APPENDIX G

Human Health Risk Assessment Tables

THIS PAGE INTENTIONALLY LEFT BLANK.

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

Table G-1. SRC and COPC Screening for Surface Soil (0-1 ft bgs ISM Samples) at Wet Storage Area

Analyte (mg/kg)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	Background Criteria[a]	SRC? (yes/no)	SRC Justification	Screening FWCUG[b] (HQ= 0.1 or Risk=10^{-6}) RA	RC	NGT	Risk Screening Level	Screening Level Source[c]	COPC? (yes/no)	COPC Justification	Station at Max Detect	Date Collected at Max Detect
Metals																	
Aluminum	**7429-90-5**	**22/ 22**	**8400**	**27100**	**12400**	**17700**	**Yes**	**Exceeds background**	**52923**	**7380**	**3496**	**3496**	**NGT**	**Yes**	**Exceeds screening level**	**WSAss-033M**	**03/24/2010**
Antimony	7440-36-0	5/ 22	0.1	0.52	0.571	0.96	No	Below background	13.6	2.82	175	2.82	RC	No	Below background	WSAss-008M	10/29/2004
Arsenic	**7440-38-2**	**22/ 22**	**11**	**21**	**15.3**	**15.4**	**Yes**	**Exceeds background**	**0.425**	**0.524**	**2.78**	**0.425**	**RA**	**Yes**	**Exceeds screening level**	**WSAss-020M**	**12/03/2004**
Barium	7440-39-3	22/ 22	45	110	57.7	88.4	Yes	Exceeds background	8966	1413	351	351	NGT	No	Below risk screening criteria	WSAss-005M	10/27/2004
Beryllium	7440-41-7	22/ 22	0.49	1.3	0.715	0.88	Yes	Exceeds background	--	--	--	16	RSL	No	Below risk screening criteria	WSAss-033M	03/24/2010
Cadmium	7440-43-9	4/ 22	0.11	0.19	0.185	0	Yes	Exceeds background	22.3	6.41	10.9	6.41	RC	No	Below risk screening criteria	WSAss-035M	03/24/2010
Calcium	7440-70-2	22/ 22	750	5900	2190	15800	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAss-003M	10/26/2004
Chromium[d]	**7440-47-3**	**22/ 22**	**16**	**26**	**20.9**	**17.4**	**Yes**	**Exceeds background**	**90.4**	**19.9**	**1.64**	**1.64**	**NGT**	**Yes**	**Exceeds screening level**	**WSAss-003M**	**10/26/2004**
Cobalt	**7440-48-4**	**22/ 22**	**6.6**	**14**	**10.6**	**10.4**	**Yes**	**Exceeds background**	**803**	**131**	**7.03**	**7.03**	**NGT**	**Yes**	**Exceeds screening level**	**WSAss-020M**	**12/03/2004**
Copper	7440-50-8	22/ 22	15	21	18.6	17.7	Yes	Exceeds background	2714	311	25368	311	RC	No	Below risk screening criteria	WSAss-001M	10/27/2004
Iron	7439-89-6	22/ 22	17000	32000	26600	23100	No	Essential Nutrient	19010	2313	184370	180000	RDA	No	Essential Nutrient	WSAss-020M	12/03/2004
Lead	7439-92-1	22/ 22	14	97	26.6	26.1	Yes	Exceeds background	--	--	--	400	RSL	No	Below risk screening criteria	WSAss-002M	10/26/2004
Magnesium	7439-95-4	22/ 22	1800	3900	3010	3030	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAss-005M	10/27/2004
Manganese	7439-96-5	22/ 22	290	1130	420	1450	No	Below background	1482	293	35.1	35.1	NGT	No	Below background	WSAss-033M	03/24/2010
Mercury	7439-97-6	22/ 22	0.018	2.1	0.466	0.036	Yes	Exceeds background	16.5	2.27	172	2.27	RC	No	Below risk screening criteria	WSAss-010M	10/28/2004
Nickel	7440-02-0	22/ 22	18	32	24.5	21.1	Yes	Exceeds background	1346	155	12639	155	RC	No	Below risk screening criteria	WSAss-020M	12/03/2004
Potassium	7440-09-7	22/ 22	740	2230	1220	927	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAss-033M	03/24/2010
Selenium	7782-49-2	6/ 22	0.42	1.4	0.821	1.4	No	Below background	--	--	--	39	RSL	No	Below background	WSAss-033M	03/24/2010
Silver	7440-22-4	1/ 22	0.035	0.035	0.398	0	Yes	Exceeds background	324	38.6	3105	38.6	RC	No	Below risk screening criteria	WSAss-035M	03/24/2010
Sodium	7440-23-5	22/ 22	35.4	430	269	123	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAss-005M	10/27/2004
Thallium	7440-28-0	8/ 22	0.15	0.31	0.261	0	Yes	Exceeds background	4.76	0.612	47.7	0.612	RC	No	Below risk screening criteria	WSAss-007M	10/27/2004
Vanadium	7440-62-2	22/ 22	15	28	19.5	31.1	No	Below background	156	44.9	2304	44.9	RC	No	Below background	WSAss-005M	10/27/2004
Zinc	7440-66-6	22/ 22	56	140	69.7	61.8	Yes	Exceeds background	19659	2321	187269	2321	RC	No	Below risk screening criteria	WSAss-002M	10/26/2004
Explosives																	
3-Nitrotoluene	99-08-1	1/ 22	0.08	0.08	0.103	--	Yes	Detected organic	--	--	--	0.63	RSL	No	Below risk screening criteria	WSAss-001M	10/27/2004
Nitrocellulose	9004-70-0	2/ 3	0.73	1.1	1.46	--	Yes	Detected organic	--	--	--	19000000	RSL	No	Below risk screening criteria	WSAss-011M	11/01/2004

Table G-1. SRC and COPC Screening for Surface Soil (0-1 ft bgs ISM Samples) at Wet Storage Area (continued)

