SD	2543.427		
Coefficient of Variation	0.266945		
Skewness	0.850085		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.892932	Shapiro Wilk Test Statistic	0.920013
Shapiro Wilk Critical Value	0 85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	10917.84	95% H-UCL	11131 38
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	12722.49
95% Adjusted-CLT UCL	10999 33	97.5% Chebyshev (MVUE) UCL	14108.79
95% Modified-t UCL	10950 6	99% Chebyshev (MVUE) UCL	16831.91
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	12.1577	**Data appear Normal at 5% Significance Level**	
Theta Star	783 6943		
nu star	267 4694		
Approximate Chi Square Value (.05)	230 5964	**Nonparametric Statistics**	
Adjusted Level of Significance	0 02783	95% CLT UCL	10789 31
Adjusted Chi Square Value	225.0127	95% Jackknife UCL	10917.84
		95% Standard Bootstrap UCL	10740.38
Anderson-Darling Test Statistic	0 457101	95% Bootstrap-t UCL	11379.31
Anderson-Darling 5% Critical Value	0 728926	95% Hall's Bootstrap UCL	10948.57
Kolmogorov-Smirnov Test Statistic	0.208357	95% Percentile Bootstrap UCL	10739.91
Kolmogorov-Smirnov 5% Critical Value	0.255148	95% BCA Bootstrap UCL	10897.18

Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	12870 64
		97.5% Chebyshev(Mean, Sd) UCL	14317.03
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	17158 2
95% Approximate Gamma UCL	11051.46		
95% Adjusted Gamma UCL	11325.7		
Potential UCL to Use		Use 95% Student's-t UCL	10917.84

Benzo(b)fluoranthene (mg/kg)

General Statistics

Number of Valid Data	3	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	1
		Percent Non-Detects	33.33%

Warning: This data set only has 3 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Benzo(b)fluoranthene (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Iron (mg/kg)

General Statistics

Number of Valid Observations	11	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	6000	Minimum of Log Data	8 699515
Maximum	22519	Maximum of Log Data	10.02212
Mean	16224.09	Mean of log Data	9 652213
Median	16074	SD of log Data	0 339072
SD	4073.703		
Coefficient of Variation	0.25109		
Skewness	-1 384002		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.836104	Shapiro Wilk Test Statistic	0 687156
Shapiro Wilk Critical Value	0 85	Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit G

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	18450 28	95% H-UCL	20391.48
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	23764 81
95% Adjusted-CLT UCL	17696.75	97.5% Chebyshev (MVUE) UCL	26957.17
95% Modified-t UCL	18364.85	99% Chebyshev (MVUE) UCL	33227.95

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	8 830019	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	1837.379		
nu star	194 2604		
Approximate Chi Square Value (.05)	163.015	**Nonparametric Statistics**	
Adjusted Level of Significance	0.02783	95% CLT UCL	18244.41
Adjusted Chi Square Value	158.3493	95% Jackknife UCL	18450.28
		95% Standard Bootstrap UCL	18140.9
Anderson-Darling Test Statistic	1.211324	95% Bootstrap-t UCL	18079.01
Anderson-Darling 5% Critical Value	0.729232	95% Hall's Bootstrap UCL	17986.56
Kolmogorov-Smirnov Test Statistic	0.349614	95% Percentile Bootstrap UCL	17895.09
Kolmogorov-Smirnov 5% Critical Value	0.255308	95% BCA Bootstrap UCL	17726.18
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	21577.99
		97.5% Chebyshev(Mean, Sd) UCL	23894.62
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	28445.2
95% Approximate Gamma UCL	19333.8		
95% Adjusted Gamma UCL	19903.46		

Potential UCL to Use		Use 95% Student's-t UCL	18450.28
		or 95% Modified-t UCL	18364.85

Lead (mg/kg)

General Statistics			
Number of Valid Observations	12	Number of Distinct Observations	12
Raw Statistics		**Log-transformed Statistics**	
Minimum	11	Minimum of Log Data	2.397895
Maximum	983	Maximum of Log Data	6.890609
Mean	133 457	Mean of log Data	4.014905
Median	57.9	SD of log Data	1.201265
SD	270 2262		
Coefficient of Variation	2.024818		
Skewness	3 343343		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.453314	Shapiro Wilk Test Statistic	0 910641
Shapiro Wilk Critical Value	0.859	Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	273.5496	95% H-UCL	375.8374
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	274.8556
95% Adjusted-CLT UCL	342.2146	97 5% Chebyshev (MVUE) UCL	348.7083
95% Modified-t UCL	286.0977	99% Chebyshev (MVUE) UCL	493.7775

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.572411	**Data appear Lognormal at 5% Significance Level**	
Theta Star	233.1489		
nu star	13.73787		
Approximate Chi Square Value (.05)	6.39227	**Nonparametric Statistics**	
Adjusted Level of Significance	0 02896	95% CLT UCL	261.768
Adjusted Chi Square Value	5 644918	95% Jackknife UCL	273.5496
		95% Standard Bootstrap UCL	257 0518
Anderson-Darling Test Statistic	1.1518	95% Bootstrap-t UCL	909.0532
Anderson-Darling 5% Critical Value	0.770308	95% Hall's Bootstrap UCL	835 0536
Kolmogorov-Smirnov Test Statistic	0 276234	95% Percentile Bootstrap UCL	283 957
Kolmogorov-Smirnov 5% Critical Value	0.255752	95% BCA Bootstrap UCL	361 9118
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	473.4841
		97.5% Chebyshev(Mean, Sd) UCL	620.6141
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	909.6225
95% Approximate Gamma UCL	286.8174		
95% Adjusted Gamma UCL	324.7902		

