Correlation Coefficient R 0.963
Lilliefors Test Statistic 0.124
Lilliefors Critical (0.9) Value 0.0906
Data not Lognormal at (0.1) Significance Level

Manganese (background)

Raw Statistics
Number of Valid Observations 20
Number of Distinct Observations 19
Minimum 278
Maximum 2270
Mean of Raw Data 761.8
Standard Deviation of Raw Data 406.1
Kstar 4.582
Mean of Log Transformed Data 6.539
Standard Deviation of Log Transformed Data 0.43

Normal Distribution Test Results

Correlation Coefficient R 0.826
Shapiro Wilk Test Statistic 0.711
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.239
Lilliefors Critical (0.9) Value 0.18
Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.884
A-D Test Statistic 0.674
A-D Critical (0.9) Value 0.627
K-S Test Statistic 0.168
K-S Critical(0.9) Value 0.179
Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.954
Shapiro Wilk Test Statistic 0.933
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.147
Lilliefors Critical (0.9) Value 0.18
Data appear Lognormal at (0.1) Significance Level

Manganese (s. exposure area rev)

Raw Statistics
Number of Valid Observations 240

Number of Missing Values 48
Number of Distinct Observations 221
Minimum 84
Maximum 20700
Mean of Raw Data 2262
Standard Deviation of Raw Data 2558
Kstar 1.137
Mean of Log Transformed Data 7.229
Standard Deviation of Log Transformed Data 1.015

Normal Distribution Test Results

Correlation Coefficient R 0.829
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 0.958
A-D Test Statistic 3.954
A-D Critical (0.9) Value 0.652
K-S Test Statistic 0.125
K-S Critical(0.9) Value 0.0555

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.99
Lilliefors Test Statistic 0.0762
Lilliefors Critical (0.9) Value 0.052

Data not Lognormal at (0.1) Significance Level

Vanadium (aoc 13)

Raw Statistics

Number of Valid Observations 79
Number of Distinct Observations 71
Minimum 1.57
Maximum 59.5
Mean of Raw Data 21.02
Standard Deviation of Raw Data 12.18
Kstar 2.995
Mean of Log Transformed Data 2.876
Standard Deviation of Log Transformed Data 0.616

Normal Distribution Test Results

Correlation Coefficient R 0.957

Lilliefors Test Statistic 0.161
Lilliefors Critical (0.9) Value 0.0906

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.995
A-D Test Statistic 0.505
A-D Critical (0.9) Value 0.636
K-S Test Statistic 0.0917
K-S Critical(0.9) Value 0.0928

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.98
Lilliefors Test Statistic 0.0531
Lilliefors Critical (0.9) Value 0.0906

Data appear Lognormal at (0.1) Significance Level

Vanadium (background)

Raw Statistics
Number of Valid Observations 20
Number of Distinct Observations 19
Minimum 10.7
Maximum 59.3
Mean of Raw Data 24.76
Standard Deviation of Raw Data 12.2
Kstar 3.922
Mean of Log Transformed Data 3.096
Standard Deviation of Log Transformed Data 0.493

Normal Distribution Test Results

Correlation Coefficient R 0.943
Shapiro Wilk Test Statistic 0.893
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.125
Lilliefors Critical (0.9) Value 0.18

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.972
A-D Test Statistic 0.531
A-D Critical (0.9) Value 0.628
K-S Test Statistic 0.142
K-S Critical(0.9) Value 0.179

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.969
Shapiro Wilk Test Statistic 0.929
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.149
Lilliefors Critical (0.9) Value 0.18

Data appear Lognormal at (0.1) Significance Level

Vanadium (a. exposure area rev)

Raw Statistics

Number of Valid Observations 240
Number of Missing Values 48
Number of Distinct Observations 189
Minimum 5.2
Maximum 485
Mean of Raw Data 27.88
Standard Deviation of Raw Data 34.15
Kstar 2.416
Mean of Log Transformed Data 3.11
Standard Deviation of Log Transformed Data 0.588

Normal Distribution Test Results

Correlation Coefficient R 0.583
Lilliefors Test Statistic 0.266
Lilliefors Critical (0.9) Value 0.052

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.701
A-D Test Statistic 4.403
A-D Critical (0.9) Value 0.64
K-S Test Statistic 0.0964
K-S Critical(0.9) Value 0.0547

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.982
Lilliefors Test Statistic 0.0371
Lilliefors Critical (0.9) Value 0.052

Data appear Lognormal at (0.1) Significance Level

Arsenic (aoc 1)

Raw Statistics

Number of Valid Observations	34
Number of Distinct Observations	31
Minimum	1.05
Maximum	24
Mean of Raw Data	9.31
Standard Deviation of Raw Data	5.621
Kstar	2.112
Mean of Log Transformed Data	1.998
Standard Deviation of Log Transformed Data	0.79

Normal Distribution Test Results

Correlation Coefficient R	0.969
Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical (0.9) Value	0.943
Lilliefors Test Statistic	0.109
Lilliefors Critical (0.9) Value	0.138

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.982
A-D Test Statistic	0.526
A-D Critical (0.9) Value	0.637
K-S Test Statistic	0.0986
K-S Critical(0.9) Value	0.14

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.947
Shapiro Wilk Test Statistic	0.891
Shapiro Wilk Critical (0.9) Value	0.943
Lilliefors Test Statistic	0.141
Lilliefors Critical (0.9) Value	0.138

Data not Lognormal at (0.1) Significance Level

Arsenic (aoc 18 and aoc 21)

Raw Statistics

Number of Valid Observations	42
Number of Distinct Observations	38
Minimum	0.666
Maximum	18.4
Mean of Raw Data	7.066
Standard Deviation of Raw Data	3.842
Kstar	2.793

Mean of Log Transformed Data 1.779
Standard Deviation of Log Transformed Data 0.666

Normal Distribution Test Results

Correlation Coefficient R 0.979
Shapiro Wilk Test Statistic 0.915
Shapiro Wilk Critical (0.9) Value 0.951
Lilliefors Test Statistic 0.118
Lilliefors Critical (0.9) Value 0.124

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.992
A-D Test Statistic 0.281
A-D Critical (0.9) Value 0.634
K-S Test Statistic 0.0846
K-S Critical(0.9) Value 0.126

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.961
Shapiro Wilk Test Statistic 0.893
Shapiro Wilk Critical (0.9) Value 0.951
Lilliefors Test Statistic 0.113
Lilliefors Critical (0.9) Value 0.124

Data not Lognormal at (0.1) Significance Level

Arsenic (aoc 19)

Raw Statistics

Number of Valid Observations 32
Number of Distinct Observations 29
Minimum 4.3
Maximum 101
Mean of Raw Data 11.61
Standard Deviation of Raw Data 16.7
Kstar 1.729
Mean of Log Transformed Data 2.164
Standard Deviation of Log Transformed Data 0.602

Normal Distribution Test Results

Correlation Coefficient R 0.566
Shapiro Wilk Test Statistic 0.358
Shapiro Wilk Critical (0.9) Value 0.941
Lilliefors Test Statistic 0.371

Lilliefors Critical (0.9) Value 0.142

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.719
A-D Test Statistic 2.813
A-D Critical (0.9) Value 0.639
K-S Test Statistic 0.23
K-S Critical(0.9) Value 0.145

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.893
Shapiro Wilk Test Statistic 0.819
Shapiro Wilk Critical (0.9) Value 0.941
Lilliefors Test Statistic 0.139
Lilliefors Critical (0.9) Value 0.142