Analyte (mg/kg)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	Background Criteria[a]	SRC? (yes/no)	SRC Justification	Screening FWCUG[b] (HQ= 0.1 or Risk=1E-6) RFA	RFC	NGT	Risk Screening Level	Screening Level Source[c]	COPC? (yes/no)	COPC Justification	Station at Max Detect	Date Collected at Max Detect
Semi-volatile Organic Compounds																	
2-Methylnaphthalene	91-57-6	2/ 3	0.009	0.058	0.028	--	Yes	Detected organic	238	30.6	2384	30.6	RC	No	Below risk screening criteria	WSAss-004M	10/26/2004
Acenaphthene	83-32-9	3/ 6	0.011	1.5	0.265	--	Yes	Detected organic	--	--	--	360	RSL	No	Below risk screening criteria	WSAss-004M	10/26/2004
Acenaphthylene[e]	208-96-8	1/ 6	0.016	0.016	0.0115	--	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAss-004M	10/26/2004
Anthracene	120-12-7	4/ 6	0.0068	2.9	0.5	--	Yes	Detected organic	--	--	--	1800	RSL	No	Below risk screening criteria	WSAss-004M	10/26/2004
Benz(a)anthracene	**56-55-3**	**5/ 6**	**0.023**	**8.2**	**1.41**	--	**Yes**	**Detected organic**	**0.221**	**0.65**	**4.77**	**0.221**	**RA**	**Yes**	**Exceeds screening level**	**WSAss-004M**	**10/26/2004**
Benzenemethanol	100-51-6	1/ 3	0.62	0.62	0.378	--	Yes	Detected organic			--	630	RSL	No	Below risk screening criteria	WSAss-004M	10/26/2004
Benzo(a)pyrene	**50-32-8**	**6/ 6**	**0.012**	**5.5**	**0.957**	--	**Yes**	**Detected organic**	**0.022**	**0.065**	**0.477**	**0.022**	**RA**	**Yes**	**Exceeds screening level**	**WSAss-004M**	**10/26/2004**
Benzo(b)fluoranthene	**205-99-2**	**6/ 6**	**0.019**	**7.3**	**1.27**	--	**Yes**	**Detected organic**	**0.221**	**0.65**	**4.77**	**0.221**	**RA**	**Yes**	**Exceeds screening level**	**WSAss-004M**	**10/26/2004**
Benzo(ghi)perylene[e]	191-24-2	5/ 6	0.016	3.7	0.649	--	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAss-004M	10/26/2004
Benzo(k)fluoranthene	**207-08-9**	**5/ 6**	**0.012**	**3.2**	**0.561**	--	**Yes**	**Detected organic**	**2.21**	**6.5**	**47.7**	**2.21**	**RA**	**Yes**	**Exceeds screening level**	**WSAss-004M**	**10/26/2004**
Carbazole	86-74-8	1/ 3	1.4	1.4	0.504	--	Yes	Detected organic	69.4	44.6	835	44.6	RC	No	Below risk screening criteria	WSAss-004M	10/26/2004
Chrysene	218-01-9	6/ 6	0.015	7.8	1.35	--	Yes	Detected organic	22.1	65	477	22.1	RA	No	Below risk screening criteria	WSAss-004M	10/26/2004
Dibenz(a,h)anthracene	**53-70-3**	**4/ 6**	**0.0084**	**0.94**	**0.171**	--	**Yes**	**Detected organic**	**0.022**	**0.065**	**0.477**	**0.022**	**RA**	**Yes**	**Exceeds screening level**	**WSAss-004M**	**10/26/2004**
Dibenzofuran	132-64-9	1/ 3	0.54	0.54	0.248	--	Yes	Detected organic	119	15.3	1192	15.3	RC	No	Below risk screening criteria	WSAss-004M	10/26/2004
Fluoranthene	206-44-0	6/ 6	0.024	18	3.11	--	Yes	Detected organic	276	163	5087	163	RC	No	Below risk screening criteria	WSAss-004M	10/26/2004
Fluorene	86-73-7	4/ 6	0.0076	1.3	0.232	--	Yes	Detected organic	737	243	11458	243	RC	No	Below risk screening criteria	WSAss-004M	10/26/2004
Indeno(1,2,3-cd)pyrene	**193-39-5**	**5/ 6**	**0.015**	**3.4**	**0.595**	--	**Yes**	**Detected organic**	**0.221**	**0.65**	**4.77**	**0.221**	**RA**	**Yes**	**Exceeds screening level**	**WSAss-004M**	**10/26/2004**
Naphthalene	91-20-3	5/ 6	0.0075	0.081	0.0241	--	Yes	Detected organic	368	122	1541	122	RC	No	Below risk screening criteria	WSAss-004M	10/26/2004
Phenanthrene[e]	85-01-8	5/ 6	0.031	12	2.07	--	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAss-004M	10/26/2004
Phenol	108-95-2	1/ 3	0.028	0.028	0.0943	--	Yes	Detected organic	--	--	--	1900	RSL	No	Below risk screening criteria	WSAss-004M	10/26/2004
Pyrene	129-00-0	6/ 6	0.016	17	2.91	--	Yes	Detected organic	207	122	3815	122	RC	No	Below risk screening criteria	WSAss-004M	10/26/2004
Pesticides/PCBs																	
4,4'-DDE	72-55-9	1/ 3	0.0004	0.0004	0.00713	--	Yes	Detected organic	4.08	2.63	49.1	2.63	RC	No	Below risk screening criteria	WSAss-036M	03/24/2010
Endosulfan sulfate	1031-07-8	1/ 3	0.0026	0.0026	0.00682	--	Yes	Detected organic	--	--	--	47	RSL	No	Below risk screening criteria	WSAss-036M	03/24/2010
Endrin	72-20-8	1/ 3	0.00069	0.00069	0.00618	--	Yes	Detected organic	1.77	1.12	33	1.12	RC	No	Below risk screening criteria	WSAss-036M	03/24/2010
alpha-Chlordane	5103-71-9	1/ 3	0.0021	0.0021	0.00665	--	Yes	Detected organic	--	--	--	1.7	RSL	No	Below risk screening criteria	WSAss-036M	03/24/2010
beta-BHC	319-85-7	1/ 3	0.0034	0.0034	0.0074	--	Yes	Detected organic	0.77	0.496	7.42	0.496	RC	No	Below risk screening criteria	WSAss-011M	11/01/2004

[a]Background criteria for soil 0-1 ft bgs from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

[b]Facility-Wide Cleanup Goals (FWCUG) for Resident Adult (RA), Resident Child (RC), and National Guard Trainee (NGT) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).

[c]Screening Level Source:

RDA = Concentration associated with recommended daily allowance of essential nutrient
RA = FWCUG for Resident Adult
RC = FWCUG for Resident Child
RSL = USEPA Residential Regional Screening Level
NGT = National Guard Trainee

[d]FWCUG is the most conservative (smallest) of the FWCUGs for hexavalent and trivalent chromium.

[e]No reference dose or cancer potency factors are available for these PAHs; therefore, the RSL value for pyrene was used (NDEP 2006).

bgs = Below ground surface
CAS = Chemical Abstract Service
COPC = Chemical of Potential Concern
HQ = Hazard Quotient
ISM = Incremental Sampling Method
PAH = Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
SRC = Site-related Contaminant
USEPA = United States Environmental Protection Agency
-- = No value available
Bold = Chemical is a COPC

Table G-2. SRC and COPC Screening for Subsurface Soil (1-13 ft bgs Discrete Samples) at Wet Storage Area

