Table H-4A
Detection Limit Evaluation - Chemicals Never Detected in Sediment

Area	CAS No.	Chemical	Units	PRG Resid Soil (c)	Maximum DL	Maximum DL Exceeds PRG?	Minimum DL	Minimum DL Exceeds PRG?	Number of DLs Exceeding PRG	Sample Count
Great Miami River	106-47-8	4-Chloroaniline	mg/kg	24.4412388	46	Yes	0.39	No	1	10
Great Miami River	7005-72-3	4-Chlorophenylphenyl ether	mg/kg		46	NA	0.39	NA		10
Great Miami River	108-10-1	4-Methyl-2-pentanone	mg/kg	528.0885751	0.019	No	0.011	No	0	10
Great Miami River	100-01-6	4-Nitroaniline	mg/kg	23.16097678	240	Yes	2	No	1	10
Great Miami River	100-02-7	4-Nitrophenol	mg/kg	6.339845745	240	Yes	2	No	4	10
Great Miami River	98-86-2	Acetophenone	mg/kg	780	46	No	0.39	No	0	10
Great Miami River	7440-36-0	Antimony	mg/kg	3.128571233	10.1	Yes	7.2	Yes	10	10
Great Miami River	12674-11-2	Aroclor 1016	mg/kg	0.39330823	0.23	No	0.039	No	0	10
Great Miami River	11104-28-2	Aroclor 1221	mg/kg	0.11	0.47	Yes	0.08	No	2	10
Great Miami River	11141-16-5	Aroclor 1232	mg/kg	0.11	0.23	Yes	0.039	No	1	10
Great Miami River	53469-21-9	Aroclor 1242	mg/kg	0.11	0.23	Yes	0.039	No	1	10
Great Miami River	1912-24-9	Atrazine	mg/kg	2.190904294	46	Yes	0.39	No	2	10
Great Miami River	100-52-7	Benzaldehyde	mg/kg	611.0309701	240	No	2	No	0	10
Great Miami River	7440-41-7	Beryllium	mg/kg	15.43741586	0.84	No	0.6	No	0	10
Great Miami River	111-91-1	Bis(2-Chloroethoxy)methane	mg/kg		46	NA	0.39	NA		10
Great Miami River	111-44-4	Bis(2-Chloroethyl)ether	mg/kg	0.217502019	46	Yes	0.39	Yes	10	10
Great Miami River	75-27-4	Bromodichloromethane	mg/kg	0.824275042	0.0094	No	0.0056	No	0	10
Great Miami River	75-25-2	Bromoform	mg/kg	61.56888849	0.0094	No	0.0056	No	0	10
Great Miami River	74-83-9	Bromomethane	mg/kg	0.389656117	0.0094	No	0.0056	No	0	10
Great Miami River	85-68-7	Butylbenzylphthalate	mg/kg	1222.06194	46	No	0.39	No	0	10
Great Miami River	105-60-2	Caprolactam	mg/kg	3055.15485	240	No	2	No	0	10
Great Miami River	56-23-5	Carbon tetrachloride	mg/kg	0.251246068	0.0094	No	0.0056	No	0	10
Great Miami River	108-90-7	Chlorobenzene	mg/kg	15.06578627	0.0094	No	0.0056	No	0	10
Great Miami River	75-00-3	Chloroethane	mg/kg	3.025815812	0.019	No	0.011	No	0	10
Great Miami River	75-00-3	Chloroethane	mg/kg	3.025815812	0.019	No	0.011	No	0	10
Great Miami River	67-66-3	Chloroform	mg/kg	0.220791771	0.0094	No	0.0056	No	0	10
Great Miami River	74-87-3	Chloromethane	mg/kg	4.685346206	0.0094	No	0.0056	No	0	10
Great Miami River	156-59-2	cis-1,2-Dichloroethene	mg/kg	4.294190036	0.0094	No	0.0056	No	0	10
Great Miami River	10061-01-5	cis-1,3-Dichloropropene	mg/kg	0.776532354	0.0094	No	0.0056	No	0	10
Great Miami River	124-48-1	Dibromochloromethane	mg/kg	1.108664857	0.0094	No	0.0056	No	0	10
Great Miami River	75-71-8	Dichlorodifluoromethane	mg/kg	9.387910292	0.0094	No	0.0056	No	0	10
Great Miami River	84-66-2	Diethylphthalate	mg/kg	4888.247761	46	No	0.39	No	0	10
Great Miami River	131-11-3	Dimethylphthalate	mg/kg	61000	46	No	0.39	No	0	10
Great Miami River	84-74-2	Di-n-butylphthalate	mg/kg	611.0309701	46	No	0.39	No	0	10
Great Miami River	117-84-0	Di-n-octylphthalate	mg/kg	244.412388	46	No	0.39	No	0	10
Great Miami River	118-74-1	Hexachlorobenzene	mg/kg	0.303987716	46	Yes	0.39	Yes	10	10
Great Miami River	87-68-3	Hexachlorobutadiene	mg/kg	1.8	46	Yes	0.39	No	2	10
Great Miami River	77-47-4	Hexachlorocyclopentadiene	mg/kg	36.54874986	46	Yes	0.39	No	1	10
Great Miami River	67-72-1	Hexachloroethane	mg/kg	34.74146517	46	Yes	0.39	No	1	10
Great Miami River	78-59-1	Isophorone	mg/kg	511.9794868	46	No	0.39	No	0	10
Great Miami River	98-82-8	Isopropylbenzene	mg/kg	15.70273706	0.0094	No	0.0056	No	0	10
Great Miami River	79-20-9	Methyl acetate	mg/kg	2208.674401	0.019	No	0.011	No	0	10
Great Miami River	75-09-2	Methylene chloride	mg/kg	9.10698969	0.0094	No	0.0056	No	0	10
Great Miami River	1634-04-4	Methyl-tert-butyl-ether	mg/kg	16.70074836	0.0094	No	0.0056	No	0	10
Great Miami River	98-95-3	Nitrobenzene	mg/kg	1.964120482	46	Yes	0.39	No	2	10
Great Miami River	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	0.06948293	46	Yes	0.39	Yes	10	10
Great Miami River	86-30-6	N-Nitrosodiphenylamine	mg/kg	99.26132907	46	No	0.39	No	0	10
Great Miami River	95-48-7	o-Cresol (2-Methylphenol)	mg/kg	305.515485	46	No	0.39	No	0	10

Table H-4A
Detection Limit Evaluation - Chemicals Never Detected in Sediment

Area	CAS No.	Chemical	Units	PRG Resid. Soil (c)	Maximum DL	Maximum DL Exceeds PRG?	Minimum DL	Minimum DL Exceeds PRG?	Number of DLs Exceeding PRG	Sample Count
Great Miami River	87-86-5	Pentachlorophenol	mg/kg	2.978985095	240	Yes	2	No	6	10
Great Miami River	108-95-2	Phenol	mg/kg	1833.09291	46	No	0.39	No	0	10
Great Miami River	7440-22-4	Silver	mg/kg	39.10711227	1.7	No	1.2	No	0	10
Great Miami River	100-42-5	Styrene	mg/kg	440	0.0094	No	0.0056	No	0	10
Great Miami River	127-18-4	Tetrachloroethene	mg/kg	0.483591399	0.0094	No	0.0056	No	0	10
Great Miami River	7440-28-0	Thallium	mg/kg	0.51821428	8.4	Yes	6	Yes	10	10
Great Miami River	156-60-5	trans-1,2-Dichloroethene	mg/kg	6.948962718	0.0094	No	0.0056	No	0	10
Great Miami River	10061-02-6	trans-1,3-Dichloropropene	mg/kg	0.776532354	0.0094	No	0.0056	No	0	10
Great Miami River	79-01-6	Trichloroethene	mg/kg	0.052983337	0.0094	No	0.0056	No	0	10
Great Miami River	75-69-4	Trichlorofluoromethane	mg/kg	38.58178986	0.0094	No	0.0056	No	0	10
Great Miami River	75-01-4	Vinyl chloride	mg/kg	0.079067784	0.0094	No	0.0056	No	0	10

Notes:
DL - Detection Limit.
(a) - Location where former COG pipeline passed beneath Great Miami River.
(b) - Intermittent stream.
(c) - EPA Region 9 PRG for residential soil. PRGs for noncarcinogens are divided by 10 (HQ = 0.1).

Table H-4B
Detection Limit Evaluation - Chemicals Never Detected in Sediment - Maximum DL Exceeds

Area	CAS No.	Chemical	Units	PRG Result Soil (c)	Maximum DL	Maximum DL Exceeds PRG?	Minimum DL	Minimum DL Exceeds PRG?	Number of DLs Exceeding PRG	Sample Count
AOC 19 (a)	91-94-1	3,3'-Dichlorobenzidine	mg/kg	1.080845583	1.6	Yes	0.38	No	2	4
AOC 19 (a)	99-09-2	3-Nitroaniline	mg/kg	1.83309291	8.2	Yes	2	Yes	4	4
AOC 19 (a)	534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	0.61103097	8.2	Yes	2	Yes	4	4
AOC 19 (a)	100-02-7	4-Nitrophenol	mg/kg	6.339845745	8.2	Yes	2	No	2	4
AOC 19 (a)	7440-36-0	Antimony	mg/kg	3.128571233	9.4	Yes	6.9	Yes	4	4
AOC 19 (a)	111-44-4	Bis(2-Chloroethyl)ether	mg/kg	0.217502019	1.6	Yes	0.38	Yes	4	4
AOC 19 (a)	118-74-1	Hexachlorobenzene	mg/kg	0.303987716	1.6	Yes	0.38	Yes	4	4
AOC 19 (a)	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	0.06948293	1.6	Yes	0.38	Yes	4	4
AOC 19 (a)	87-86-5	Pentachlorophenol	mg/kg	2.978985095	8.2	Yes	2	No	2	4
AOC 19 (a)	7440-28-0	Thallium	mg/kg	0.51621428	7.8	Yes	5.7	Yes	4	4
AOC 7 (b)	91-94-1	3,3'-Dichlorobenzidine	mg/kg	1.080845583	2.4	Yes	0.4	No	2	5
AOC 7 (b)	99-09-2	3-Nitroaniline	mg/kg	1.83309291	12	Yes	2.1	Yes	5	5
AOC 7 (b)	534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	0.61103097	12	Yes	2.1	Yes	5	5
AOC 7 (b)	100-02-7	4-Nitrophenol	mg/kg	6.339845745	12	Yes	2.1	No	1	5
AOC 7 (b)	7440-36-0	Antimony	mg/kg	3.128571233	8.5	Yes	7.1	Yes	5	5
AOC 7 (b)	1912-24-9	Atrazine	mg/kg	2.190904294	2.4	Yes	0.4	No	1	5
AOC 7 (b)	111-44-4	Bis(2-Chloroethyl)ether	mg/kg	0.217502019	2.4	Yes	0.4	Yes	5	5
AOC 7 (b)	118-74-1	Hexachlorobenzene	mg/kg	0.303987716	2.4	Yes	0.4	Yes	5	5
AOC 7 (b)	87-68-3	Hexachlorobutadiene	mg/kg	1.8	2.4	Yes	0.4	No	1	5
AOC 7 (b)	98-95-3	Nitrobenzene	mg/kg	1.964120482	2.4	Yes	0.4	No	1	5
AOC 7 (b)	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	0.06948293	2.4	Yes	0.4	Yes	5	5
AOC 7 (b)	87-86-5	Pentachlorophenol	mg/kg	2.978985095	12	Yes	2.1	No	2	5
AOC 7 (b)	7440-28-0	Thallium	mg/kg	0.51621428	64.8	Yes	5.9	Yes	5	5
Great Miami River	108-60-1	2,2'-Oxybis(1-Chloropropane)	mg/kg	2.884215512	46	Yes	0.39	No	1	10
Great Miami River	88-06-2	2,4,6-Trichlorophenol	mg/kg	6.110309701	46	Yes	0.39	No	1	10
Great Miami River	120-83-2	2,4-Dichlorophenol	mg/kg	18.3309291	46	Yes	0.39	No	1	10
Great Miami River	51-28-5	2,4-Dinitrophenol	mg/kg	12.2206194	240	Yes	2	No	1	10
Great Miami River	121-14-2	2,4-Dinitrotoluene	mg/kg	12.2206194	46	Yes	0.39	No	1	10
Great Miami River	606-20-2	2,6-Dinitrotoluene	mg/kg	6.110309701	46	Yes	0.39	No	1	10
Great Miami River	95-57-8	2-Chlorophenol	mg/kg	6.339845745	46	Yes	0.39	No	1	10
Great Miami River	91-57-6	2-Methylnaphthalene	mg/kg	5.591605683	46	Yes	0.39	No	1	10
Great Miami River	88-74-4	2-Nitroaniline	mg/kg	18.27722139	240	Yes	2	No	1	10
Great Miami River	88-75-5	2-Nitrophenol	mg/kg	6.339845745	46	Yes	0.39	No	1	10
Great Miami River	91-94-1	3,3'-Dichlorobenzidine	mg/kg	1.080845583	46	Yes	0.39	No	4	10
Great Miami River	99-09-2	3-Nitroaniline	mg/kg	1.83309291	240	Yes	2	Yes	10	10
Great Miami River	534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	0.61103097	240	Yes	2	Yes	10	10
Great Miami River	106-47-8	4-Chloroaniline	mg/kg	24.4412388	46	Yes	0.39	No	1	10
Great Miami River	100-01-6	4-Nitroaniline	mg/kg	23.16097678	240	Yes	2	No	1	10
Great Miami River	100-02-7	4-Nitrophenol	mg/kg	6.339845745	240	Yes	2	No	4	10
Great Miami River	7440-36-0	Antimony	mg/kg	3.128571233	10.1	Yes	7.2	Yes	10	10
Great Miami River	11104-28-2	Aroclor 1221	mg/kg	0.11	0.47	Yes	0.08	No	2	10
Great Miami River	11141-16-5	Aroclor 1232	mg/kg	0.11	0.23	Yes	0.039	No	1	10
Great Miami River	53469-21-9	Aroclor 1242	mg/kg	0.11	0.23	Yes	0.039	No	1	10
Great Miami River	1912-24-9	Atrazine	mg/kg	2.190904294	46	Yes	0.39	No	2	10
Great Miami River	111-44-4	Bis(2-Chloroethyl)ether	mg/kg	0.217502019	46	Yes	0.39	Yes	10	10
Great Miami River	118-74-1	Hexachlorobenzene	mg/kg	0.303987716	46	Yes	0.39	Yes	10	10
Great Miami River	87-68-3	Hexachlorobutadiene	mg/kg	1.8	46	Yes	0.39	No	2	10
Great Miami River	77-47-4	Hexachlorocyclopentadiene	mg/kg	38.54874986	46	Yes	0.39	No	1	10

Table H-4B
Detection Limit Evaluation - Chemicals Never Detected in Sediment - Maximum DL Exceeds

Area	CAS No.	Chemical	Units	PRG Resid Soil (c)	Maximum DL	Maximum DL Exceeds PRG?	Minimum DL	Minimum DL Exceeds PRG?	Number of DLs Exceeding PRG	Sample Count
Great Miami River	67-72-1	Hexachloroethane	mg/kg	34.74148517	46	Yes	0.39	No	1	10
Great Miami River	98-95-3	Nitrobenzene	mg/kg	1.964120482	46	Yes	0.39	No	2	10
Great Miami River	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	0.06948293	46	Yes	0.39	Yes	10	10
Great Miami River	87-86-5	Pentachlorophenol	mg/kg	2.978985095	240	Yes	2	No	8	10
Great Miami River	7440-28-0	Thallium	mg/kg	0.51621428	8.4	Yes	6	Yes	10	10

Notes:
DL - Detection Limit.
(a) - Location where former COG pipeline passed beneath Great Miami River.
(b) - Intermittent stream.
(c) - EPA Region 9 PRG for residential soil. PRGs for noncarcinogens are divided by 10 (HQ = 0.1).

Table H-4C
Detection Limit Evaluation - Chemicals Never Detected in Sediment - Minimum DL Exceeds

Area	CAS No.	Chemical	Units	PRG Resid. Soil (c)	Maximum DL	Maximum DL Exceeds PRG?	Minimum DL	Minimum DL Exceeds PRG?	Ratio of Exceedance	Number of DLs Exceeding PRG	Sample Count
AOC 19 (a)	99-09-2	3-Nitroaniline	mg/kg	1.83309291	8.2	Yes	2	Yes	1.1	4	4
AOC 19 (a)	534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	0.61103097	8.2	Yes	2	Yes	3.3	4	4
AOC 19 (a)	7440-36-0	Antimony	mg/kg	3.128571233	9.4	Yes	6.9	Yes	2.2	4	4
AOC 19 (a)	111-44-4	Bis(2-Chloroethyl)ether	mg/kg	0.217502019	1.6	Yes	0.38	Yes	1.7	4	4
AOC 19 (a)	118-74-1	Hexachlorobenzene	mg/kg	0.303987716	1.6	Yes	0.38	Yes	1.3	4	4
AOC 19 (a)	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	0.06948293	1.6	Yes	0.38	Yes	5.5	4	4
AOC 19 (a)	7440-28-0	Thallium	mg/kg	0.51621428	7.8	Yes	5.7	Yes	11.0	4	4
AOC 7 (b)	99-09-2	3-Nitroaniline	mg/kg	1.83309291	12	Yes	2.1	Yes	1.1	5	5
AOC 7 (b)	534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	0.61103097	12	Yes	2.1	Yes	3.4	5	5
AOC 7 (b)	7440-36-0	Antimony	mg/kg	3.128571233	8.5	Yes	7.1	Yes	2.3	5	5
AOC 7 (b)	111-44-4	Bis(2-Chloroethyl)ether	mg/kg	0.217502019	2.4	Yes	0.4	Yes	1.8	5	5
AOC 7 (b)	118-74-1	Hexachlorobenzene	mg/kg	0.303987716	2.4	Yes	0.4	Yes	1.3	5	5
AOC 7 (b)	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	0.06948293	2.4	Yes	0.4	Yes	5.8	5	5
AOC 7 (b)	7440-28-0	Thallium	mg/kg	0.51621428	64.8	Yes	5.9	Yes	11.4	5	5
Great Miami River	99-09-2	3-Nitroaniline	mg/kg	1.83309291	240	Yes	2	Yes	1.1	10	10
Great Miami River	534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	0.61103097	240	Yes	2	Yes	3.3	10	10
Great Miami River	7440-36-0	Antimony	mg/kg	3.128571233	10.1	Yes	7.2	Yes	2.3	10	10
Great Miami River	111-44-4	Bis(2-Chloroethyl)ether	mg/kg	0.217502019	46	Yes	0.39	Yes	1.8	10	10
Great Miami River	118-74-1	Hexachlorobenzene	mg/kg	0.303987716	46	Yes	0.39	Yes	1.3	10	10
Great Miami River	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	0.06948293	46	Yes	0.39	Yes	5.6	10	10
Great Miami River	7440-28-0	Thallium	mg/kg	0.51621428	8.4	Yes	6	Yes	11.6	10	10

Notes:
DL - Detection Limit.
(a) - Location where former COG pipeline passed beneath Great Miami River.
(b) - Intermittent stream.
(c) - EPA Region 9 PRG for residential soil. PRGs for noncarcinogens are divided by 10 (HQ = 0.1).

Table H-4D
Detection Limit Evaluation - Chemicals Never Detected in Sediment - Constituents Lacking Screening Levels

Area	CAS No.	Chemical	Units	PRG Resid. Soil (c)	Maximum DL	Maximum DL Exceeds PRG?	Minimum DL	Minimum DL Exceeds PRG?	Number of DLs Exceeding PRG	Sample Count
AOC 19 (a)	101-55-3	4-Bromophenylphenyl ether	mg/kg		1.6	NA	0.38	NA		4
AOC 19 (a)	59-50-7	4-Chloro-3-methylphenol	mg/kg		1.6	NA	0.38	NA		4
AOC 19 (a)	7005-72-3	4-Chlorophenylphenyl ether	mg/kg		1.6	NA	0.38	NA		4
AOC 19 (a)	111-91-1	Bis(2-Chloroethoxy)methane	mg/kg		1.6	NA	0.38	NA		4
AOC 7 (b)	101-55-3	4-Bromophenylphenyl ether	mg/kg		2.4	NA	0.4	NA		5
AOC 7 (b)	59-50-7	4-Chloro-3-methylphenol	mg/kg		2.4	NA	0.4	NA		5
AOC 7 (b)	7005-72-3	4-Chlorophenylphenyl ether	mg/kg		2.4	NA	0.4	NA		5
AOC 7 (b)	111-91-1	Bis(2-Chloroethoxy)methane	mg/kg		2.4	NA	0.4	NA		5
Great Miami River	101-55-3	4-Bromophenylphenyl ether	mg/kg		46	NA	0.39	NA		10
Great Miami River	59-50-7	4-Chloro-3-methylphenol	mg/kg		46	NA	0.39	NA		10
Great Miami River	7005-72-3	4-Chlorophenylphenyl ether	mg/kg		46	NA	0.39	NA		10
Great Miami River	111-91-1	Bis(2-Chloroethoxy)methane	mg/kg		46	NA	0.39	NA		10

Notes:
DL - Detection Limit.
(a) - Location where former COG pipeline passed beneath Great Miami River.
(b) - Intermittent stream.
(c) - EPA Region 9 PRG for residential soil. PRGs for noncarcinogens are divided by 10 (HQ = 0.1).