Potential UCL to Use		Use 95% Chebyshev (MVUE) UCL	274.8556

Manganese (mg/kg)

General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	10

Raw Statistics		**Log-transformed Statistics**	
Minimum	601	Minimum of Log Data	6 398595
Maximum	1070	Maximum of Log Data	6.975414
Mean	814.0536	Mean of log Data	6.684848
Median	766.83	SD of log Data	0.193117
SD	160.4565		
Coefficient of Variation	0 197108		
Skewness	0.516657		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.895289	Shapiro Wilk Test Statistic	0.913979
Shapiro Wilk Critical Value	0 85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit G

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	901 7395	95% H-UCL	913.0081
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1021.125
95% Adjusted-CLT UCL	901.6836	97.5% Chebyshev (MVUE) UCL	1110.814
95% Modified-t UCL	902 9956	99% Chebyshev (MVUE) UCL	1286.989

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	21.34923	**Data appear Normal at 5% Significance Level**	
Theta Star	38 13035		
nu star	469.6831		
Approximate Chi Square Value (.05)	420.4322	**Nonparametric Statistics**	
Adjusted Level of Significance	0 02783	95% CLT UCL	893.6308
Adjusted Chi Square Value	412 8277	95% Jackknife UCL	901.7395
		95% Standard Bootstrap UCL	890.4479
Anderson-Darling Test Statistic	0.547479	95% Bootstrap-t UCL	919.4727
Anderson-Darling 5% Critical Value	0 728607	95% Hall's Bootstrap UCL	888.5684
Kolmogorov-Smirnov Test Statistic	0 204919	95% Percentile Bootstrap UCL	894 16
Kolmogorov-Smirnov 5% Critical Value	0.254913	95% BCA Bootstrap UCL	898 9846
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1024.935
		97 5% Chebyshev(Mean, Sd) UCL	1116 183
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1295.423
95% Approximate Gamma UCL	909 4147		
95% Adjusted Gamma UCL	926 1666		

Potential UCL to Use	Use 95% Student's-t UCL	901.7395

Thallium (mg/kg)

General Statistics			
Number of Valid Data	7	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	5
		Percent Non-Detects	71.43%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	1 94	Minimum Detected	0.662688
Maximum Detected	5.19	Maximum Detected	1.646734
Mean of Detected	3 565	Mean of Detected	1.154711
SD of Detected	2 298097	SD of Detected	0.695825
Minimum Non-Detect	31 3	Minimum Non-Detect	3.443618
Maximum Non-Detect	31.3	Maximum Non-Detect	3.443618

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit G
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.999981	Shapiro Wilk Test Statistic	0.999981
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	12.19714	Mean	2.29454
SD	5.971043	SD	0 828851
95% DL/2 (t) UCL	16.58259	95% H-Stat (DL/2) UCL	289 3964
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	0 359119	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	3.565
5% K-S Critical Value	N/A	SD	1.625
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.625
		95% KM (t) UCL	6 722667
Assuming Gamma Distribution		95% KM (z) UCL	6.237887
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	N/A
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A

Median	N/A	95% KM (Chebyshev) UCL	10 64821
SD	N/A	97 5% KM (Chebyshev) UCL	13.71312
k star	N/A	99% KM (Chebyshev) UCL	19.73355
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	6.722667
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	N/A
95% Adjusted Gamma UCL	N/A		

Warning: Recommended UCL exceeds the maximum observation
Note: DL/2 is not a recommended method.

Vanadium (mg/kg)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	22.2	Minimum of Log Data	3.100092
Maximum	50.2	Maximum of Log Data	3.916015
Mean	31.37267	Mean of log Data	3.411056
Median	27.9	SD of log Data	0.272087
SD	9.338842		
Coefficient of Variation	0.297675		
Skewness	1.273469		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.860513	Shapiro Wilk Test Statistic	0.91355
Shapiro Wilk Critical Value	0 829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	37.16134	95% H-UCL	38.03834
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	43 7425
95% Adjusted-CLT UCL	37.90496	97 5% Chebyshev (MVUE) UCL	49.12322
95% Modified-t UCL	37.38158	99% Chebyshev (MVUE) UCL	59.6926

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	9.740137	**Data appear Normal at 5% Significance Level**
Theta Star	3.220968	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit G