Data not Lognormal at (0.1) Significance Level

Arsenic (aoc 2 - ra)

Raw Statistics

Number of Valid Observations 20
Number of Distinct Observations 20
Minimum 0.181
Maximum 23.7
Mean of Raw Data 5.096
Standard Deviation of Raw Data 6.042
Kstar 0.71
Mean of Log Transformed Data 0.883
Standard Deviation of Log Transformed Data 1.41

Normal Distribution Test Results

Correlation Coefficient R 0.871
Shapiro Wilk Test Statistic 0.768
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.233
Lilliefors Critical (0.9) Value 0.18

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.992
A-D Test Statistic 0.3
A-D Critical (0.9) Value 0.651
K-S Test Statistic 0.149

K-S Critical(0.9) Value 0.184

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.98

Shapiro Wilk Test Statistic 0.95

Shapiro Wilk Critical (0.9) Value 0.92

Lilliefors Test Statistic 0.137

Lilliefors Critical (0.9) Value 0.18

Data appear 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 (block a)

Raw Statistics

Number of Valid Observations 31

Number of Distinct Observations 21

Minimum 1.1

Maximum 9.4

Mean of Raw Data 3.394

Standard Deviation of Raw Data 2.43

Kstar 2.223

Mean of Log Transformed Data 1.003

Standard Deviation of Log Transformed Data 0.665

Normal Distribution Test Results

Correlation Coefficient R 0.909

Shapiro Wilk Test Statistic 0.815

Shapiro Wilk Critical (0.9) Value 0.94

Lilliefors Test Statistic 0.176

Lilliefors Critical (0.9) Value 0.145

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.972

A-D Test Statistic 0.702

A-D Critical (0.9) Value 0.636

K-S Test Statistic 0.114

K-S Critical(0.9) Value 0.146

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.976

Shapiro Wilk Test Statistic 0.931

Shapiro Wilk Critical (0.9) Value 0.94

Lilliefors Test Statistic 0.125

Lilliefors Critical (0.9) Value 0.145

Data not Lognormal at (0.1) Significance Level

Lead (aoc 1)

Raw Statistics

Number of Valid Observations 34

Number of Distinct Observations 34

Minimum 2.8

Maximum 3840
Mean of Raw Data 398.1
Standard Deviation of Raw Data 921.3
Kstar 0.355
Mean of Log Transformed Data 4.173
Standard Deviation of Log Transformed Data 1.91

Normal Distribution Test Results

Correlation Coefficient R 0.677
Shapiro Wilk Test Statistic 0.473
Shapiro Wilk Critical (0.9) Value 0.943
Lilliefors Test Statistic 0.385
Lilliefors Critical (0.9) Value 0.138
Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.946
A-D Test Statistic 2.271
A-D Critical (0.9) Value 0.697
K-S Test Statistic 0.203
K-S Critical(0.9) Value 0.148
Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.984
Shapiro Wilk Test Statistic 0.957
Shapiro Wilk Critical (0.9) Value 0.943
Lilliefors Test Statistic 0.0749
Lilliefors Critical (0.9) Value 0.138
Data appear Lognormal at (0.1) Significance Level

Lead (aoc 18 and aoc 21)

Raw Statistics
Number of Valid Observations 42
Number of Distinct Observations 40
Minimum 2.45
Maximum 93.5
Mean of Raw Data 12.29
Standard Deviation of Raw Data 14
Kstar 1.79
Mean of Log Transformed Data 2.224
Standard Deviation of Log Transformed Data 0.702

Normal Distribution Test Results

Correlation Coefficient R 0.681
Shapiro Wilk Test Statistic 0.491
Shapiro Wilk Critical (0.9) Value 0.951
Lilliefors Test Statistic 0.263
Lilliefors Critical (0.9) Value 0.124

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.808
A-D Test Statistic 1.135
A-D Critical (0.9) Value 0.639
K-S Test Statistic 0.134
K-S Critical(0.9) Value 0.127

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

Lognormal Distribution Test Results

Correlation Coefficient R 0.97
Shapiro Wilk Test Statistic 0.905
Shapiro Wilk Critical (0.9) Value 0.951
Lilliefors Test Statistic 0.117
Lilliefors Critical (0.9) Value 0.124

Data not Lognormal at (0.1) Significance Level

Lead (soc 19)

Raw Statistics

Number of Valid Observations 32
Number of Distinct Observations 28
Minimum 5
Maximum 435
Mean of Raw Data 31.42
Standard Deviation of Raw Data 75.63
Kstar 0.762
Mean of Log Transformed Data 2.724
Standard Deviation of Log Transformed Data 0.97

Normal Distribution Test Results

Correlation Coefficient R 0.538
Shapiro Wilk Test Statistic 0.325
Shapiro Wilk Critical (0.9) Value 0.941
Lilliefors Test Statistic 0.396
Lilliefors Critical (0.9) Value 0.142

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.769
A-D Test Statistic 3.138
A-D Critical (0.9) Value 0.656
K-S Test Statistic 0.274
K-S Critical(0.9) Value 0.148

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 0.941
Lilliefors Test Statistic 0.148
Lilliefors Critical (0.9) Value 0.142

Data not Lognormal at (0.1) Significance Level

Lead (aoc 2 - ra)

Raw Statistics

Number of Valid Observations 20
Number of Distinct Observations 20
Minimum 0.303
Maximum 336
Mean of Raw Data 30.39
Standard Deviation of Raw Data 78.61
Kstar 0.405
Mean of Log Transformed Data 1.928
Standard Deviation of Log Transformed Data 1.553

Normal Distribution Test Results

Correlation Coefficient R 0.614
Shapiro Wilk Test Statistic 0.402
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.456
Lilliefors Critical (0.9) Value 0.18

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R 0.903
A-D Test Statistic 2.24
A-D Critical (0.9) Value 0.679
K-S Test Statistic 0.311
K-S Critical(0.9) Value 0.189

Data not Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R 0.958
Shapiro Wilk Test Statistic 0.932
Shapiro Wilk Critical (0.9) Value 0.92
Lilliefors Test Statistic 0.161
Lilliefors Critical (0.9) Value 0.18

Data appear 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 (block a)

Raw Statistics

Number of Valid Observations	31
Number of Distinct Observations	30
Minimum	1.9
Maximum	34.3
Mean of Raw Data	12.44
Standard Deviation of Raw Data	9.45
Kstar	1.745
Mean of Log Transformed Data	2.236
Standard Deviation of Log Transformed Data	0.785

Normal Distribution Test Results

Correlation Coefficient R	0.927
Shapiro Wilk Test Statistic	0.848
Shapiro Wilk Critical (0.9) Value	0.94
Lilliefors Test Statistic	0.172
Lilliefors Critical (0.9) Value	0.145

Data not Normal at (0.1) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.969
A-D Test Statistic	0.688
A-D Critical (0.9) Value	0.638
K-S Test Statistic	0.145
K-S Critical(0.9) Value	0.147

Data appear Gamma Distributed at (0.1) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.984
Shapiro Wilk Test Statistic	0.955
Shapiro Wilk Critical (0.9) Value	0.94
Lilliefors Test Statistic	0.123
Lilliefors Critical (0.9) Value	0.145

Data appear Lognormal at (0.1) Significance Level

Attachment I-2a:

ProUCL Hypothesis Test Results (Surface Soil)

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Aluminum(aoc 13)