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected in Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 19	71-55-6	1,1,1-Trichloroethane	ug/l	1	200	NO	1	NO	1
AOC 19	79-34-5	1,1,2,2-Tetrachloroethane	ug/l	1	1.7	NO	1	NO	1
AOC 19	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	1		NA	1	NA	1
AOC 19	79-00-5	1,1,2-Trichloroethane	ug/l	1	5	NO	1	NO	1
AOC 19	92-52-4	1,1-Biphenyl	ug/l	9.3		NA	9.3	NA	1
AOC 19	75-34-3	1,1-Dichloroethane	ug/l	1		NA	1	NA	1
AOC 19	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	1
AOC 19	120-82-1	1,2,4-Trichlorobenzene	ug/l	1	35	NO	1	NO	1
AOC 19	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	1
AOC 19	106-93-4	1,2-Dibromoethane	ug/l	1		NA	1	NA	1
AOC 19	95-50-1	1,2-Dichlorobenzene	ug/l	1	600	NO	1	NO	1
AOC 19	107-06-2	1,2-Dichloroethane	ug/l	1	3.8	NO	1	NO	1
AOC 19	78-87-5	1,2-Dichloropropane	ug/l	1	5	NO	1	NO	1
AOC 19	541-73-1	1,3-Dichlorobenzene	ug/l	1	400	NO	1	NO	1
AOC 19	106-46-7	1,4-Dichlorobenzene	ug/l	1	75	NO	1	NO	1
AOC 19	108-60-1	2,2'-Oxybis(1-Chloropropane)	ug/l	9.3		NA	9.3	NA	1
AOC 19	95-95-4	2,4,5-Trichlorophenol	ug/l	9.3	2600	NO	9.3	NO	1
AOC 19	88-06-2	2,4,6-Trichlorophenol	ug/l	9.3	21	NO	9.3	NO	1
AOC 19	120-83-2	2,4-Dichlorophenol	ug/l	9.3	93	NO	9.3	NO	1
AOC 19	105-67-9	2,4-Dimethylphenol	ug/l	9.3	540	NO	9.3	NO	1
AOC 19	51-28-5	2,4-Dinitrophenol	ug/l	47	70	NO	47	NO	1
AOC 19	121-14-2	2,4-Dinitrotoluene	ug/l	9.3	1.1	YES	9.3	YES	1
AOC 19	606-20-2	2,6-Dinitrotoluene	ug/l	9.3		NA	9.3	NA	1
AOC 19	78-93-3	2-Butanone	ug/l	5		NA	5	NA	1
AOC 19	91-58-7	2-Chloronaphthalene	ug/l	9.3	1700	NO	9.3	NO	1
AOC 19	95-57-8	2-Chlorophenol	ug/l	9.3	120	NO	9.3	NO	1
AOC 19	591-78-6	2-Hexanone	ug/l	5		NA	5	NA	1
AOC 19	91-57-6	2-Methylnaphthalene	ug/l	9.3		NA	9.3	NA	1
AOC 19	88-74-4	2-Nitroaniline	ug/l	47		NA	47	NA	1
AOC 19	88-75-5	2-Nitrophenol	ug/l	9.3		NA	9.3	NA	1
AOC 19	91-94-1	3,3'-Dichlorobenzidine	ug/l	9.3	0.4	YES	9.3	YES	1
AOC 19	99-09-2	3-Nitroaniline	ug/l	47		NA	47	NA	1
AOC 19	534-52-1	4,6-Dinitro-2-methylphenol	ug/l	47	310000	NO	47	NO	1
AOC 19	101-55-3	4-Bromophenylphenyl ether	ug/l	9.3		NA	9.3	NA	1
AOC 19	59-50-7	4-Chloro-3-methylphenol	ug/l	9.3		NA	9.3	NA	1
AOC 19	106-47-8	4-Chloroaniline	ug/l	9.3		NA	9.3	NA	1
AOC 19	7005-72-3	4-Chlorophenylphenyl ether	ug/l	9.3		NA	9.3	NA	1
AOC 19	108-10-1	4-Methyl-2-pentanone	ug/l	5	199.3015873	NO	5	NO	1
AOC 19	100-01-6	4-Nitroaniline	ug/l	47		NA	47	NA	1
AOC 19	100-02-7	4-Nitrophenol	ug/l	47		NA	47	NA	1
AOC 19	83-32-9	Acenaphthene	ug/l	0.19	1200	NO	0.19	NO	1
AOC 19	208-96-8	Acenaphthylene	ug/l	0.19	1200	NO	0.19	NO	1
AOC 19	67-64-1	Acetone	ug/l	10	547.5	NO	10	NO	1
AOC 19	98-86-2	Acetophenone	ug/l	9.3		NA	9.3	NA	1
AOC 19	120-12-7	Anthracene	ug/l	0.19	9600	NO	0.19	NO	1
AOC 19	7440-36-0	Antimony	ug/l	8.1	6	YES	8.1	YES	1
AOC 19	12674-11-2	Aroclor 1016	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	11104-28-2	Aroclor 1221	ug/l	1.9	0.0017	YES	1.9	YES	1

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected in Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 19	11141-16-5	Aroclor 1232	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	53469-21-9	Aroclor 1242	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	12672-29-6	Aroclor 1248	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	11097-69-1	Aroclor 1254	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	11096-82-5	Aroclor 1260	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	7440-38-2	Arsenic	ug/l	3.7	10	NO	3.7	NO	1
AOC 19	1912-24-9	Atrazine	ug/l	9.3	3	YES	9.3	YES	1
AOC 19	100-52-7	Benzaldehyde	ug/l	9.3		NA	9.3	NA	1
AOC 19	71-43-2	Benzene	ug/l	1	5	NO	1	NO	1
AOC 19	56-55-3	Benzo(a)anthracene	ug/l	0.093	0.044	YES	0.093	YES	1
AOC 19	50-32-8	Benzo(a)pyrene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	205-99-2	Benzo(b)fluoranthene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	191-24-2	Benzo(g,h,i)perylene	ug/l	0.19		NA	0.19	NA	1
AOC 19	207-08-9	Benzo(k)fluoranthene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	7440-41-7	Beryllium	ug/l	0.27	4	NO	0.27	NO	1
AOC 19	111-91-1	Bis(2-Chloroethoxy)methane	ug/l	9.3		NA	9.3	NA	1
AOC 19	111-44-4	Bis(2-Chloroethyl)ether	ug/l	9.3	0.31	YES	9.3	YES	1
AOC 19	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	9.3	1.2	YES	9.3	YES	1
AOC 19	75-27-4	Bromodichloromethane	ug/l	1		NA	1	NA	1
AOC 19	75-25-2	Bromoform	ug/l	1	43	NO	1	NO	1
AOC 19	74-83-9	Bromomethane	ug/l	2		NA	2	NA	1
AOC 19	85-68-7	Butylbenzylphthalate	ug/l	9.3	3000	NO	9.3	NO	1
AOC 19	7440-43-9	Cadmium	ug/l	0.42	5	NO	0.42	NO	1
AOC 19	105-60-2	Caprolactam	ug/l	47		NA	47	NA	1
AOC 19	86-74-8	Carbazole	ug/l	9.3		NA	9.3	NA	1
AOC 19	75-15-0	Carbon disulfide	ug/l	1		NA	1	NA	1
AOC 19	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	1
AOC 19	108-90-7	Chlorobenzene	ug/l	1	100	NO	1	NO	1
AOC 19	75-00-3	Chloroethane	ug/l	2		NA	2	NA	1
AOC 19	75-00-3	Chloroethane	ug/l	2		NA	2	NA	1
AOC 19	67-66-3	Chloroform	ug/l	1	57	NO	1	NO	1
AOC 19	74-87-3	Chloromethane	ug/l	2		NA	2	NA	1
AOC 19	218-01-9	Chrysene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	156-59-2	cis-1,2-Dichloroethene	ug/l	1	70	NO	1	NO	1
AOC 19	10061-01-5	cis-1,3-Dichloropropene	ug/l	1		NA	1	NA	1
AOC 19	7440-48-4	Cobalt	ug/l	1.7	72.99994671	NO	1.7	NO	1
AOC 19	7440-50-8	Copper	ug/l	4.7	1300	NO	4.7	NO	1
AOC 19	57-12-5	CYANIDE	ug/L	10	200	NO	10	NO	1
AOC 19	110-82-7	Cyclohexane	ug/l	1		NA	1	NA	1
AOC 19	53-70-3	Dibenz(a,h)anthracene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	132-64-9	Dibenzofuran	ug/l	9.3		NA	9.3	NA	1
AOC 19	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	1
AOC 19	75-71-8	Dichlorodifluoromethane	ug/l	1		NA	1	NA	1
AOC 19	84-66-2	Diethylphthalate	ug/l	9.3		NA	9.3	NA	1
AOC 19	131-11-3	Dimethylphthalate	ug/l	9.3	310000	NO	9.3	NO	1
AOC 19	84-74-2	Di-n-butylphthalate	ug/l	9.3		NA	9.3	NA	1
AOC 19	117-84-0	Di-n-octylphthalate	ug/l	9.3		NA	9.3	NA	1
AOC 19	100-41-4	Ethylbenzene	ug/l	1	700	NO	1	NO	1

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected In Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 19	206-44-0	Fluoranthene	ug/l	0.19	300	NO	0.19	NO	1
AOC 19	86-73-7	Fluorene	ug/l	0.19	1300	NO	0.19	NO	1
AOC 19	118-74-1	Hexachlorobenzene	ug/l	9.3	0.0075	YES	9.3	YES	1
AOC 19	87-68-3	Hexachlorobutadiene	ug/l	9.3	4.4	YES	9.3	YES	1
AOC 19	77-47-4	Hexachlorocyclopentadiene	ug/l	9.3	50	NO	9.3	NO	1
AOC 19	67-72-1	Hexachloroethane	ug/l	9.3	19	NO	9.3	NO	1
AOC 19	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	78-59-1	Isophorone	ug/l	9.3	360	NO	9.3	NO	1
AOC 19	98-82-8	Isopropylbenzene	ug/l	1		NA	1	NA	1
AOC 19	XYLMP	m+p-Xylene	ug/l	1	10000	NO	1	NO	1
AOC 19	79-20-9	Methyl acetate	ug/l	10		NA	10	NA	1
AOC 19	108-87-2	Methylcyclohexane	ug/l	1		NA	1	NA	1
AOC 19	75-09-2	Methylene chloride	ug/l	1	5	NO	1	NO	1
AOC 19	1634-04-4	Methyl-tert-butyl-ether	ug/l	1		NA	1	NA	1
AOC 19	91-20-3	Naphthalene	ug/l	0.19	0.62029408	NO	0.19	NO	1
AOC 19	98-95-3	Nitrobenzene	ug/l	9.3	17	NO	9.3	NO	1
AOC 19	621-64-7	N-Nitroso-di-n-propylamine	ug/l	9.3	0.05	YES	9.3	YES	1
AOC 19	86-30-6	N-Nitrosodiphenylamine	ug/l	9.3	50	NO	9.3	NO	1
AOC 19	95-48-7	o-Cresol (2-Methylphenol)	ug/l	9.3		NA	9.3	NA	1
AOC 19	95-47-6	o-Xylene	ug/l	1	10000	NO	1	NO	1
AOC 19	106-44-5	p-Cresol (4-Methylphenol)	ug/l	9.3		NA	9.3	NA	1
AOC 19	87-86-5	Pentachlorophenol	ug/l	47	1	YES	47	YES	1
AOC 19	85-01-8	Phenanthrene	ug/l	0.19		NA	0.19	NA	1
AOC 19	108-95-2	Phenol	ug/l	9.3	21000	NO	9.3	NO	1
AOC 19	129-00-0	Pyrene	ug/l	0.19	980	NO	0.19	NO	1
AOC 19	7782-49-2	Selenium	ug/l	4	50	NO	4	NO	1
AOC 19	7440-22-4	Silver	ug/l	1.1		NA	1.1	NA	1
AOC 19	100-42-5	Styrene	ug/l	1	100	NO	1	NO	1
AOC 19	127-18-4	Tetrachloroethene	ug/l	1	5	NO	1	NO	1
AOC 19	7440-28-0	Thallium	ug/l	3.3	1.7	YES	3.3	YES	1
AOC 19	108-88-3	Toluene	ug/l	1	1000	NO	1	NO	1
AOC 19	156-60-5	trans-1,2-Dichloroethene	ug/l	1	100	NO	1	NO	1
AOC 19	10061-02-6	trans-1,3-Dichloropropene	ug/l	1	10	NO	1	NO	1
AOC 19	79-01-6	Trichloroethene	ug/l	1	5	NO	1	NO	1
AOC 19	75-69-4	Trichlorofluoromethane	ug/l	1		NA	1	NA	1
AOC 19	75-01-4	Vinyl chloride	ug/l	1	2	NO	1	NO	1
AOC 19	7440-66-6	Zinc	ug/l	14.3	9100	NO	14.3	NO	1
AOC 7	71-55-6	1,1,1-Trichloroethane	ug/l	1	200	NO	1	NO	5
AOC 7	79-34-5	1,1,2,2-Tetrachloroethane	ug/l	1	1.7	NO	1	NO	5
AOC 7	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	1		NA	1	NA	5
AOC 7	79-00-5	1,1,2-Trichloroethane	ug/l	1	5	NO	1	NO	5
AOC 7	92-52-4	1,1-Biphenyl	ug/l	9.6		NA	9.3	NA	5
AOC 7	75-34-3	1,1-Dichloroethane	ug/l	1		NA	1	NA	5
AOC 7	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	5
AOC 7	67562-39-4	HEPTACHLORODIBENZOFURAN	ug/l	0.000000529		NA	0.000000529	NA	1
AOC 7	35822-46-9	DIOXIN	ug/l	0.00000029		NA	0.00000029	NA	1
AOC 7	55673-89-7	HEPTACHLORODIBENZOFURAN	ug/l	0.000000742		NA	0.000000742	NA	1
AOC 7	70648-26-9	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	ug/l	0.000000186		NA	0.000000186	NA	1

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected in Surface Water

Area	TICAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 7	39227-28-6	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	ug/l	0.000000233		NA	0.000000233	NA	1
AOC 7	57117-44-9	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	ug/l	0.000000194		NA	0.000000194	NA	1
AOC 7	57653-85-7	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	ug/l	0.000000224		NA	0.000000224	NA	1
AOC 7	72918-21-9	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	ug/l	0.000000239		NA	0.000000239	NA	1
AOC 7	19408-74-3	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	ug/l	0.000000222		NA	0.000000222	NA	1
AOC 7	57117-41-6	1,2,3,7,8-PENTACHLORODIBENZOFURAN	ug/l	0.000000119		NA	0.000000119	NA	1
AOC 7	40321-76-4	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	ug/l	0.000000211		NA	0.000000211	NA	1
AOC 7	120-82-1	1,2,4-Trichlorobenzene	ug/l	1	35	NO	1	NO	5
AOC 7	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	5
AOC 7	106-93-4	1,2-Dibromoethane	ug/l	1		NA	1	NA	5
AOC 7	95-50-1	1,2-Dichlorobenzene	ug/l	1	600	NO	1	NO	5
AOC 7	107-06-2	1,2-Dichloroethane	ug/l	1	3.8	NO	1	NO	5
AOC 7	78-87-5	1,2-Dichloropropane	ug/l	1	5	NO	1	NO	5
AOC 7	541-73-1	1,3-Dichlorobenzene	ug/l	1	400	NO	1	NO	5
AOC 7	106-46-7	1,4-Dichlorobenzene	ug/l	1	75	NO	1	NO	5
AOC 7	108-60-1	2,2'-Oxybis(1-Chloropropane)	ug/l	9.6		NA	9.3	NA	5
AOC 7	60851-34-5	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	ug/l	0.000000207		NA	0.000000207	NA	1
AOC 7	57117-31-4	2,3,4,7,8-PENTACHLORODIBENZOFURAN	ug/l	0.000000115		NA	0.000000115	NA	1
AOC 7	51207-31-9	2,3,7,8-TETRACHLORODIBENZOFURAN	ug/l	0.000000346		NA	0.000000346	NA	1
AOC 7	1746-01-6	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	ug/l	0.000000165		NA	0.000000165	NA	1
AOC 7	95-95-4	2,4,5-Trichlorophenol	ug/l	9.6	2600	NO	9.3	NO	5
AOC 7	88-06-2	2,4,6-Trichlorophenol	ug/l	9.6	21	NO	9.3	NO	5
AOC 7	120-83-2	2,4-Dichlorophenol	ug/l	9.6	93	NO	9.3	NO	5
AOC 7	105-67-9	2,4-Dimethylphenol	ug/l	9.6	540	NO	9.3	NO	5
AOC 7	51-28-5	2,4-Dinitrophenol	ug/l	48	70	NO	47	NO	5
AOC 7	121-14-2	2,4-Dinitrotoluene	ug/l	9.6	1.1	YES	9.3	YES	5
AOC 7	606-20-2	2,6-Dinitrotoluene	ug/l	9.6		NA	9.3	NA	5
AOC 7	78-93-3	2-Butanone	ug/l	5		NA	5	NA	5
AOC 7	91-58-7	2-Chloronaphthalene	ug/l	9.6	1700	NO	9.3	NO	5
AOC 7	95-57-8	2-Chlorophenol	ug/l	9.6	120	NO	9.3	NO	5
AOC 7	591-78-6	2-Hexanone	ug/l	5		NA	5	NA	5
AOC 7	91-57-6	2-Methylnaphthalene	ug/l	9.6		NA	9.3	NA	5
AOC 7	88-74-4	2-Nitroaniline	ug/l	48		NA	47	NA	5
AOC 7	88-75-5	2-Nitrophenol	ug/l	9.6		NA	9.3	NA	5
AOC 7	91-94-1	3,3'-Dichlorobenzidine	ug/l	9.6	0.4	YES	9.3	YES	5
AOC 7	99-09-2	3-Nitroaniline	ug/l	48		NA	47	NA	5
AOC 7	534-52-1	4,6-Dinitro-2-methylphenol	ug/l	48		NA	47	NA	5
AOC 7	101-55-3	4-Bromophenylphenyl ether	ug/l	9.6		NA	9.3	NA	5
AOC 7	59-50-7	4-Chloro-3-methylphenol	ug/l	9.6		NA	9.3	NA	5
AOC 7	106-47-8	4-Chloroaniline	ug/l	9.6		NA	9.3	NA	5
AOC 7	7005-72-3	4-Chlorophenylphenyl ether	ug/l	9.6		NA	9.3	NA	5
AOC 7	108-10-1	4-Methyl-2-pentanone	ug/l	5	199.3015873	NO	5	NO	5
AOC 7	100-01-6	4-Nitroaniline	ug/l	48		NA	47	NA	5
AOC 7	100-02-7	4-Nitrophenol	ug/l	48		NA	47	NA	5
AOC 7	83-32-9	Acenaphthene	ug/l	0.2	1200	NO	0.19	NO	5
AOC 7	208-96-8	Acenaphthylene	ug/l	0.2	1200	NO	0.19	NO	5
AOC 7	98-86-2	Acetophenone	ug/l	9.6		NA	9.3	NA	5
AOC 7	120-12-7	Anthracene	ug/l	0.2	9600	NO	0.19	NO	5

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected In Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (e)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 7	7440-36-0	Antimony	ug/l	8.1	6	YES	7.6	YES	5
AOC 7	12674-11-2	Aroclor 1016	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	11104-28-2	Aroclor 1221	ug/l	2	0.0017	YES	1.9	YES	5
AOC 7	11141-16-5	Aroclor 1232	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	53469-21-9	Aroclor 1242	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	12672-29-6	Aroclor 1248	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	11097-69-1	Aroclor 1254	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	11096-82-5	Aroclor 1260	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	7440-38-2	Arsenic	ug/l	4.7	10	NO	2.4	NO	5
AOC 7	1912-24-9	Atrazine	ug/l	9.6	3	YES	9.3	YES	5
AOC 7	100-52-7	Benzaldehyde	ug/l	48		NA	4.8	NA	5
AOC 7	71-43-2	Benzene	ug/l	1	5	NO	1	NO	5
AOC 7	56-55-3	Benzo(a)anthracene	ug/l	0.1	0.044	YES	0.093	YES	5
AOC 7	50-32-8	Benzo(a)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	205-99-2	Benzo(b)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	191-24-2	Benzo(g,h,i)perylene	ug/l	0.2		NA	0.19	NA	5
AOC 7	207-08-9	Benzo(k)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	7440-41-7	Beryllium	ug/l	0.27	4	NO	0.21	NO	5
AOC 7	111-91-1	Bis(2-Chloroethoxy)methane	ug/l	9.6		NA	9.3	NA	5
AOC 7	111-44-4	Bis(2-Chloroethyl)ether	ug/l	9.6	0.31	YES	9.3	YES	5
AOC 7	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	9.6	1.2	YES	9.3	YES	5
AOC 7	75-27-4	Bromodichloromethane	ug/l	1		NA	1	NA	5
AOC 7	75-25-2	Bromoform	ug/l	1	43	NO	1	NO	5
AOC 7	74-83-9	Bromomethane	ug/l	2		NA	2	NA	5
AOC 7	85-68-7	Butylbenzylphthalate	ug/l	9.6	3000	NO	9.3	NO	5
AOC 7	7440-43-9	Cadmium	ug/l	0.57	5	NO	0.42	NO	5
AOC 7	105-60-2	Caprolactam	ug/l	47		NA	9.3	NA	5
AOC 7	86-74-8	Carbazole	ug/l	9.6		NA	9.3	NA	5
AOC 7	75-15-0	Carbon disulfide	ug/l	1		NA	1	NA	5
AOC 7	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	5
AOC 7	108-90-7	Chlorobenzene	ug/l	1	100	NO	1	NO	5
AOC 7	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
AOC 7	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
AOC 7	67-66-3	Chloroform	ug/l	1		NA	1	NA	5
AOC 7	74-87-3	Chloromethane	ug/l	2		NA	2	NA	5
AOC 7	7440-47-3	Chromium (total)	ug/l	4.3	100	NO	2	NO	5
AOC 7	218-01-9	Chrysene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	156-59-2	cis-1,2-Dichloroethene	ug/l	1		NA	1	NA	5
AOC 7	10061-01-5	cis-1,3-Dichloropropene	ug/l	1		NA	1	NA	5
AOC 7	7440-50-8	Copper	ug/l	5.4	1300	NO	4.7	NO	5
AOC 7	110-82-7	Cyclohexane	ug/l	1		NA	1	NA	5
AOC 7	53-70-3	Dibenz(a,h)anthracene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	132-64-9	Dibenzofuran	ug/l	9.6		NA	9.3	NA	5
AOC 7	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	5
AOC 7	75-71-8	Dichlorodifluoromethane	ug/l	1		NA	1	NA	5
AOC 7	84-66-2	Diethylphthalate	ug/l	9.6	23000	NO	9.3	NO	5
AOC 7	131-11-3	Dimethylphthalate	ug/l	9.6	310000	NO	9.3	NO	5
AOC 7	84-74-2	Di-n-butylphthalate	ug/l	9.6		NA	9.3	NA	5

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected in Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 7	117-84-0	Di-n-octylphthalate	ug/l	9.6		NA	9.3	NA	5
AOC 7	100-41-4	Ethylbenzene	ug/l	1	700	NO	1	NO	5
AOC 7	86-73-7	Fluorene	ug/l	0.2	1300	NO	0.19	NO	5
AOC 7	118-74-1	Hexachlorobenzene	ug/l	9.6	0.0075	YES	9.3	YES	5
AOC 7	87-68-3	Hexachlorobutadiene	ug/l	9.6	4.4	YES	9.3	YES	5
AOC 7	77-47-4	Hexachlorocyclopentadiene	ug/l	9.6	50	NO	9.3	NO	5
AOC 7	67-72-1	Hexachloroethane	ug/l	9.6	19	NO	9.3	NO	5
AOC 7	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	78-59-1	Isophorone	ug/l	9.6	360	NO	9.3	NO	5
AOC 7	98-82-8	Isopropylbenzene	ug/l	1		NA	1	NA	5
AOC 7	XYLMP	m+p-Xylene	ug/l	1	10000	NO	1	NO	5
AOC 7	7439-97-6	Mercury	ug/l	0.02	0.012	YES	0.02	YES	5
AOC 7	79-20-9	Methyl acetate	ug/l	10		NA	10	NA	5
AOC 7	108-87-2	Methylcyclohexane	ug/l	1		NA	1	NA	5
AOC 7	75-09-2	Methylene chloride	ug/l	1	5	NO	1	NO	5
AOC 7	1634-04-4	Methyl-tert-butyl-ether	ug/l	1		NA	1	NA	5
AOC 7	98-95-3	Nitrobenzene	ug/l	9.6	17	NO	9.3	NO	5
AOC 7	621-64-7	N-Nitroso-di-n-propylamine	ug/l	9.6	0.05	YES	9.3	YES	5
AOC 7	86-30-6	N-Nitrosodiphenylamine	ug/l	9.6	50	NO	9.3	NO	5
AOC 7	95-48-7	o-Cresol (2-Methylphenol)	ug/l	9.6		NA	9.3	NA	5
AOC 7	39001-02-0	OCTACHLORODIBENZOFURAN	ug/l	0.0000036		NA	0.0000036	NA	1
AOC 7	3268-87-9	OCTACHLORODIBENZO-P-DIOXIN	ug/l	0.000012209		NA	0.000012209	NA	1
AOC 7	95-47-6	o-Xylene	ug/l	1	10000	NO	1	NO	5
AOC 7	106-44-5	p-Cresol (4-Methylphenol)	ug/l	9.6		NA	9.3	NA	5
AOC 7	87-86-5	Pentachlorophenol	ug/l	48	1	YES	47	YES	5
AOC 7	85-01-8	Phenanthrene	ug/l	0.2		NA	0.19	NA	5
AOC 7	108-95-2	Phenol	ug/l	9.6	21000	NO	9.3	NO	5
AOC 7	129-00-0	Pyrene	ug/l	0.2	960	NO	0.19	NO	5
AOC 7	7782-49-2	Selenium	ug/l	6	50	NO	4	NO	5
AOC 7	7440-22-4	Silver	ug/l	1.1		NA	0.8	NA	5
AOC 7	100-42-5	Styrene	ug/l	1	100	NO	1	NO	5
AOC 7	127-18-4	Tetrachloroethene	ug/l	1	5	NO	1	NO	5
AOC 7	7440-28-0	Thallium	ug/l	4.1	1.7	YES	3.3	YES	5
AOC 7	108-88-3	Toluene	ug/l	1	1000	NO	1	NO	5
AOC 7	156-60-5	trans-1,2-Dichloroethene	ug/l	1	100	NO	1	NO	5
AOC 7	10061-02-6	trans-1,3-Dichloropropene	ug/l	1	10	NO	1	NO	5
AOC 7	79-01-6	Trichloroethene	ug/l	1	5	NO	1	NO	5
AOC 7	75-69-4	Trichlorofluoromethane	ug/l	1		NA	1	NA	5
AOC 7	75-01-4	Vinyl chloride	ug/l	1	2	NO	1	NO	5
River	71-55-6	1,1,1-Trichloroethane	ug/l	1	200	NO	1	NO	5
River	79-34-5	1,1,2,2-Tetrachloroethane	ug/l	1	1.7	NO	1	NO	5
River	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	1		NA	1	NA	5
River	79-00-5	1,1,2-Trichloroethane	ug/l	1	5	NO	1	NO	5
River	92-52-4	1,1-Biphenyl	ug/l	10		NA	9.3	NA	5
River	75-34-3	1,1-Dichloroethane	ug/l	1		NA	1	NA	5
River	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	5
River	120-82-1	1,2,4-Trichlorobenzene	ug/l	1	35	NO	1	NO	5
River	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	5