Analyte (mg/kg)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	Background Criteria[a]	SRC? (yes/no)	SRC Justification	Screening FWCUG[b] (HQ= 0.1 or Risk=1E-6) RA	RC	NGT	Risk Screening Level	Screening Level Source[c]	COPC? (yes/no)	COPC Justification	Station at Max Detect	Date Collected at Max Detect
Metals																	
Aluminum	7429-90-5	19/ 19	6240	13800	9560	19500	No	Below background	52923	7380	3496	3496	NGT	No	Below background	WSAsb-026	03/23/2010
Antimony	7440-36-0	12/ 19	0.079	0.1	0.166	0.96	No	Below background	13.6	2.82	175	2.82	RC	No	Below background	WSAsb-022	03/23/2010
Arsenic	**7440-38-2**	**19/ 19**	**13**	**21.3**	**16.7**	**19.8**	**Yes**	**Exceeds background**	**0.425**	**0.524**	**2.78**	**0.425**	**RA**	**Yes**	**Exceeds screening level**	**WSAsb-026**	**03/23/2010**
Barium	7440-39-3	19/ 19	21.5	65.5	39.3	124	No	Below background	8966	1413	351	351	NGT	No	Below background	WSAsb-023	03/23/2010
Beryllium	7440-41-7	19/ 19	0.33	0.68	0.526	0.88	No	Below background	--	--	--	16	RSL	No	Below background	WSAsb-024	03/24/2010
Cadmium	7440-43-9	11/ 19	0.042	0.071	0.0414	0	Yes	Exceeds background	22.3	6.41	10.9	6.41	RC	No	Below risk screening criteria	WSAsb-021	03/23/2010
Calcium	7440-70-2	19/ 19	269	11600	2960	35500	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsb-028	03/23/2010
Chromium[d]	7440-47-3	19/ 19	10	20.9	15	27.2	No	Below background	90.4	19.9	1.64	1.64	NGT	No	Below background	WSAsb-026	03/23/2010
Cobalt	**7440-48-4**	**19/ 19**	**7.4**	**25.8**	**12.6**	**23.2**	**Yes**	**Exceeds background**	**803**	**131**	**7.03**	**7.03**	**NGT**	**Yes**	**Exceeds screening level**	**WSAsb-022**	**03/23/2010**
Copper	7440-50-8	19/ 19	17.5	24.3	20.5	32.3	No	Below background	2714	311	25368	311	RC	No	Below background	WSAsb-023	03/23/2010
Iron	7439-89-6	19/ 19	20000	35000	27500	35200	No	Essential Nutrient	19010	2313	184370	180000	RDA	No	Essential Nutrient	WSAsb-026	03/23/2010
Lead	7439-92-1	19/ 19	9.8	18.3	12.6	19.1	No	Below background	--	--	--	400	RSL	No	Below background	WSAsb-022	03/23/2010
Magnesium	7439-95-4	19/ 19	2290	5650	3800	8790	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsb-021	03/23/2010
Manganese	7439-96-5	19/ 19	254	572	355	3030	No	Below background	1482	293	35.1	35.1	NGT	No	Below background	WSAsb-022	03/23/2010
Mercury	7439-97-6	2/ 19	0.025	0.032	0.0577	0.044	No	Below background	16.5	2.27	172	2.27	RC	No	Below background	WSAsb-021	03/23/2010
Nickel	7440-02-0	19/ 19	17.1	35	26.8	60.7	No	Below background	1346	155	12639	155	RC	No	Below background	WSAsb-027	03/23/2010
Potassium	7440-09-7	19/ 19	689	1760	1240	3350	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsb-021	03/23/2010
Selenium	7782-49-2	19/ 19	0.64	1.4	0.988	1.5	No	Below background	--	--	--	39	RSL	No	Below background	WSAsb-022	03/23/2010
Silver	7440-22-4	4/ 19	0.016	0.026	0.0124	0	Yes	Exceeds background	324	38.6	3105	38.6	RC	No	Below risk screening criteria	WSAsb-021	03/23/2010
Sodium	7440-23-5	19/ 19	32.8	77.4	55.4	145	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsb-021	03/23/2010
Thallium	7440-28-0	19/ 19	0.1	0.22	0.157	0.91	No	Below background	4.76	0.612	47.7	0.612	RC	No	Below background	WSAsb-026	03/23/2010
Vanadium	7440-62-2	19/ 19	10.7	20.4	15.5	37.6	No	Below background	156	44.9	2304	44.9	RC	No	Below background	WSAsb-026	03/23/2010
Zinc	7440-66-6	19/ 19	50.3	72.2	61.4	93.3	No	Below background	19659	2321	187269	2321	RC	No	Below background	WSAsb-024	03/24/2010

Table G-2. SRC and COPC Screening for Subsurface Soil (1-13 ft bgs Discrete Samples) at Wet Storage Area (continued)

Analyte (mg/kg)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	Background Criteria[a]	SRC? (yes/no)	SRC Justification	Screening FWCUG[b] (HQ= 0.1 or Risk=1E-6) RA	RC	NGT	Risk Screening Level	Screening Level Source[c]	COPC? (yes/no)	COPC Justification	Station at Max Detect	Date Collected at Max Detect
Semi-volatile Organic Compounds																	
Acenaphthene	83-32-9	1/ 19	0.021	0.021	0.0119	None	Yes	Detected organic	--	--	--	360	RSL	No	Below risk screening criteria	WSAsb-024	03/24/2010
Anthracene	120-12-7	1/ 19	0.059	0.059	0.0139	None	Yes	Detected organic	--	--	--	1800	RSL	No	Below risk screening criteria	WSAsb-024	03/24/2010
Benz(a)anthracene	56-55-3	2/ 19	0.01	0.13	0.0165	None	Yes	Detected organic	0.221	0.65	4.77	0.221	RA	No	Below risk screening criteria	WSAsb-024	03/24/2010
Benzo(a)pyrene	**50-32-8**	**1/ 19**	**0.12**	**0.12**	**0.0171**	**None**	**Yes**	**Detected organic**	**0.022**	**0.065**	**0.477**	**0.022**	**RA**	**Yes**	**Exceeds screening level**	**WSAsb-024**	**03/24/2010**
Benzo(b)fluoranthene	205-99-2	2/ 19	0.011	0.14	0.0171	None	Yes	Detected organic	0.221	0.65	4.77	0.221	RA	No	Below risk screening criteria	WSAsb-024	03/24/2010
Benzo(ghi)perylene[e]	191-24-2	1/ 19	0.089	0.089	0.0155	None	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAsb-024	03/24/2010
Benzo(k)fluoranthene	207-08-9	1/ 19	0.077	0.077	0.0148	None	Yes	Detected organic	2.21	6.5	47.7	2.21	RA	No	Below risk screening criteria	WSAsb-024	03/24/2010
Bis(2-ethylhexyl)phthalate	117-81-7	2/ 5	0.024	0.038	0.132	None	Yes	Detected organic	--	--	--	39	RSL	No	Below risk screening criteria	WSAsb-022	03/23/2010
Chrysene	218-01-9	1/ 19	0.12	0.12	0.0171	None	Yes	Detected organic	22.1	65	477	22.1	RA	No	Below risk screening criteria	WSAsb-024	03/24/2010
Di-n-butyl phthalate	84-74-2	2/ 5	0.021	0.022	0.128	None	Yes	Detected organic	--	--	--	630	RSL	No	Below risk screening criteria	WSAsb-022	03/23/2010
Dibenz(a,h)anthracene	53-70-3	1/ 19	0.019	0.019	0.0118	None	Yes	Detected organic	0.022	0.065	0.477	0.022	RA	No	Below risk screening criteria	WSAsb-024	03/24/2010
Fluoranthene	206-44-0	3/ 19	0.01	0.37	0.0299	None	Yes	Detected organic	276	163	5087	163	RC	No	Below risk screening criteria	WSAsb-024	03/24/2010
Fluorene	86-73-7	1/ 19	0.016	0.016	0.0116	None	Yes	Detected organic	737	243	11458	243	RC	No	Below risk screening criteria	WSAsb-024	03/24/2010
Indeno(1,2,3-cd)pyrene	193-39-5	1/ 19	0.067	0.067	0.0143	None	Yes	Detected organic	0.221	0.65	4.77	0.221	RA	No	Below risk screening criteria	WSAsb-024	03/24/2010
Naphthalene	91-20-3	1/ 19	0.0081	0.0081	0.0112	None	Yes	Detected organic	368	122	1541	122	RC	No	Below risk screening criteria	WSAsb-026	03/23/2010
Phenanthrene[e]	85-01-8	3/ 19	0.01	0.2	0.0209	None	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAsb-024	03/24/2010
Pyrene	129-00-0	2/ 19	0.015	0.27	0.0241	None	Yes	Detected organic	207	122	3815	122	RC	No	Below risk screening criteria	WSAsb-024	03/24/2010
Pesticides/PCBs																	
4,4'-DDT	50-29-3	1/ 5	0.00085	0.00085	0.00115	None	Yes	Detected organic	--	--	--	1.9	RSL	No	Below risk screening criteria	WSAsb-028	03/23/2010
Volatile Organic Compounds																	
Toluene	108-88-3	1/ 5	0.00034	0.00034	0.00247	None	Yes	Detected organic	--	--	--	490	RSL	No	Below risk screening criteria	WSAsb-028	03/23/2010