Background Data: Aluminum(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	25	11
Minimum	4920	3910
Maximum	36100	17400
Mean	12181	8493
Median	12600	7350
SD	6901	4233
SE of Mean	1328	1276

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	6
Approximate K Value (0.109)	6
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.107

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	6116
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Aluminum(aoc 13)

Background Data: Aluminum(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	25	11
Minimum	4920	3910
Maximum	36100	17400
Mean	12181	8493
Median	12600	7350
SD	6901	4233
SE of Mean	1328	1276

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 6116

Site Rank Sum W-Stat	479
WMW Test U-Stat	101
WMW Critical Value (0.100)	79
Approximate P-Value	0.0652

Conclusion with Alpha = 0.10

Do Not Reject H0, Conclude Site >= Background + 6116.00

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(aoc 13)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	26	11
Minimum	0.178	5.9
Maximum	14.8	68.5
Mean	7.238	19.78
Median	6.9	10.9
SD	2.975	19.63
SE of Mean	0.573	5.917

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	6
Approximate K Value (0.109)	6
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.107

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	32
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Arsenic(aoc 13)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	26	11
Minimum	0.178	5.9
Maximum	14.8	68.5
Mean	7.238	19.78
Median	6.9	10.9
SD	2.975	19.63
SE of Mean	0.573	5.917

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 32

Site Rank Sum W-Stat	378
WMW Test U-Stat	0
WMW Critical Value (0.100)	79
Approximate P-Value	9.505E-07

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 32.00

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Iron(aoc 13)

Background Data: Iron(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	25	11
Minimum	2200	13600
Maximum	185000	132000
Mean	22602	28309
Median	15000	17400
SD	33010	34564
SE of Mean	6353	10421

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	6
Approximate K Value (0.109)	6
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.107

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	18101
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Iron(aoc 13)

Background Data: Iron(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	25	11
Minimum	2200	13600
Maximum	185000	132000
Mean	22602	28309
Median	15000	17400
SD	33010	34564
SE of Mean	6353	10421

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 18101

Site Rank Sum W-Stat	389
WMW Test U-Stat	11
WMW Critical Value (0.100)	79
Approximate P-Value	5.178E-06

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 18101.00

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(aoc 13)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	26	11
Minimum	1.53	13.25
Maximum	464	2230
Mean	53.95	257.3
Median	20.3	42.5
SD	105.3	657.2
SE of Mean	20.27	198.1

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	6
Approximate K Value (0.109)	6
Number of Site Observations in 'R' Largest	3
Calculated Alpha	0.107

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\Background Evaluation\ProUCL\F
Full Precision	OFF
Confidence Coefficient	90%
Substantial Difference	376
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Lead(aoc 13)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	26	11
Minimum	1.53	13.25
Maximum	464	2230
Mean	53.95	257.3
Median	20.3	42.5
SD	105.3	657.2
SE of Mean	20.27	198.1

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 376

Site Rank Sum W-Stat	386
WMW Test U-Stat	8
WMW Critical Value (0.100)	79
Approximate P-Value	3.3003E-06

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 376.00

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Manganese(aoc 13)

Background Data: Manganese(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	27	11
Minimum	318	278
Maximum	4200	2270
Mean	991.6	833.2
Median	755	820
SD	871.5	519.6
SE of Mean	167.7	156.7

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	6
Approximate K Value (0.109)	6
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.107

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	238
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Manganese(aoc 13)

Background Data: Manganese(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	27	11
Minimum	318	278
Maximum	4200	2270
Mean	991.6	833.2
Median	755	820
SD	871.5	519.6
SE of Mean	167.7	156.7

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 238

Site Rank Sum W-Stat	477
WMW Test U-Stat	99
WMW Critical Value (0.100)	79
Approximate P-Value	0.0574

Conclusion with Alpha = 0.10

Do Not Reject H0, Conclude Site >= Background + 238.00

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Vanadium(aoc 13)

Background Data: Vanadium(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	27	11
Minimum	5.24	10.7
Maximum	45	35
Mean	22.36	21.54
Median	18.1	21.2
SD	10.25	8.431
SE of Mean	1.973	2.542

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	6
Approximate K Value (0.109)	6
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.107

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	10
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Vanadium(aoc 13)
Background Data: Vanadium(background)

Raw Statistics

	Site	Background
Number of Valid Observations	27	11
Number of Distinct Observations	27	11
Minimum	5.24	10.7
Maximum	45	35
Mean	22.36	21.54
Median	18.1	21.2
SD	10.25	8.431
SE of Mean	1.973	2.542

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 10

Site Rank Sum W-Stat	444.5
WMW Test U-Stat	66.5
WMW Critical Value (0.100)	79
Approximate P-Value	0.00435

Conclusion with Alpha = 0.10
Reject H0, Conclude Site < Background + 10.00

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: BAP-TE(aoc 13)

Background Data: BAP-TE(background)

Raw Statistics

	Site	Background
Number of Valid Data	27	10
Number of Missing Values	0	1
Number of Non-Detect Data	2	1
Number of Detect Data	25	9
Minimum Non-Detect	0.901	0.901
Maximum Non-Detect	0.948	0.901
Percent Non detects	7.41%	10.00%
Minimum Detected	0.251	0.238
Maximum Detected	59.68	10.43
Mean of Detected Data	6.969	2.448
Median of Detected Data	0.791	1.182
SD of Detected Data	14.04	3.275

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	6
Approximate K Value (0.109)	6
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.127

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	4.4
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: BAP-TE(aoc 13)

Background Data: BAP-TE(background)

Raw Statistics

	Site	Background
Number of Valid Data	27	10
Number of Missing Values	0	1
Number of Non-Detect Data	2	1
Number of Detect Data	25	9
Minimum Non-Detect	0.901	0.901
Maximum Non-Detect	0.948	0.901
Percent Non detects	7.41%	10.00%
Minimum Detected	0.251	0.238
Maximum Detected	59.68	10.43
Mean of Detected Data	6.969	2.448
Median of Detected Data	0.791	1.182
SD of Detected Data	14.04	3.275

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 4.4

Gehan z Test Value	-2.186
Critical z (0.90)	-1.282
P-Value	0.0144

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 4.40

P-Value < alpha (0.1)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Aluminum(aoc 22)

Background Data: Aluminum(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	3020	3910
Maximum	19200	17400
Mean	9541	8493
Median	8215	7350
SD	4354	4233
SE of Mean	1026	1276

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	5
Approximate K Value (0.109)	5
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0721

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	6116
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Aluminum(aoc 22)

Background Data: Aluminum(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	3020	3910
Maximum	19200	17400
Mean	9541	8493
Median	8215	7350
SD	4354	4233
SE of Mean	1026	1276

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 6116

Site Rank Sum W-Stat	209
WMW Test U-Stat	38
WMW Critical Value (0.100)	70
Approximate P-Value	0.00327

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 6116.00

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(aoc 22)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	3.26	5.9
Maximum	14.3	68.5
Mean	8.049	19.78
Median	6.39	10.9
SD	3.454	19.63
SE of Mean	0.814	5.917

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	5
Approximate K Value (0.109)	5
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.0721

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	32
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Arsenic(aoc 22)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	3.26	5.9
Maximum	14.3	68.5
Mean	8.049	19.78
Median	6.39	10.9
SD	3.454	19.63
SE of Mean	0.814	5.917

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 32

Site Rank Sum W-Stat	171
WMW Test U-Stat	0
WMW Critical Value (0.100)	70
Approximate P-Value	4.772E-06