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected in Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
River	106-93-4	1,2-Dibromoethane	ug/l	1		NA	1	NA	5
River	95-50-1	1,2-Dichlorobenzene	ug/l	1	600	NO	1	NO	5
River	107-06-2	1,2-Dichloroethane	ug/l	1	3.8	NO	1	NO	5
River	78-87-5	1,2-Dichloropropane	ug/l	1	5	NO	1	NO	5
River	541-73-1	1,3-Dichlorobenzene	ug/l	1	400	NO	1	NO	5
River	106-46-7	1,4-Dichlorobenzene	ug/l	1	75	NO	1	NO	5
River	108-60-1	2,2'-Oxybis(1-Chloropropane)	ug/l	10		NA	9.3	NA	5
River	95-95-4	2,4,5-Trichlorophenol	ug/l	10	2600	NO	9.3	NO	5
River	88-06-2	2,4,6-Trichlorophenol	ug/l	10	21	NO	9.3	NO	5
River	120-83-2	2,4-Dichlorophenol	ug/l	10	93	NO	9.3	NO	5
River	105-67-9	2,4-Dimethylphenol	ug/l	10	540	NO	9.3	NO	5
River	51-28-5	2,4-Dinitrophenol	ug/l	51	70	NO	47	NO	5
River	121-14-2	2,4-Dinitrotoluene	ug/l	10	1.1	YES	9.3	YES	5
River	606-20-2	2,6-Dinitrotoluene	ug/l	10		NA	9.3	NA	5
River	78-93-3	2-Butanone	ug/l	5		NA	5	NA	5
River	91-58-7	2-Chloronaphthalene	ug/l	10	1700	NO	9.3	NO	5
River	95-57-8	2-Chlorophenol	ug/l	10	120	NO	9.3	NO	5
River	591-78-6	2-Hexanone	ug/l	5		NA	5	NA	5
River	91-57-6	2-Methylnaphthalene	ug/l	10		NA	9.3	NA	5
River	88-74-4	2-Nitroaniline	ug/l	51		NA	47	NA	5
River	88-75-5	2-Nitrophenol	ug/l	10		NA	9.3	NA	5
River	91-94-1	3,3'-Dichlorobenzidine	ug/l	10	0.4	YES	9.3	YES	5
River	99-09-2	3-Nitroaniline	ug/l	51		NA	47	NA	5
River	534-52-1	4,6-Dinitro-2-methylphenol	ug/l	51		NA	47	NA	5
River	101-55-3	4-Bromophenylphenyl ether	ug/l	10		NA	9.3	NA	5
River	59-50-7	4-Chloro-3-methylphenol	ug/l	10		NA	9.3	NA	5
River	106-47-8	4-Chloroaniline	ug/l	10		NA	9.3	NA	5
River	7005-72-3	4-Chlorophenylphenyl ether	ug/l	10		NA	9.3	NA	5
River	100-01-6	4-Nitroaniline	ug/l	51		NA	47	NA	5
River	100-02-7	4-Nitrophenol	ug/l	51		NA	47	NA	5
River	83-32-9	Acenaphthene	ug/l	0.2	1200	NO	0.19	NO	5
River	208-96-8	Acenaphthylene	ug/l	0.2	1200	NO	0.19	NO	5
River	98-86-2	Acetophenone	ug/l	10		NA	9.3	NA	5
River	120-12-7	Anthracene	ug/l	0.2	9600	NO	0.19	NO	5
River	7440-36-0	Antimony	ug/l	8.1	6	YES	8.1	YES	5
River	12674-11-2	Aroclor 1016	ug/l	1	0.0017	YES	0.93	YES	5
River	11104-28-2	Aroclor 1221	ug/l	2	0.0017	YES	1.9	YES	5
River	11141-16-5	Aroclor 1232	ug/l	1	0.0017	YES	0.93	YES	5
River	53469-21-9	Aroclor 1242	ug/l	1	0.0117	YES	0.93	YES	5
River	12672-29-6	Aroclor 1248	ug/l	1	0.0017	YES	0.93	YES	5
River	11097-69-1	Aroclor 1254	ug/l	1	0.0017	YES	0.93	YES	5
River	11096-82-5	Aroclor 1260	ug/l	1	0.0017	YES	0.93	YES	5
River	7440-38-2	Arsenic	ug/l	5.8	10	NO	2.4	NO	5
River	1912-24-9	Atrazine	ug/l	10	3	YES	9.3	YES	5
River	100-52-7	Benzaldehyde	ug/l	51		NA	9.3	NA	5
River	71-43-2	Benzene	ug/l	1	5	NO	1	NO	5
River	56-55-3	Benzo(a)anthracene	ug/l	0.1	0.044	YES	0.093	YES	5
River	50-32-8	Benzo(a)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected in Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (e)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
River	205-99-2	Benzo(b)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
River	191-24-2	Benzo(g,h,i)perylene	ug/l	0.2		NA	0.19	NA	5
River	207-08-9	Benzo(k)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
River	7440-41-7	Beryllium	ug/l	0.27	4	NO	0.27	NO	5
River	111-91-1	Bis(2-Chloroethoxy)methane	ug/l	10		NA	9.3	NA	5
River	111-44-4	Bis(2-Chloroethyl)ether	ug/l	10	0.31	YES	9.3	YES	5
River	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	10	1.2	YES	9.3	YES	5
River	75-27-4	Bromodichloromethane	ug/l	1		NA	1	NA	5
River	75-25-2	Bromoform	ug/l	1	43	NO	1	NO	5
River	74-83-9	Bromomethane	ug/l	2		NA	2	NA	5
River	85-68-7	Butylbenzylphthalate	ug/l	10	3000	NO	9.3	NO	5
River	7440-43-9	Cadmium	ug/l	0.42	5	NO	0.42	NO	5
River	105-60-2	Caprolactam	ug/l	51		NA	47	NA	5
River	86-74-8	Carbazole	ug/l	10		NA	9.3	NA	5
River	75-15-0	Carbon disulfide	ug/l	1		NA	1	NA	5
River	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	5
River	108-90-7	Chlorobenzene	ug/l	1	100	NO	1	NO	5
River	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
River	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
River.	67-66-3	Chloroform	ug/l	1	57	NO	1	NO	5
River	74-87-3	Chloromethane	ug/l	2		NA	2	NA	5
River	7440-47-3	Chromium (total)	ug/l	2.3	100	NO	1.7	NO	5
River	218-01-9	Chrysene	ug/l	0.2	0.044	YES	0.19	YES	5
River	156-59-2	cis-1,2-Dichloroethene	ug/l	1	70	NO	1	NO	5
River	10061-01-5	cis-1,3-Dichloropropene	ug/l	1		NA	1	NA	5
River	7440-48-4	Cobalt	ug/l	1.1	72.99994671	NO	1	NO	5
River	7440-50-8	Copper	ug/l	4.7	1300	NO	4.7	NO	5
River	57-12-5	CYANIDE	ug/L	10	200	NO	10	NO	5
River	110-82-7	Cyclohexane	ug/l	1		NA	1	NA	5
River	53-70-3	Dibenz(a,h)anthracene	ug/l	0.2	0.044	YES	0.19	YES	5
River	132-64-9	Dibenzofuran	ug/l	10		NA	9.3	NA	5
River	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	5
River	75-71-8	Dichlorodifluoromethane	ug/l	1		NA	1	NA	5
River	84-66-2	Diethylphthalate	ug/l	10	23000	NO	9.3	NO	5
River	131-11-3	Dimethylphthalate	ug/l	10	310000	NO	9.3	NO	5
River	84-74-2	Di-n-butylphthalate	ug/l	10		NA	9.3	NA	5
River	117-84-0	Di-n-octylphthalate	ug/l	10		NA	9.3	NA	5
River	100-41-4	Ethylbenzene	ug/l	1	700	NO	1	NO	5
River	86-73-7	Fluorene	ug/l	0.2	1300	NO	0.19	NO	5
River	118-74-1	Hexachlorobenzene	ug/l	10	0.0075	YES	9.3	YES	5
River	87-68-3	Hexachlorobutadiene	ug/l	10	4.4	YES	9.3	YES	5
River	77-47-4	Hexachlorocyclopentadiene	ug/l	10	50	NO	9.3	NO	5
River	67-72-1	Hexachloroethane	ug/l	10	19	NO	9.3	NO	5
River	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5
River	78-59-1	Isophorone	ug/l	10	360	NO	9.3	NO	5
River	98-82-8	Isopropylbenzene	ug/l	1		NA	1	NA	5
River	XYLMP	m+p-Xylene	ug/l	1	10000	NO	1	NO	5
River	79-20-9	Methyl acetate	ug/l	10		NA	10	NA	5

Table H-5A
Detection Limit Evaluation - Chemicals Never Detected in Surface Water

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
River	108-87-2	Methylcyclohexane	ug/l	1		NA	1	NA	5
River	1634-04-4	Methyl-tert-butyl-ether	ug/l	1		NA	1	NA	5
River	91-20-3	Naphthalene	ug/l	0.2	0.82028408	NO	0.19	NO	5
River	98-95-3	Nitrobenzene	ug/l	10	17	NO	9.3	NO	5
River	621-64-7	N-Nitroso-di-n-propylamine	ug/l	10	0.05	YES	9.3	YES	5
River	86-30-6	N-Nitrosodiphenylamine	ug/l	10	50	NO	9.3	NO	5
River	95-48-7	o-Cresol (2-Methylphenol)	ug/l	10		NA	9.3	NA	5
River	95-47-6	o-Xylene	ug/l	1	10000	NO	1	NO	5
River	106-44-5	p-Cresol (4-Methylphenol)	ug/l	10		NA	9.3	NA	5
River	87-86-5	Pentachlorophenol	ug/l	51	1	YES	47	YES	5
River	85-01-8	Phenanthrene	ug/l	0.2		NA	0.19	NA	5
River	108-95-2	Phenol	ug/l	10	21000	NO	9.3	NO	5
River	129-00-0	Pyrene	ug/l	0.2	960	NO	0.19	NO	5
River	7782-49-2	Selenium	ug/l	5.3	50	NO	4	NO	5
River	7440-22-4	Silver	ug/l	1.1		NA	1.1	NA	5
River	100-42-5	Styrene	ug/l	1	100	NO	1	NO	5
River	127-18-4	Tetrachloroethene	ug/l	1	5	NO	1	NO	5
River	7440-28-0	Thallium	ug/l	4.4	1.7	YES	3.3	YES	5
River	108-88-3	Toluene	ug/l	1	1000	NO	1	NO	5
River	156-60-5	trans-1,2-Dichloroethene	ug/l	1	100	NO	1	NO	5
River	10061-02-6	trans-1,3-Dichloropropene	ug/l	1	10	NO	1	NO	5
River	79-01-6	Trichloroethene	ug/l	1	5	NO	1	NO	5
River	75-69-4	Trichlorofluoromethane	ug/l	1		NA	1	NA	5
River	75-01-4	Vinyl chloride	ug/l	1	2	NO	1	NO	5
River	7440-66-6	Zinc	ug/l	9.8	9100	NO	7	NO	5

Notes:
DL - Detection Limit.
(a) - Ohio WQC (2002) for Ohio River Drainage Basin if available, or EPA Human Health Water Quality Criteria (2006).

Table H-5B
Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Maximum DL Exceeds

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 19	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	1
AOC 19	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	1
AOC 19	121-14-2	2,4-Dinitrotoluene	ug/l	9.3	1.1	YES	9.3	YES	1
AOC 19	91-94-1	3,3'-Dichlorobenzidine	ug/l	9.3	0.4	YES	9.3	YES	1
AOC 19	7440-36-0	Antimony	ug/l	8.1	6	YES	8.1	YES	1
AOC 19	12674-11-2	Aroclor 1016	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	11104-28-2	Aroclor 1221	ug/l	1.9	0.0017	YES	1.9	YES	1
AOC 19	11141-16-5	Aroclor 1232	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	53469-21-9	Aroclor 1242	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	12672-29-6	Aroclor 1248	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	11097-69-1	Aroclor 1254	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	11096-82-5	Aroclor 1260	ug/l	0.93	0.0017	YES	0.93	YES	1
AOC 19	1912-24-9	Atrazine	ug/l	9.3	3	YES	9.3	YES	1
AOC 19	56-55-3	Benzo(a)anthracene	ug/l	0.093	0.044	YES	0.093	YES	1
AOC 19	50-32-8	Benzo(a)pyrene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	205-99-2	Benzo(b)fluoranthene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	207-08-9	Benzo(k)fluoranthene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	111-44-4	Bis(2-Chloroethyl)ether	ug/l	9.3	0.31	YES	9.3	YES	1
AOC 19	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	9.3	1.2	YES	9.3	YES	1
AOC 19	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	1
AOC 19	218-01-9	Chrysene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	53-70-3	Dibenz(a,h)anthracene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	1
AOC 19	118-74-1	Hexachlorobenzene	ug/l	9.3	0.0075	YES	9.3	YES	1
AOC 19	87-68-3	Hexachlorobutadiene	ug/l	9.3	4.4	YES	9.3	YES	1
AOC 19	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.19	0.044	YES	0.19	YES	1
AOC 19	621-64-7	N-Nitroso-di-n-propylamine	ug/l	9.3	0.05	YES	9.3	YES	1
AOC 19	87-86-5	Pentachlorophenol	ug/l	47	1	YES	47	YES	1
AOC 19	7440-28-0	Thallium	ug/l	3.3	1.7	YES	3.3	YES	1
AOC 7	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	5
AOC 7	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	5
AOC 7	121-14-2	2,4-Dinitrotoluene	ug/l	9.6	1.1	YES	9.3	YES	5
AOC 7	91-94-1	3,3'-Dichlorobenzidine	ug/l	9.6	0.4	YES	9.3	YES	5
AOC 7	7440-36-0	Antimony	ug/l	8.1	6	YES	7.6	YES	5
AOC 7	12674-11-2	Aroclor 1016	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	11104-28-2	Aroclor 1221	ug/l	2	0.0017	YES	1.9	YES	5
AOC 7	11141-16-5	Aroclor 1232	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	53469-21-9	Aroclor 1242	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	12672-29-6	Aroclor 1248	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	11097-69-1	Aroclor 1254	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	11096-82-5	Aroclor 1260	ug/l	1	0.0017	YES	0.97	YES	5
AOC 7	1912-24-9	Atrazine	ug/l	9.6	3	YES	9.3	YES	5
AOC 7	56-55-3	Benzo(a)anthracene	ug/l	0.1	0.044	YES	0.093	YES	5
AOC 7	50-32-8	Benzo(a)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	205-99-2	Benzo(b)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	207-08-9	Benzo(k)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	111-44-4	Bis(2-Chloroethyl)ether	ug/l	9.6	0.31	YES	9.3	YES	5
AOC 7	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	9.6	1.2	YES	9.3	YES	5

Table H-5B
Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Maximum DL Exceeds

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 7	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	5
AOC 7	218-01-9	Chrysene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	53-70-3	Dibenz(a,h)anthracene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	5
AOC 7	118-74-1	Hexachlorobenzene	ug/l	9.6	0.0075	YES	9.3	YES	5
AOC 7	87-68-3	Hexachlorobutadiene	ug/l	9.6	4.4	YES	9.3	YES	5
AOC 7	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5
AOC 7	7439-97-6	Mercury	ug/l	0.02	0.012	YES	0.02	YES	5
AOC 7	621-64-7	N-Nitroso-di-n-propylamine	ug/l	9.6	0.05	YES	9.3	YES	5
AOC 7	87-86-5	Pentachlorophenol	ug/l	48	1	YES	47	YES	5
AOC 7	7440-28-0	Thallium	ug/l	4.1	1.7	YES	3.3	YES	5
River	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	5
River	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	5
River	121-14-2	2,4-Dinitrotoluene	ug/l	10	1.1	YES	9.3	YES	5
River	91-94-1	3,3'-Dichlorobenzidine	ug/l	10	0.4	YES	9.3	YES	5
River	7440-36-0	Antimony	ug/l	8.1	6	YES	8.1	YES	5
River	12674-11-2	Aroclor 1016	ug/l	1	0.0017	YES	0.93	YES	5
River	11104-28-2	Aroclor 1221	ug/l	2	0.0017	YES	1.9	YES	5
River	11141-16-5	Aroclor 1232	ug/l	1	0.0017	YES	0.93	YES	5
River	53469-21-9	Aroclor 1242	ug/l	1	0.0117	YES	0.93	YES	5
River	12672-29-6	Aroclor 1248	ug/l	1	0.0017	YES	0.93	YES	5
River	11097-69-1	Aroclor 1254	ug/l	1	0.0017	YES	0.93	YES	5
River	11096-82-5	Aroclor 1260	ug/l	1	0.0017	YES	0.93	YES	5
River	1912-24-9	Atrazine	ug/l	10	3	YES	9.3	YES	5
River	56-55-3	Benzo(a)anthracene	ug/l	0.1	0.044	YES	0.093	YES	5
River	50-32-8	Benzo(a)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5
River	205-99-2	Benzo(b)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
River	207-08-9	Benzo(k)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	5
River	111-44-4	Bis(2-Chloroethyl)ether	ug/l	10	0.31	YES	9.3	YES	5
River	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	10	1.2	YES	9.3	YES	5
River	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	5
River	218-01-9	Chrysene	ug/l	0.2	0.044	YES	0.19	YES	5
River	53-70-3	Dibenz(a,h)anthracene	ug/l	0.2	0.044	YES	0.19	YES	5
River	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	5
River	118-74-1	Hexachlorobenzene	ug/l	10	0.0075	YES	9.3	YES	5
River	87-68-3	Hexachlorobutadiene	ug/l	10	4.4	YES	9.3	YES	5
River	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.2	0.044	YES	0.19	YES	5
River	621-64-7	N-Nitroso-di-n-propylamine	ug/l	10	0.05	YES	9.3	YES	5
River	87-86-5	Pentachlorophenol	ug/l	51	1	YES	47	YES	5
River	7440-28-0	Thallium	ug/l	4.4	1.7	YES	3.3	YES	5

Notes:
DL - Detection Limit.
(a) - Ohio WQC (2002) for Ohio River Drainage Basin if available, or EPA Human Health Water Quality Criteria (2006).

Table H-5C
Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Minimum DL Exceeds

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (1)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Ratio of Exceedance	Sample Count
AOC 19	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	1.8	1
AOC 19	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	10.0	1
AOC 19	121-14-2	2,4-Dinitrotoluene	ug/l	9.3	1.1	YES	9.3	YES	8.5	1
AOC 19	91-94-1	3,3'-Dichlorobenzidine	ug/l	9.3	0.4	YES	9.3	YES	23.3	1
AOC 19	7440-36-0	Antimony	ug/l	8.1	6	YES	8.1	YES	1.4	1
AOC 19	12674-11-2	Aroclor 1016	ug/l	0.93	0.0017	YES	0.93	YES	547.1	1
AOC 19	11104-28-2	Aroclor 1221	ug/l	1.9	0.0017	YES	1.9	YES	1117.6	1
AOC 19	11141-16-5	Aroclor 1232	ug/l	0.93	0.0017	YES	0.93	YES	547.1	1
AOC 19	53469-21-9	Aroclor 1242	ug/l	0.93	0.0017	YES	0.93	YES	547.1	1
AOC 19	12672-29-6	Aroclor 1248	ug/l	0.93	0.0017	YES	0.93	YES	547.1	1
AOC 19	11097-69-1	Aroclor 1254	ug/l	0.93	0.0017	YES	0.93	YES	547.1	1
AOC 19	11096-82-5	Aroclor 1260	ug/l	0.93	0.0017	YES	0.93	YES	547.1	1
AOC 19	1912-24-9	Atrazine	ug/l	9.3	3	YES	9.3	YES	3.1	1
AOC 19	56-55-3	Benzo(a)anthracene	ug/l	0.093	0.044	YES	0.093	YES	2.1	1
AOC 19	50-32-8	Benzo(a)pyrene	ug/l	0.19	0.044	YES	0.19	YES	4.3	1
AOC 19	205-99-2	Benzo(b)fluoranthene	ug/l	0.19	0.044	YES	0.19	YES	4.3	1
AOC 19	207-08-9	Benzo(k)fluoranthene	ug/l	0.19	0.044	YES	0.19	YES	4.3	1
AOC 19	111-44-4	Bis(2-Chloroethyl)ether	ug/l	9.3	0.31	YES	9.3	YES	30.0	1
AOC 19	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	9.3	1.2	YES	9.3	YES	7.8	1
AOC 19	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	4.3	1
AOC 19	218-01-9	Chrysene	ug/l	0.19	0.044	YES	0.19	YES	4.3	1
AOC 19	53-70-3	Dibenz(a,h)anthracene	ug/l	0.19	0.044	YES	0.19	YES	4.3	1
AOC 19	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	2.5	1
AOC 19	118-74-1	Hexachlorobenzene	ug/l	9.3	0.0075	YES	9.3	YES	1240.0	1
AOC 19	87-68-3	Hexachlorobutadiene	ug/l	9.3	4.4	YES	9.3	YES	2.1	1
AOC 19	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.19	0.044	YES	0.19	YES	4.3	1
AOC 19	621-64-7	N-Nitroso-di-n-propylamine	ug/l	9.3	0.05	YES	9.3	YES	186.0	1
AOC 19	87-86-5	Pentachlorophenol	ug/l	47	1	YES	47	YES	47.0	1
AOC 19	7440-28-0	Thallium	ug/l	3.3	1.7	YES	3.3	YES	1.9	1
AOC 7	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	1.8	5
AOC 7	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	10.0	5
AOC 7	121-14-2	2,4-Dinitrotoluene	ug/l	9.6	1.1	YES	9.3	YES	8.5	5
AOC 7	91-94-1	3,3'-Dichlorobenzidine	ug/l	9.6	0.4	YES	9.3	YES	23.3	5
AOC 7	7440-36-0	Antimony	ug/l	8.1	6	YES	7.6	YES	1.3	5
AOC 7	12674-11-2	Aroclor 1016	ug/l	1	0.0017	YES	0.97	YES	570.6	5
AOC 7	11104-28-2	Aroclor 1221	ug/l	2	0.0017	YES	1.9	YES	1117.6	5
AOC 7	11141-16-5	Aroclor 1232	ug/l	1	0.0017	YES	0.97	YES	570.6	5
AOC 7	53469-21-9	Aroclor 1242	ug/l	1	0.0017	YES	0.97	YES	570.6	5
AOC 7	12672-29-6	Aroclor 1248	ug/l	1	0.0017	YES	0.97	YES	570.6	5
AOC 7	11097-69-1	Aroclor 1254	ug/l	1	0.0017	YES	0.97	YES	570.6	5
AOC 7	11096-82-5	Aroclor 1260	ug/l	1	0.0017	YES	0.97	YES	570.6	5
AOC 7	1912-24-9	Atrazine	ug/l	9.6	3	YES	9.3	YES	3.1	5
AOC 7	56-55-3	Benzo(a)anthracene	ug/l	0.1	0.044	YES	0.093	YES	2.1	5
AOC 7	50-32-8	Benzo(a)pyrene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
AOC 7	205-99-2	Benzo(b)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
AOC 7	207-08-9	Benzo(k)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
AOC 7	111-44-4	Bis(2-Chloroethyl)ether	ug/l	9.6	0.31	YES	9.3	YES	30.0	5
AOC 7	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	9.6	1.2	YES	9.3	YES	7.8	5