[a]Background criteria for soil >1 ft bgs from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).
[b]Facility-Wide Cleanup Goals (FWCUGs) for Resident Adult (RA), Resident Child (RC), and National Guard Trainee (NGT) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).
[c]Screening Level Source:
RDA = Concentration associated with recommended daily allowance of essential nutrient
RA = FWCUG for Resident Adult
RC = FWCUG for Resident Child
RSL = USEPA Residential Regional Screening Level
NGT = National Guard Trainee
[d]FWCUG is the most conservative (smallest) of the FWCUGs for hexavalent and trivalent chromium.
[e]No reference dose or cancer potency factors are available for these PAHs; therefore, the RSL value for pyrene was used (NDEP 2006).
bgs = Below ground surface
CAS = Chemical Abstract Service
COPC = Chemical of Potential Concern
HQ = Hazard Quotient
PAH = Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
SRC = Site-related Contaminant
USEPA = United States Environmental Protection Agency
-- = No value available
Bold = Chemical is a COPC

Table G-3. SRC and COPC Screening for Sediment at Wet Storage Area

Analyte (mg/kg)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	Background Criteria[a]	SRC? (yes/no)	SRC Justification	Screening FWCUG[b] (HQ= 0.1 or Risk=1E-6) RA	RC	NGT	Risk Screening Level	Screening Level Source[c]	COPC? (yes/no)	COPC Justification	Station at Max Detect	Date Collected at Max Detect
Metals																	
Aluminum	7429-90-5	2/ 2	4540	4600	4570	13900	No	Below background	52923	7380	3496	3496	NGT	No	Below background	WSAsd-038	03/23/2010
Antimony	7440-36-0	1/ 2	0.095	0.095	0.193	0	Yes	Exceeds background	13.6	2.82	175	2.82	RC	No	Below risk screening criteria	WSAsd-037	03/23/2010
Arsenic	7440-38-2	2/ 2	7.1	7.3	7.2	19.5	No	Below background	0.425	0.524	2.78	0.425	RA	No	Below background	WSAsd-038	03/23/2010
Barium	7440-39-3	2/ 2	78.2	78.5	78.4	123	No	Below background	8966	1413	351	351	NGT	No	Below background	WSAsd-038	03/23/2010
Beryllium	7440-41-7	2/ 2	0.37	0.42	0.395	0.38	Yes	Exceeds background	--	--	--	16	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Cadmium	7440-43-9	2/ 2	0.11	0.15	0.13	0	Yes	Exceeds background	22.3	6.41	10.9	6.41	RC	No	Below risk screening criteria	WSAsd-037	03/23/2010
Calcium	7440-70-2	2/ 2	956	2260	1610	5510	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsd-037	03/23/2010
Chromium[d]	7440-47-3	2/ 2	8	9	8.5	18.1	No	Below background	90.4	19.9	1.64	1.64	NGT	No	Below background	WSAsd-038	03/23/2010
Cobalt[e]	7440-48-4	2/ 2	7.3	8.7	8	9.1	No	Below background	803	131	7.03	7.03	NGT	No	Below background	WSAsd-037	03/23/2010
Copper	7440-50-8	2/ 2	13.2	14.1	13.7	27.6	No	Below background	2714	311	25368	311	RC	No	Below background	WSAsd-037	03/23/2010
Iron	7439-89-6	2/ 2	21900	26700	24300	28200	No	Essential Nutrient	19010	2313	184370	180000	RDA	No	Essential Nutrient	WSAsd-038	03/23/2010
Lead	7439-92-1	2/ 2	8.6	11.1	9.85	27.4	No	Below background	--	--	--	400	RSL	No	Below background	WSAsd-037	03/23/2010
Magnesium	7439-95-4	2/ 2	1570	1650	1610	2760	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsd-037	03/23/2010
Manganese	**7439-96-5**	**2/ 2**	**1750**	**2230**	**1990**	**1950**	**Yes**	**Exceeds background**	**1482**	**293**	**35.1**	**35.1**	**NGT**	**Yes**	**Exceeds screening level**	**WSAsd-037**	**03/23/2010**
Nickel	7440-02-0	2/ 2	15.5	16.1	15.8	17.7	No	Below background	1346	155	12639	155	RC	No	Below background	WSAsd-038	03/23/2010
Potassium	7440-09-7	2/ 2	458	518	488	1950	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsd-038	03/23/2010
Selenium	7782-49-2	2/ 2	0.46	0.68	0.57	1.7	No	Below background	--	--	--	39	RSL	No	Below background	WSAsd-037	03/23/2010
Silver	7440-22-4	2/ 2	0.012	0.027	0.0195	0	Yes	Exceeds background	324	38.6	3105	38.6	RC	No	Below risk screening criteria	WSAsd-037	03/23/2010
Sodium	7440-23-5	2/ 2	28.8	35.7	32.3	112	No	Essential Nutrient	--	--	--	1000000	RDA	No	Essential Nutrient	WSAsd-037	03/23/2010
Thallium	7440-28-0	1/ 2	0.078	0.078	0.114	0.89	No	Below background	4.76	0.612	47.7	0.612	RC	No	Below background	WSAsd-038	03/23/2010
Vanadium	7440-62-2	2/ 2	9	9.3	9.15	26.1	No	Below background	156	44.9	2304	44.9	RC	No	Below background	WSAsd-037	03/23/2010
Zinc	7440-66-6	2/ 2	55.1	58.9	57	532	No	Below background	19659	2321	187269	2321	RC	No	Below background	WSAsd-037	03/23/2010

Table G-3. SRC and COPC Screening for Sediment at Wet Storage Area (continued)