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 32.00

Non-parametric Quantile Hypothoeis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Iron(aoc 22)

Background Data: Iron(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	8940	13600
Maximum	69200	132000
Mean	31036	28309
Median	24250	17400
SD	19544	34564
SE of Mean	4607	10421

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	5
Approximate K Value (0.109)	5
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0721

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	18101
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Iron(aoc 22)

Background Data: Iron(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	8940	13600
Maximum	69200	132000
Mean	31036	28309
Median	24250	17400
SD	19544	34564
SE of Mean	4607	10421

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 18101

Site Rank Sum W-Stat	237
WMW Test U-Stat	66
WMW Critical Value (0.100)	70
Approximate P-Value	0.072

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 18101.00

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(aoc 22)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Observations	17	11
Number of Missing Values	1	0
Number of Distinct Observations	17	11
Minimum	10.2	13.25
Maximum	341	2230
Mean	107.1	257.3
Median	66.3	42.5
SD	109.4	657.2
SE of Mean	26.54	198.1

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	4
Approximate K Value (0.109)	4
Number of Site Observations in 'R' Largest	3
Calculated Alpha	0.116

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	376
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Lead(aoc 22)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Observations	17	11
Number of Missing Values	1	0
Number of Distinct Observations	17	11
Minimum	10.2	13.25
Maximum	341	2230
Mean	107.1	257.3
Median	66.3	42.5
SD	109.4	657.2
SE of Mean	26.54	198.1

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 376

Site Rank Sum W-Stat	153
WMW Test U-Stat	0
WMW Critical Value (0.100)	66
Approximate P-Value	6.078E-06

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 376.00

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Manganese(aoc 22)

Background Data: Manganese(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	236	278
Maximum	3180	2270
Mean	1118	833.2
Median	804.5	820
SD	908.1	519.6
SE of Mean	214	156.7

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	5
Approximate K Value (0.109)	5
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0721

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	238
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Manganese(aoc 22)

Background Data: Manganese(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	236	278
Maximum	3180	2270
Mean	1118	833.2
Median	804.5	820
SD	908.1	519.6
SE of Mean	214	156.7

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 238

Site Rank Sum W-Stat	248
WMW Test U-Stat	77
WMW Critical Value (0.100)	70
Approximate P-Value	0.167

Conclusion with Alpha = 0.10

Do Not Reject H0, Conclude Site >= Background + 238.00

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Vanadium(aoc 22)

Background Data: Vanadium(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	7.55	10.7
Maximum	30.5	35
Mean	16.68	21.54
Median	15	21.2
SD	6.958	8.431
SE of Mean	1.64	2.542

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	5
Approximate K Value (0.109)	5
Number of Site Observations in 'R' Largest	2
Calculated Alpha	0.0721

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

t-Test Site vs Background Comparison for Full Data Sets without NDs

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	90%
Substantial Difference (S)	7
Selected Null Hypothesis	Site or AOC Mean Greater Than or Equal to Background Mean + Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean Less Than the Background Mean + S

Area of Concern Data: Vanadium(aoc 22)

Background Data: Vanadium(background)

Raw Statistics

	Site	Background
Number of Valid Observations	18	11
Number of Distinct Observations	18	11
Minimum	7.55	10.7
Maximum	30.5	35
Mean	16.68	21.54
Median	15	21.2
SD	6.958	8.431
SE of Mean	1.64	2.542

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background >= 7.00

Method	DF	t-Test Value	Critical - t (0.100)	P-Value
Pooled (Equal Variance)	27	-4.112	2.7E+308	0
Satterthwaite (Unequal Variance)	18.2	-3.921	2.7E+308	0

Pooled SD: 7.537

Conclusion with Alpha = 0.100

* Student t (Pooled): Do Not Reject H0, Conclude Site >= Background + 7.00
* Satterthwaite: Do Not Reject H0, Conclude Site >= Background + 7.00

Test of Equality of Variances

Numerator DF	Denominator DF	F-Test Value	P-Value
10	17	1.468	0.467

Conclusion with Alpha = 0.10

* Two variances appear to be equal

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: BAP-TE(aoc 22)

Background Data: BAP-TE(background)

Raw Statistics

	Site	Background
Number of Valid Data	18	10
Number of Missing Values	0	1
Number of Non-Detect Data	0	1
Number of Detect Data	18	9
Minimum Non-Detect	N/A	0.901
Maximum Non-Detect	N/A	0.901
Percent Non detects	0.00%	10.00%
Minimum Detected	0.453	0.238
Maximum Detected	52.79	10.43
Mean of Detected Data	8.775	2.448
Median of Detected Data	1.263	1.182
SD of Detected Data	17.07	3.275

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.109)	5
Approximate K Value (0.109)	5
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0872

Conclusion with Alpha = 0.109

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with 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	90%
Substantial Difference (S)	4.4
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: BAP-TE(aoc 22)
Background Data: BAP-TE(background)

Raw Statistics

	Site	Background
Number of Valid Data	18	10
Number of Missing Values	0	1
Number of Non-Detect Data	0	1
Number of Detect Data	18	9
Minimum Non-Detect	N/A	0.901
Maximum Non-Detect	N/A	0.901
Percent Non detects	0.00%	10.00%
Minimum Detected	0.453	0.238
Maximum Detected	52.79	10.43
Mean of Detected Data	8.775	2.448
Median of Detected Data	1.263	1.182
SD of Detected Data	17.07	3.275

Wilcoxon-Mann-Whitney Site vs Background Test
All observations <= 0.901 (Max DL) are ranked the same
Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 4.4

Site Rank Sum W-Stat	208
WMW Test U-Stat	37
WMW Critical Value (0.100)	63
Approximate P-Value	0.00591

Conclusion with Alpha = 0.10
Reject H0, Conclude Site < Background + 4.40

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Aluminum(s. exposure area rev)

Background Data: Aluminum(background)

Raw Statistics

	Site	Background
Number of Valid Observations	121	11
Number of Missing Values	21	0
Number of Distinct Observations	106	11
Minimum	4260	3910
Maximum	90200	17400
Mean	19217	8493
Median	16700	7350
SD	11216	4233
SE of Mean	1020	1276

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0)	0
Approximate K Value (0)	0
R Value Adjusted for Ties in Data	1
K Value Adjusted for Ties in Data	1
Number of Site Observations in 'R' Largest	1
Calculated Alpha	1

Conclusion with Alpha = 0

Reject H0, Conclude Site Concentration > Background Concentration

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(a. exposure area rev)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	121	11
Number of Missing Values	21	0
Number of Non-Detect Data	8	0
Number of Detect Data	113	11
Minimum Non-Detect	1	N/A
Maximum Non-Detect	5.5	N/A
Percent Non detects	6.61%	0.00%
Minimum Detected	0.474	5.9
Maximum Detected	33.6	68.5
Mean of Detected Data	9.28	19.78
Median of Detected Data	8.8	10.9
SD of Detected Data	6.067	19.63

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0)	0
Approximate K Value (0)	0
R Value Adjusted for Ties in Data	1
K Value Adjusted for Ties in Data	1
Number of Site Observations in 'R' Largest	0
Calculated Alpha	1

Conclusion with Alpha = 0

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	32
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(s. exposure area rev)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	121	11
Number of Missing Values	21	0
Number of Non-Detect Data	8	0
Number of Detect Data	113	11
Minimum Non-Detect	1	N/A
Maximum Non-Detect	5.5	N/A
Percent Non detects	6.61%	0.00%
Minimum Detected	0.474	5.9
Maximum Detected	33.6	68.5
Mean of Detected Data	9.28	19.78
Median of Detected Data	8.8	10.9
SD of Detected Data	6.067	19.63