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

nu star	175.3225		
Approximate Chi Square Value (.05)	145.6999	**Nonparametric Statistics**	
Adjusted Level of Significance	0.02308	95% CLT UCL	36.49301
Adjusted Chi Square Value	140.003	95% Jackknife UCL	37.16134
		95% Standard Bootstrap UCL	36.28607
Anderson-Darling Test Statistic	0.46012	95% Bootstrap-t UCL	41.6403
Anderson-Darling 5% Critical Value	0 721399	95% Hall's Bootstrap UCL	64 99986
Kolmogorov-Smirnov Test Statistic	0.192242	95% Percentile Bootstrap UCL	36 46667
Kolmogorov-Smirnov 5% Critical Value	0.279109	95% BCA Bootstrap UCL	37.43333
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	44.94169
		97.5% Chebyshev(Mean, Sd) UCL	50.81302
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	62.3461
95% Approximate Gamma UCL	37.7511		
95% Adjusted Gamma UCL	39.28725		
Potential UCL to Use		Use 95% Student's-t UCL	37.16134

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	7	0	0.00%	5395.6	8960	7181.5	7440	1125.319	658.7102	-0.103223	0.156697
Arsenic (mg/kg)	18	1	5 26%	4.035499	23 5	9.367002	8.3	4.534913	2.887396	1.995704	0.484137
Iron (mg/kg)	7	0	0.00%	12114	15913	14146.14	14421	1332.478	1383.247	-0.290213	0.094194
Manganese (mg/kg)	7	0	0.00%	530	656.17	584.6243	570 17	47 41419	59.55523	0 419946	0 081102
Silver (mg/kg)	5	2	28 57%	0 72	82.6	22.226	3.85	35.02479	4.640474	1.881541	1.575848
Thallium (mg/kg)	1	1	50.00%	4.52	4.52	4.52	4 52	N/A	0	N/A	N/A

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options		
Full Precision	ON	
Confidence Coefficient	95%	
Number of Bootstrap Operations		2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		**Log-transformed Statistics**	
Minimum	5395 6	Minimum of Log Data	8.593339
Maximum	8960	Maximum of Log Data	9.100526
Mean	7181.5	Mean of log Data	8 868366
Median	7440	SD of log Data	0 161147
SD	1125.319		
Coefficient of Variation	0 156697		
Skewness	-0 103223		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.964157	Shapiro Wilk Test Statistic	0.95388
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8007.994	95% H-UCL	8174 512
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9091.38
95% Adjusted-CLT UCL	7863 376	97 5% Chebyshev (MVUE) UCL	9917 115
95% Modified-t UCL	8005.228	99% Chebyshev (MVUE) UCL	11539 11

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	26.40791	**Data appear Normal at 5% Significance Level**	
Theta Star	271.945		
nu star	369 7107		
Approximate Chi Square Value (05)	326 1489	**Nonparametric Statistics**	
Adjusted Level of Significance	0 01584	95% CLT UCL	7881.107
Adjusted Chi Square Value	313.7204	95% Jackknife UCL	8007.994
		95% Standard Bootstrap UCL	7832.594
Anderson-Darling Test Statistic	0.284662	95% Bootstrap-t UCL	7920.984
Anderson-Darling 5% Critical Value	0.70754	95% Hall's Bootstrap UCL	7924.997
Kolmogorov-Smirnov Test Statistic	0 185669	95% Percentile Bootstrap UCL	7806 114
Kolmogorov-Smirnov 5% Critical Value	0.311408	95% BCA Bootstrap UCL	7806.657
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9035.473
		97.5% Chebyshev(Mean, Sd) UCL	9837 689
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	11413.49
95% Approximate Gamma UCL	8140 691		
95% Adjusted Gamma UCL	8463 197		
Potential UCL to Use		Use 95% Student's-t UCL	8007.994

Arsenic (MG/KG)

General Statistics			
Number of Valid Data	19	Number of Detected Data	18
Number of Distinct Detected Data	18	Number of Non-Detect Data	1
		Percent Non-Detects	5.26%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	4.035499	Minimum Detected	1.39513
Maximum Detected	23.5	Maximum Detected	3.157
Mean of Detected	9.367002	Mean of Detected	2.149937
SD of Detected	4 534913	SD of Detected	0.413031
Minimum Non-Detect	1.376	Minimum Non-Detect	0.319181
Maximum Non-Detect	1.376	Maximum Non-Detect	0 319181

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.816611	Shapiro Wilk Test Statistic	0.967356
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0 897
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	8.910212	Mean	2.0171
SD	4 836051	SD	0.704546
95% DL/2 (t) UCL	10.8341	95% H-Stat (DL/2) UCL	11.12111
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	8.835349	Mean in Log Scale	2.096885
SD	4.865321	SD in Log Scale	0.463241
95% MLE (t) UCL	10.77088	Mean in Original Scale	9.038891
95% MLE (Tiku) UCL	10.77048	SD in Original Scale	4.633398
		95% Percentile Bootstrap UCL	10.79765
		95% BCA Bootstrap UCL	11.23182