Table H-5C
Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Minimum DL Exceeds

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Ratio of Exceedance	Sample Count
AOC 7	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	4.3	5
AOC 7	218-01-9	Chrysene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
AOC 7	53-70-3	Dibenz(a,h)anthracene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
AOC 7	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	2.5	5
AOC 7	118-74-1	Hexachlorobenzene	ug/l	9.6	0.0075	YES	9.3	YES	1240.0	5
AOC 7	87-68-3	Hexachlorobutadiene	ug/l	9.6	4.4	YES	9.3	YES	2.1	5
AOC 7	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
AOC 7	7439-97-6	Mercury	ug/l	0.02	0.012	YES	0.02	YES	1.7	5
AOC 7	621-64-7	N-Nitroso-di-n-propylamine	ug/l	9.6	0.05	YES	9.3	YES	186.0	5
AOC 7	87-86-5	Pentachlorophenol	ug/l	48	1	YES	47	YES	47.0	5
AOC 7	7440-28-0	Thallium	ug/l	4.1	1.7	YES	3.3	YES	1.9	5
River	75-35-4	1,1-Dichloroethene	ug/l	1	0.57	YES	1	YES	1.8	5
River	96-12-8	1,2-Dibromo-3-chloropropane	ug/l	2	0.2	YES	2	YES	10.0	5
River	121-14-2	2,4-Dinitrotoluene	ug/l	10	1.1	YES	9.3	YES	8.5	5
River	91-94-1	3,3'-Dichlorobenzidine	ug/l	10	0.4	YES	9.3	YES	23.3	5
River	7440-36-0	Antimony	ug/l	8.1	6	YES	8.1	YES	1.4	5
River	12674-11-2	Aroclor 1016	ug/l	1	0.0017	YES	0.93	YES	547.1	5
River	11104-28-2	Aroclor 1221	ug/l	2	0.0017	YES	1.9	YES	1117.6	5
River	11141-16-5	Aroclor 1232	ug/l	1	0.0017	YES	0.93	YES	547.1	5
River	53469-21-9	Aroclor 1242	ug/l	1	0.0117	YES	0.93	YES	79.5	5
River	12672-29-6	Aroclor 1248	ug/l	1	0.0017	YES	0.93	YES	547.1	5
River	11097-69-1	Aroclor 1254	ug/l	1	0.0017	YES	0.93	YES	547.1	5
River	11096-82-5	Aroclor 1260	ug/l	1	0.0017	YES	0.93	YES	547.1	5
River	1912-24-9	Atrazine	ug/l	10	3	YES	9.3	YES	3.1	5
River	56-55-3	Benzo(a)anthracene	ug/l	0.1	0.044	YES	0.093	YES	2.1	5
River	50-32-8	Benzo(a)pyrene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
River	205-99-2	Benzo(b)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
River	207-08-9	Benzo(k)fluoranthene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
River	111-44-4	Bis(2-Chloroethyl)ether	ug/l	10	0.31	YES	9.3	YES	30.0	5
River	117-81-7	Bis(2-Ethylhexyl)phthalate	ug/l	10	1.2	YES	9.3	YES	7.8	5
River	56-23-5	Carbon tetrachloride	ug/l	1	0.23	YES	1	YES	4.3	5
River	218-01-9	Chrysene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
River	53-70-3	Dibenz(a,h)anthracene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
River	124-48-1	Dibromochloromethane	ug/l	1	0.4	YES	1	YES	2.5	5
River	118-74-1	Hexachlorobenzene	ug/l	10	0.0075	YES	9.3	YES	1240.0	5
River	87-68-3	Hexachlorobutadiene	ug/l	10	4.4	YES	9.3	YES	2.1	5
River	193-39-5	Indeno(1,2,3-cd)pyrene	ug/l	0.2	0.044	YES	0.19	YES	4.3	5
River	621-64-7	N-Nitroso-di-n-propylamine	ug/l	10	0.05	YES	9.3	YES	186.0	5
River	87-86-5	Pentachlorophenol	ug/l	51	1	YES	47	YES	47.0	5
River	7440-28-0	Thallium	ug/l	4.4	1.7	YES	3.3	YES	1.9	5

Notes:
DL - Detection Limit.
(a) - Ohio WQC (2002) for Ohio River Drainage Basin if available, or EPA Human Health Water Quality Criteria (2006).

Table H-5D

Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Constituents Lacking Screening Levels

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 19	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	1		NA	1	NA	1
AOC 19	92-52-4	1,1-Biphenyl	ug/l	9.3		NA	9.3	NA	1
AOC 19	75-34-3	1,1-Dichloroethane	ug/l	1		NA	1	NA	1
AOC 19	106-93-4	1,2-Dibromoethane	ug/l	1		NA	1	NA	1
AOC 19	108-60-1	2,2'-Oxybis(1-Chloropropane)	ug/l	9.3		NA	9.3	NA	1
AOC 19	606-20-2	2,6-Dinitrotoluene	ug/l	9.3		NA	9.3	NA	1
AOC 19	78-93-3	2-Butanone	ug/l	5		NA	5	NA	1
AOC 19	591-78-6	2-Hexanone	ug/l	5		NA	5	NA	1
AOC 19	91-57-6	2-Methylnaphthalene	ug/l	9.3		NA	9.3	NA	1
AOC 19	88-74-4	2-Nitroaniline	ug/l	47		NA	47	NA	1
AOC 19	88-75-5	2-Nitrophenol	ug/l	9.3		NA	9.3	NA	1
AOC 19	99-09-2	3-Nitroaniline	ug/l	47		NA	47	NA	1
AOC 19	101-55-3	4-Bromophenylphenyl ether	ug/l	9.3		NA	9.3	NA	1
AOC 19	59-50-7	4-Chloro-3-methylphenol	ug/l	9.3		NA	9.3	NA	1
AOC 19	106-47-8	4-Chloroaniline	ug/l	9.3		NA	9.3	NA	1
AOC 19	7005-72-3	4-Chlorophenylphenyl ether	ug/l	9.3		NA	9.3	NA	1
AOC 19	100-01-6	4-Nitroaniline	ug/l	47		NA	47	NA	1
AOC 19	100-02-7	4-Nitrophenol	ug/l	47		NA	47	NA	1
AOC 19	98-86-2	Acetophenone	ug/l	9.3		NA	9.3	NA	1
AOC 19	100-52-7	Benzaldehyde	ug/l	9.3		NA	9.3	NA	1
AOC 19	191-24-2	Benzo(g,h,i)perylene	ug/l	0.19		NA	0.19	NA	1
AOC 19	111-91-1	Bis(2-Chloroethoxy)methane	ug/l	9.3		NA	9.3	NA	1
AOC 19	75-27-4	Bromodichloromethane	ug/l	1		NA	1	NA	1
AOC 19	74-83-9	Bromomethane	ug/l	2		NA	2	NA	1
AOC 19	105-60-2	Caprolactam	ug/l	47		NA	47	NA	1
AOC 19	86-74-8	Carbazole	ug/l	9.3		NA	9.3	NA	1
AOC 19	75-15-0	Carbon disulfide	ug/l	1		NA	1	NA	1
AOC 19	75-00-3	Chloroethane	ug/l	2		NA	2	NA	1
AOC 19	75-00-3	Chloroethane	ug/l	2		NA	2	NA	1
AOC 19	74-87-3	Chloromethane	ug/l	2		NA	2	NA	1
AOC 19	10061-01-5	cis-1,3-Dichloropropene	ug/l	1		NA	1	NA	1
AOC 19	110-82-7	Cyclohexane	ug/l	1		NA	1	NA	1
AOC 19	132-64-9	Dibenzofuran	ug/l	9.3		NA	9.3	NA	1
AOC 19	75-71-8	Dichlorodifluoromethane	ug/l	1		NA	1	NA	1
AOC 19	84-66-2	Diethylphthalate	ug/l	9.3		NA	9.3	NA	1
AOC 19	84-74-2	Di-n-butylphthalate	ug/l	9.3		NA	9.3	NA	1
AOC 19	117-84-0	Di-n-octylphthalate	ug/l	9.3		NA	9.3	NA	1
AOC 19	98-82-8	Isopropylbenzene	ug/l	1		NA	1	NA	1
AOC 19	79-20-9	Methyl acetate	ug/l	10		NA	10	NA	1
AOC 19	108-87-2	Methylcyclohexane	ug/l	1		NA	1	NA	1
AOC 19	1634-04-4	Methyl-tert-butyl-ether	ug/l	1		NA	1	NA	1
AOC 19	95-48-7	o-Cresol (2-Methylphenol)	ug/l	9.3		NA	9.3	NA	1
AOC 19	106-44-5	p-Cresol (4-Methylphenol)	ug/l	9.3		NA	9.3	NA	1
AOC 19	85-01-8	Phenanthrene	ug/l	0.19		NA	0.19	NA	1
AOC 19	7440-22-4	Silver	ug/l	1.1		NA	1.1	NA	1
AOC 19	75-69-4	Trichlorofluoromethane	ug/l	1		NA	1	NA	1
AOC 7	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	1		NA	1	NA	5
AOC 7	92-52-4	1,1-Biphenyl	ug/l	9.6		NA	9.3	NA	5

Table H-5D

Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Constituents Lacking Screening Levels

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 7	75-34-3	1,1-Dichloroethane	ug/l	1		NA	1	NA	5
AOC 7	67562-39-4	HEPTACHLORODIBENZOFURAN	ug/l	0.000000529		NA	0.000000529	NA	1
AOC 7	35822-46-9	DIOXIN	ug/l	0.00000029		NA	0.00000029	NA	1
AOC 7	55673-89-7	HEPTACHLORODIBENZOFURAN	ug/l	0.000000742		NA	0.000000742	NA	1
AOC 7	70648-26-9	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	ug/l	0.000000186		NA	0.000000186	NA	1
AOC 7	39227-28-6	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	ug/l	0.000000233		NA	0.000000233	NA	1
AOC 7	57117-44-9	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	ug/l	0.000000194		NA	0.000000194	NA	1
AOC 7	57653-85-7	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	ug/l	0.000000224		NA	0.000000224	NA	1
AOC 7	72918-21-9	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	ug/l	0.000000239		NA	0.000000239	NA	1
AOC 7	19408-74-3	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	ug/l	0.000000222		NA	0.000000222	NA	1
AOC 7	57117-41-6	1,2,3,7,8-PENTACHLORODIBENZOFURAN	ug/l	0.000000119		NA	0.000000119	NA	1
AOC 7	40321-76-4	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	ug/l	0.000000211		NA	0.000000211	NA	1
AOC 7	106-93-4	1,2-Dibromoethane	ug/l	1		NA	1	NA	5
AOC 7	108-60-1	2,2'-Oxybis(1-Chloropropane)	ug/l	9.6		NA	9.3	NA	5
AOC 7	60851-34-5	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	ug/l	0.000000207		NA	0.000000207	NA	1
AOC 7	57117-31-4	2,3,4,7,8-PENTACHLORODIBENZOFURAN	ug/l	0.000000115		NA	0.000000115	NA	1
AOC 7	51207-31-9	2,3,7,8-TETRACHLORODIBENZOFURAN	ug/l	0.000000346		NA	0.000000346	NA	1
AOC 7	1746-01-6	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	ug/l	0.000000165		NA	0.000000165	NA	1
AOC 7	606-20-2	2,6-Dinitrotoluene	ug/l	9.6		NA	9.3	NA	5
AOC 7	78-93-3	2-Butanone	ug/l	5		NA	5	NA	5
AOC 7	591-78-6	2-Hexanone	ug/l	5		NA	5	NA	5
AOC 7	91-57-6	2-Methylnaphthalene	ug/l	9.6		NA	9.3	NA	5
AOC 7	88-74-4	2-Nitroaniline	ug/l	48		NA	47	NA	5
AOC 7	88-75-5	2-Nitrophenol	ug/l	9.6		NA	9.3	NA	5
AOC 7	99-09-2	3-Nitroaniline	ug/l	48		NA	47	NA	5
AOC 7	534-52-1	4,6-Dinitro-2-methylphenol	ug/l	48		NA	47	NA	5
AOC 7	101-55-3	4-Bromophenylphenyl ether	ug/l	9.6		NA	9.3	NA	5
AOC 7	59-50-7	4-Chloro-3-methylphenol	ug/l	9.6		NA	9.3	NA	5
AOC 7	106-47-8	4-Chloroaniline	ug/l	9.6		NA	9.3	NA	5
AOC 7	7005-72-3	4-Chlorophenylphenyl ether	ug/l	9.6		NA	9.3	NA	5
AOC 7	100-01-6	4-Nitroaniline	ug/l	48		NA	47	NA	5
AOC 7	100-02-7	4-Nitrophenol	ug/l	48		NA	47	NA	5
AOC 7	98-86-2	Acetophenone	ug/l	9.6		NA	9.3	NA	5
AOC 7	100-52-7	Benzaldehyde	ug/l	48		NA	4.8	NA	5
AOC 7	191-24-2	Benzo(g,h,i)perylene	ug/l	0.2		NA	0.19	NA	5
AOC 7	111-91-1	Bis(2-Chloroethoxy)methane	ug/l	9.6		NA	9.3	NA	5
AOC 7	75-27-4	Bromodichloromethane	ug/l	1		NA	1	NA	5
AOC 7	74-83-9	Bromomethane	ug/l	2		NA	2	NA	5
AOC 7	105-60-2	Caprolactam	ug/l	47		NA	9.3	NA	5
AOC 7	86-74-8	Carbazole	ug/l	9.6		NA	9.3	NA	5
AOC 7	75-15-0	Carbon disulfide	ug/l	1		NA	1	NA	5
AOC 7	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
AOC 7	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
AOC 7	67-66-3	Chloroform	ug/l	1		NA	1	NA	5
AOC 7	74-87-3	Chloromethane	ug/l	2		NA	2	NA	5
AOC 7	156-59-2	cis-1,2-Dichloroethene	ug/l	1		NA	1	NA	5
AOC 7	10061-01-5	cis-1,3-Dichloropropene	ug/l	1		NA	1	NA	5
AOC 7	110-82-7	Cyclohexane	ug/l	1		NA	1	NA	5

Table H-5D
Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Constituents Lacking Screening Levels

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
AOC 7	132-64-9	Dibenzofuran	ug/l	9.6		NA	9.3	NA	5
AOC 7	75-71-8	Dichlorodifluoromethane	ug/l	1		NA	1	NA	5
AOC 7	84-74-2	Di-n-butylphthalate	ug/l	9.6		NA	9.3	NA	5
AOC 7	117-84-0	Di-n-octylphthalate	ug/l	9.6		NA	9.3	NA	5
AOC 7	98-82-8	Isopropylbenzene	ug/l	1		NA	1	NA	5
AOC 7	79-20-9	Methyl acetate	ug/l	10		NA	10	NA	5
AOC 7	108-87-2	Methylcyclohexane	ug/l	1		NA	1	NA	5
AOC 7	1634-04-4	Methyl-tert-butyl-ether	ug/l	1		NA	1	NA	5
AOC 7	95-48-7	o-Cresol (2-Methylphenol)	ug/l	9.6		NA	9.3	NA	5
AOC 7	39001-02-0	OCTACHLORODIBENZOFURAN	ug/l	0.0000036		NA	0.0000036	NA	1
AOC 7	3268-87-9	OCTACHLORODIBENZO-P-DIOXIN	ug/l	0.000012209		NA	0.000012209	NA	1
AOC 7	106-44-5	p-Cresol (4-Methylphenol)	ug/l	9.6		NA	9.3	NA	5
AOC 7	85-01-8	Phenanthrene	ug/l	0.2		NA	0.19	NA	5
AOC 7	7440-22-4	Silver	ug/l	1.1		NA	0.6	NA	5
AOC 7	75-69-4	Trichlorofluoromethane	ug/l	1		NA	1	NA	5
River	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	1		NA	1	NA	5
River	92-52-4	1,1-Biphenyl	ug/l	10		NA	9.3	NA	5
River	75-34-3	1,1-Dichloroethane	ug/l	1		NA	1	NA	5
River	106-93-4	1,2-Dibromoethane	ug/l	1		NA	1	NA	5
River	108-60-1	2,2'-Oxybis(1-Chloropropane)	ug/l	10		NA	9.3	NA	5
River	606-20-2	2,6-Dinitrotoluene	ug/l	10		NA	9.3	NA	5
River	78-93-3	2-Butanone	ug/l	5		NA	5	NA	5
River	591-78-6	2-Hexanone	ug/l	5		NA	5	NA	5
River	91-57-6	2-Methylnaphthalene	ug/l	10		NA	9.3	NA	5
River	88-74-4	2-Nitroaniline	ug/l	51		NA	47	NA	5
River	88-75-5	2-Nitrophenol	ug/l	10		NA	9.3	NA	5
River	99-09-2	3-Nitroaniline	ug/l	51		NA	47	NA	5
River	534-52-1	4,6-Dinitro-2-methylphenol	ug/l	51		NA	47	NA	5
River	101-55-3	4-Bromophenylphenyl ether	ug/l	10		NA	9.3	NA	5
River	59-50-7	4-Chloro-3-methylphenol	ug/l	10		NA	9.3	NA	5
River	106-47-8	4-Chloroaniline	ug/l	10		NA	9.3	NA	5
River	7005-72-3	4-Chlorophenylphenyl ether	ug/l	10		NA	9.3	NA	5
River	100-01-6	4-Nitroaniline	ug/l	51		NA	47	NA	5
River	100-02-7	4-Nitrophenol	ug/l	51		NA	47	NA	5
River	98-86-2	Acetophenone	ug/l	10		NA	9.3	NA	5
River	100-52-7	Benzaldehyde	ug/l	51		NA	9.3	NA	5
River	191-24-2	Benzo(g,h,i)perylene	ug/l	0.2		NA	0.19	NA	5
River	111-91-1	Bis(2-Chloroethoxy)methane	ug/l	10		NA	9.3	NA	5
River	75-27-4	Bromodichloromethane	ug/l	1		NA	1	NA	5
River	74-83-9	Bromomethane	ug/l	2		NA	2	NA	5
River	105-60-2	Caprolactam	ug/l	51		NA	47	NA	5
River	86-74-8	Carbazole	ug/l	10		NA	9.3	NA	5
River	75-15-0	Carbon disulfide	ug/l	1		NA	1	NA	5
River	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
River	75-00-3	Chloroethane	ug/l	2		NA	2	NA	5
River	74-87-3	Chloromethane	ug/l	2		NA	2	NA	5
River	10061-01-5	cis-1,3-Dichloropropene	ug/l	1		NA	1	NA	5
River	110-82-7	Cyclohexane	ug/l	1		NA	1	NA	5

Table H-5D
Detection Limit Evaluation - Chemicals Never Detected in Surface Water - Constituents Lacking Screening Levels

Area	CAS No.	Chemical	Units	Maximum DL	Surface Water Screening Level (a)	Maximum DL Exceeds?	Minimum DL	Minimum DL Exceeds?	Sample Count
River	132-64-9	Dibenzofuran	ug/l	10		NA	9.3	NA	5
River	75-71-8	Dichlorodifluoromethane	ug/l	1		NA	1	NA	5
River	84-74-2	Di-n-butylphthalate	ug/l	10		NA	9.3	NA	5
River	117-84-0	Di-n-octylphthalate	ug/l	10		NA	9.3	NA	5
River	98-82-8	Isopropylbenzene	ug/l	1		NA	1	NA	5
River	79-20-9	Methyl acetate	ug/l	10		NA	10	NA	5
River	108-87-2	Methylcyclohexane	ug/l	1		NA	1	NA	5
River	1634-04-4	Methyl-tert-butyl-ether	ug/l	1		NA	1	NA	5
River	95-48-7	o-Cresol (2-Methylphenol)	ug/l	10		NA	9.3	NA	5
River	106-44-5	p-Cresol (4-Methylphenol)	ug/l	10		NA	9.3	NA	5
River	85-01-8	Phenanthrene	ug/l	0.2		NA	0.19	NA	5
River	7440-22-4	Silver	ug/l	1.1		NA	1.1	NA	5
River	75-69-4	Trichlorofluoromethane	ug/l	1		NA	1	NA	5

Notes:
DL - Detection Limit.
(a) - Ohio WQC (2002) for Ohio River Drainage Basin if available, or EPA Human Health Water Quality Criteria (2006).

Appendix I

Background Evaluation

Appendix I
Background Evaluation for Soil

As part of the uncertainty evaluation for the HHRA for the former ARMCO Hamilton Site, a statistical analysis of soil data was conducted to determine whether or not concentrations of specific COPCs in the exposure areas evaluated in the HHRA are consistent with concentrations in background samples. In accordance with USEPA guidance (USEPA, 2002b), the CERCLA program does not require clean up to concentrations below natural or anthropogenic background levels.

The background comparison was conducted in accordance with the USEPA *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (USEPA, 2002a), and as documented in responses to USEPA's comments on the draft HHRA. Comments were provided by USEPA on August 3, 2007 on the Draft HHRA for the former ARMCO Hamilton Site. The comments requested clarification of techniques used to conduct the statistical analysis used in the 2006 draft HHRA in light of technical guidance (USEPA, 2007a) and updated ProUCL software (version 4.00.02; USEPA, 2007b) published after the submittal of the Draft HHRA. In the Response to Comments (included as Appendix K of the Final HHRA), AK Steel clarified the process and assumptions, and USEPA agreed to allow the statistical evaluation from the Draft HHRA to be finalized as is for AOCs where no additional data were to be collected (AOC 1, AOC 2, AOC 18/21, AOC 19 and Block A). Statistical analysis of AOCs where new soil data were collected (AOC 13, Southern Parcel, and AOC 22 – a new area not included in the draft RI or draft HHRA) would be conducted using ProUCL 4.00.02, consistent with guidance provided by USEPA (2007a) to support the software. In addition, for a couple of key inorganics (arsenic and lead), the background evaluation was performed for subsurface soil as well as surface soil. In general, the statistical evaluation presented in the Addendum follows the same theories as that presented in the Draft HHRA. Subtle differences include the specific test selected and treatment of non-detected values.

I.1 Data Sets Used in the Statistical Evaluation

This section provides an overview of the approach and statistical calculations performed. Additional details concerning the calculations are provided in Section I.2.

As described in the U.S. EPA's (2002) *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* and consistent with the U.S. EPA-approved Work Plan (ENSR, 2005), sampling station locations were selected following a "Targeted Sampling Design" where prior knowledge of site-related factors were incorporated into the process of station location. The targeted sampling design was developed to meet the following criteria:

- Sampling stations were selected that were representative of the defined area of interest; and

- Stations with similar physical characteristics were selected to minimize the sampling error, as described in the study data quality objectives (DQO) process (U.S. EPA, 2001b).

As part of the RI/FS program, twelve background surface soil samples and nine background subsurface soil samples were collected from areas that have not been influenced by current or previous site activities and are similar in basic characteristics to the soil at the site. These samples are identified in Table 3-6 of the HHRA report. Sections 2.10 and 4.28 of the Draft RI/FS Report (ENSR, 2006) discuss the background soil sampling and analysis performed for the Site.

Surface soil data for the Site were divided into the human health exposure areas evaluated in the HHRA, as described in Section 5.3 of the HHRA report:

- AOC 1 – Sludge laydown area;
- AOC 2 – Closed landfill;
- AOC 18 and AOC 21 (On-site portion of former COG pipeline and Wooded area);
- AOC 19 (Off-site portion of former COG pipeline);
- Block A – Slag piles;
- Southern Parcel (excluding AOC 13);
- AOC 13; and
- AOC 22 (Riparian Area).