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 32

Gehan z Test Value	-5.485
Critical z (0.90)	-1.282
P-Value	2.064E-08

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 32.00

P-Value < alpha (0.1)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Iron(s. exposure area rev)

Background Data: Iron(background)

Raw Statistics

	Site	Background
Number of Valid Observations	121	11
Number of Missing Values	21	0
Number of Distinct Observations	110	11
Minimum	4805	13600
Maximum	170000	132000
Mean	45797	28309
Median	27100	17400
SD	39323	34564
SE of Mean	3575	10421

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0)	0
Approximate K Value (0)	0
R Value Adjusted for Ties in Data	1
K Value Adjusted for Ties in Data	1
Number of Site Observations in 'R' Largest	1
Calculated Alpha	1

Conclusion with Alpha = 0

Reject H0, Conclude Site Concentration > Background Concentration

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(s. exposure area rev)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	121	11
Number of Missing Values	21	0
Number of Non-Detect Data	2	0
Number of Detect Data	119	11
Minimum Non-Detect	5.1	N/A
Maximum Non-Detect	5.7	N/A
Percent Non detects	1.65%	0.00%
Minimum Detected	1.86	13.25
Maximum Detected	1330	2230
Mean of Detected Data	77.1	257.3
Median of Detected Data	25.8	42.5
SD of Detected Data	144.4	657.2

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0)	0
Approximate K Value (0)	0
R Value Adjusted for Ties in Data	1
K Value Adjusted for Ties in Data	1
Number of Site Observations in 'R' Largest	0
Calculated Alpha	1

Conclusion with Alpha = 0

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	376
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(s. exposure area rev)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	121	11
Number of Missing Values	21	0
Number of Non-Detect Data	2	0
Number of Detect Data	119	11
Minimum Non-Detect	5.1	N/A
Maximum Non-Detect	5.7	N/A
Percent Non detects	1.65%	0.00%
Minimum Detected	1.86	13.25
Maximum Detected	1330	2230
Mean of Detected Data	77.1	257.3
Median of Detected Data	25.8	42.5
SD of Detected Data	144.4	657.2

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 376

Gehan z Test Value	-5.299
Critical z (0.90)	-1.282
P-Value	5.835E-08

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 376.00

P-Value < alpha (0.1)

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Manganese(a. exposure area rev)

Background Data: Manganese(background)

Raw Statistics

	Site	Background
Number of Valid Observations	121	11
Number of Missing Values	21	0
Number of Distinct Observations	116	11
Minimum	337	278
Maximum	20700	2270
Mean	3031	833.2
Median	2160	820
SD	2976	519.6
SE of Mean	270.6	156.7

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0)	0
Approximate K Value (0)	0
R Value Adjusted for Ties in Data	1
K Value Adjusted for Ties in Data	1
Number of Site Observations in 'R' Largest	1
Calculated Alpha	1

Conclusion with Alpha = 0

Reject H0, Conclude Site Concentration > Background Concentration

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Vanadium(s. exposure area rev)

Background Data: Vanadium(background)

Raw Statistics

	Site	Background
Number of Valid Observations	121	11
Number of Missing Values	21	0
Number of Distinct Observations	107	11
Minimum	8.4	10.7
Maximum	485	35
Mean	33.23	21.54
Median	25.6	21.2
SD	45.32	8.431
SE of Mean	4.12	2.542

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0)	0
Approximate K Value (0)	0
R Value Adjusted for Ties in Data	1
K Value Adjusted for Ties in Data	1
Number of Site Observations in 'R' Largest	1
Calculated Alpha	1

Conclusion with Alpha = 0

Reject H0, Conclude Site Concentration > Background Concentration

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: BAP-TE(s. exposure area rev)

Background Data: BAP-TE(background)

Raw Statistics

	Site	Background
Number of Valid Data	119	10
Number of Missing Values	23	1
Number of Non-Detect Data	7	1
Number of Detect Data	112	9
Minimum Non-Detect	0.855	0.901
Maximum Non-Detect	90.13	0.901
Percent Non detects	5.88%	10.00%
Minimum Detected	0.182	0.238
Maximum Detected	40	10.43
Mean of Detected Data	3.032	2.448
Median of Detected Data	1.032	1.182
SD of Detected Data	5.338	3.275

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0)	0
Approximate K Value (0)	0
R Value Adjusted for Ties in Data	1
K Value Adjusted for Ties in Data	1
Number of Site Observations in 'R' Largest	1

Non-Detect Values in the 'R' Largest - Cannot complete Quantile Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	4.4
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: BAP-TE(s. exposure area rev)
Background Data: BAP-TE(background)

Including sample in Southern Parcel with elevated detection limits

Raw Statistics

	Site	Background
Number of Valid Data	119	10
Number of Missing Values	23	1
Number of Non-Detect Data	7	1
Number of Detect Data	112	9
Minimum Non-Detect	0.855	0.901
Maximum Non-Detect	90.13	0.901
Percent Non detects	5.88%	10.00%
Minimum Detected	0.182	0.238
Maximum Detected	40	10.43
Mean of Detected Data	3.032	2.448
Median of Detected Data	1.032	1.182
SD of Detected Data	5.338	3.275

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 4.4

Gehan z Test Value	-3.387
Critical z (0.90)	-1.282
P-Value	0.0003538

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 4.40

P-Value < alpha (0.1)

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	4.4
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: BAP-TE(southern parcel)
Background Data: BAP-TE(background)

Excluding sample in Southern Parcel with elevated detection limits

Raw Statistics

	Site	Background
Number of Valid Data	118	10
Number of Missing Values	24	1
Number of Non-Detect Data	6	1
Number of Detect Data	112	9
Minimum Non-Detect	0.855	0.901
Maximum Non-Detect	0.901	0.901
Percent Non detects	5.08%	10.00%
Minimum Detected	0.182	0.238
Maximum Detected	40	10.43
Mean of Detected Data	3.032	2.448
Median of Detected Data	1.032	1.182
SD of Detected Data	5.338	3.275

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 4.4

Gehan z Test Value	-3.374
Critical z (0.90)	-1.282
P-Value	0.0003698

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 4.40

P-Value < alpha (0.1)

Attachment I-2b:

ProUCL Hypothesis Test Results (Combined Soil)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(aoc 1)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	34	20
Number of Non-Detect Data	3	0
Number of Detect Data	31	20
Minimum Non-Detect	1.05	N/A
Maximum Non-Detect	1.2	N/A
Percent Non detects	8.82%	0.00%
Minimum Detected	2.2	5.3
Maximum Detected	24	68.5
Mean of Detected Data	10.1	16.16
Median of Detected Data	8.8	9.75
SD of Detected Data	5.233	15.99

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.093)	5
Approximate K Value (0.093)	5
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.088

Conclusion with Alpha = 0.093

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(aoc 1)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	34	20
Number of Non-Detect Data	3	0
Number of Detect Data	31	20
Minimum Non-Detect	1.05	N/A
Maximum Non-Detect	1.2	N/A
Percent Non detects	8.82%	0.00%
Minimum Detected	2.2	5.3
Maximum Detected	24	68.5
Mean of Detected Data	10.1	16.16
Median of Detected Data	8.8	9.75
SD of Detected Data	5.233	15.99