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**
k star (bias corrected)	4 946929	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	1.893498	
nu star	178.0895	
A-D Test Statistic	0.466111	**Nonparametric Statistics**
5% A-D Critical Value	0.742317	Kaplan-Meier (KM) Method
K-S Test Statistic	0.742317	Mean 9.086396
5% K-S Critical Value	0 203976	SD 4.451737
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 1.050907
		95% KM (t) UCL 10.90874
Assuming Gamma Distribution		95% KM (z) UCL 10.81499
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 10.86972
Minimum	0.871425	95% KM (bootstrap t) UCL 11.82202
Maximum	23 5	95% KM (BCA) UCL 10.76275
Mean	8.919866	95% KM (Percentile Bootstrap) UCL 10 90699
Median	8.19	95% KM (Chebyshev) UCL 13.6672
SD	4 818878	97 5% KM (Chebyshev) UCL 15.64931
k star	2 820016	99% KM (Chebyshev) UCL 19 54279
Theta star	3.163055	
Nu star	107.1606	**Potential UCLs to Use**
AppChi2	84.26984	95% KM (BCA) UCL 10.76275
95% Gamma Approximate UCL	11 34283	
95% Adjusted Gamma UCL	11.58666	

Note: DL/2 is not a recommended method.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Iron (mg/kg)

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		**Log-transformed Statistics**	
Minimum	12114	Minimum of Log Data	9 402117
Maximum	15913	Maximum of Log Data	9 674892
Mean	14146 14	Mean of log Data	9.553317
Median	14421	SD of log Data	0.095652
SD	1332.478		
Coefficient of Variation	0.094194		
Skewness	-0 290213		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		***Lognormal Distribution Test***	
Shapiro Wilk Test Statistic	0.975429	Shapiro Wilk Test Statistic	0 969136
Shapiro Wilk Critical Value	0 803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	15124.79	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16376 58
95% Adjusted-CLT UCL	14915 51	97.5% Chebyshev (MVUE) UCL	17341.45
95% Modified-t UCL	15115.58	99% Chebyshev (MVUE) UCL	19236.76

Gamma Distribution Test		***Data Distribution***	
k star (bias corrected)	73.82616	**Data appear Normal at 5% Significance Level**	
Theta Star	191.6142		
nu star	1033.566		
Approximate Chi Square Value (05)	959.9359	**Nonparametric Statistics**	
Adjusted Level of Significance	0 01584	95% CLT UCL	14974.54
Adjusted Chi Square Value	938 3091	95% Jackknife UCL	15124.79
		95% Standard Bootstrap UCL	14915.89

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Anderson-Darling Test Statistic	0.199994	95% Bootstrap-t UCL	15090.01
Anderson-Darling 5% Critical Value	0.70765	95% Hall's Bootstrap UCL	14874
Kolmogorov-Smirnov Test Statistic	0.169592	95% Percentile Bootstrap UCL	14880.14
Kolmogorov-Smirnov 5% Critical Value	0.31132	95% BCA Bootstrap UCL	14848.57
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	16341.41
		97 5% Chebyshev(Mean, Sd) UCL	17291 31
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	19157 19
95% Approximate Gamma UCL	15231.2		
95% Adjusted Gamma UCL	15582 26		
Potential UCL to Use		Use 95% Student's-t UCL	15124 79

Manganese (mg/kg)

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		**Log-transformed Statistics**	
Minimum	530	Minimum of Log Data	6 272877
Maximum	656.17	Maximum of Log Data	6.48642
Mean	584.6243	Mean of log Data	6 368184
Median	570.17	SD of log Data	0.080381
SD	47.41419		
Coefficient of Variation	0.081102		
Skewness	0.419946		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.9168	Shapiro Wilk Test Statistic	0.920546
Shapiro Wilk Critical Value	0 803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	619 4478	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	662.0467
95% Adjusted-CLT UCL	617.1409	97.5% Chebyshev (MVUE) UCL	695.5518
95% Modified-t UCL	619.9219	99% Chebyshev (MVUE) UCL	761.3662

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	102 7596	**Data appear Normal at 5% Significance Level**	
Theta Star	5.689245		
nu star	1438 634		
Approximate Chi Square Value (.05)	1351 555	**Nonparametric Statistics**	
Adjusted Level of Significance	0 01584	95% CLT UCL	614.1015
Adjusted Chi Square Value	1325.813	95% Jackknife UCL	619 4478
		95% Standard Bootstrap UCL	611.9186
Anderson-Darling Test Statistic	0.380323	95% Bootstrap-t UCL	624.4874
Anderson-Darling 5% Critical Value	0 70765	95% Hall's Bootstrap UCL	609.0149
Kolmogorov-Smirnov Test Statistic	0.213765	95% Percentile Bootstrap UCL	612.9343
Kolmogorov-Smirnov 5% Critical Value	0 31132	95% BCA Bootstrap UCL	614.1714
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	662.7396
		97.5% Chebyshev(Mean, Sd) UCL	696.5402
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	762.9348
95% Approximate Gamma UCL	622.2907		
95% Adjusted Gamma UCL	634 3734		

Potential UCL to Use		Use 95% Student's-t UCL	619.4478

Silver (mg/kg)

General Statistics			
Number of Valid Data	7	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	2
		Percent Non-Detects	28 57%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.72	Minimum Detected	-0.3285
Maximum Detected	82 6	Maximum Detected	4.41401
Mean of Detected	22.226	Mean of Detected	1.660659
SD of Detected	35.02479	SD of Detected	2.096471
Minimum Non-Detect	2.5	Minimum Non-Detect	0.916291
Maximum Non-Detect	2 5	Maximum Non-Detect	0.916291