Each exposure area was compared to background separately. The details of the statistical methods are discussed in the following section, followed by the results of the analyses. The results for the Southern Parcel, AOC 13, and AOC 22 (Riparian Area), are provided in an Addendum that comes at the end of this Appendix.

I.2 Statistical Analysis Methods for AOC 1, AOC 2, AOC 18/21, AOC 19 and Block A

Chemical Selection for Background Evaluation

Surface soil samples collected from the former ARMCO Hamilton site and surrounding background sites were analyzed for an extensive list of constituents. Statistical calculations were performed for a subset of the chemicals detected in soil at AOC 1, AOC 2, AOC 18/21, AOC 19 and Block A. The chemicals included in the background evaluation were those identified in the HHRA results to be the primary risk drivers in surface soil. The following chemicals were considered in the background evaluation: aluminum, antimony, arsenic, iron, manganese, mercury, vanadium, and benzo(a)pyrene toxic equivalents (BaP-TE). Antimony was not detected in the background samples, therefore was not included in the statistical evaluation.

Treatment of Non-Detects

Because the datasets that included a large percentage of non-detects were excluded, the non-detect values in the remaining data sets were assumed not to introduce significant statistical bias. Therefore, all non-detect values were replaced with ½ the value of the sample quantitation limit (SQL) for the purposes of calculating the statistics. Where ½ the SQL was greater than the highest detected concentrations, the sample results for the non-detect were eliminated from the analysis.

Tests for Normality

Each constituent in each dataset was tested to determine whether the data were normally or lognormally distributed. The Shapiro-Wilk's test was used for this determination (α=0.10). To evaluate a lognormal distribution, the data were transformed by calculating the natural logarithm of each concentration. If both untransformed and log-tranformed data were normally distributed, untransformed data were selected for the analysis. Generalized statistical references describing the various methods are listed in the references at the end of this appendix.

Parametric Comparison of Means

For any individual chemical, where both the exposure area and background dataset distributions were normal or lognormal, the Student's t-test (α= 0.10) was used to compare the exposure area mean to the background mean. The variances of each paired dataset were calculated, and compared using an F-test (α=0.10). The t-test for either equal or unequal variance was used, as appropriate. For the lognormally distributed data sets, all calculations were performed on the log-transformed data.

Non-Parametric Comparison of Populations

For any individual chemical, if the distribution of either the exposure area or background datasets was neither normally nor lognormally distributed, or if the distributions were mixed, then a non-parametric comparison was necessary. The Wilcoxon Rank-Sum Test (also known as the Mann-Whitney U Test) was used for the non-parametric comparison (α=0.10).

Hypothesis Testing

The surface soil data from each exposure area was evaluated against background data using statistical Background Test Form 2 from the U.S. EPA *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (U.S. EPA, 2002a). Background Test Form 2 requires a strict burden of proof by selecting the null hypothesis that the chemical concentration in potentially contaminated areas exceeds background by more than a substantial difference S (Δ > S). This approach favors the protection of the environment (U.S. EPA, 2002a). A significant difference (S) of one standard deviation (1sd) of the background dataset was selected to provide a reasonable ability

to distinguish differences between datasets. If background data were normally or lognormally distributed, S was calculated as 1sd, with sd calculated in log-space for lognormally distributed data. If the background data were neither normally nor lognormally distributed, a percentile value was calculated equivalent to the mean plus one standard deviation in a normally distributed data set (84.13th percentile). The S for nonparametric tests was determined as the difference between the 84.13th percentile and the median (50th percentile).

Figure I-1 provides a graphical depiction of the test selection criteria. The specific statistical tests performed, and the S selected, are specified in Tables I-1a-e. The specific hypotheses to be used in the statistical evaluation are as stated in Test Form 2 (USEPA, 2002a):

H_o: The mean of the contaminant concentration in the exposure area dataset is greater than or equal to the mean of the background dataset by S (Δ > S) where, S = 1sd of the upstream data set ($u_{site} \geq u_{back}$+S).

H_A: The mean of the contaminant concentration in the exposure area dataset does not exceed the mean of the background dataset by S ($\Delta \leq$ S)($u_{site} < u_{back}$+S).

If the null hypothesis H_0 is rejected, it can be concluded with statistical significance that the mean of the exposure area data set is not significantly greater than the mean of the background dataset, or that, in general, the exposure area is consistent with background. If the null hypothesis is not rejected, it was assumed that the mean from the exposure area dataset may be greater than the mean of the background dataset, although this is not a statistically significant conclusion. This hypothesis was tested at the 0.10 level of significance (α = 0.10).

Evaluation of Power

The power represents the ability of the test to reject the null hypothesis; specifically, are there enough samples to make it theoretically possible to reject the null hypothesis? Because of the structure of the null hypothesis (U.S. EPA Test Form 2), insufficient power may result in a Type II error, the incorrect acceptance of the null hypothesis, that the exposure area data are greater than the background data. A power of 80-90% is the intended target for the statistical comparisons.

For the parametric t-tests, the power of each comparison was calculated. These results can be used to aid the interpretation of statistical results, and may be useful to identify data gaps. Power was not calculated for non-parametric Wilcoxon Rank Sum tests. Although power has not been calculated for the non-parametric Wilcoxon Rank Sum tests, the rejection of the null hypothesis indicates that power was sufficient.

I.3 Results of Statistical Analyses for AOC 1, AOC 2, AOC 18/21, AOC 19 and Block A

The statistical software Stata 8.2 was used to perform the statistical calculations. Raw results from the Stata 8.2 program are attached to this Appendix. The distributions of the constituents from the site and

background datasets are presented in Tables I-1a-e. The results indicate a mixture of normally, lognormally, and not normally distributed data.

AOC1 vs. Background

In the AOC1 vs. Background evaluation, parametric tests were run using untransformed data for aluminum and vanadium, parametric tests were run using log-transformed data for manganese and B(a)P TE. Non-parametric tests were run for the remaining 3 constituents, including arsenic, iron, and mercury. The step-by-step summary of the statistical results is presented in Table I-1a.

The null hypothesis was rejected for one parametric t-test (B(a)P-TE, log-transformed data) and two non-parametric Wilcoxon Rank Sum tests (arsenic and mercury), indicating concentrations for these constituents are consistent with the background dataset. For the remaining constituents, the null hypothesis was not rejected, indicating either the exposure area dataset is greater than the Background dataset, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power ranged from 11% to > 99%. The power was adequate to evaluate the log-transformed datasets for manganese and B(a)P - TE, however power was less than 70% in the evaluation of aluminum and vanadium.

AOC18_21 vs. Background

In the AOC18_21 vs. Background evaluation, parametric tests were run using untransformed data for aluminum and log-transformed data for vanadium. Non-parametric tests were run for the remaining five constituents, including arsenic, iron, manganese, mercury, and B(a)P-TE. The step-by-step summary of the statistical results is presented in Table I-1b.

The null hypothesis was rejected for four non-parametric Wilcoxon Rank Sum tests (arsenic, iron, mercury, and B(a)P-TE), indicating concentrations for these constituents in AOC18_21 are consistent with Background. For the remaining three constituents, the null hypothesis was not rejected, indicating either the constituent concentrations in the AOC18_21 dataset are greater than the Background dataset, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power ranged from 13% (vanadium) to 94% (aluminum), so power is likely to be insufficient for the evaluation of vanadium.

AOC19 vs. Background

In the AOC19 vs. Background evaluation, parametric tests were run using untransformed data for aluminum and vanadium, parametric tests were run using log-transformed data for manganese and B(a)P-TE. Non-parametric tests were run for the remaining three constituents, including arsenic, iron, and mercury. The step-by-step summary of the statistical results is presented in Table I-1c.

The null hypothesis was rejected for three non-parametric Wilcoxon Rank Sum tests (arsenic, iron, and mercury), indicating concentrations for these constituents in AOC19 are consistent with Background.

The null hypothesis was also rejected for the two parametric tests using log-transformed data (manganese and B(a)P-TE). For the remaining two constituents, the null hypothesis was not rejected, indicating either the constituent concentrations in the AOC19 dataset are greater than the Background dataset, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power ranged from 15% to 99%, with power likely insufficient to evaluate aluminum and vanadium.

AOC2 vs. Background

In the AOC2 vs. Background evaluation, parametric tests were run using untransformed data for aluminum and vanadium, and parametric tests were run using log-transformed data for arsenic, manganese, and B(a)P-TE. Non-parametric tests were run for the remaining two constituents, including iron, and mercury. The step-by-step summary of the statistical results is presented in Table I-1d.

The null hypothesis was rejected for the two non-parametric Wilcoxon Rank Sum tests (iron, and mercury), indicating concentrations for these constituents in AOC2 are consistent with Background. The null hypothesis was also rejected for two parametric tests using log-transformed data (arsenic and B(a)P-TE). For the remaining three constituents, the null hypothesis was not rejected, indicating either the constituent concentrations in the AOC2 dataset are greater than the Background dataset, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power ranged from 34% to > 99%, with power likely insufficient to evaluate aluminum, manganese, and vanadium.

Block A vs. Background

In the Block A vs. Background evaluation, parametric tests were run using log-transformed data for arsenic, manganese, and vanadium. Non-parametric tests were run for the remaining four constituents, including aluminum, iron, mercury, and B(a)P-TE. The step-by-step summary of the statistical results is presented in Table I-1e.

The null hypothesis was rejected for the two non-parametric Wilcoxon Rank Sum tests (mercury and B(a)P-TE), indicating concentrations for these constituents in Block A are consistent with Background. The null hypothesis was also rejected for one parametric test using log-transformed data (arsenic). For the remaining four constituents, the null hypothesis was not rejected, indicating either the constituent concentrations in the Block A dataset are greater than the Background dataset, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power ranged from 13% (vanadium) to 100%, with power likely insufficient to evaluate vanadium.

Summary of Data Comparisons

Based on the evaluation of the five exposure areas compared to background, it could not be ruled out (i.e., the null hypothesis could not be rejected) that the surface soil concentrations of aluminum and vanadium in all five exposure areas may exceed Background by more than S. Surface soil concentrations of manganese may exceed Background by more than S in four of the five exposure areas. Manganese is consistent with Background in AOC 19. Surface soil concentrations of iron may exceed Background by more than S in two of five areas. Iron is consistent with Background in AOC 2, AOC18_21, and AOC 19. Surface soil concentrations of arsenic, mercury and B(a)P-TE are consistent with Background in all five areas.

I.4 Uncertainties

In general, the statistical analysis was conducted in order to reduce uncertainties in the HHRA evaluation of surface soil at the former ARMCO Hamilton site. However, there are specific uncertainties associated with the statistical analysis. None of the datasets assessed in the statistical evaluation were quantitatively examined for outliers. In general, the presence of outliers would tend to make two different groups of data look different, when they in fact might be more similar if the outlier(s) were to be omitted.

Where the Background data were normally distributed, S was defined as one standard deviation, regardless of the test used to compare to other data sets. For all tests where the Background data were not normally distributed, a non-parametric test was used and a non-parametric S was calculated. The value selected for S (the difference between the median and the 84.13th percentile of the data) is equivalent to one standard deviation above the mean in a normally distributed data set. One standard deviation was selected for ease of statistical implementation and may or may not have significance from a human health risk perspective in the HHRA.

I.5 Conclusions for AOC 1, AOC 2, AOC 18/21, AOC 19 and Block A

This statistical evaluation compared the concentration of specific constituents in surface soil in five exposure areas to site-specific Background surface soil concentrations. The results of this statistical evaluation indicate that aluminum and vanadium were not consistent with background at all five exposure areas, concentrations of manganese were not consistent with background at four exposure areas, and that concentrations of iron were not consistent with background at two of the five exposure areas. Arsenic, mercury, and B(a)P-TE were found to be consistent with background at all five exposure areas.

I.6 References

ENSR, 2005. Remedial Investigation/Feasibility Study Support Sampling Plant (Revision 3) for the Former Armco Hamilton Plant Site, 401 Augspurger Road, New Miami, Butler County, Ohio. August 2005.

ENSR. 2006. Draft Remedial Investigation/Feasibility Study for the Former Armco Hamilton Plant Site. Report No. 00076-069-650. July 2006.

Gilbert, R. O. 1987. Statistical Methods for Environmental Pollution Monitoring. New York: Van Nostrand Reinhold Company.

Shapiro, S.S., and M.B. Wilk, 1965. An Analysis of Variance Test for Normality (complete samples), *Biometrika* 52:591-611.

United States Environmental Protection Agency. 2002a. Guidance for Comparing Background and Chemical Concentration sin Soil for CERCLA Sites. EPA 540-R-01-003. OSWER 9285.7-41. September 2002.

United States Environmental Protection Agency. 2002b. Transmittal of Policy Statement: "Role of Background in the CERCLA Cleanup Program" OSWER 9285.6-07P. Michael Cook, Director, Office of Emergency and Remedial Response. Signed May 1, 2002.

Walpole, Ronald E. and Raymond H. Myers. 1989. Probability and Statistics for Engineers and Scientists. New York: Macmillan Publishing Company.

I.7 Addendum: Soil Background Evaluation

This addendum to Appendix I augments the background statistical evaluation described above. In addition to presenting the statistical analysis using the new soil data for AOC 13, Southern Parcel, and AOC 22 (Riparian Area), results are presented for arsenic and lead in combined surface and subsurface soil in all exposure areas. Based on the risk results, inorganics in subsurface soil are generally not risk drivers. However, because of the influence of background levels of arsenic on risk results, a background evaluation was also performed for arsenic in all areas. Lead was also identified as an inorganic of interest in combined soil for some areas (e.g., AOC 1), and was therefore included in the combined surface and subsurface soil background evaluation. To be consistent with the combined soil exposure point concentrations used in the HHRA, surface and subsurface background samples were combined for the background evaluation. The updated background statistical evaluation presented in this addendum was performed using ProUCL 4.00.02, consistent with AK Steel's discussions with USEPA (see Response to Comments in Appendix K) and in accordance with guidance provided by USEPA (2007a) to support the software.

I.8 Data Sets Used in the Updated Statistical Evaluation

In July 2008, new soil data were collected at AOC 13, AOC 22 (Riparian Area), and Southern Parcel. No new data were collected for the background soil. All soil samples for both the Site and background data were divided into two data sets: surface soil and subsurface soil. Consistent with the soil depth classification scheme used in the HHRA, samples with a depth of less than or equal to 2 feet below ground surface were classified as surface soil whereas deeper soil (i.e., greater than 2 feet below ground surface) were classified as subsurface soil. The combined soil data set consisted of all soil samples, surface and subsurface. The following comparisons were statistically analyzed:

<u>Surface Soil:</u>

- AOC 13 vs. Background
- AOC 22 (Riparian Area) vs. Background
- Southern Parcel vs. Background

<u>Combined Soil:</u>

- AOC 1 vs. Background
- AOC 2 vs. Background
- AOC 18 and 21 vs. Background
- AOC 19 vs. Background
- Block A vs. Background
- AOC 13 vs. Background
- Southern Parcel vs. Background

A "combined soil" evaluation was not performed for AOC 22 (Riparian Area) because AOC 22 samples were collected at depths of less than or equal to 2 feet and were therefore classified as surface soil.

I.9 Chemical Selection

Only a subset of the chemicals that were detected in the soil samples collected from the former ARMCO Hamilton site were analyzed in this statistical evaluation. Chemicals included in this background evaluation were those identified in the revised HHRA results to be the primary risk drivers in either the surface soil or combined soil pathways. For surface soil the following chemicals were evaluated: Aluminum, Arsenic, Iron, Lead, Manganese, Vanadium, and B(a)P-TE. For combined soil, Arsenic and Lead were evaluated.

I.10 Updated Statistical Analysis Methodology

USEPA (2002a) Guidance for Comparing Background and Chemical Concentration in Soil for CERCLA Sites was used as the primary source for the development of the methodology used in this evaluation. ProUCL version 4.00.02 (USEPA, 2007b) is statistical software that uses as its basis for background evaluations USEPA (2002a) Guidance for Comparing Background and Chemical Concentration in Soil for CERCLA Sites. The USEPA ProUCL Technical Guide (USEPA, 2007a) was used as a reference for selection of specific statistical tests, based on the attributes of the data sets. The output files from the ProUCL software are included in Attachments 1, 2, and 4 and the output files for the Stata program are included in Attachment 3. Goodness-of-Fit statistics are included in **Attachment I-1a** and **I-1b** (surface soil and combined soil) and hypothesis test results are included in **Attachment I-2a** and **I-2b** (surface soil and combined soil). Box plots showing each data set are included in **Attachment I-4a** and **I-4b** (surface soil and combined soil). The statistical software package Stata (Stata Corporation, 2003) was used to calculate the 84.13th and 50th percentiles needed to calculate the Substantial Difference (S), details below. Raw results from the Stata program are included in **Attachment I-3a** and **I-3b** (surface soil and combined soil).

Two-sample hypothesis testing was used to compare the Site data set to the background data set. All statistical tests, including the GOF statistics and two-sample hypothesis tests, were run at 90% confidence.

Null and Alternate Hypotheses

Consistent with USEPA (2002; 2007a), two hypothesis tests were used in this evaluation: Test Form 1 and Test Form 2. The null hypothesis for Test Form 1 states that there is not a statistically significant difference between the means of the Site and background data. Test Form 2 requires a strict burden of proof to prove the Site is consistent with background by selecting a null hypothesis that the Site

mean exceeds the background mean by more than a Substantial Difference (S)[1]. Therefore, while Test Form 1 uses a more conservative investigative level of $\Delta = 0$ (i.e., does not allow for S), it has a more relaxed burden of proof than Test Form 1.

The Quantile test uses Test Form 1. The hypotheses used for Test Form 1 are:

- H_O: The mean of the Site data set is less than or equal to the mean of the background data set. ($\mu_{Site} \leq \mu_{background}$)
- H_A: The mean of the Site data set is greater than the mean of the background data set. ($\mu_{Site} > \mu_{background}$)

The Student's and Satterthwaite's t-tests, the Wilcoxon Mann-Whitney (WMW) test and the Gehan test use Test Form 2 (USEPA, 2002). The hypotheses used for Test Form 2 are:

- H_O: The mean of the Site data set is greater than or equal to the mean of the background data set. ($\mu_{Site} \geq \mu_{background} + S$)
- H_A: The mean of the Site data set is less than the mean of the background data set. ($\mu_{Site} < \mu_{background} + S$)

Calculation of the Substantial Difference (S)

S is the Substantial Difference and is used in the hypotheses for Test Form 2 (USEPA, 2002, 2007a). Consistent with the statistical evaluation presented in the Draft HHRA, S used in this evaluation was equal to one standard deviation (SD) in the background data set. S was calculated in the following manner:

- S was calculated as 1 SD only if both the Site and Background data sets had a frequency of detection (FOD) of 100% and the Background was normally distributed.
- In all other cases, statistical were calculated using nonparametric techniques, and 1 SD was approximated by the difference between the 84.13th and the 50th percentiles. The 84.13th percentile of the data approximates one standard deviation of a data set. On a normal curve, the arithmetic mean plus 1 SD corresponds to the 84.13th percentile of a data set.

Statistical Analysis Procedure

Table I-2a and **Table I-2b** provide a step-by-step presentation of the background evaluation for surface soil and combined soil, respectively. This section provides a detailed explanation of the

[1] The calculation of S is explained in the next section.

methodology used. **Figure I-2** also presents a graphical depiction of the test selection process. The test selection process and data analysis follow USEPA (2007a) guidance.

Validity of Background Evaluation

Two sample hypothesis testing was conducted for data sets with greater than 8 detected results. If either the Site or background data set had less than 8 samples, no statistical evaluation was conducted.

Statistical Test Selection

Two parametric tests, the Satterthwaite's and Student's t-tests, and three non-parametric tests, the Quantile test, the WMW test, and the Gehan test were used to compare the Site and background data. In order to select the appropriate test, several characteristics of the data sets were reviewed, including the FOD, detection limits of the any non-detect results, and the distribution, or GOF, of each data set. The distribution was analyzed by ProUCL GOF tests and the data set was concluded to normally distributed or not normally distributed (with 90% confidence). The ProUCL GOF test output is in **Attachment I-1a and I-1b**.

The Quantile test, using Test Form 1, was used to initially to evaluate all comparisons. If the null hypothesis was rejected and the Site mean was concluded to be greater than the background mean, no other statistical tests were calculated. If the null hypothesis was not rejected, then one of tests using Test Form 2 was selected. The Quantile test focuses on the right tails of the data sets and therefore can have more power to detect a difference than the two-sample t-test, the WMW or the Gehan test (USEPA, 2007b). More details on the statistical test conclusions are detailed in the next section.

Figure I-2 provides a graphical depiction of the test selection criteria. The specific criteria that determine the selection of the second statistical test (if necessary after the Quantile test results) are outlined below:

<u>Parametric 2-Sample t-Tests:</u>

- A parametric 2-sample t-test was used if the Site and Background both had FOD of 100% and if both Site and background were normally distributed.
- An F-test was conducted using ProUCL to determine the variance's of the Site and the background data set. If the variances are equal the Student's t-test is used. Satterthwaite's t-test is used if the variances are unequal.

Nonparametric WMW Test:

- The WMW was selected in two scenarios:

  1. If the FOD is 100 % for both Site and background and either Site or background is not normally distributed.

  2. If the FOD is less than 100% but greater than 60% and the detection limits for both data sets are equal.

Nonparametric Gehan Test:

- The Gehan Test is used in two scenarios:

  1. If the FOD is less than 100% but greater than 60% and there are multiple detection limits in the two data sets.

  2. If the FOD is less than 60%.

Evaluation of Statistical Test Results

For the t-tests and the Gehan test, the null hypothesis was rejected if the calculated p-value was less than 0.1. The confidence level for the WMW test was also set at 0.1, consistent with the test design described above. Because the WMW test results output only provides an approximate p-value, it was determined that the decision whether or not to reject the null hypothesis would be based not on calculated p-value, but using the WMW test statistics. If the calculated test statistic was less than the test critical value, the null hypothesis was rejected. For the Quantile test, although 90% confidence is selected, ProUCL uses an alpha approximated by lookup tables without interpolation. The null hypothesis was then rejected or not rejected based on the results in the ProUCL output. The results of all the two-sample hypothesis tests are provided in **Attachment I-2a** (surface soil) and **Attachment I-2b** (combined soil).

As discussed in the preceding section, the Quantile test was the only statistical test run for all comparisons. The rejection of the null hypothesis in Test Form 1 indicates that the Site mean is greater than the background mean at a conservative investigation level ($\Delta = 0$). Therefore, no further tests were necessary when the Quantile test rejected the null hypothesis. In addition, this test focuses on the right tails of the data sets and therefore can have more power to detect a difference than the two-sample t-test, the WMW or the Gehan test (USEPA, 2007b).

If the Quantile test accepted the null hypothesis, additional tests using Test Form 2 (i.e., the t-tests, the WMW or the Gehan test) were used to compare the Site and background data sets. The null hypothesis in Test Form 2 requires a stricter burden of proof and is considered protective of human health and the environment (USEPA, 2007b).

I.11 Results of the Updated Statistical Analysis

Table I-3 provides a summary of the results of this updated statistical analysis for surface soil and combined soil in AOC 13, Southern Parcel and AOC 22, and for combined soil in AOC 1, AOC 2, AOC 18 and 21, AOC 19, Block A. The results for each exposure area are summarized below.

AOC 1 vs. Background

Only combined soil was analyzed in AOC 1. Arsenic and Lead, the only chemicals evaluated for this area, were both found to be consistent with background.

AOC 2 vs. Background

Only combined soil was analyzed in AOC 2. Arsenic and Lead, the only chemicals evaluated for this area, were both found to be consistent with background.

AOC 18 and 21 vs. Background

Only combined soil was analyzed for AOC 18 and 21. Arsenic and Lead, the only chemicals evaluated for this area, were both found to be consistent with background.