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 24

Gehan z Test Value	-6.091
Critical z (0.90)	-1.282
P-Value	5.621E-10

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 24.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(aoc 1)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	34	20
Number of Non-Detect Data	1	0
Number of Detect Data	33	20
Minimum Non-Detect	5.3	N/A
Maximum Non-Detect	5.3	N/A
Percent Non detects	2.94%	0.00%
Minimum Detected	2.8	9.7
Maximum Detected	3840	2230
Mean of Detected Data	410	163.4
Median of Detected Data	57	22.35
SD of Detected Data	932.9	492

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.093)	5
Approximate K Value (0.093)	5
Number of Site Observations In 'R' Largest	4
Calculated Alpha	0.088

Conclusion with Alpha = 0.093

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with 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	90%
Substantial Difference (S)	160
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(aoc 1)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	34	20
Number of Non-Detect Data	1	0
Number of Detect Data	33	20
Minimum Non-Detect	5.3	N/A
Maximum Non-Detect	5.3	N/A
Percent Non detects	2.94%	0.00%
Minimum Detected	2.8	9.7
Maximum Detected	3840	2230
Mean of Detected Data	410	163.4
Median of Detected Data	57	22.35
SD of Detected Data	932.9	492

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 160

Site Rank Sum W-Stat	N/A
WMW Test U-Stat	N/A
WMW Critical Value (0.100)	152
Approximate P-Value	N/A

Conclusion with Alpha = 0.10

Do Not Reject H0, Conclude Site >= Background + 160.00

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	160
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(aoc 1)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	34	20
Number of Non-Detect Data	1	0
Number of Detect Data	33	20
Minimum Non-Detect	5.3	N/A
Maximum Non-Detect	5.3	N/A
Percent Non detects	2.94%	0.00%
Minimum Detected	2.8	9.7
Maximum Detected	3840	2230
Mean of Detected Data	410	163.4
Median of Detected Data	57	22.35
SD of Detected Data	932.9	492

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 160

Gehan z Test Value	-3.278
Critical z (0.90)	-1.282
P-Value	0.0005224

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 160.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(aoc 2 - ra)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	20	20
Number of Non-Detect Data	2	0
Number of Detect Data	18	20
Minimum Non-Detect	0.181	N/A
Maximum Non-Detect	0.2	N/A
Percent Non detects	10.00%	0.00%
Minimum Detected	0.515	5.3
Maximum Detected	23.7	68.5
Mean of Detected Data	5.641	16.16
Median of Detected Data	3.99	9.75
SD of Detected Data	6.137	15.99

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.115)	3
Approximate K Value (0.115)	3
Number of Site Observations in 'R' Largest	0
Calculated Alpha	0.115

Conclusion with Alpha = 0.115

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(aoc 2 - ra)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	20	20
Number of Non-Detect Data	2	0
Number of Detect Data	18	20
Minimum Non-Detect	0.181	N/A
Maximum Non-Detect	0.2	N/A
Percent Non detects	10.00%	0.00%
Minimum Detected	0.515	5.3
Maximum Detected	23.7	68.5
Mean of Detected Data	5.641	16.16
Median of Detected Data	3.99	9.75
SD of Detected Data	6.137	15.99

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 24

Gehan z Test Value	-5.41
Critical z (0.90)	-1.282
P-Value	3.147E-08

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 24.00

P-Value < alpha (0.1)

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(aoc 2 - ra)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Observations	20	20
Number of Distinct Observations	20	20
Minimum	0.303	9.7
Maximum	336	2230
Mean	30.39	163.4
Median	6.785	22.35
SD	78.61	492
SE of Mean	17.58	110

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.115)	3
Approximate K Value (0.115)	3
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.115

Conclusion with Alpha = 0.115

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	160
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Lead(aoc 2 - ra)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Observations	20	20
Number of Distinct Observations	20	20
Minimum	0.303	9.7
Maximum	336	2230
Mean	30.39	163.4
Median	6.785	22.35
SD	78.61	492
SE of Mean	17.58	110

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 160

Site Rank Sum W-Stat	227
WMW Test U-Stat	17
WMW Critical Value (0.100)	152
Approximate P-Value	3.974E-07

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 160.00

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(aoc 18 and aoc 21)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	42	20
Number of Non-Detect Data	1	0
Number of Detect Data	41	20
Minimum Non-Detect	1.1	N/A
Maximum Non-Detect	1.1	N/A
Percent Non detects	2.38%	0.00%
Minimum Detected	0.666	5.3
Maximum Detected	18.4	68.5
Mean of Detected Data	7.212	16.16
Median of Detected Data	6.8	9.75
SD of Detected Data	3.771	15.99

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.084)	10
Approximate K Value (0.084)	9
Number of Site Observations in 'R' Largest	3
Calculated Alpha	0.0966

Conclusion with Alpha = 0.084

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with 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	90%
Substantial Difference (S)	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(aoc 18 and aoc 21)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	42	20
Number of Non-Detect Data	1	0
Number of Detect Data	41	20
Minimum Non-Detect	1.1	N/A
Maximum Non-Detect	1.1	N/A
Percent Non detects	2.38%	0.00%
Minimum Detected	0.666	5.3
Maximum Detected	18.4	68.5
Mean of Detected Data	7.212	16.16
Median of Detected Data	6.8	9.75
SD of Detected Data	3.771	15.99

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 24

Site Rank Sum W-Stat	N/A
WMW Test U-Stat	N/A
WMW Critical Value (0.100)	152
Approximate P-Value	N/A

Conclusion with Alpha = 0.10

Do Not Reject H0, Conclude Site >= Background + 24.00

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(aoc 18 and aoc 21)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	42	20
Number of Non-Detect Data	1	0
Number of Detect Data	41	20
Minimum Non-Detect	1.1	N/A
Maximum Non-Detect	1.1	N/A
Percent Non detects	2.38%	0.00%
Minimum Detected	0.666	5.3
Maximum Detected	18.4	68.5
Mean of Detected Data	7.212	16.16
Median of Detected Data	6.8	9.75
SD of Detected Data	3.771	15.99

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 24

Gehan z Test Value	-6.325
Critical z (0.90)	-1.282
P-Value	1.269E-10

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 24.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(aoc 18 and aoc 21)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	42	20
Number of Non-Detect Data	4	0
Number of Detect Data	38	20
Minimum Non-Detect	5	N/A
Maximum Non-Detect	5.7	N/A
Percent Non detects	9.52%	0.00%
Minimum Detected	2.45	9.7
Maximum Detected	93.5	2230
Mean of Detected Data	13.02	163.4
Median of Detected Data	11.7	22.35
SD of Detected Data	14.54	492

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.084)	10
Approximate K Value (0.084)	9
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.0966

Conclusion with Alpha = 0.084

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	160
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(aoc 18 and aoc 21)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	42	20
Number of Non-Detect Data	4	0
Number of Detect Data	38	20
Minimum Non-Detect	5	N/A
Maximum Non-Detect	5.7	N/A
Percent Non detects	9.52%	0.00%
Minimum Detected	2.45	9.7
Maximum Detected	93.5	2230
Mean of Detected Data	13.02	163.4
Median of Detected Data	11.7	22.35
SD of Detected Data	14.54	492

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 160

Gehan z Test Value	-6.338
Critical z (0.90)	-1.282
P-Value	1.166E-10

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 160.00

P-Value < alpha (0.1)