Analyte (mg/kg)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	Background Criteria[a]	SRC? (yes/no)	SRC Justification	Screening FWCUG[b] (HQ= 0.1 or Risk=1E-6) RA	RC	NGT	Risk Screening Level	Screening Level Source[c]	COPC? (yes/no)	COPC Justification	Station at Max Detect	Date Collected at Max Detect
Semi-volatile Organic Compounds																	
2-Methylnaphthalene	91-57-6	2/ 2	0.0084	0.08	0.0442	None	Yes	Detected organic	--	--	--	24	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Acenaphthylene[f]	208-96-8	1/ 2	0.011	0.011	0.02	None	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Anthracene	120-12-7	1/ 2	0.031	0.031	0.03	None	Yes	Detected organic	--	--	--	1800	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Benz(a)anthracene	56-55-3	2/ 2	0.012	0.12	0.066	None	Yes	Detected organic	0.221	0.65	4.77	0.221	RA	No	Below risk screening criteria	WSAsd-037	03/23/2010
Benzo(a)pyrene	**50-32-8**	**2/ 2**	**0.012**	**0.092**	**0.052**	**None**	**Yes**	**Detected organic**	**0.022**	**0.065**	**0.477**	**0.022**	**RA**	**Yes**	**Exceeds screening level**	**WSAsd-037**	**03/23/2010**
Benzo(b)fluoranthene	205-99-2	2/ 2	0.02	0.14	0.08	None	Yes	Detected organic	0.221	0.65	4.77	0.221	RA	No	Below risk screening criteria	WSAsd-037	03/23/2010
Benzo(ghi)perylene[f]	191-24-2	2/ 2	0.012	0.064	0.038	None	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Benzo(k)fluoranthene	207-08-9	1/ 2	0.064	0.064	0.0465	None	Yes	Detected organic	2.21	6.5	47.7	2.21	RA	No	Below risk screening criteria	WSAsd-037	03/23/2010
Chrysene	218-01-9	2/ 2	0.014	0.12	0.067	None	Yes	Detected organic	--	--	--	16	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Fluoranthene	206-44-0	2/ 2	0.022	0.28	0.151	None	Yes	Detected organic	--	--	--	240	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Indeno(1,2,3-cd)pyrene	193-39-5	2/ 2	0.009	0.057	0.033	None	Yes	Detected organic	0.221	0.65	4.77	0.221	RA	No	Below risk screening criteria	WSAsd-037	03/23/2010
Naphthalene	91-20-3	1/ 2	0.068	0.068	0.0485	None	Yes	Detected organic	--	--	--	3.8	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Phenanthrene[f]	85-01-8	2/ 2	0.01	0.078	0.044	None	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Pyrene	129-00-0	2/ 2	0.018	0.19	0.104	None	Yes	Detected organic	--	--	--	180	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010
Volatile Organic Compounds																	
2-Butanone	78-93-3	1/ 1	0.0021	0.0021	0.0021	None	Yes	Detected organic	--	--	--	2700	RSL	No	Below risk screening criteria	WSAsd-037	03/23/2010

[a]Background criteria for sediment from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

[b]Facility-Wide Cleanup Goals (FWCUGs) for Resident Adult (RA), Resident Child (RC), and National Guard Trainee (NGT) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).

[c]Screening Level Source:

ATSDR = FWCUG for pyrene used as surrogate. Surrogate assignment based on Agency for Toxic Substances Disease Registry (ATSDR) (1995).
RDA = Concentration associated with recommended daily allowance of essential nutrient
RA = FWCUG for Resident Adult
RC = FWCUG for Resident Child
RSL = United States Environmental Protection Agency (USEPA) Residential Regional Screening Level
NGT = National Guard Trainee

[d]FWCUG is the most conservative (smallest) of the FWCUGs for hexavalent and trivalent chromium.

[e]No FWCUG available for cobalt in sediment. Value is FWCUG for cobalt in soil.

[f]No reference dose or cancer potency factors are available for these PAHs; therefore, the RSL value for pyrene was used (NDEP 2006).

bgs = Below ground surface
CAS = Chemical Abstract Service
COPC = Chemical of Potential Concern
HQ = Hazard Quotient
PAH = Polycyclic Aromatic Hydrocarbon
SRC = Site-related Contaminant
-- = No value available
Bold = Chemical is a COPC

Table G-4. SRC and COPC Screening for Surface Water at Wet Storage Area

Analyte (mg/L)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	Background Criteria[a]	SRC? (yes/no)	SRC Justification	Screening FWCUG[b] (HQ= 0.1 or Risk=1E-6) RA	RC	NGT	Risk Screening Level	Screening Level Source[c]	COPC? (yes/no)	COPC Justification	Station at Max Detect	Date Collected at Max Detect
Metals																	
Aluminum	7429-90-5	2/ 2	0.272	0.289	0.281	3.37	No	Below background	63.895	14.827	73.445	14.827	RC	No	Below background	WSAsw-038	03/23/2010
Antimony	7440-36-0	1/ 2	0.00028	0.00028	0.00139	0	Yes	Exceeds background	0.0171	0.0049	0.0065	0.00491	RC	No	Below risk screening criteria	WSAsw-038	03/23/2010
Arsenic	7440-38-2	2/ 2	0.00051	0.00058	0.00055	0.0032	No	Below background	0.0011	0.0012	0.0042	0.0011	RA	No	Below background	WSAsw-038	03/23/2010
Barium	7440-39-3	2/ 2	0.0193	0.0197	0.0195	0.0475	No	Below background	12.131	2.901	10.64	2.901	RC	No	Below background	WSAsw-037	03/23/2010
Calcium	7440-70-2	2/ 2	21.7	22.3	22	41.4	No	Essential Nutrient	--	--	--	500	RDA	No	Essential Nutrient	WSAsw-037	03/23/2010
Iron	7439-89-6	2/ 2	0.686	0.721	0.704	2.56	No	Essential Nutrient	20	4.527	31.296	18	RDA	No	Essential Nutrient	WSAsw-038	03/23/2010
Lead	7439-92-1	2/ 2	0.00025	0.00026	0.00026	0	Yes	Exceeds background	--	--	--	0.015	RSL	No	Below risk screening criteria	WSAsw-038	03/23/2010
Magnesium	7439-95-4	2/ 2	6.28	6.45	6.37	10.8	No	Essential Nutrient	--	--	--	200	RDA	No	Essential Nutrient	WSAsw-037	03/23/2010
Manganese	7439-96-5	2/ 2	0.0887	0.0949	0.0918	0.391	No	Below background	2.476	0.633	1.449	0.633	RC	No	Below background	WSAsw-037	03/23/2010
Nickel	7440-02-0	2/ 2	0.0008	0.00085	0.00083	0	Yes	Exceeds background	1.445	0.312	8.258	0.312	RC	No	Below risk screening criteria	WSAsw-038	03/23/2010
Potassium	7440-09-7	2/ 2	1.08	1.1	1.09	3.17	No	Essential Nutrient	--	--	--	1750	RDA	No	Essential Nutrient	WSAsw-037	03/23/2010
Selenium	7782-49-2	1/ 2	0.00022	0.00022	0.00136	0	Yes	Exceeds background	--	--	--	0.01	RSL	No	Below risk screening criteria	WSAsw-038	03/23/2010
Sodium	7440-23-5	2/ 2	3.45	3.52	3.49	21.3	No	Essential Nutrient	--	--	--	1200	RDA	No	Essential Nutrient	WSAsw-037	03/23/2010
Vanadium	7440-62-2	1/ 2	0.00063	0.00063	0.00282	0	Yes	Exceeds background	0.211	0.0706	0.0572	0.0572	NGT	No	Below risk screening criteria	WSAsw-038	03/23/2010

[a]Background criteria for surface water from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

[b]Facility-Wide Cleanup Goals (FWCUGs) for Resident Adult (RA), Resident Child (RC), and National Guard Trainee (NGT) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).