AOC 19 vs. Background

Only combined soil was analyzed for AOC 19. Arsenic and Lead, the only chemicals evaluated for this area, were both found to be consistent with background.

Block A vs. Background

Only combined soil was analyzed for Block A. Arsenic and Lead, the only chemicals evaluated for this area, were both found to be consistent with background.

AOC 13 vs. Background

In AOC 13 surface soil, Arsenic, Iron, Lead, Vanadium and B(a)P-TE were found to be consistent with background. In AOC13 combined soil, Arsenic and Lead were the only chemicals evaluated, and both were found to be consistent with background.

AOC 22 (Riparian Area) vs. Background

In AOC 22 surface soil, Aluminum, Arsenic, Iron, Lead, Vanadium, and B(a)P-TE were found to be consistent with Background. No evaluation of combined soil was performed for AOC 22 since no subsurface soil samples were collected.

Southern Parcel vs. Background

In Southern Parcel surface soil, Arsenic, Lead, and B(a)P-TE were found to be consistent with background. In Southern Parcel combined soil, Arsenic and Lead were the only chemicals evaluated, and both were found to be consistent with background.

I.12 Summary and Conclusions of All Background Evaluations

Table I-4 presents the results from the original and updated statistical analyses. **Table I-4** provides updated conclusions on whether the former ARMCO Hamilton site soil samples can be considered consistent with background soil samples. Based on these combined results, the following chemicals can be considered consistent with background and for which no further evaluation is necessary:

Chemicals Consistent with Background Surface Soil:

- AOC 1: Arsenic, Mercury, and B(a)P-TE
- AOC 2: Arsenic, Iron, Mercury and B(a)P-TE
- AOC 13: Arsenic, Iron, Lead, Vanadium, and B(a)P-TE
- AOC 18 and AOC 21: Arsenic, Iron, Mercury, and B(a)P-TE.
- AOC 19: Arsenic, Iron, Manganese, Mercury and B(a)P-TE
- AOC 22 (Riparian Area): Aluminum, Arsenic, Iron, Lead, Vanadium, and B(a)P-TE
- Block A: Arsenic, Mercury, B(a)P-TE
- Southern Parcel: Arsenic, Lead, and B(a)P-TE

Chemicals Consistent with Background Combined Soil:

- AOC 1: Arsenic and Lead
- AOC 2: Arsenic and Lead
- AOC 13: Arsenic and Lead
- AOC 18 and AOC 21: Arsenic and Lead
- AOC 19: Arsenic and Lead
- Block A: Arsenic and Lead
- Southern Parcel: Arsenic and Lead

I.13 References

United States Environmental Protection Agency (USEPA), 2007a. ProUCL Version 4.0 Technical Guide.

United States Environmental Protection Agency (USEPA), 2007b. ProUCL Software. Version 4.00.02.

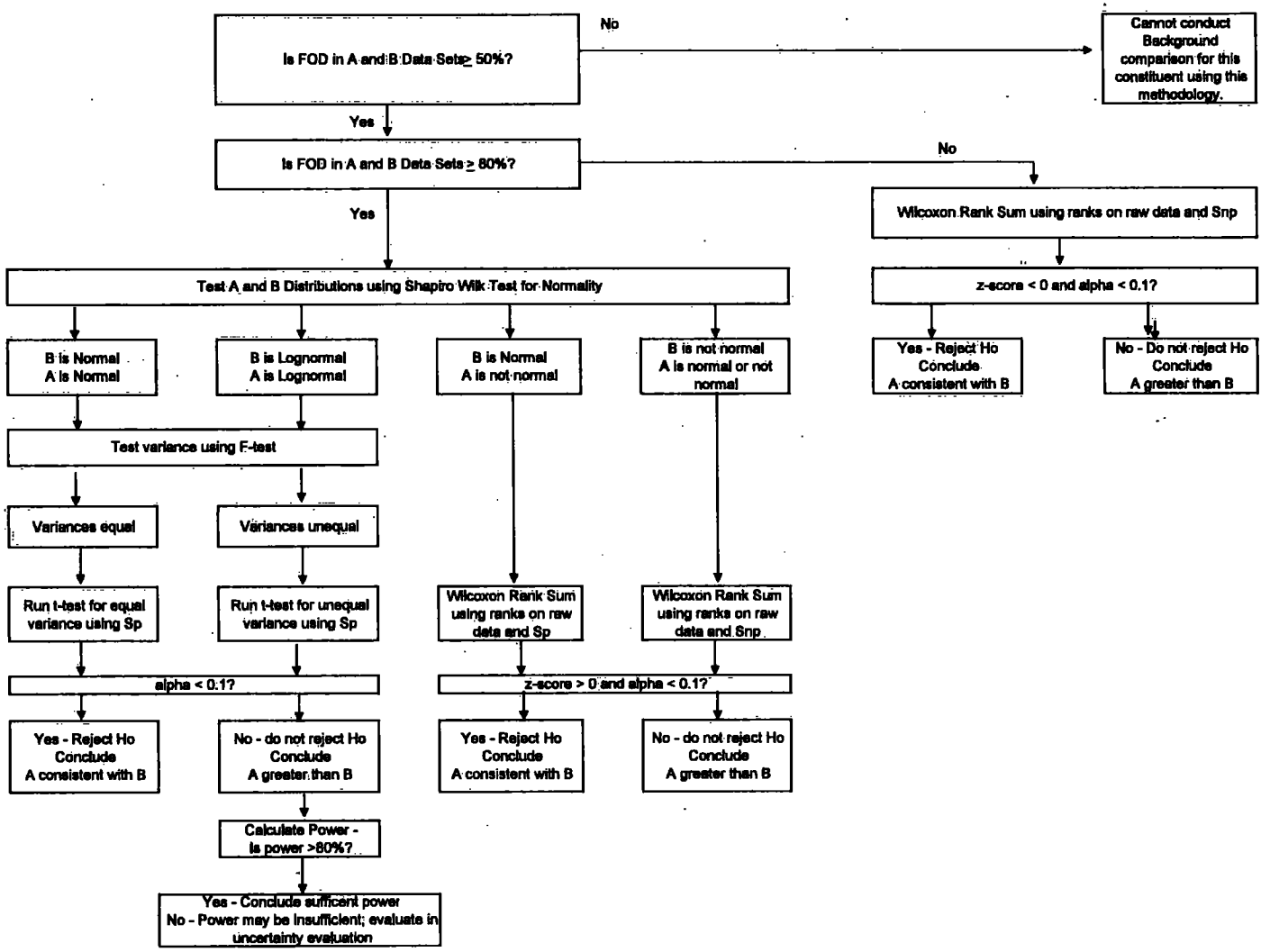
United States Environmental Protection Agency (USEPA). 2002a. Guidance for Comparing Background and Chemical Concentration sin Soil for CERCLA Sites. EPA 540-R-01-003. OSWER 9285.7-41. September 2002.

USEPA. 2002b. Transmittal of Policy Statement: "Role of Background in the CERCLA Cleanup Program" OSWER 9285.6-07P. Michael Cook, Director, Office of Emergency and Remedial Response. Signed May 1, 2002.

Stata Corporation, 2003. Stata Software for Statistics and Data Analysis.

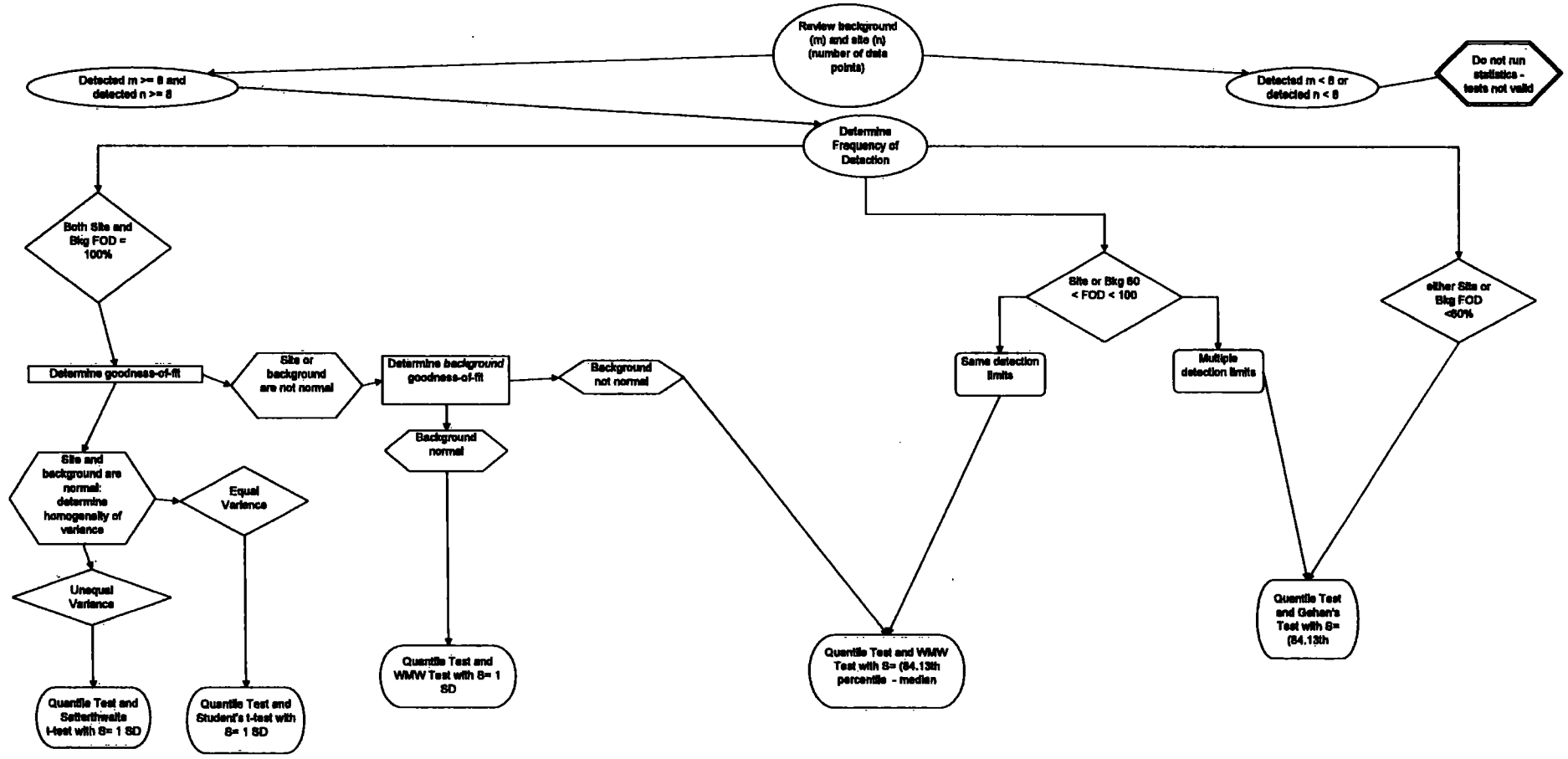
Figures

Figure I-1
Background Comparison Approach
Former ARMCO Hamilton Site



Notes:
FOD = Frequency of Detection = Number of Detects/Total number of Samples * 100%.
A = Area of Investigation
B = Background
Sp = Substantial Difference where Background data are at least 80% detected and normally distributed. Equal to the standard deviation of the background data set.
Snp = Substantial Difference where Background data are greater than 50% detected but less than 80% detected, and/or not normally distributed.
Equal to the difference between the 84.13th and 50th percentiles of the background data (equivalent to one standard deviation for a normal distribution).

Figure I-2 - Background Evaluation Hypothesis Test Selection Flow Chart



Notes:
n = Site sample size
m = Background sample size
SD - Standard Deviation.
WMW - Wilcoxon-Mann-Whitney.
FOD = Frequency of Detection.
Quantile Test uses Form 1
All other tests use Form 2

Tables

Table I-1a
Results of Surface Soil Statistical Analysis
Former ARMCO Hamilton Site
AOC1
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal distribution				Non-parametric Tests		Results	Is AOC1 consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_t]	power	Test for homogeneity of variance		t-test p-value [p_t]	power				
	AOC1	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Aluminum	N + LN	N + LN	sigma	Yes			**0.0802**	unequal	0.9577	0.6954							Do not reject Ho	No
Arsenic	N	LN	84.13%			Yes									**0.0000**	4.399	Reject Ho	Yes
Iron	N + LN	--	84.13%			Yes									**0.0323**	**-2.140**	Do not reject Ho	No
Manganese	N + LN	LN	84.13%		Yes						0.8990	equal	0.9995	0.9925			Do not reject Ho	No
Mercury	LN	--	84.13%			Yes									**0.0000**	4.437	Reject Ho	Yes
Vanadium	N	N + LN	sigma	Yes			0.4102	equal	0.4753	0.1121							Do not reject Ho	No
B(a)P TE	LN	LN	84.13%		Yes						**0.0184**	unequal	**0.0011**	0.9955			Reject Ho	Yes

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
S = One standard deviation (normal and log-normal distributions)
S = 84.13% (not normal distributions)
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table I-1b
Results of Surface Soil Statistical Analysis
Former ARMCO Hamilton Site
AOC18_21
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal distribution				Non-parametric Tests		Results	Is AOC18 & 21 consistent with Background?
				Parametric t-test		Non-parametric	Test for homogeneity of variance		t-test	power	Test for homogeneity of variance		t-test	power				
	AOC18 & 21	Background	S	Raw data	Log-trans. data	Wilcoxon rank sum test	F-test p-value	t-test used	p-value [p_t]		F-test p-value	t-test used	p-value [p_t]		p-value	z-score		
Aluminum	LN	N + LN	sigma		Yes						0.4083	equal	0.9593	0.7429			Do not reject Ho	No
Arsenic	N	LN	84.13%			Yes									**0.0000**	4.541	Reject Ho	Yes
Iron	N + LN	--	84.13%			Yes									**0.0005**	3.468	Reject Ho	Yes
Manganese	--	LN	84.13%			Yes									0.7412	**-0.330**	Do not reject Ho	No
Mercury	--	--	84.13%			Yes									**0.0000**	4.572	Reject Ho	Yes
Vanadium	N + LN	N + LN	sigma	Yes			0.1010	equal	0.5478	0.1264							Do not reject Ho	No
B(a)P TE	--	LN	84.13%			Yes									**0.0000**	4.144	Reject Ho	Yes

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
S = One standard deviation (normal and log-normal distributions)
S = 84.13% (not normal distributions)
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table I-1c
Results of Surface Soil Statistical Analysis
Former ARMCO Hamilton Site
AOC19
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal distribution				Non-parametric Tests		Results	Is AOC19 consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_t]	power	Test for homogeneity of variance		t-test p-value [p_t]	power				
	AOC19	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Aluminum	N + LN	N + LN	sigma	Yes			0.9597	equal	0.2912	0.2345							Do not reject Ho	No
Arsenic	--	LN	84.13%			Yes									**0.0005**	3.505	Reject Ho	Yes
Iron	N + LN	--	84.13%			Yes									**0.0002**	3.737	Reject Ho	Yes
Manganese	N + LN	LN	84.13%		Yes						0.4661	equal	**0.0035**	0.9496			Reject Ho	Yes
Mercury	LN	--	84.13%			Yes									**0.0136**	2.468	Reject Ho	Yes
Vanadium	N + LN	N + LN	sigma	Yes			0.5779	equal	0.5890	0.1468							Do not reject Ho	No
B(a)P TE	LN	LN	84.13%		Yes						0.1539	equal	**0.0012**	0.9759			Reject Ho	Yes

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
S = One standard deviation (normal and log-normal distributions)
S = 84.13% (not normal distributions)
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table I-1d
Results of Surface Soil Statistical Analysis
Former ARMCO Hamilton Site
AOC2
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal distribution				Non-parametric Tests		Results	Is AOC2 RA consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	AOC2 RA	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Aluminum	N + LN	N + LN	sigma	Yes			**0.0159**	unequal	0.8534	0.4279							Do not reject Ho	No
Arsenic	N + LN	LN	84.13%		Yes						**0.0332**	unequal	**0.0017**	0.9893			Reject Ho	Yes
Iron	--	--	84.13%			Yes									**0.0167**	2.394	Reject Ho	Yes
Manganese	N + LN	LN	84.13%		Yes						0.3747	equal	0.6451	0.1816			Do not reject Ho	No
Mercury	--	--	84.13%			Yes									**0.0001**	3.882	Reject Ho	Yes
Vanadium	N + LN	N + LN	sigma	Yes			0.2761	equal	0.1302	0.4436							Do not reject Ho	No
B(a)P TE	LN	LN	84.13%		Yes						0.8614	equal	**0.0064**	0.9309			Reject Ho	Yes

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
S = One standard deviation (normal and log-normal distributions)
S = 84.13% (not normal distributions)
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table I-1e
Results of Surface Soil Statistical Analysis
Former ARMCO Hamilton Site
Block A
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal distribution				Non-parametric Tests		Results	Is Block A consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_t]	power	Test for homogeneity of variance		t-test p-value [p_t]	power				
	Block A	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Aluminum	--	N + LN	sigma			Yes									**0.0007**	**-3.399**	Do not reject Ho	No
Arsenic	LN	LN	84.13%		Yes						0.4644	equal	**0.0000**	1.0000			Reject Ho	Yes
Iron	LN	--	84.13%			Yes									0.5506	0.597	Do not reject Ho	No
Manganese	N + LN	LN	84.13%		Yes						0.4176	equal	1.0000	1.0000			Do not reject Ho	No
Mercury	--	--	84.13%			Yes									**0.0000**	4.457	Reject Ho	Yes
Vanadium	LN	N + LN	sigma		Yes						0.5720	equal	0.1832	0.3685			Do not reject Ho	No
B(a)P TE	--	LN	84.13%			Yes									**0.0002**	3.763	Reject Ho	Yes

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
S = One standard deviation (normal and log-normal distributions)
S = 84.13% (not normal distributions)
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

TABLE I-2a
POPULATION COMPARISON - AOC 13, AOC 22 (RIPARIAN AREA) AND SOUTHERN PARCEL SURFACE SOIL v. BACKGROUND SURFACE SOIL
BACKGROUND EVALUATION
AK STEEL FORMER ARMCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

Constituent	Site			Background			Validity of Background Evaluation? (a)	Distribution (b)		Parametric or Non-Parametric Test (c)	DL Review (d)	Tests to Run (e)				Basis of S (f)	S	Test Results															Conclusion: Are Site Data Consistent with Background? (j)
																		Quantile Test Results (H_0: Site <= Bkg)	F-Test (h)		Satterthwaite or Student's t-Test (H_0: Site >= Bkg+S)				WMW Test Results (H_0: Site >= Bkg+S)				Gehan Test Results (H_0: Site >= Bkg+S)				
	Number of Detects	n	% FOD	Number of Detects	m	% FOD		Site	Background			Quantile Test	t-Test	WMW Test	Gehan Test			Reject H_0 and accept H_a: Site > Bkg)?	p-value (g)	t-Test Used	t-Test Value	Critical t	Reject H_0 and accept H_a: Site < Bkg + S)?	p-value (g)	Test U-Stat	Critical Value	Reject H_0 and accept H_a: Site < Bkg + S)?	Approximate p-value (i)	z Test Value	Critical z	Reject H_0 and accept H_a: Site < Bkg + S)?	p-value (g)	
AOC 13																																	
Aluminum	27	27	100	11	11	100	Run Tests	Not Normal	Normal	Non-Parametric		X		X		(84.13-50) th %	6116	No															
Arsenic	27	27	100	11	11	100	Run Tests	Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	32	No							101	79	No	6.82E-02					No
Iron	27	27	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	18101	No							0	79	Yes	9.81E-07					Yes
Lead	27	27	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	376	No							11	79	Yes	5.18E-06					Yes
Manganese	27	27	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	238	No							5	79	Yes	3.30E-06					Yes
Vanadium	27	27	100	11	11	100	Run Tests	Not Normal	Normal	Non-Parametric		X		X		(84.13-50) th %	10	No							99	79	No	5.74E-02					No
BAP-TE	25	27	93	9	10	90	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	4.4	No							67	79	Yes	4.36E-03					Yes
																														-2.186	-1.282	Yes	1.44E-02	Yes
AOC 22																																	
Aluminum	18	18	100	11	11	100	Run Tests	Not Normal	Normal	Non-Parametric		X		X		(84.13-50) th %	6116	No															
Arsenic	18	18	100	11	11	100	Run Tests	Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	32	No							38	70	Yes	3.27E-03					Yes
Iron	18	18	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	18101	No							0	70	Yes	4.77E-06					Yes
Lead	17	17	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	376	No							66	70	Yes	7.20E-02					Yes
Manganese	18	18	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	238	No							0	66	Yes	6.09E-06					Yes
Vanadium	18	18	100	11	11	100	Run Tests	Normal	Normal	Parametric		X	X			1 SD	7.0	No	4.67E-01	Pooled	-4.112	2.7E+308	Yes	0.00E+00	77	70	No	1.67E-01					No
BAP-TE	18	18	100	9	10	90	Run Tests	--	--	Non-Parametric	Equal	X		X		(84.13-50) th %	4.4	No															Yes
																									37	63	Yes	5.91E-03					Yes
Southern Parcel																																	
Aluminum	121	121	100	11	11	100	Run Tests	Not Normal	Normal	Non-Parametric		X		X		(84.13-50) th %	6116	Yes															
Arsenic	113	121	93	11	11	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	32	No															No
Iron	121	121	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	18101	Yes												-5.485	-1.282	Yes	2.06E-08	Yes
Lead	119	121	98	11	11	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	376	No															No
Manganese	121	121	100	11	11	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	238	Yes												-5.299	-1.282	Yes	6.84E-08	Yes
Vanadium	121	121	100	11	11	100	Run Tests	Not Normal	Normal	Non-Parametric		X		X		(84.13-50) th %	10	Yes															No
BAP-TE	112	119	94	9	10	90	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	4.4	NA (k)															No
																														-3.387	-1.282	Yes (l)	3.54E-04	Yes

Notes:
BAP-TE - Benzo(a)Pyrene Toxicity Equivalent.
DL - Detection Limit.
FOD - Frequency of Detection. Number of detected samples / Number of total samples.
H_a - Alternate Hypothesis.
H_0 = - Null Hypothesis.
m - Background sample size.
n - Site sample size.
NC - Not calculated.
S - Substantial Difference.
SD - Standard Deviation.
WMW - Wilcoxon-Mann-Whitney Test.
(a) Hypothesis tests were not calculated if either the site or background data sets have less than 8 detected results.
(b) Distribution determined by ProUCL Goodness of Fit Test Statistics. Distribution was only analyzed if both the Site and Background data sets have FODs of 100%.
(c) If both the site and background data sets are normally distributed, a parametric t-test can be calculated. Otherwise, a non-parametric test is used.
(d) The detection limits were reviewed to determine whether the data sets have equal or multiple detection limits. Detection Limits were only reviewed if the Site or Background data sets had a FOD less than 100% but greater than 60%.
(e) The hypothesis tests were selected depending on the FOD, distribution, and detection limits. See Figure I-2.
(f) If both background and site data are normally distributed and have FOD=100%, 1 standard deviation is used. If either site or background dataset has any nondetects or either dataset is not normal, the 84.13th - 50th percentile is used to approximate 1 standard deviation.
(g) The null hypothesis (Ho) was rejected when the calculated p-value was less than 0.1.
(h) The F-test tests for equality of the variances of the two data sets. If the variances are equal (p-value greater than 0.1), they are pooled together and a Student's t-test is used. If the variances are unequal (p-value less than 0.1), then the Satterthwaite's t-test is used.
(i) For the nonparametric WMW test, the p value is approximated. Therefore, the comparison of the calculated test statistic is compared to the test critical value to determine whether to reject the null hypothesis. If the U-statistic is less than the critical value, the null hypothesis is rejected.
(j) If the Quantile test rejects the null hypothesis and accepts the alternate hypothesis (H_a: Site > Bkg), then the Site data set is not consistent with Background. Otherwise, the results of the WMW or the Gehan tests are used. For either the WMW or the Gehan test, if the null hypothesis is accepted (H_0: Site >= Bkg + S), then the Site data set is not consistent with Background. If the WMW or Gehan test rejects the null hypothesis and accepts the alternate hypothesis (HA: Site < Bkg + S), then the Site data set is consistent with Background.
(k) Cannot complete the Quantile test; non-detect values in 'B' largest.
(l) The Gehan's test results shown are for all samples in Southern Parcel, including one sample with an elevated detection limitfor B(a)P-TE (AOC9SB4AA). For comparison, the Gehan's test was also run excluding this sample. Both scenarios resulted in the same conclusion; B(a)P-TE in Southern Parcel surface soil is consistent with background. The results of both Gehan's tests are included in Attachment I-2a and box plots for both data sets are included in Attachment I-4a.