Non-parametric Quantile Hypothesis Test for Full Dataset (No NDs)

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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(aoc 19)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Observations	32	20
Number of Distinct Observations	29	19
Minimum	4.3	5.3
Maximum	101	68.5
Mean	11.61	16.16
Median	8.35	9.75
SD	16.7	15.99
SE of Mean	2.953	3.576

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.119)	4
Approximate K Value (0.119)	4
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.133

Conclusion with Alpha = 0.119

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

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	90%
Substantial Difference	24
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Area of Concern Data: Arsenic(aoc 19)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Observations	32	20
Number of Distinct Observations	29	19
Minimum	4.3	5.3
Maximum	101	68.5
Mean	11.61	16.16
Median	8.35	9.75
SD	16.7	15.99
SE of Mean	2.953	3.576

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 24

Site Rank Sum W-Stat	548
WMW Test U-Stat	20
WMW Critical Value (0.100)	152
Approximate P-Value	8.842E-09

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 24.00

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(aoc 19)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	32	20
Number of Non-Detect Data	6	0
Number of Detect Data	26	20
Minimum Non-Detect	5	N/A
Maximum Non-Detect	5.3	N/A
Percent Non detects	18.75%	0.00%
Minimum Detected	5	9.7
Maximum Detected	435	2230
Mean of Detected Data	37.47	163.4
Median of Detected Data	18.9	22.35
SD of Detected Data	83.01	492

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.119)	4
Approximate K Value (0.119)	4
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.133

Conclusion with Alpha = 0.119

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	160
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(aoc 19)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	32	20
Number of Non-Detect Data	6	0
Number of Detect Data	26	20
Minimum Non-Detect	5	N/A
Maximum Non-Detect	5.3	N/A
Percent Non detects	18.75%	0.00%
Minimum Detected	5	9.7
Maximum Detected	435	2230
Mean of Detected Data	37.47	163.4
Median of Detected Data	18.9	22.35
SD of Detected Data	83.01	492

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 160

Gehan z Test Value	-5.687
Critical z (0.90)	-1.282
P-Value	6.466E-09

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 160.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(block a)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	31	20
Number of Non-Detect Data	6	0
Number of Detect Data	25	20
Minimum Non-Detect	1.1	N/A
Maximum Non-Detect	1.3	N/A
Percent Non detects	19.35%	0.00%
Minimum Detected	1.2	5.3
Maximum Detected	9.4	68.5
Mean of Detected Data	3.928	16.16
Median of Detected Data	3.1	9.75
SD of Detected Data	2.417	15.99

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.119)	4
Approximate K Value (0.119)	4
Number of Site Observations in 'R' Largest	0
Calculated Alpha	0.126

Conclusion with Alpha = 0.119

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(block a)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	31	20
Number of Non-Detect Data	6	0
Number of Detect Data	25	20
Minimum Non-Detect	1.1	N/A
Maximum Non-Detect	1.3	N/A
Percent Non detects	19.35%	0.00%
Minimum Detected	1.2	5.3
Maximum Detected	9.4	68.5
Mean of Detected Data	3.928	16.16
Median of Detected Data	3.1	9.75
SD of Detected Data	2.417	15.99

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 24

Gehan z Test Value	-5.986
Critical z (0.90)	-1.282
P-Value	1.073E-09

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 24.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(block a)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	31	20
Number of Non-Detect Data	2	0
Number of Detect Data	29	20
Minimum Non-Detect	5.3	N/A
Maximum Non-Detect	5.7	N/A
Percent Non detects	6.45%	0.00%
Minimum Detected	1.9	9.7
Maximum Detected	34.3	2230
Mean of Detected Data	12.92	163.4
Median of Detected Data	11.4	22.35
SD of Detected Data	9.592	492

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.119)	4
Approximate K Value (0.119)	4
Number of Site Observations in 'R' Largest	0
Calculated Alpha	0.126

Conclusion with Alpha = 0.119

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	160
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(block a)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	31	20
Number of Non-Detect Data	2	0
Number of Detect Data	29	20
Minimum Non-Detect	5.3	N/A
Maximum Non-Detect	5.7	N/A
Percent Non detects	6.45%	0.00%
Minimum Detected	1.9	9.7
Maximum Detected	34.3	2230
Mean of Detected Data	12.92	163.4
Median of Detected Data	11.4	22.35
SD of Detected Data	9.592	492

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 160

Gehan z Test Value	-5.994
Critical z (0.90)	-1.282
P-Value	1.022E-09

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 160.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(aoc 13)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	79	20
Number of Non-Detect Data	1	0
Number of Detect Data	78	20
Minimum Non-Detect	0.381	N/A
Maximum Non-Detect	0.381	N/A
Percent Non detects	1.27%	0.00%
Minimum Detected	0.178	5.3
Maximum Detected	38.7	68.5
Mean of Detected Data	7.659	16.16
Median of Detected Data	6.5	9.75
SD of Detected Data	5.492	15.99

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.095)	10
Approximate K Value (0.095)	10
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.0925

Conclusion with Alpha = 0.095

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with 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	90%
Substantial Difference (S)	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(aoc 13)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	79	20
Number of Non-Detect Data	1	0
Number of Detect Data	78	20
Minimum Non-Detect	0.381	N/A
Maximum Non-Detect	0.381	N/A
Percent Non detects	1.27%	0.00%
Minimum Detected	0.178	5.3
Maximum Detected	38.7	68.5
Mean of Detected Data	7.659	16.16
Median of Detected Data	6.5	9.75
SD of Detected Data	5.492	15.99

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 24

Site Rank Sum W-Stat	N/A
WMW Test U-Stat	N/A
WMW Critical Value (0.100)	152
Approximate P-Value	N/A

Conclusion with Alpha = 0.10

Do Not Reject H0, Conclude Site >= Background + 24.00

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(aoc 13)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	79	20
Number of Non-Detect Data	1	0
Number of Detect Data	78	20
Minimum Non-Detect	0.381	N/A
Maximum Non-Detect	0.381	N/A
Percent Non detects	1.27%	0.00%
Minimum Detected	0.178	5.3
Maximum Detected	38.7	68.5
Mean of Detected Data	7.659	16.16
Median of Detected Data	6.5	9.75
SD of Detected Data	5.492	15.99

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 24

Gehan z Test Value	-6.754
Critical z (0.90)	-1.282
P-Value	7.188E-12

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 24.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(aoc 13)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	79	20
Number of Non-Detect Data	18	0
Number of Detect Data	61	20
Minimum Non-Detect	0.254	N/A
Maximum Non-Detect	5.9	N/A
Percent Non detects	22.78%	0.00%
Minimum Detected	1.53	9.7
Maximum Detected	464	2230
Mean of Detected Data	52.45	163.4
Median of Detected Data	20.3	22.35
SD of Detected Data	90.48	492

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.095)	10
Approximate K Value (0.095)	10
Number of Site Observations in 'R' Largest	7
Calculated Alpha	0.0925

Conclusion with Alpha = 0.095

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	160
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(aoc 13)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	79	20
Number of Non-Detect Data	18	0
Number of Detect Data	61	20
Minimum Non-Detect	0.254	N/A
Maximum Non-Detect	5.9	N/A
Percent Non detects	22.78%	0.00%
Minimum Detected	1.53	9.7
Maximum Detected	464	2230
Mean of Detected Data	52.45	163.4
Median of Detected Data	20.3	22.35
SD of Detected Data	90.48	492