[c]Screening Level Source:
RDA = Concentration associated with recommended daily allowance of essential nutrient
RA = FWCUG for Resident Adult
RC = FWCUG for Resident Child
RSL = United States Environmental Protection Agency (USEPA) Residential Regional Screening Level
NGT = National Guard Trainee
bgs = Below ground surface
CAS = Chemical Abstract Service
COPC = Chemical of Potential Concern
HQ = Hazard Quotient
SRC = Site-related Contaminant
-- = No value available
Bold = Chemical is a COPC

Table G-5. COC Screening for Surface Soil (0-1 ft bgs ISM Samples) at Wet Storage Area
Unrestricted Land Use Receptor: Resident (Adult and Child)

		COPC		Aluminum	Arsenic[c]	Chromium[d]	Cobalt	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene
		CAS Number		7429-90-5	7440-38-2	7440-47-3	7440-48-4	56-55-3	50-32-8	205-99-2	207-08-9	53-70-3	193-39-5
		Resident FWCUG[a]:											
		HQ=1		73798	20.2	81,473	1313	--	--	--	--	--	--
		Risk=10^{-5}		--	4.25	--	8030	2.21	0.221	2.21	22.1	0.221	2.21
		Background Criteria[b]		17700 (19500)	15.4 (19.8)	17.4 (27.2)	10.4 (23.2)	--	--	--	--	--	--
Sample ID	Date	Depth (ft bgs)	Station	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?	Result Exceeds FWCUG?
WSAss-001M-SO	10/27/2004	0.0 - 1.0	WSAss-001M	13000 No	18 No	22 No	10 No	NR	NR	NR	NR	NR	NR
WSAss-002M-SO	10/26/2004	0.0 - 1.0	WSAss-002M	12000 No	19 No	25 No	12 No	NR	NR	NR	NR	NR	NR
WSAss-003M-SO	10/26/2004	0.0 - 1.0	WSAss-003M	11000 No	16 No	26 No	12 No	NR	NR	NR	NR	NR	NR
WSAss-004M-SO	10/26/2004	0.0 - 1.0	WSAss-004M	10000 No	15 No	20 No	10 No	**8.2 Yes**	**5.5 Yes**	**7.3 Yes**	3.2 No	**0.94 Yes**	**3.4 Yes**
WSAss-005M-SO	10/27/2004	0.0 - 1.0	WSAss-005M	16000 No	11 No	23 No	11 No	NR	NR	NR	NR	NR	NR
WSAss-006M-SO	10/27/2004	0.0 - 1.0	WSAss-006M	12000 No	15 No	21 No	11 No	NR	NR	NR	NR	NR	NR
WSAss-007M-SO	10/27/2004	0.0 - 1.0	WSAss-007M	13000 No	18 No	24 No	12 No	NR	NR	NR	NR	NR	NR
WSAss-008M-SO	10/29/2004	0.0 - 1.0	WSAss-008M	10000 No	14 No	18 No	11 No	NR	NR	NR	NR	NR	NR
WSAss-009M-SO	10/29/2004	0.0 - 1.0	WSAss-009M	11000 No	16 No	18 No	12 No	NR	NR	NR	NR	NR	NR
WSAss-010M-SO	10/28/2004	0.0 - 1.0	WSAss-010M	9500 No	14 No	16 No	9.6 No	NR	NR	NR	NR	NR	NR
WSAss-011M-SO	11/01/2004	0.0 - 1.0	WSAss-011M	12000 No	14 No	19 No	8.9 No	<0.034U No	0.012J No	0.019J No	<0.034U No	<0.034U No	<0.034U No
WSAss-012M-SO	10/29/2004	0.0 - 1.0	WSAss-012M	8400 No	11 No	18 No	6.6 No	NR	NR	NR	NR	NR	NR
WSAss-013M-SO	10/29/2004	0.0 - 1.0	WSAss-013M	12000 No	17 No	19 No	10 No	NR	NR	NR	NR	NR	NR
WSAss-014M-SO	10/27/2004	0.0 - 1.0	WSAss-014M	11000 No	15 No	20 No	10 No	NR	NR	NR	NR	NR	NR
WSAss-015M-SO	10/27/2004	0.0 - 1.0	WSAss-015M	11000 No	15 No	26 No	9.9 No	NR	NR	NR	NR	NR	NR
WSAss-016M-SO	10/27/2004	0.0 - 1.0	WSAss-016M	11000 No	16 No	21 No	10 No	NR	NR	NR	NR	NR	NR
WSAss-017M-SO	10/27/2004	0.0 - 1.0	WSAss-017M	13000 No	14 No	22 No	10 No	NR	NR	NR	NR	NR	NR
WSAss-020M-SO	12/3/2004	0.0 - 1.0	WSAss-020M	12000 No	**21 Yes**	20 No	14 No	NR	NR	NR	NR	NR	NR
WSAss-033M-5645-SO	03/24/2010	0.0 - 1.0	WSAss-033M	27100J No	15.5J No	19.4 No	12.2 No	0.11J No	0.097J No	0.13J No	0.061J No	0.02J No	0.064J No
WSAss-034M-5646-SO	03/24/2010	0.0 - 1.0	WSAss-034M	12500J No	14J No	20.4 No	9.9 No	0.074 No	0.071 No	0.082 No	0.053 No	0.014 No	0.044 No
WSAss-035M-5648-SO	03/24/2010	0.0 - 1.0	WSAss-035M	11800J No	13.2J No	21.6 No	9.6 No	0.034 No	0.039 No	0.063 No	0.024 No	0.0084 No	0.03 No
WSAss-036M-5647-SO	03/24/2010	0.0 - 1.0	WSAss-036M	12900J No	14.8J No	20 No	11 No	0.023J No	0.022J No	0.033J No	0.012J No	<0.051U No	0.015J No

[a]Facility-Wide Cleanup Goals (FWCUG) for Resident Adult (RA) and Resident Child (RC) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).

[b]Background criteria for soil 0-1 ft bgs and >1 ft bgs from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

[c]Since the Resident (Adult and Child) FWCUG for arsenic is less than the surface soil background screening value (15.4 mg/kg) and the subsurface soil screening value (19.8 mg/kg), the background level is used as the cleanup goal (CUG) for comparison. As ground disturbance has occurred at the site with the demolition and removal of the igloos, the subsurface background value was used as the CUG for comparison.

[d]Reported concentration is for total chromium; FWCUG shown is for trivalent chromium which is the appropriate comparison based on chromium speciation results at Wet Storage Area as described in Section 7.2.4.1.

Data Qualifiers:

J=indicates that the analyte was positively identified, but the associated numerical value is an approximate concentration of the analyte in the sample.

U=not detected

UJ=not detected and reporting limit estimated

bgs = below ground surface

CAS = Chemical Abstract Service

COC = Chemical of Concern

HQ = Hazard Quotient

ISM = Incremental Sampling Method

NR = Not Reported

-- = No value available

Bold = concentration in this sample exceeds FWCUG.