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough tp draw conclusions

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0 729557	Shapiro Wilk Test Statistic	0.89955
5% Shapiro Wilk Critical Value	0 762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	16.23286	Mean	1.24994
SD	30.37407	SD	1.849903
95% DL/2 (t) UCL	38.54118	95% H-Stat (DL/2) UCL	1836.637
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.090128
		SD in Log Scale	2.007357
		Mean in Original Scale	16.12752
		SD in Original Scale	30.43662
		95% Percentile Bootstrap UCL	36.54884
		95% BCA Bootstrap UCL	42 33676
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.312732	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	71.07042		
nu star	3.127321		
A-D Test Statistic	0.385962	**Nonparametric Statistics**	
5% A-D Critical Value	0.718222	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.718222	Mean	16.08714
5% K-S Critical Value	0.373755	SD	28.1994
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	11.91642
		95% KM (t) UCL	39.24289
Assuming Gamma Distribution		95% KM (z) UCL	35.68791
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	38.45773
Minimum	0 72	95% KM (bootstrap t) UCL	306 7872
Maximum	82.6	95% KM (BCA) UCL	39.02286
Mean	17.93426	95% KM (Percentile Bootstrap) UCL	37.15857
Median	3.85	95% KM (Chebyshev) UCL	68.02962
SD	29.71043	97.5% KM (Chebyshev) UCL	90.50517
k star	0 378263	99% KM (Chebyshev) UCL	134.654
Theta star	47.41215		
Nu star	5.29568	**Potential UCLs to Use**	
AppChi2	1.291193	95% KM (Chebyshev) UCL	68.02962

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit H

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

95% Gamma Approximate UCL	73.55531
95% Adjusted Gamma UCL	120.1886

Note: DL/2 is not a recommended method.

Thallium (mg/kg)

General Statistics

Number of Valid Data	2	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	1
		Percent Non-Detects	50.00%

Warning: This data set only has 2 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Thallium (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit I

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	8	0	0.00%	7161.8	9440	8180.088	7925.5	946.2983	1121.0526	0.399091	0.115683
Iron (mg/kg)	8	0	0.00%	13876	17800	15669.25	15503.5	1278.966	1540.4003	0.304568	0.081623
Manganese (mg/kg)	8	0	0.00%	562	1120	789.6388	722.5	196.7654	133 29133	0.858824	0.249184
Thallium (mg/kg)	1	3	75.00%	5.78	5.78	5.78	5.78	N/A	0	N/A	N/A

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit I

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options		
Full Precision	ON	
Confidence Coefficient	95%	
Number of Bootstrap Operations		2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	7161 8	Minimum of Log Data	8.876517
Maximum	9440	Maximum of Log Data	9.152711
Mean	8180.088	Mean of log Data	9 003689
Median	7925 5	SD of log Data	0.1144
SD	946.2983		
Coefficient of Variation	0.115683		
Skewness	0 399091		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0 875737	Shapiro Wilk Test Statistic	0.883103
Shapiro Wilk Critical Value	0 818	Shapiro Wilk Critical Value	0 818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8813.951	95% H-UCL	8872.493
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9622.709
95% Adjusted-CLT UCL	8780 843	97.5% Chebyshev (MVUE) UCL	10247.1
95% Modified-t UCL	8821.819	99% Chebyshev (MVUE) UCL	11473 59

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	54.35485	**Data appear Normal at 5% Significance Level**
Theta Star	150.4942	
nu star	869.6775	

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit I
St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Approximate Chi Square Value (.05)	802.2337	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	8730.401
Adjusted Chi Square Value	785.7451	95% Jackknife UCL	8813.951
		95% Standard Bootstrap UCL	8702.941
Anderson-Darling Test Statistic	0.453044	95% Bootstrap-t UCL	8858.735
Anderson-Darling 5% Critical Value	0.714735	95% Hall's Bootstrap UCL	8680 596
Kolmogorov-Smirnov Test Statistic	0.175726	95% Percentile Bootstrap UCL	8699.725
Kolmogorov-Smirnov 5% Critical Value	0 293535	95% BCA Bootstrap UCL	8727.238
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9638.431
		97.5% Chebyshev(Mean, Sd) UCL	10269 46
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	11508 99
95% Approximate Gamma UCL	8867.788		
95% Adjusted Gamma UCL	9053.876		
Potential UCL to Use		Use 95% Student's-t UCL	8813.951

Iron (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	13876	Minimum of Log Data	9.537916
Maximum	17800	Maximum of Log Data	9 786954
Mean	15669.25	Mean of log Data	9.656559
Median	15503.5	SD of log Data	0.081256
SD	1278 966		
Coefficient of Variation	0.081623		
Skewness	0 304568		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.978059	Shapiro Wilk Test Statistic	0.982167
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0 818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit I

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	16525.95	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	17631.88
95% Adjusted-CLT UCL	16465.05	97.5% Chebyshev (MVUE) UCL	18481.18
95% Modified-t UCL	16534.06	99% Chebyshev (MVUE) UCL	20149.44