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 160

Gehan z Test Value	-6.297
Critical z (0.90)	-1.282
P-Value	1.515E-10

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 160.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic(s. exposure area rev)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	240	20
Number of Missing Values	48	0
Number of Non-Detect Data	13	0
Number of Detect Data	227	20
Minimum Non-Detect	1	N/A
Maximum Non-Detect	5.5	N/A
Percent Non detects	5.42%	0.00%
Minimum Detected	0.474	5.3
Maximum Detected	50.95	68.5
Mean of Detected Data	9.041	16.16
Median of Detected Data	8.4	9.75
SD of Detected Data	6.762	15.99

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.1)	12
Approximate K Value (0.1)	12
Number of Site Observations in 'R' Largest	8
Calculated Alpha	N/A

Conclusion with Alpha = 0.1

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	24
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Arsenic(s. exposure area rev)

Background Data: Arsenic(background)

Raw Statistics

	Site	Background
Number of Valid Data	240	20
Number of Missing Values	48	0
Number of Non-Detect Data	13	0
Number of Detect Data	227	20
Minimum Non-Detect	1	N/A
Maximum Non-Detect	5.5	N/A
Percent Non detects	5.42%	0.00%
Minimum Detected	0.474	5.3
Maximum Detected	50.95	68.5
Mean of Detected Data	9.041	16.16
Median of Detected Data	8.4	9.75
SD of Detected Data	6.762	15.99

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 24

Gehan z Test Value	-7.281
Critical z (0.90)	-1.282
P-Value	1.656E-13

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 24.00

P-Value < alpha (0.1)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead(s. exposure area rev)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	240	20
Number of Missing Values	48	0
Number of Non-Detect Data	12	0
Number of Detect Data	228	20
Minimum Non-Detect	5	N/A
Maximum Non-Detect	5.9	N/A
Percent Non detects	5.00%	0.00%
Minimum Detected	1.86	9.7
Maximum Detected	1330	2230
Mean of Detected Data	56.14	163.4
Median of Detected Data	20.85	22.35
SD of Detected Data	111.9	492

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.1)	12
Approximate K Value (0.1)	12
Number of Site Observations in 'R' Largest	10
Calculated Alpha	N/A

Conclusion with Alpha = 0.1

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Site vs Background Comparison Hypothesis Test for Data Sets with 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	90%
Substantial Difference	160
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median plus a Substantial Difference, S (
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median plus a Substantial Difference, S

Area of Concern Data: Lead(s. exposure area rev)

Background Data: Lead(background)

Raw Statistics

	Site	Background
Number of Valid Data	240	20
Number of Missing Values	48	0
Number of Non-Detect Data	12	0
Number of Detect Data	228	20
Minimum Non-Detect	5	N/A
Maximum Non-Detect	5.9	N/A
Percent Non detects	5.00%	0.00%
Minimum Detected	1.86	9.7
Maximum Detected	1330	2230
Mean of Detected Data	56.14	163.4
Median of Detected Data	20.85	22.35
SD of Detected Data	111.9	492

Site vs Background Gehan Test

H0: Mu of Site or AOC >= Mu of background 160

Gehan z Test Value	-6.584
Critical z (0.90)	-1.282
P-Value	2.29E-11

Conclusion with Alpha = 0.10

Reject H0, Conclude Site < Background + 160.00

P-Value < alpha (0.1)

Attachment I-3a:

Stata output: 84.13th and 50th percentiles (Surface Soil)

```
-----------------------------------------------------------------------------------------------
    ---------------------
       log:  J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\
           Background Evaluation\SS
> .smcl
  log type:  smcl
 opened on:  14 Oct 2008, 16:07:10

. edit
(1 var, 199 obs pasted into editor)
(1 var, 198 obs pasted into editor)
(1 var, 198 obs pasted into editor)
(1 var, 198 obs pasted into editor)
(1 var, 198 obs pasted into editor)
(1 var, 198 obs pasted into editor)
(1 var, 198 obs pasted into editor)
(1 var, 198 obs pasted into editor)
- preserve

. bysort AREA: centile aluminum, centile (50, 84.13)

-------------------------------------------------------------------------------
-> AREA = AOC 13

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
    aluminum |       27         50         12600        6934.586    15303.38
             |               84.13      17690.24        15308.04    31677.48

-------------------------------------------------------------------------------
-> AREA = AOC 22

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
    aluminum |       18         50          8215        6542.824    10766.05
             |               84.13      15198.47        9639.242       19200*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-------------------------------------------------------------------------------
-> AREA = Background

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
    aluminum |       11         50          7350        4511.164    12800.55
             |               84.13      13465.86        7712.518       17400*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-------------------------------------------------------------------------------
-> AREA = S. Exposure Area Rev

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
    aluminum |      121         50         16700        15442.04    19115.92
             |               84.13      28363.86        26810.42    32106.63

. bysort AREA: centile arsenic, centile (50, 84.13)

-------------------------------------------------------------------------------
-> AREA = AOC 13
```

```
                                                       -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
     arsenic |       27         50          6.9        5.786464    8.053384
             |                84.13      10.61128        8.058042    13.71063

-------------------------------------------------------------------------------
-> AREA = AOC 22

                                                       -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
     arsenic |       18         50          6.39        5.499714    11.04151
             |                84.13      12.49694        9.664818        14.3*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-------------------------------------------------------------------------------
-> AREA = Background

                                                       -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
     arsenic |       11         50          10.9        7.340364      34.328
             |                84.13      43.26724        12.86606        68.5*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-------------------------------------------------------------------------------
-> AREA = S. Exposure Area Rev

                                                       -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
     arsenic |      121         50          8.7        7.306306         9.1
             |                84.13      11.96386        11.11042    15.28513

. bysort AREA: centile  iron, centile (50, 84.13)

-------------------------------------------------------------------------------
-> AREA = AOC 13

                                                       -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        iron |       27         50         15000        13072.93    21147.38
             |                84.13       25067.3        21212.58    134401.1

-------------------------------------------------------------------------------
-> AREA = AOC 22

                                                       -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        iron |       18         50         24250        15197.14    45737.82
             |                84.13       54923.5        39168.88       69200*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-------------------------------------------------------------------------------
-> AREA = Background

                                                       -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        iron |       11         50         17400        14513.82    22805.45
```

```
             |              84.13       35500.52        18450.24      132000*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-> AREA = S. Exposure Area Rev

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        iron |      121         50         27100        23321.02    36805.73
             |               84.13      87247.02        73041.67    109553.8

. bysort AREA: centile  lead, centile (50, 84.13)

-> AREA = AOC 13

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        lead |       27         50          20.3         14.2797    30.39475
             |               84.13      49.76552        30.52516    426.1159

-> AREA = AOC 22

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        lead |       17         50          66.3        26.77862    128.5748
             |               84.13      298.1586        84.52897         341*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-> AREA = Background

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        lead |       11         50          42.5        15.85527    131.9222
             |               84.13      418.4868        58.95316        2230*

* Lower (upper) confidence limit held at minimum (maximum) of sample

-> AREA = S. Exposure Area Rev

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
        lead |      121         50          25.6        21.16306    42.54268
             |               84.13      131.6386        88.64586    183.5538

. bysort AREA: centile manganese, centile (50, 84.13)

-> AREA = AOC 13

                                                        -- Binom. Interp. --
    Variable |      Obs  Percentile      Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
   manganese |       27         50           755        433.9171    887.0099
             |               84.13      1673.809        906.2921    3580.521
```