Table G-6. Sum-of-Ratios for Non-Carcinogens
COC Screening for Surface Soil (0-1 ft bgs ISM Samples) at Wet Storage Area
Unrestricted Land Use Receptor: Resident (Adult and Child)

		COPC		Aluminum		Arsenic[c]		Chromium[d]		Cobalt		
		CAS Number		7429-90-5		7440-38-2		7440-47-3		7440-48-4		
		Resident FWCUG[a]:										
		HQ=1		73,798		20.2		81,473		1,313		
		Critical Effect or Target Organ		Neurotoxicity in Offspring		Skin		NOAEL		Not Specified		
		Background Criteria[b]		17700 (19500)		15.4 (19.8)		17.4 (27.2)		10.4 (23.2)		
Sample ID	Date	Depth (ft bgs)	Station	Result	Ratio	Result	Ratio	Result	Ratio	Result	Ratio	SOR
WSAss-001M-SO	10/27/2004	0.0 - 1.0	WSAss-001M	13000	NA	18	NA	22	NA	10	NA	--
WSAss-002M-SO	10/26/2004	0.0 - 1.0	WSAss-002M	12000	NA	19	NA	25	NA	12	NA	--
WSAss-003M-SO	10/26/2004	0.0 - 1.0	WSAss-003M	11000	NA	16	NA	26	NA	12	NA	--
WSAss-004M-SO	10/26/2004	0.0 - 1.0	WSAss-004M	10000	NA	15	NA	20	NA	10	NA	--
WSAss-005M-SO	10/27/2004	0.0 - 1.0	WSAss-005M	16000	NA	11	NA	23	NA	11	NA	--
WSAss-006M-SO	10/27/2004	0.0 - 1.0	WSAss-006M	12000	NA	15	NA	21	NA	11	NA	--
WSAss-007M-SO	10/27/2004	0.0 - 1.0	WSAss-007M	13000	NA	18	NA	24	NA	12	NA	--
WSAss-008M-SO	10/29/2004	0.0 - 1.0	WSAss-008M	10000	NA	14	NA	18	NA	11	NA	--
WSAss-009M-SO	10/29/2004	0.0 - 1.0	WSAss-009M	11000	NA	16	NA	18	NA	12	NA	--
WSAss-010M-SO	10/28/2004	0.0 - 1.0	WSAss-010M	9500	NA	14	NA	16	NA	9.6	NA	--
WSAss-011M-SO	11/01/2004	0.0 - 1.0	WSAss-011M	12000	NA	14	NA	19	NA	8.9	NA	--
WSAss-012M-SO	10/29/2004	0.0 - 1.0	WSAss-012M	8400	NA	11	NA	18	NA	6.6	NA	--
WSAss-013M-SO	10/29/2004	0.0 - 1.0	WSAss-013M	12000	NA	17	NA	19	NA	10	NA	--
WSAss-014M-SO	10/27/2004	0.0 - 1.0	WSAss-014M	11000	NA	15	NA	20	NA	10	NA	--
WSAss-015M-SO	10/27/2004	0.0 - 1.0	WSAss-015M	11000	NA	15	NA	26	NA	9.9	NA	--
WSAss-016M-SO	10/27/2004	0.0 - 1.0	WSAss-016M	11000	NA	16	NA	21	NA	10	NA	--
WSAss-017M-SO	10/27/2004	0.0 - 1.0	WSAss-017M	13000	NA	14	NA	22	NA	10	NA	--
WSAss-020M-SO	12/3/2004	0.0 - 1.0	WSAss-020M	12000	NA	21	1	20	NA	14	NA	1
WSAss-033M-5645-SO	03/24/2010	0.0 - 1.0	WSAss-033M	27100	0.4	15.5	NA	19.4	NA	12.2	NA	0.4
WSAss-034M-5646-SO	03/24/2010	0.0 - 1.0	WSAss-034M	12500	NA	14	NA	20.4	NA	9.9	NA	--
WSAss-035M-5648-SO	03/24/2010	0.0 - 1.0	WSAss-035M	11800	NA	13.2	NA	21.6	NA	9.6	NA	--
WSAss-036M-5647-SO	03/24/2010	0.0 - 1.0	WSAss-036M	12900	NA	14.8	NA	20	NA	11	NA	--

[a]Facility-Wide Cleanup Goals (FWCUG) for Resident Adult (RA) and Resident Child (RC) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).

[b]Background criteria for soil 0-1 ft bgs from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

[c]Since the Resident (Adult and Child) FWCUG for arsenic is less than the surface soil background screening value (15.4 mg/kg), the background level is used as the cleanup goal (CUG) for comparison.

[d]Reported concentration is for total chromium; FWCUG shown is for trivalent chromium which is the appropriate comparison based on chromium speciation results at Wet Storage Area as described in Section 7.2.4.1.

Data Qualifiers:

J=indicates that the analyte was positively identified, but the associated numerical value is an approximate concentration of the analyte in the sample.

U=not detected

UJ=not detected and reporting limit estimated

bgs = below ground surface
CAS = Chemical Abstract Service
COC = Chemical of Concern
HQ = Hazard Quotient
ISM = Incremental Sampling Method
NR = Not Reported
-- = No value available
Bold = concentration in this sample exceeds FWCUG.

Table G-7. Sum-of-Ratios for Carcinogens
COC Screening for Surface Soil (0-1 ft bgs ISM Samples) at Wet Storage Area
Unrestricted Land Use Receptor: Resident (Adult and Child)

		Analyte (mg/kg)		Arsenic		Cobalt		Benz(a)anthracene		Benzo(a)pyrene		Benzo(b)fluoranthene		Benzo(k)fluoranthene		Dibenz(a,h)anthracene		Indeno(1,2,3-cd)pyrene		
		CAS Number		7440-38-2		7440-48-4		56-55-3		50-32-8		205-99-2		207-08-9		53-70-3		193-39-5		
		Resident FWCUG[a]:																		
		Risk=1E-5		4.25		8,030		2.21		0.221		2.21		22.1		0.221		2.21		
		Background Criteria[b]		15.4 (19.8)		10.4 (23.2)		--		--		--		--		--		--		
Sample ID	Date	Depth (ft)	Station	Result	Ratio	Result	Ratio	Result	Ratio	Result	Ratio	Result	Ratio	Result	Ratio	Result	Ratio	Result	Ratio	SOR
WSAss-001M-SO	10/27/2004	0.0 - 1.0	WSAss-001M	18	NA	10	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-002M-SO	10/26/2004	0.0 - 1.0	WSAss-002M	19	NA	12	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-003M-SO	10/26/2004	0.0 - 1.0	WSAss-003M	16	NA	12	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-004M-SO	10/26/2004	0.0 - 1.0	WSAss-004M	15	NA	10	NA	8.2	4	5.5	25	7.3	3	3.2	0.14	0.94	4	3.4	2	**38**
WSAss-005M-SO	10/27/2004	0.0 - 1.0	WSAss-005M	11	NA	11	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-006M-SO	10/27/2004	0.0 - 1.0	WSAss-006M	15	NA	11	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-007M-SO	10/27/2004	0.0 - 1.0	WSAss-007M	18	NA	12	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-008M-SO	10/29/2004	0.0 - 1.0	WSAss-008M	14	NA	11	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-009M-SO	10/29/2004	0.0 - 1.0	WSAss-009M	16	NA	12	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-010M-SO	10/28/2004	0.0 - 1.0	WSAss-010M	14	NA	9.6	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-011M-SO	11/1/2004	0.0 - 1.0	WSAss-011M	14	NA	8.9	NA	<0.034U	--	0.012	0.05	0.019	0.01	<0.034U	--	<0.034U	--	<0.034U	--	0.1
WSAss-012M-SO	10/29/2004	0.0 - 1.0	WSAss-012M	11	NA	6.6	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-013M-SO	10/29/2004	0.0 - 1.0	WSAss-013M	17	NA	10	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-014M-SO	10/27/2004	0.0 - 1.0	WSAss-014M	15	NA	10	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-015M-SO	10/27/2004	0.0 - 1.0	WSAss-015M	15	NA	9.9	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-016M-SO	10/27/2004	0.0 - 1.0	WSAss-016M	16	NA	10	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-017M-SO	10/27/2004	0.0 - 1.0	WSAss-017M	14	NA	10	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	--
WSAss-020M-SO	12/3/2004	0.0 - 1.0	WSAss-020M	21	5	14	NA	NR	--	NR	--	NR	--	NR	--	NR	--	NR	--	**5**
WSAss-033M-5645-SO	3/24/2010	0.0 - 1.0	WSAss-033M	15.5	NA	12.2	NA	0.11	0.05	0.097	0.44	0.13	0.06	0.061	0.003	0.02	0.09	0.064	0.03	1
WSAss-034M-5646-SO	3/24/2010	0.0 - 1.0	WSAss-034M	14	NA	9.9	NA	0.074	0.03	0.071	0.32	0.082	0.04	0.053	0.002	0.014	0.06	0.044	0.02	0.5
WSAss-035M-5648-SO	3/24/2010	0.0 - 1.0	WSAss-035M	13.2	NA	9.6	NA	0.034	0.02	0.039	0.18	0.063	0.03	0.024	0.001	0.0084	0.04	0.03	0.01	0.3
WSAss-036M-5647-SO	3/24/2010	0.0 - 1.0	WSAss-036M	14.8	NA	11	NA	0.023	0.01	0.022	0.10	0.033	0.01	0.012	0.001	<0.051U	--	0.015	0.01	0.1