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	108 0867	**Data appear Normal at 5% Significance Level**	
Theta Star	144.9693		
nu star	1729.387		
Approximate Chi Square Value (.05)	1633.801	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	16413.03
Adjusted Chi Square Value	1610.126	95% Jackknife UCL	16525.95
		95% Standard Bootstrap UCL	16352.85
Anderson-Darling Test Statistic	0 171696	95% Bootstrap-t UCL	16644.07
Anderson-Darling 5% Critical Value	0 71473	95% Hall's Bootstrap UCL	16567.07
Kolmogorov-Smirnov Test Statistic	0.148488	95% Percentile Bootstrap UCL	16396
Kolmogorov-Smirnov 5% Critical Value	0.29358	95% BCA Bootstrap UCL	16410.25
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	17640.27
		97 5% Chebyshev(Mean, Sd) UCL	18493.13
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	20168.41
95% Approximate Gamma UCL	16585.98		
95% Adjusted Gamma UCL	16829 86		

Potential UCL to Use	Use 95% Student's-t UCL	16525.95

Manganese (mg/kg)

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	562	Minimum of Log Data	6.331502
Maximum	1120	Maximum of Log Data	7.021084
Mean	789 6388	Mean of log Data	6.645997
Median	722 5	SD of log Data	0.238377
SD	196.7654		
Coefficient of Variation	0.249184		
Skewness	0.858824		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit I

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.897671	Shapiro Wilk Test Statistic	0 933346
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	921.4391	95% H-UCL	946.9276
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1079.642
95% Adjusted-CLT UCL	926.637	97.5% Chebyshev (MVUE) UCL	1205.395
95% Modified-t UCL	924.9596	99% Chebyshev (MVUE) UCL	1452.412

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	12.40397	**Data appear Normal at 5% Significance Level**	
Theta Star	63.66016		
nu star	198 4635		
Approximate Chi Square Value (.05)	166.8689	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	904.0664
Adjusted Chi Square Value	159.5278	95% Jackknife UCL	921.4391
		95% Standard Bootstrap UCL	896.3162
Anderson-Darling Test Statistic	0.3803	95% Bootstrap-t UCL	1003 377
Anderson-Darling 5% Critical Value	0.716204	95% Hall's Bootstrap UCL	1044.918
Kolmogorov-Smirnov Test Statistic	0 21195	95% Percentile Bootstrap UCL	904.5375
Kolmogorov-Smirnov 5% Critical Value	0.293872	95% BCA Bootstrap UCL	919.1013
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1092.875
		97.5% Chebyshev(Mean, Sd) UCL	1224.085
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1481 823
95% Approximate Gamma UCL	939 1477		
95% Adjusted Gamma UCL	982 3648		

Potential UCL to Use		Use 95% Student's-t UCL	921.4391

Thallium (mg/kg)

General Statistics

Number of Valid Data	4	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	3
		Percent Non-Detects	75.00%

Warning: This data set only has 4 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Thallium (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missoun

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

				Raw Statistics using Detected Observations							
Variable	**Num Ds**	**NumNDs**	**% NDs**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**	**MAD/0.675**	**Skewness**	**CV**
Aluminum (mg/kg)	8	0	0.00%	4192.7	9733.4	7377 225	7542.3	1570.209	777.68718	-0.923832	0.2128455
Arsenic (mg/kg)	22	0	0.00%	5.729168	36.3	10.27105	8.18	6.743424	2 7427724	3.0474051	0.6565467
Benzo(b)fluoranthene (mg/kg)	10	0	0.00%	0 0172	0 7669	0 3261	0 32145	0.240071	0.2628614	0.5466378	0.7361888
Copper (mg/kg)	8	0	0.00%	11.975	410 2	77 38325	19.7545	136.0501	8.1186064	2.7035772	1.7581336
Iron (mg/kg)	8	0	0.00%	9094.2	18123	15353.03	15880 5	2847.301	1890.2891	-1.716439	0.1854554
Manganese (mg/kg)	8	0	0.00%	336.26	938.2	622.63	594 39	199.9374	263.15789	0 1137941	0.3211175
Thallium (mg/kg)	4	0	0.00%	0.2	8 64	2 36	0.3	4.186932	0.074129	1.9992374	1.7741238

APPENDIX O
ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J
St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

General UCL Statistics for Data Sets with Non-Detects

User Selected Options		
Full Precision	ON	
Confidence Coefficient	95%	
Number of Bootstrap Operations		2000

Aluminum (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	4192.7	Minimum of Log Data	8.3411
Maximum	9733.4	Maximum of Log Data	9.183319
Mean	7377.225	Mean of log Data	8.882442
Median	7542.3	SD of log Data	0.244803
SD	1570 209		
Coefficient of Variation	0 212846		
Skewness	-0.923832		

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.913356	Shapiro Wilk Test Statistic	0.8369
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0 818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8429.006	95% H-UCL	8925.911
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10192.92
95% Adjusted-CLT UCL	8096.62	97 5% Chebyshev (MVUE) UCL	11403.49
95% Modified-t UCL	8398.785	99% Chebyshev (MVUE) UCL	13781.44

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	13.36651	**Data appear Normal at 5% Significance Level**
Theta Star	551.9187	
nu star	213 8641	