TABLE I-2b
BACKGROUND EVALUATION - AOC 1, AOC 2, AOC18/21, AOC 19, BLOCK A, AOC 13 AND SOUTHERN PARCEL COMBINED SOIL v. BACKGROUND COMBINED SOIL
ADDENDUM TO STATISTICAL EVALUATION OF BACKGROUND SOIL
AK STEEL FORMER ARMCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

Constituent	Site			Background			Validity of Background Evaluation? (a)	Distribution (b)		Parametric or Non-Parametric Test (c)	DL Review (d)	Tests to Run (e)				Basis of S (f)	S	Test Results									Conclusion: Are Site Data Consistent with Background? (i)
																		Quantile Test Results (H_0: Site <= Bkg)	WMW Test Results (H_0: Site >= Bkg + S)				Gehan Test Results (H_0: Site >= Bkg + S)				
	Number of Detects	n	% FOD	Number of Detects	m	% FOD		Site	Bkg			Quantile Test	2 Sample t-Test	WMW Test	Gehan Test			Reject H_0 and accept H_A: Site > Bkg)?	Test U-Stat	Critical Value	Reject H_0 and accept H_A: Site < Bkg + S)?	Approximate p value (g)	z Test Value	Critical z	Reject H_0 and accept H_A: Site < Bkg + S)?	p-value (h)	
AOC 1																											
Arsenic	31	34	91	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	24	No					-6.091	-1.282	Yes	5.62E-10	Yes
Lead	33	34	97	20	20	100	Run Tests	--	--	Non-Parametric	Equal	X		X		(84.13-50) th %	160	No	(j)	(j)	(j)	(j)	-3.278	-1.282	Yes	5.22E-04	Yes
AOC 2																											
Arsenic	18	20	90	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	24	No					-5.41	-1.282	Yes	3.18E-08	Yes
Lead	20	20	100	20	20	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	160	No	17	152	Yes	3.97E-07					Yes
AOC 18 and 21																											
Arsenic	41	42	98	20	20	100	Run Tests	--	--	Non-Parametric	Equal	X		X		(84.13-50) th %	24	No	(j)	(j)	(j)	(j)	-6.325	-1.282	Yes	1.27E-10	Yes
Lead	38	42	90	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	160	No					-6.338	-1.282	Yes	1.17E-10	Yes
AOC 19																											
Arsenic	32	32	100	20	20	100	Run Tests	Not Normal	Not Normal	Non-Parametric		X		X		(84.13-50) th %	24	No	20	152	Yes	8.84E-09					Yes
Lead	26	32	81	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	160	No					-5.687	-1.282	Yes	6.47E-09	Yes
Block A																											
Arsenic	25	31	81	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	24	No					-5.986	-1.282	Yes	1.07E-09	Yes
Lead	29	31	94	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	160	No					-5.994	-1.282	Yes	1.02E-09	Yes
AOC 13																											
Arsenic	78	79	99	20	20	100	Run Tests	--	--	Non-Parametric	Equal	X		X		(84.13-50) th %	24	No	(j)	(j)	(j)	(j)	-6.754	-1.282	Yes	7.19E-12	Yes
Lead	61	79	77	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	160	No					-6.297	-1.282	Yes	1.52E-10	Yes
Southern Parcel																											
Arsenic	227	240	95	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	24	No					-7.281	-1.282	Yes	1.66E-13	Yes
Lead	228	240	95	20	20	100	Run Tests	--	--	Non-Parametric	Multiple	X			X	(84.13-50) th %	160	No					-6.584	-1.282	Yes	2.29E-11	Yes

Notes:
BAP-TE - Benzo(a)Pyrene Toxicity Equivalent.
DL - Detection Limit.
FOD - Frequncy of Detection. Number of detected samples / Number of total samples.
H_A - Alternate Hypothesis.
H_0 = - Null Hypothesis.
m - Background sample size.
n - Site sample size.
NC - Not calculated.
S - Substantial Difference.
SD - Standard Deviation
WMW - Wilcoxon-Mann-Whitney Test.
(a) Hypothesis tests were not calculated if either the site or background data sets have less than 8 detected results.
(b) Distribution determined by ProUCL Goodness of Fit Test Statistics. Distribution was only analyzed if both the Site and Background data sets have FODs of 100%.
(c) If both the site and background data sets are normally distributed, a parametric t-test can be calculated. Otherwise, a non-parametric test is used.
(d) The detection limits were reviewed to determine whether the data sets have equal or multiple detection limits. Detection Limits were only reviewed if the Site or Background data sets had a FOD less than 100% but greater than 60%.
(e) The hypothesis tests were selected depending on the FOD, distribution, and detection limits. See Figure 1.
(f) If both background and site data are normally distributed and have FOD=100%, 1 standard deviation is used. If either site or background dataset has any nondetects or either dataset is not normal, the 84.13th - 50th percentile is used to approximate 1 SD.
(g) For the nonparametric WMW test, the p value is approximated. For the nonparametric WMW test, the p value is approximated. Therefore, the comparison of the calculated test statistic is compared to the test critical value to determine whether to reject the null hypothesis. If the U-statistic is less than the critical value, the null hypothesis is rejected.
(h) The null hypothesis (Ho) was rejected when the calculated p-value was less than 0.1.
(i) If the Quantile test rejects the null hypothesis and accepts the alternate hypothesis (H_A: Site > Bkg), then the Site data set is not consistent with Background. Otherwise, the results of the WMW or the Gehan tests are used. For either the WMW or the Gehan test, if the null hypothesis is accepted (H_0: Site >= Bkg + S), then the Site data set is not consistent with Background. If the WMW or Gehan test rejects the null hypothesis and accepts the alternate hypothesis (HA: Site < Bkg + S), then the Site data set is consistent with Background.
(j) ProUCL does not give a result for the WMW test if background dataset contains all detected results and the site dataset has NDs; results for Gehan's Test shown.

TABLE I-3
SUMMARY OF RESULTS OF UPDATED BACKGROUND EVALUATIONS (ADDENDUM)
ADDENDUM TO STATISTICAL EVALUATION OF BACKGROUND SOIL
AK STEEL FORMER ARMCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

Constituent	Site Data Are Consistent with Background (a)?															
	AOC 1		AOC 2		AOC 18 and AOC 21		AOC 19		Block A		AOC 13		AOC 22 (Riparian Area)		Southern Parcel	
	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	No	NA	Yes	NC	No	NA
Arsenic	NA	Yes	NA	Yes	NA	Yes	NA	Yes	NA	Yes	Yes	Yes	Yes	NC	Yes	Yes
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Yes	NA	Yes	NC	No	NA
Lead	NA	Yes	NA	Yes	NA	Yes	NA	Yes	NA	Yes	Yes	Yes	Yes	NC	Yes	Yes
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	No	NA	No	NC	No	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Yes	NA	Yes	NC	No	NA
BAP-TE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Yes	NA	Yes	NC	Yes	NA

Notes:
BAP-TE - Benzo(a)Pyrene Toxicity Equivalent.
(a) The background evaluation was conducted using ProUCL 4.00.02 (USEPA, 2007) and Stata (Stata Corporation, 2003). For details of statistical analysis, see Table I-2a (surface soil) and Table I-2b (combined soil).
NA - Not applicable. Constituents were not included in the background evaluation in the specified human health exposure area and media.
NC - Not calculated. All soil samples in AOC 22 (Riparian Area) are surface soil.

TABLE I-4
SUMMARY OF RESULTS OF BACKGROUND EVALUATIONS (ORIGINAL AND ADDENDUM)
STATISTICAL EVALUATION OF BACKGROUND SOIL
AK STEEL FORMER ARMCO HAMILTON PLANT
NEW MIAMI, BUTLER COUNTY, OHIO
BASELINE HUMAN HEALTH RISK ASSESSMENT

Constituent	Site Data Are Consistent with Background?															
	AOC 1 (b)		AOC 2 (b)		AOC 18 and AOC 21 (b)		AOC 19 (b)		Block A (b)		AOC 13 (a)		AOC 22 (Riparian Area) (a)		Southern Parcel (a)	
	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil	Surface Soil (0-2)	Combined Soil
Aluminum	No	NA	No	NA	No	NA	No	NA	No	NA	No	NA	Yes	NC	No	NA
Arsenic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NC	Yes	Yes
Iron	No	NA	Yes	NA	Yes	NA	Yes	NA	No	NA	Yes	NA	Yes	NC	No	NA
Lead	NA	Yes	NA	Yes	NA	Yes	NA	Yes	NA	Yes	Yes	Yes	Yes	NC	Yes	Yes
Manganese	No	NA	No	NA	No	NA	Yes	NA	No	NA	No	NA	No	NC	No	NA
Mercury	Yes	NA	Yes	NA	Yes	NA	Yes	NA	Yes	NA	NA	NA	NA	NA	NA	NA
Vanadium	No	NA	No	NA	No	NA	No	NA	No	NA	Yes	NA	Yes	NC	No	NA
BAP-TE	Yes	NA	Yes	NA	Yes	NA	Yes	NA	Yes	NA	Yes	NA	Yes	NC	Yes	NA

Notes:
BAP-TE - Benzo(a)Pyrene Toxicity Equivalent.
(a) Results from the Addendum to the Background Evaluation of Soil. The background evaluation was conducted using ProUCL 4.00.02 (USEPA, 2007) and Stata (Stata Corporation, 2003). For details of statistical analysis, see Table I-2a (surface soil) and Table I-2b (combined soil).
(b) Results for surface soil are from the original Background Evaluation of Soil. See Tables I-1a through I-1e for results. Results for combined soil are from the Addendum to the Background Evaluation of Soil. The results are provided in Table I-2b. The updated background evaluation was conducted using ProUCL 4.00.02 (USEPA, 2007) and Stata (Stata Corporation, 2003).
NA - Not applicable. Constituents were not included in the background evaluation in the specified human health exposure area and media.
NC - Not calculated. All soil samples in AOC 22 (Riparian Area) are surface soil.

Attachment I-1a:

ProUCL Goodness-of-Fit Statistics (Surface Soil)

Goodness-of-Fit Test Statistics for Full Data Sets without Non-Detects

User Selected Options

From File	J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\Background Evaluation\ProUCL
Full Precision	OFF
Confidence Coefficient	0.9

Aluminum (aoc 13)

Raw Statistics

Number of Valid Observations	27
Number of Distinct Observations	25
Minimum	4920
Maximum	36100
Mean of Raw Data	12181
Standard Deviation of Raw Data	6901
Kstar	3.488
Mean of Log Transformed Data	9.274
Standard Deviation of Log Transformed Data	0.519

Normal Distribution Test Results

Correlation Coefficient R	0.914
Shapiro Wilk Test Statistic	0.846
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.153
Lilliefors Critical (0.9) Value	0.155

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.969
A-D Test Statistic	0.597
A-D Critical (0.9) Value	0.63
K-S Test Statistic	0.142
K-S Critical(0.9) Value	0.155

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.977
Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.145
Lilliefors Critical (0.9) Value	0.155

Data appear Lognormal at (0.1) Significance Level

Aluminum (aoc 22)

Raw Statistics

Number of Valid Observations	18
Number of Distinct Observations	18
Minimum	3020
Maximum	19200
Mean of Raw Data	9541
Standard Deviation of Raw Data	4354
Kstar	4.544
Mean of Log Transformed Data	9.068
Standard Deviation of Log Transformed Data	0.454

Normal Distribution Test Results

Correlation Coefficient R	0.947
Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.174
Lilliefors Critical (0.9) Value	0.19

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.977
A-D Test Statistic	0.48
A-D Critical (0.9) Value	0.626
K-S Test Statistic	0.126
K-S Critical(0.9) Value	0.188

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.973
Shapiro Wilk Test Statistic	0.953
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.135
Lilliefors Critical (0.9) Value	0.19

Data appear Lognormal at (0.1) Significance Level

Aluminum (background)

Raw Statistics

Number of Valid Observations	11
Number of Distinct Observations	11
Minimum	3910
Maximum	17400
Mean of Raw Data	8493
Standard Deviation of Raw Data	4233
Kstar	3.602
Mean of Log Transformed Data	8.941

Standard Deviation of Log Transformed Data 0.48

Normal Distribution Test Results

Correlation Coefficient R 0.946
Shapiro Wilk Test Statistic 0.891
Shapiro Wilk Critical (0.9) Value 0.876
Lilliefors Test Statistic 0.218
Lilliefors Critical (0.9) Value 0.243

Data appear Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.981
A-D Test Statistic 0.345
A-D Critical (0.9) Value 0.619
K-S Test Statistic 0.169
K-S Critical(0.9) Value 0.236

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.98
Shapiro Wilk Test Statistic 0.949
Shapiro Wilk Critical (0.9) Value 0.876
Lilliefors Test Statistic 0.138
Lilliefors Critical (0.9) Value 0.243

Data appear Lognormal at (0.1) Significance Level

Aluminum (s. exposure area rev)

Raw Statistics

Number of Valid Observations 121
Number of Missing Values 21
Number of Distinct Observations 106
Minimum 4260
Maximum 90200
Mean of Raw Data 19217
Standard Deviation of Raw Data 11216
Kstar 3.278
Mean of Log Transformed Data 9.707
Standard Deviation of Log Transformed Data 0.579

Normal Distribution Test Results

Correlation Coefficient R 0.912
Lilliefors Test Statistic 0.105
Lilliefors Critical (0.9) Value 0.0732

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.954
A-D Test Statistic	0.665
A-D Critical (0.9) Value	0.636
K-S Test Statistic	0.0732
K-S Critical(0.9) Value	0.0776

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.984
Lilliefors Test Statistic	0.0837
Lilliefors Critical (0.9) Value	0.0732

Data not Lognormal at (0.1) Significance Level

Arsenic (aoc 13)

Raw Statistics

Number of Valid Observations	27
Number of Distinct Observations	26
Minimum	0.178
Maximum	14.8
Mean of Raw Data	7.238
Standard Deviation of Raw Data	2.975
Kstar	2.973
Mean of Log Transformed Data	1.821
Standard Deviation of Log Transformed Data	0.788

Normal Distribution Test Results

Correlation Coefficient R	0.978
Shapiro Wilk Test Statistic	0.971
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.127
Lilliefors Critical (0.9) Value	0.155

Data appear Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.972
A-D Test Statistic	1.334
A-D Critical (0.9) Value	0.631
K-S Test Statistic	0.217
K-S Critical(0.9) Value	0.155

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.762
Shapiro Wilk Test Statistic 0.616
Shapiro Wilk Critical (0.9) Value 0.935
Lilliefors Test Statistic 0.288
Lilliefors Critical (0.9) Value 0.155

Data not Lognormal at (0.1) Significance Level

Arsenic (aoc 22)

Raw Statistics

Number of Valid Observations 18
Number of Distinct Observations 18
Minimum 3.26
Maximum 14.3
Mean of Raw Data 8.049
Standard Deviation of Raw Data 3.454
Kstar 4.889
Mean of Log Transformed Data 1.997
Standard Deviation of Log Transformed Data 0.436

Normal Distribution Test Results

Correlation Coefficient R 0.958
Shapiro Wilk Test Statistic 0.905
Shapiro Wilk Critical (0.9) Value 0.914
Lilliefors Test Statistic 0.234
Lilliefors Critical (0.9) Value 0.19

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.967
A-D Test Statistic 0.577
A-D Critical (0.9) Value 0.626
K-S Test Statistic 0.201
K-S Critical(0.9) Value 0.187

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.977
Shapiro Wilk Test Statistic 0.943
Shapiro Wilk Critical (0.9) Value 0.914
Lilliefors Test Statistic 0.176
Lilliefors Critical (0.9) Value 0.19

Data appear Lognormal at (0.1) Significance Level

Arsenic (background)

Raw Statistics

Number of Valid Observations	11
Number of Distinct Observations	11
Minimum	5.9
Maximum	68.5
Mean of Raw Data	19.78
Standard Deviation of Raw Data	19.63
Kstar	1.238
Mean of Log Transformed Data	2.645
Standard Deviation of Log Transformed Data	0.808

Normal Distribution Test Results

Correlation Coefficient R	0.849
Shapiro Wilk Test Statistic	0.729
Shapiro Wilk Critical (0.9) Value	0.876
Lilliefors Test Statistic	0.327
Lilliefors Critical (0.9) Value	0.243

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.968
A-D Test Statistic	0.796
A-D Critical (0.9) Value	0.627
K-S Test Statistic	0.26
K-S Critical(0.9) Value	0.238

Data follow Appr. Gamma Distribution at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.949
Shapiro Wilk Test Statistic	0.891
Shapiro Wilk Critical (0.9) Value	0.876
Lilliefors Test Statistic	0.203
Lilliefors Critical (0.9) Value	0.243

Data appear Lognormal at (0.1) Significance Level

Arsenic (s. exposure area rev)

Raw Statistics

Number of Valid Observations	121
Number of Missing Values	21
Number of Distinct Observations	86
Minimum	0.474
Maximum	33.6
Mean of Raw Data	8.779
Standard Deviation of Raw Data	6.17

Kstar	1.931
Mean of Log Transformed Data	1.898
Standard Deviation of Log Transformed Data	0.831

Normal Distribution Test Results

Correlation Coefficient R	0.924
Lilliefors Test Statistic	0.156
Lilliefors Critical (0.9) Value	0.0732

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.977
A-D Test Statistic	2.075
A-D Critical (0.9) Value	0.642
K-S Test Statistic	0.104
K-S Critical(0.9) Value	0.0781

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.957
Lilliefors Test Statistic	0.146
Lilliefors Critical (0.9) Value	0.0732

Data not Lognormal at (0.1) Significance Level

Iron (aoc 13)

Raw Statistics

Number of Valid Observations	27
Number of Distinct Observations	25
Minimum	2200
Maximum	185000
Mean of Raw Data	22602
Standard Deviation of Raw Data	33010
Kstar	1.544
Mean of Log Transformed Data	9.706
Standard Deviation of Log Transformed Data	0.685

Normal Distribution Test Results

Correlation Coefficient R	0.563
Shapiro Wilk Test Statistic	0.353
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.381
Lilliefors Critical (0.9) Value	0.155

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.721
A-D Test Statistic	3.156
A-D Critical (0.9) Value	0.639
K-S Test Statistic	0.248
K-S Critical(0.9) Value	0.157

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.857
Shapiro Wilk Test Statistic	0.783
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.216
Lilliefors Critical (0.9) Value	0.155

Data not Lognormal at (0.1) Significance Level

Iron (aoc 22)

Raw Statistics

Number of Valid Observations	18
Number of Distinct Observations	18
Minimum	8940
Maximum	69200
Mean of Raw Data	31036
Standard Deviation of Raw Data	19544
Kstar	2.28
Mean of Log Transformed Data	10.15
Standard Deviation of Log Transformed Data	0.657

Normal Distribution Test Results

Correlation Coefficient R	0.953
Shapiro Wilk Test Statistic	0.892
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.216
Lilliefors Critical (0.9) Value	0.19

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.976
A-D Test Statistic	0.505
A-D Critical (0.9) Value	0.631
K-S Test Statistic	0.18
K-S Critical(0.9) Value	0.189

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.979
Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.147
Lilliefors Critical (0.9) Value	0.19

Data appear Lognormal at (0.1) Significance Level

Iron (background)

Raw Statistics

Number of Valid Observations	11
Number of Distinct Observations	11
Minimum	13600
Maximum	132000
Mean of Raw Data	28309
Standard Deviation of Raw Data	34564
Kstar	1.42
Mean of Log Transformed Data	9.96
Standard Deviation of Log Transformed Data	0.635

Normal Distribution Test Results

Correlation Coefficient R	0.635
Shapiro Wilk Test Statistic	0.436
Shapiro Wilk Critical (0.9) Value	0.876
Lilliefors Test Statistic	0.444
Lilliefors Critical (0.9) Value	0.243

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.799
A-D Test Statistic	2.211
A-D Critical (0.9) Value	0.626
K-S Test Statistic	0.37
K-S Critical(0.9) Value	0.238

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.77
Shapiro Wilk Test Statistic	0.622
Shapiro Wilk Critical (0.9) Value	0.876
Lilliefors Test Statistic	0.3
Lilliefors Critical (0.9) Value	0.243

Data not Lognormal at (0.1) Significance Level

Iron (a. exposure area rev)

Raw Statistics

Number of Valid Observations	121
Number of Missing Values	21
Number of Distinct Observations	110
Minimum	4805
Maximum	170000
Mean of Raw Data	45797
Standard Deviation of Raw Data	39323
Kstar	1.542
Mean of Log Transformed Data	10.38
Standard Deviation of Log Transformed Data	0.852

Normal Distribution Test Results

Correlation Coefficient R	0.914
Lilliefors Test Statistic	0.204
Lilliefors Critical (0.9) Value	0.0732

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.985
A-D Test Statistic	2.368
A-D Critical (0.9) Value	0.645
K-S Test Statistic	0.143
K-S Critical(0.9) Value	0.0784

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.988
Lilliefors Test Statistic	0.1
Lilliefors Critical (0.9) Value	0.0732

Data not Lognormal at (0.1) Significance Level

Lead (aoc 13)

Raw Statistics

Number of Valid Observations	27
Number of Distinct Observations	26
Minimum	1.53
Maximum	464
Mean of Raw Data	53.95
Standard Deviation of Raw Data	105.3
Kstar	0.694
Mean of Log Transformed Data	3.193
Standard Deviation of Log Transformed Data	1.11

Normal Distribution Test Results

Correlation Coefficient R 0.654
Shapiro Wilk Test Statistic 0.449
Shapiro Wilk Critical (0.9) Value 0.935
Lilliefors Test Statistic 0.393
Lilliefors Critical (0.9) Value 0.155

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.886
A-D Test Statistic 3.1
A-D Critical (0.9) Value 0.656
K-S Test Statistic 0.295
K-S Critical(0.9) Value 0.16

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.923
Shapiro Wilk Test Statistic 0.874
Shapiro Wilk Critical (0.9) Value 0.935
Lilliefors Test Statistic 0.186
Lilliefors Critical (0.9) Value 0.155

Data not Lognormal at (0.1) Significance Level

Lead (soc 22)

Raw Statistics

Number of Valid Observations 17
Number of Missing Values 1
Number of Distinct Observations 17
Minimum 10.2
Maximum 341
Mean of Raw Data 107.1
Standard Deviation of Raw Data 109.4
Kstar 1.026
Mean of Log Transformed Data 4.202
Standard Deviation of Log Transformed Data 1.019

Normal Distribution Test Results

Correlation Coefficient R 0.881
Shapiro Wilk Test Statistic 0.769
Shapiro Wilk Critical (0.9) Value 0.91
Lilliefors Test Statistic 0.279
Lilliefors Critical (0.9) Value 0.195

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.959
A-D Test Statistic	0.559
A-D Critical (0.9) Value	0.641
K-S Test Statistic	0.169
K-S Critical(0.9) Value	0.197

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.984
Shapiro Wilk Test Statistic	0.96
Shapiro Wilk Critical (0.9) Value	0.91
Lilliefors Test Statistic	0.111
Lilliefors Critical (0.9) Value	0.195

Data appear Lognormal at (0.1) Significance Level

Lead (background)

Raw Statistics

Number of Valid Observations	11
Number of Distinct Observations	11
Minimum	13.25
Maximum	2230
Mean of Raw Data	257.3
Standard Deviation of Raw Data	657.2
Kstar	0.375
Mean of Log Transformed Data	4.047
Standard Deviation of Log Transformed Data	1.499