[a]Facility-Wide Cleanup Goals (FWCUG) for Resident Adult (RA) and Resident Child (RC) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010). Lower of the two values for the RA and RC are presented.

[b]Background criteria for soil 0-1 ft bgs from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

Data Qualifiers: U=not detected

bgs = below ground surface

CAS = Chemical Abstract Service

COC = Chemical of Concern

ISM = Incremental Sampling Method

NA = Not applicable; the cobalt result for this sample is not included in the SOR because the reported concentration is less than the background screening value.

NR = Not reported

-- = No value available

SOR = Sum-of-ratios

Bold = SOR is greater than 1. See Section 7.2.4.3 and Table 7-9 for evaluation of chemicals contributing to this SOR.

Table G-8. Sum-of-Ratios for Carcinogens

		Analyte (mg/kg)		Arsenic			Cobalt			Benz(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(k)fluoranthene			Dibenz(a,h)anthracene			Indeno(1,2,3-cd)pyrene			
		CAS Number		7440-38-2			7440-48-4			56-55-3			50-32-8			205-99-2			207-08-9			53-70-3			193-39-5			
		Resident FWCUG[a]:																										
		Risk=1E-5		4.25			8,030			2.21			0.221			2.21			22.1			0.221			2.21			
		Background Criteria[b]		15.4 (19.8)			10.4 (23.2)			--			--			--			--			--			--			
Sample ID	Date	Depth (ft)	Station	Result	Ratio	% Contribution to SOR	Result	Ratio	% Contribution to SOR	Result	Ratio	% Contribution to SOR	Result	Ratio	% Contribution to SOR	Result	Ratio	% Contribution to SOR	Result	Ratio	% Contribution to SOR	Result	Ratio	% Contribution to SOR	Result	Ratio	% Contribution to SOR	SOR
WSAss-004M-SO	10/26/2004	0.0 - 1.0	WSAss-004M	15	NA	--	10	NA	--	8.2	4	10%	5.5	25	66%	7.3	3	9%	3.2	0.14	0.4%	0.94	4	11%	3.4	2	4%	**38**

[a]Facility-Wide Cleanup Goals (FWCUG) for Resident Adult (RA) and Resident Child (RC) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010). Lower of the two values for the RA and RC are presented.

[b]Background criteria for surface soil (0-1 ft bgs) and subsurface soil (>1 ft bgs) from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

bgs = below ground surface

CAS = Chemical Abstract Service

COC = Chemical of Concern

ISM = Incremental Sampling Method

NA = Not applicable; the arsenic or cobalt result for this sample is not included in the SOR because the reported concentration is less than the background screening value.

NR = Not reported

-- = No value available

SOR = Sum-of-ratios

Bold = SOR is greater than 1.

Table G-9. COC Screening for Subsurface Soil (1-13 ft bgs Discrete Samples) at Wet Storage Area
Unrestricted Land Use Receptor: Resident (Adult and Child)

COPC (mg/kg)	CAS Number	Freq of Detect	Minimum Detect	Maximum Detect	Average Result	UCL 95	Dist.	EPC	Resident FWCUG[a]		Background Criteria[b]	EPC Exceeds FWCUG?
									HQ=1	Risk=10^{-5}		
Metals												
Arsenic[c]	7440-38-2	19/ 19	13	21.3	16.7	17.8	L	17.8	20.2	4.25	19.8	No
Cobalt	7440-48-4	19/ 19	7.4	25.8	12.6	14.3	L	14.3	1313	8030	23.2	No
Semi-volatile Organic Compounds												
Benzo(a)pyrene	50-32-8	1/ 19	0.12	0.12	0.0171	0.028	D	0.028	--	0.221	--	No

All units are milligrams per kilogram (mg/kg)

[a]Facility-Wide Cleanup Goal (FWCUG) is the most conservative (smallest) of the FWCUGs for Resident Adult and Resident Child from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).

[b]Background criteria for soil >1 ft bgs from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

[c]Since the Resident FWCUG for arsenic is less than the background level, background is used as the point of comparison.

Dist.: N=normal distribution, t statistic used for UCL 95 calculation.
L=lognormal distribution, Land statistic used for UCL 95 calculation.
D=fewer than 5 or 50% detects, t statistic used for UCL 95 calculation.

bgs = below ground surface
CAS = Chemical Abstract Service
COC = Chemical of Concern
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration
HQ = Hazard Quotient
UCL 95 = 95% Upper Confidence Limit of the mean
Bold = EPC exceeds FWCUG
-- = No value available

Table G-10. COC Screening for Sediment at Wet Storage Area
Unrestricted Land Use Receptor: Resident (Adult and Child)

			COPC	Manganese	Benzo(a)pyrene
			CAS Number	7439-96-5	50-32-8
			Resident FWCUG[a]:		
			HQ=1	2927	--
			Risk=1E-5	--	0.221
			Background Criteria[b]	1950	--
Sample ID	Date	Depth (ft bgs)	Station	Result Exceeds FWCUG?	Result Exceeds FWCUG?
WSAsd-037-5649-SD	03/23/2010	0.0 - 0.5	WSAsd-037	2230 No	0.092 No
WSAsd-038-5650-SD	03/23/2010	0.0 - 0.5	WSAsd-038	1750 No	0.012J No

[a]Facility-Wide Cleanup Goals (FWCUG) for ResidentAdult (RA) and Resident Child (RC) from *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (USACE 2010).

[b]Background criteria for sediment from final facility-wide background values for RVAAP, published in the *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001).

Data Qualifiers:

J= indicates that the analyte was positively identified, but the associated numerical value is an approximate concentration of the analyte in the sample.

U=not detected

UJ=not detected and reporting limit estimated

bgs = below ground surface

CAS = Chemical Abstract Service

COC = Chemical of Concern

HQ = Hazard Quotient

-- = No value available

Bold = concentration in this sample exceeds FWCUG.

THIS PAGE INTENTIONALLY LEFT BLANK.