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Approximate Chi Square Value (.05)	181.0203	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	8290.37
Adjusted Chi Square Value	173 3609	95% Jackknife UCL	8429.006
		95% Standard Bootstrap UCL	8246.816
Anderson-Darling Test Statistic	0.572994	95% Bootstrap-t UCL	8208.564
Anderson-Darling 5% Critical Value	0.716178	95% Hall's Bootstrap UCL	8254.109
Kolmogorov-Smirnov Test Statistic	0 239224	95% Percentile Bootstrap UCL	8194.825
Kolmogorov-Smirnov 5% Critical Value	0.293841	95% BCA Bootstrap UCL	8069.813
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9797.08
		97.5% Chebyshev(Mean, Sd) UCL	10844 15
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	12900.93
95% Approximate Gamma UCL	8715.728		
95% Adjusted Gamma UCL	9100 805		
Potential UCL to Use		Use 95% Student's-t UCL	8429.006

Arsenic (MG/KG)

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	22
Raw Statistics		**Log-transformed Statistics**	
Minimum	5 729168	Minimum of Log Data	1.74557
Maximum	36.3	Maximum of Log Data	3.591818
Mean	10 27105	Mean of log Data	2.207256
Median	8 18	SD of log Data	0.452656
SD	6 743424		
Coefficient of Variation	0 656547		
Skewness	3 047405		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.634974	Shapiro Wilk Test Statistic	0.854172
Shapiro Wilk Critical Value	0 911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	12.74497	95% H-UCL	12.19936
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.37094
95% Adjusted-CLT UCL	13.63395	97.5% Chebyshev (MVUE) UCL	16.25337
95% Modified-t UCL	12.90065	99% Chebyshev (MVUE) UCL	19.95103

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3 705474	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	2.771859		
nu star	163.0409		
Approximate Chi Square Value (.05)	134 5182	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	12.63586
Adjusted Chi Square Value	132.5861	95% Jackknife UCL	12.74497
		95% Standard Bootstrap UCL	12.53537
Anderson-Darling Test Statistic	1.40433	95% Bootstrap-t UCL	15 35973
Anderson-Darling 5% Critical Value	0.746562	95% Hall's Bootstrap UCL	21.98572
Kolmogorov-Smirnov Test Statistic	0.193251	95% Percentile Bootstrap UCL	12.71344
Kolmogorov-Smirnov 5% Critical Value	0 186109	95% BCA Bootstrap UCL	13.96734
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	16.53785
		97 5% Chebyshev(Mean, Sd) UCL	19.2495
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	24.57601
95% Approximate Gamma UCL	12.44888		
95% Adjusted Gamma UCL	12.63029		
Potential UCL to Use		Use 95% Student's-t UCL	12.74497
		or 95% Modified-t UCL	12.90065

Benzo(b)fluoranthene (mg/kg)

General Statistics			
Number of Valid Observations	10	Number of Distinct Observations	10
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0172	Minimum of Log Data	-4.062846
Maximum	0.7669	Maximum of Log Data	-0.265399
Mean	0.3261	Mean of log Data	-1 514664
Median	0.32145	SD of log Data	1.12929
SD	0 240071		
Coefficient of Variation	0.736189		
Skewness	0.546638		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0 953118	Shapiro Wilk Test Statistic	0.893666
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.465265	95% H-UCL	1.48163
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.003222
95% Adjusted-CLT UCL	0.464995	97 5% Chebyshev (MVUE) UCL	1.272901
95% Modified-t UCL	0.467452	99% Chebyshev (MVUE) UCL	1.802633

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.055171	**Data appear Normal at 5% Significance Level**	
Theta Star	0 309049		
nu star	21 10343		
Approximate Chi Square Value (.05)	11.66855	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	0.450973
Adjusted Chi Square Value	10 46884	95% Jackknife UCL	0.465265
		95% Standard Bootstrap UCL	0.446739
Anderson-Darling Test Statistic	0.23307	95% Bootstrap-t UCL	0.483968
Anderson-Darling 5% Critical Value	0.740818	95% Hall's Bootstrap UCL	0.481343
Kolmogorov-Smirnov Test Statistic	0.188699	95% Percentile Bootstrap UCL	0.44164
Kolmogorov-Smirnov 5% Critical Value	0.271582	95% BCA Bootstrap UCL	0.45076
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.657015
		97.5% Chebyshev(Mean, Sd) UCL	0.800203
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.081466
95% Approximate Gamma UCL	0.589776		
95% Adjusted Gamma UCL	0 657363		
Potential UCL to Use		Use 95% Student's-t UCL	0.465265

Copper (mg/kg)

General Statistics			
Number of Valid Observations	8	Number of Distinct Observations	8
Raw Statistics		**Log-transformed Statistics**	
Minimum	11 975	Minimum of Log Data	2 482821
Maximum	410 2	Maximum of Log Data	6.016645
Mean	77.38325	Mean of log Data	3.540028
Median	19 7545	SD of log Data	1.17713
SD	136.0501		
Coefficient of Variation	1 758134		
Skewness	2.703577		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.537857	Shapiro Wilk Test Statistic	0.812711
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	168.5143	95% H-UCL	386.4749
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	173.7678
95% Adjusted-CLT UCL	205.6302	97.5% Chebyshev (MVUE) UCL	222.5725
95% Modified-t UCL	176.1773	99% Chebyshev (MVUE) UCL	318.4398