Normal Distribution Test Results

Correlation Coefficient R	0.62
Shapiro Wilk Test Statistic	0.415
Shapiro Wilk Critical (0.9) Value	0.876
Lilliefors Test Statistic	0.427
Lilliefors Critical (0.9) Value	0.243

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.899
A-D Test Statistic	1.535
A-D Critical (0.9) Value	0.664
K-S Test Statistic	0.334
K-S Critical(0.9) Value	0.248

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.921
Shapiro Wilk Test Statistic	0.857
Shapiro Wilk Critical (0.9) Value	0.876
Lilliefors Test Statistic	0.19
Lilliefors Critical (0.9) Value	0.243

Data not Lognormal at (0.1) Significance Level

Lead (s. exposure area rev)

Raw Statistics

Number of Valid Observations	121
Number of Missing Values	21
Number of Distinct Observations	114
Minimum	1.86
Maximum	1330
Mean of Raw Data	75.92
Standard Deviation of Raw Data	143.4
Kstar	0.732
Mean of Log Transformed Data	3.525
Standard Deviation of Log Transformed Data	1.23

Normal Distribution Test Results

Correlation Coefficient R	0.663
Lilliefors Test Statistic	0.303
Lilliefors Critical (0.9) Value	0.0732

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.883
A-D Test Statistic	4.056
A-D Critical (0.9) Value	0.664
K-S Test Statistic	0.16
K-S Critical(0.9) Value	0.08

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.992
Lilliefors Test Statistic	0.101
Lilliefors Critical (0.9) Value	0.0732

Data not Lognormal at (0.1) Significance Level

Manganese (aoc 13)

Raw Statistics

Number of Valid Observations	27
Number of Distinct Observations	27
Minimum	318
Maximum	4200
Mean of Raw Data	991.6
Standard Deviation of Raw Data	871.5
Kstar	1.821
Mean of Log Transformed Data	6.632
Standard Deviation of Log Transformed Data	0.703

Normal Distribution Test Results

Correlation Coefficient R	0.849
Shapiro Wilk Test Statistic	0.734
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.258
Lilliefors Critical (0.9) Value	0.155

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.959
A-D Test Statistic	1.165
A-D Critical (0.9) Value	0.636
K-S Test Statistic	0.179
K-S Critical(0.9) Value	0.156

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.962
Shapiro Wilk Test Statistic	0.917
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.133
Lilliefors Critical (0.9) Value	0.155

Data not Lognormal at (0.1) Significance Level

Manganese (aoc 22)

Raw Statistics

Number of Valid Observations	18
Number of Distinct Observations	18
Minimum	236
Maximum	3180
Mean of Raw Data	1118
Standard Deviation of Raw Data	908.1
Kstar	1.719

Mean of Log Transformed Data 6.751
Standard Deviation of Log Transformed Data 0.737

Normal Distribution Test Results

Correlation Coefficient R 0.894
Shapiro Wilk Test Statistic 0.794
Shapiro Wilk Critical (0.9) Value 0.914
Lilliefors Test Statistic 0.233
Lilliefors Critical (0.9) Value 0.19

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.967
A-D Test Statistic 0.611
A-D Critical (0.9) Value 0.634
K-S Test Statistic 0.137
K-S Critical(0.9) Value 0.189

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.982
Shapiro Wilk Test Statistic 0.956
Shapiro Wilk Critical (0.9) Value 0.914
Lilliefors Test Statistic 0.0972
Lilliefors Critical (0.9) Value 0.19

Data appear Lognormal at (0.1) Significance Level

Manganese (background)

Raw Statistics

Number of Valid Observations 11
Number of Distinct Observations 11
Minimum 278
Maximum 2270
Mean of Raw Data 833.2
Standard Deviation of Raw Data 519.6
Kstar 2.904
Mean of Log Transformed Data 6.592
Standard Deviation of Log Transformed Data 0.523

Normal Distribution Test Results

Correlation Coefficient R 0.834
Shapiro Wilk Test Statistic 0.728
Shapiro Wilk Critical (0.9) Value 0.876
Lilliefors Test Statistic 0.335

Lilliefors Critical (0.9) Value 0.243

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.9

A-D Test Statistic 0.607

A-D Critical (0.9) Value 0.62

K-S Test Statistic 0.258

K-S Critical(0.9) Value 0.236

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.946

Shapiro Wilk Test Statistic 0.924

Shapiro Wilk Critical (0.9) Value 0.876

Lilliefors Test Statistic 0.23

Lilliefors Critical (0.9) Value 0.243

Data appear Lognormal at (0.1) Significance Level

Manganese (s. exposure area rev)

Raw Statistics

Number of Valid Observations 121

Number of Missing Values 21

Number of Distinct Observations 116

Minimum 337

Maximum 20700

Mean of Raw Data 3031

Standard Deviation of Raw Data 2976

Kstar 1.431

Mean of Log Transformed Data 7.637

Standard Deviation of Log Transformed Data 0.905

Normal Distribution Test Results

Correlation Coefficient R 0.832

Lilliefors Test Statistic 0.183

Lilliefors Critical (0.9) Value 0.0732

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.936

A-D Test Statistic 1.375

A-D Critical (0.9) Value 0.646

K-S Test Statistic 0.091

K-S Critical(0.9) Value 0.0785

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.983
Lilliefors Test Statistic	0.105
Lilliefors Critical (0.9) Value	0.0732

Data not Lognormal at (0.1) Significance Level

Vanadium (aoc 13)

Raw Statistics

Number of Valid Observations	27
Number of Distinct Observations	27
Minimum	5.24
Maximum	45
Mean of Raw Data	22.36
Standard Deviation of Raw Data	10.25
Kstar	4.394
Mean of Log Transformed Data	3.002
Standard Deviation of Log Transformed Data	0.484

Normal Distribution Test Results

Correlation Coefficient R	0.964
Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.18
Lilliefors Critical (0.9) Value	0.155

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.984
A-D Test Statistic	0.428
A-D Critical (0.9) Value	0.629
K-S Test Statistic	0.136
K-S Critical(0.9) Value	0.155

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.975
Shapiro Wilk Test Statistic	0.955
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.124
Lilliefors Critical (0.9) Value	0.155

Data appear Lognormal at (0.1) Significance Level

Vanadium (soc 22)

Raw Statistics

Number of Valid Observations	18
Number of Distinct Observations	18
Minimum	7.55
Maximum	30.5
Mean of Raw Data	16.68
Standard Deviation of Raw Data	6.958
Kstar	5.212
Mean of Log Transformed Data	2.732
Standard Deviation of Log Transformed Data	0.422

Normal Distribution Test Results

Correlation Coefficient R	0.972
Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.167
Lilliefors Critical (0.9) Value	0.19

Data appear Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.987
A-D Test Statistic	0.267
A-D Critical (0.9) Value	0.626
K-S Test Statistic	0.117
K-S Critical(0.9) Value	0.187

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.988
Shapiro Wilk Test Statistic	0.964
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.1
Lilliefors Critical (0.9) Value	0.19

Data appear Lognormal at (0.1) Significance Level

Vanadium (background)

Raw Statistics

Number of Valid Observations	11
Number of Distinct Observations	11
Minimum	10.7
Maximum	35
Mean of Raw Data	21.54
Standard Deviation of Raw Data	8.431

Kstar 4.932
Mean of Log Transformed Data 2.993
Standard Deviation of Log Transformed Data 0.421

Normal Distribution Test Results

Correlation Coefficient R 0.979
Shapiro Wilk Test Statistic 0.938
Shapiro Wilk Critical (0.9) Value 0.876
Lilliefors Test Statistic 0.139
Lilliefors Critical (0.9) Value 0.243

Data appear Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.974
A-D Test Statistic 0.336
A-D Critical (0.9) Value 0.619
K-S Test Statistic 0.16
K-S Critical(0.9) Value 0.235

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.972
Shapiro Wilk Test Statistic 0.923
Shapiro Wilk Critical (0.9) Value 0.876
Lilliefors Test Statistic 0.151
Lilliefors Critical (0.9) Value 0.243

Data appear Lognormal at (0.1) Significance Level

Vanadium (s. exposure area rev)

Raw Statistics

Number of Valid Observations 121
Number of Missing Values 21
Number of Distinct Observations 107
Minimum 8.4
Maximum 485
Mean of Raw Data 33.23
Standard Deviation of Raw Data 45.32
Kstar 2.264
Mean of Log Transformed Data 3.272
Standard Deviation of Log Transformed Data 0.565

Normal Distribution Test Results

Correlation Coefficient R 0.547
Lilliefors Test Statistic 0.3

Lilliefors Critical (0.9) Value 0.0732

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.68

A-D Test Statistic 5.069

A-D Critical (0.9) Value 0.641

K-S Test Statistic 0.142

K-S Critical(0.9) Value 0.078

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.956

Lilliefors Test Statistic 0.0734

Lilliefors Critical (0.9) Value 0.0732

Data not Lognormal at (0.1) Significance Level

BAP-TE (aoc 13)

Raw Statistics

Number of Valid Observations 27

Number of Distinct Observations 27

Minimum 0.251

Maximum 59.68

Mean of Raw Data 6.521

Standard Deviation of Raw Data 13.59

Kstar 0.406

Mean of Log Transformed Data 0.36

Standard Deviation of Log Transformed Data 1.641

Normal Distribution Test Results

Correlation Coefficient R 0.716

Shapiro Wilk Test Statistic 0.532

Shapiro Wilk Critical (0.9) Value 0.935

Lilliefors Test Statistic 0.359

Lilliefors Critical (0.9) Value 0.155

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.974

A-D Test Statistic 2.773

A-D Critical (0.9) Value 0.685

K-S Test Statistic 0.292

K-S Critical(0.9) Value 0.164

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.932
Shapiro Wilk Test Statistic	0.856
Shapiro Wilk Critical (0.9) Value	0.935
Lilliefors Test Statistic	0.203
Lilliefors Critical (0.9) Value	0.155

Data not Lognormal at (0.1) Significance Level

BAP-TE (soc 22)

Raw Statistics

Number of Valid Observations	18
Number of Distinct Observations	18
Minimum	0.453
Maximum	52.79
Mean of Raw Data	8.775
Standard Deviation of Raw Data	17.07
Kstar	0.405
Mean of Log Transformed Data	0.705
Standard Deviation of Log Transformed Data	1.58

Normal Distribution Test Results

Correlation Coefficient R	0.728
Shapiro Wilk Test Statistic	0.535
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.418
Lilliefors Critical (0.9) Value	0.19

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.928
A-D Test Statistic	2.487
A-D Critical (0.9) Value	0.676
K-S Test Statistic	0.332
K-S Critical(0.9) Value	0.198

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.902
Shapiro Wilk Test Statistic	0.802
Shapiro Wilk Critical (0.9) Value	0.914
Lilliefors Test Statistic	0.225
Lilliefors Critical (0.9) Value	0.19

Data not Lognormal at (0.1) Significance Level

BAP-TE (background)

Raw Statistics

Number of Valid Observations	10
Number of Missing Values	1
Number of Distinct Observations	10
Minimum	0.238
Maximum	10.43
Mean of Raw Data	2.293
Standard Deviation of Raw Data	3.127
Kstar	0.677
Mean of Log Transformed Data	0.157
Standard Deviation of Log Transformed Data	1.204

Normal Distribution Test Results

Correlation Coefficient R	0.813
Shapiro Wilk Test Statistic	0.68
Shapiro Wilk Critical (0.9) Value	0.869
Lilliefors Test Statistic	0.316
Lilliefors Critical (0.9) Value	0.255

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.968
A-D Test Statistic	0.469
A-D Critical (0.9) Value	0.635
K-S Test Statistic	0.227
K-S Critical(0.9) Value	0.252

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.983
Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical (0.9) Value	0.869
Lilliefors Test Statistic	0.147
Lilliefors Critical (0.9) Value	0.255

Data appear Lognormal at (0.1) Significance Level

BAP-TE (s. exposure area rev)

Raw Statistics

Number of Valid Observations	119
Number of Missing Values	23
Number of Distinct Observations	116
Minimum	0.182

Maximum	90.13
Mean of Raw Data	3.655
Standard Deviation of Raw Data	9.536
Kstar	0.611
Mean of Log Transformed Data	0.307
Standard Deviation of Log Transformed Data	1.218

Normal Distribution Test Results

Correlation Coefficient R	0.563
Lilliefors Test Statistic	0.358
Lilliefors Critical (0.9) Value	0.0738

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.83
A-D Test Statistic	8.647
A-D Critical (0.9) Value	0.672
K-S Test Statistic	0.199
K-S Critical(0.9) Value	0.0811

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.96
Lilliefors Test Statistic	0.128
Lilliefors Critical (0.9) Value	0.0738

Data not Lognormal at (0.1) Significance Level

Attachment I-1b:

ProUCL Goodness-of-Fit Statistics (Combined Soil)

Goodness-of-Fit Test Statistics for Full Data Sets without Non-Detects

User Selected Options

From File	J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\Background Evaluation\ProUCL
Full Precision	OFF
Confidence Coefficient	0.9

Aluminum (aoc 13)

Raw Statistics

Number of Valid Observations	79
Number of Distinct Observations	75
Minimum	2100
Maximum	50800
Mean of Raw Data	12861
Standard Deviation of Raw Data	9812
Kstar	1.88
Mean of Log Transformed Data	9.183
Standard Deviation of Log Transformed Data	0.776

Normal Distribution Test Results

Correlation Coefficient R	0.925
Lilliefors Test Statistic	0.136
Lilliefors Critical (0.9) Value	0.0906

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.992
A-D Test Statistic	0.639
A-D Critical (0.9) Value	0.642
K-S Test Statistic	0.0721
K-S Critical(0.9) Value	0.0934

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.987
Lilliefors Test Statistic	0.121
Lilliefors Critical (0.9) Value	0.0906

Data not Lognormal at (0.1) Significance Level

Aluminum (background)

Raw Statistics

Number of Valid Observations	20
Number of Distinct Observations	19
Minimum	3910

Maximum 31600
Mean of Raw Data 10359
Standard Deviation of Raw Data 6675
Kstar 2.681
Mean of Log Transformed Data 9.077
Standard Deviation of Log Transformed Data 0.588

Normal Distribution Test Results

Correlation Coefficient R 0.903
Shapiro Wilk Test Statistic 0.825
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.167
Lilliefors Critical (0.9) Value 0.18

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.966
A-D Test Statistic 0.507
A-D Critical (0.9) Value 0.63
K-S Test Statistic 0.138
K-S Critical(0.9) Value 0.179

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.974
Shapiro Wilk Test Statistic 0.94
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.159
Lilliefors Critical (0.9) Value 0.18

Data appear Lognormal at (0.1) Significance Level

Aluminum (s. exposure area rev)

Raw Statistics

Number of Valid Observations 240
Number of Missing Values 48
Number of Distinct Observations 198
Minimum 2030
Maximum 249000
Mean of Raw Data 17575
Standard Deviation of Raw Data 18584
Kstar 2.002
Mean of Log Transformed Data 9.507
Standard Deviation of Log Transformed Data 0.731

Normal Distribution Test Results

Correlation Coefficient R 0.687
Lilliefors Test Statistic 0.204
Lilliefors Critical (0.9) Value 0.052

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.79
A-D Test Statistic 0.95
A-D Critical (0.9) Value 0.641
K-S Test Statistic 0.0471
K-S Critical(0.9) Value 0.0549

Data follow Appr. Gamma Distribution at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.986
Lilliefors Test Statistic 0.0726
Lilliefors Critical (0.9) Value 0.052

Data not Lognormal at (0.1) Significance Level

Arsenic (aoc 13)

Raw Statistics

Number of Valid Observations 79
Number of Distinct Observations 63
Minimum 0.178
Maximum 38.7
Mean of Raw Data 7.567
Standard Deviation of Raw Data 5.518
Kstar 2.208
Mean of Log Transformed Data 1.789
Standard Deviation of Log Transformed Data 0.773

Normal Distribution Test Results

Correlation Coefficient R 0.874
Lilliefors Test Statistic 0.162
Lilliefors Critical (0.9) Value 0.0906

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.956
A-D Test Statistic 0.685
A-D Critical (0.9) Value 0.64
K-S Test Statistic 0.079
K-S Critical(0.9) Value 0.0932

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.936
Lilliefors Test Statistic	0.0984
Lilliefors Critical (0.9) Value	0.0906

Data not Lognormal at (0.1) Significance Level

Arsenic (background)

Raw Statistics

Number of Valid Observations	20
Number of Distinct Observations	19
Minimum	5.3
Maximum	68.5
Mean of Raw Data	16.16
Standard Deviation of Raw Data	15.99
Kstar	1.587
Mean of Log Transformed Data	2.485
Standard Deviation of Log Transformed Data	0.713

Normal Distribution Test Results

Correlation Coefficient R	0.806
Shapiro Wilk Test Statistic	0.663
Shapiro Wilk Critical (0.9) Value	0.92
Lilliefors Test Statistic	0.334
Lilliefors Critical (0.9) Value	0.18

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.939
A-D Test Statistic	1.685
A-D Critical (0.9) Value	0.635
K-S Test Statistic	0.247
K-S Critical(0.9) Value	0.181

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.93
Shapiro Wilk Test Statistic	0.862
Shapiro Wilk Critical (0.9) Value	0.92
Lilliefors Test Statistic	0.204
Lilliefors Critical (0.9) Value	0.18

Data not Lognormal at (0.1) Significance Level

Arsenic (s. exposure area rev)

Raw Statistics

Number of Valid Observations	240
Number of Missing Values	48
Number of Distinct Observations	133
Minimum	0.474
Maximum	50.95
Mean of Raw Data	8.631
Standard Deviation of Raw Data	6.802
Kstar	1.925
Mean of Log Transformed Data	1.877
Standard Deviation of Log Transformed Data	0.806

Normal Distribution Test Results

Correlation Coefficient R	0.877
Lilliefors Test Statistic	0.174
Lilliefors Critical (0.9) Value	0.052

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.96
A-D Test Statistic	2.5
A-D Critical (0.9) Value	0.642
K-S Test Statistic	0.0982
K-S Critical(0.9) Value	0.0549

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.974
Lilliefors Test Statistic	0.11
Lilliefors Critical (0.9) Value	0.052

Data not Lognormal at (0.1) Significance Level

Iron (aoc 13)

Raw Statistics

Number of Valid Observations	79
Number of Distinct Observations	73
Minimum	1150
Maximum	190000
Mean of Raw Data	23021
Standard Deviation of Raw Data	32238
Kstar	1.279
Mean of Log Transformed Data	9.62
Standard Deviation of Log Transformed Data	0.844

Normal Distribution Test Results

Correlation Coefficient R 0.693
Lilliefors Test Statistic 0.299
Lilliefors Critical (0.9) Value 0.0906

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.867
A-D Test Statistic 3.585
A-D Critical (0.9) Value 0.649
K-S Test Statistic 0.184
K-S Critical(0.9) Value 0.0941

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.973
Lilliefors Test Statistic 0.107
Lilliefors Critical (0.9) Value 0.0906

Data not Lognormal at (0.1) Significance Level

Iron (background)

Raw Statistics

Number of Valid Observations 20
Number of Distinct Observations 20
Minimum 10500
Maximum 132000
Mean of Raw Data 25775
Standard Deviation of Raw Data 25715
Kstar 2.403
Mean of Log Transformed Data 9.967
Standard Deviation of Log Transformed Data 0.515

Normal Distribution Test Results

Correlation Coefficient R 0.638
Shapiro Wilk Test Statistic 0.439
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.342
Lilliefors Critical (0.9) Value 0.18

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.768

A-D Test Statistic 2.323
A-D Critical (0.9) Value 0.631
K-S Test Statistic 0.277
K-S Critical(0.9) Value 0.179

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.861
Shapiro Wilk Test Statistic 0.77
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.233
Lilliefors Critical (0.9) Value 0.18

Data not Lognormal at (0.1) Significance Level

Iron (s. exposure area rev)

Raw Statistics
Number of Valid Observations 240
Number of Missing Values 48
Number of Distinct Observations 208
Minimum 4250
Maximum 397000
Mean of Raw Data 39196
Standard Deviation of Raw Data 44899
Kstar 1.315
Mean of Log Transformed Data 10.15
Standard Deviation of Log Transformed Data 0.888

Normal Distribution Test Results

Correlation Coefficient R 0.808
Lilliefors Test Statistic 0.239
Lilliefors Critical (0.9) Value 0.052

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.957
A-D Test Statistic 5.643
A-D Critical (0.9) Value 0.649
K-S Test Statistic 0.135
K-S Critical(0.9) Value 0.0553

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.992
Lilliefors Test Statistic 0.074

Lilliefors Critical (0.9) Value 0.052

Data not Lognormal at (0.1) Significance Level

Lead (aoc 13)

Raw Statistics

Number of Valid Observations 79

Number of Distinct Observations 64

Minimum 0.254

Maximum 464

Mean of Raw Data 41.63

Standard Deviation of Raw Data 81.85

Kstar 0.653

Mean of Log Transformed Data 2.821

Standard Deviation of Log Transformed Data 1.265

Normal Distribution Test Results

Correlation Coefficient R 0.679

Lilliefors Test Statistic 0.342

Lilliefors Critical (0.9) Value 0.0906

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.92

A-D Test Statistic 5.099

A-D Critical (0.9) Value 0.668

K-S Test Statistic 0.203

K-S Critical(0.9) Value 0.096

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.969

Lilliefors Test Statistic 0.135

Lilliefors Critical (0.9) Value 0.0906

Data not Lognormal at (0.1) Significance Level

Lead (background)

Raw Statistics

Number of Valid Observations 20

Number of Distinct Observations 20

Minimum 9.7

Maximum 2230

Mean of Raw Data 163.4

Standard Deviation of Raw Data 492

Kstar 0.409

Mean of Log Transformed Data 3.629
Standard Deviation of Log Transformed Data 1.375

Normal Distribution Test Results

Correlation Coefficient R 0.55
Shapiro Wilk Test Statistic 0.331
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.406
Lilliefors Critical (0.9) Value 0.18

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.846
A-D Test Statistic 2.801
A-D Critical (0.9) Value 0.678
K-S Test Statistic 0.279
K-S Critical(0.9) Value 0.189

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.908
Shapiro Wilk Test Statistic 0.83
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.18
Lilliefors Critical (0.9) Value 0.18

Data not Lognormal at (0.1) Significance Level

Lead (s. exposure area rev)

Raw Statistics

Number of Valid Observations 240
Number of Missing Values 48
Number of Distinct Observations 204
Minimum 1.86
Maximum 1330
Mean of Raw Data 53.6
Standard Deviation of Raw Data 109.6
Kstar 0.732
Mean of Log Transformed Data 3.169
Standard Deviation of Log Transformed Data 1.194

Normal Distribution Test Results

Correlation Coefficient R 0.633
Lilliefors Test Statistic 0.318
Lilliefors Critical (0.9) Value 0.052

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.864
A-D Test Statistic	10.57
A-D Critical (0.9) Value	0.665
K-S Test Statistic	0.189
K-S Critical(0.9) Value	0.0563

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.988
Lilliefors Test Statistic	0.101
Lilliefors Critical (0.9) Value	0.052

Data not Lognormal at (0.1) Significance Level

Manganese (aoc 13)

Raw Statistics

Number of Valid Observations	79
Number of Distinct Observations	77
Minimum	234
Maximum	7950
Mean of Raw Data	1078
Standard Deviation of Raw Data	1212
Kstar	1.394
Mean of Log Transformed Data	6.598
Standard Deviation of Log Transformed Data	0.817

Normal Distribution Test Results

Correlation Coefficient R	0.801
Lilliefors Test Statistic	0.276
Lilliefors Critical (0.9) Value	0.0906

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.951
A-D Test Statistic	3.757
A-D Critical (0.9) Value	0.647
K-S Test Statistic	0.193
K-S Critical(0.9) Value	0.0939

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results