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0 546689	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	141.549		
nu star	8 747023		
Approximate Chi Square Value (05)	3.174888	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	156.5023
Adjusted Chi Square Value	2 387985	95% Jackknife UCL	168.5143
		95% Standard Bootstrap UCL	150.7611
Anderson-Darling Test Statistic	1.078931	95% Bootstrap-t UCL	556 2196
Anderson-Darling 5% Critical Value	0.745725	95% Hall's Bootstrap UCL	533.0698
Kolmogorov-Smirnov Test Statistic	0.302675	95% Percentile Bootstrap UCL	169.5808
Kolmogorov-Smirnov 5% Critical Value	0.30423	95% BCA Bootstrap UCL	218.223
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	287.0505
		97 5% Chebyshev(Mean, Sd) UCL	377.7737
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	555 9819
95% Approximate Gamma UCL	213.1959		
95% Adjusted Gamma UCL	283.4495		

Potential UCL to Use	Use 95% Approximate Gamma UCL	213.1959

Iron (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	9094.2	Minimum of Log Data	9.115392
Maximum	18123	Maximum of Log Data	9.804937
Mean	15353.03	Mean of log Data	9 620283
Median	15880.5	SD of log Data	0.219468
SD	2847 301		
Coefficient of Variation	0.185455		
Skewness	-1.716439		

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.837108	Shapiro Wilk Test Statistic	0.762533
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	17260.25	95% H-UCL	18165.17
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	20603.57
95% Adjusted-CLT UCL	16356.1	97.5% Chebyshev (MVUE) UCL	22860.6
95% Modified-t UCL	17158 43	99% Chebyshev (MVUE) UCL	27294.09

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	16.82261	**Data appear Normal at 5% Significance Level**	
Theta Star	912.6421		
nu star	269.1618		
Approximate Chi Square Value (.05)	232 1686	**Nonparametric Statistics**	
Adjusted Level of Significance	0 01946	95% CLT UCL	17008 86
Adjusted Chi Square Value	223 4513	95% Jackknife UCL	17260 25
		95% Standard Bootstrap UCL	16907 36
Anderson-Darling Test Statistic	0 748889	95% Bootstrap-t UCL	16827.49
Anderson-Darling 5% Critical Value	0 715903	95% Hall's Bootstrap UCL	16562.02
Kolmogorov-Smirnov Test Statistic	0 251981	95% Percentile Bootstrap UCL	16776.13
Kolmogorov-Smirnov 5% Critical Value	0 293758	95% BCA Bootstrap UCL	16555.5
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	19741.01
		97.5% Chebyshev(Mean, Sd) UCL	21639.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	25369.3
95% Approximate Gamma UCL	17799.34		
95% Adjusted Gamma UCL	18493.73		

Potential UCL to Use		Use 95% Student's-t UCL	17260.25

Manganese (mg/kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St. Louis Ordnance Plant, Former Hanley Area, St Louis, Missouri

Raw Statistics		**Log-transformed Statistics**	
Minimum	336.26	Minimum of Log Data	5 817885
Maximum	938.2	Maximum of Log Data	6.843963
Mean	622.63	Mean of log Data	6.385128
Median	594.39	SD of log Data	0.34226
SD	199.9374		
Coefficient of Variation	0.321118		
Skewness	0.113794		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.96495	Shapiro Wilk Test Statistic	0.951128
Shapiro Wilk Critical Value	0 818	Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	756 555	95% H-UCL	826.3911
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	954 7877
95% Adjusted-CLT UCL	741.9411	97.5% Chebyshev (MVUE) UCL	1097.936
95% Modified-t UCL	757.029	99% Chebyshev (MVUE) UCL	1379.124

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6 586182	**Data appear Normal at 5% Significance Level**	
Theta Star	94.5358		
nu star	105.3789		
Approximate Chi Square Value (.05)	82.68961	**Nonparametric Statistics**	
Adjusted Level of Significance	0.01946	95% CLT UCL	738.9023
Adjusted Chi Square Value	77.61586	95% Jackknife UCL	756.555
		95% Standard Bootstrap UCL	733.1196
Anderson-Darling Test Statistic	0 254309	95% Bootstrap-t UCL	755.9073
Anderson-Darling 5% Critical Value	0.715021	95% Hall's Bootstrap UCL	753.5673
Kolmogorov-Smirnov Test Statistic	0.162743	95% Percentile Bootstrap UCL	733.4138
Kolmogorov-Smirnov 5% Critical Value	0.294263	95% BCA Bootstrap UCL	728.7813
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	930.7542
		97 5% Chebyshev(Mean, Sd) UCL	1064.08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1325 972
95% Approximate Gamma UCL	793 4743		
95% Adjusted Gamma UCL	845 3437		

APPENDIX O

ProUCL Output – On-Site Soil (0-10 ft bgs), Exposure Unit J

St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri

Potential UCL to Use	Use 95% Student's-t UCL	756.555

Thallium (mg/kg)

General Statistics

Number of Valid Observations	4	Number of Distinct Observations	3

Warning: This data set only has 4 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Thallium (mg/kg) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.