AOC 2 - Surface Soil

Variable: Vanadium

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	10.7
Maximum	46.3
Mean	24.715
Median	23.525
Standard Deviation	12.17146
Variance	148.1445
Coefficient of Variation	0.492473
Skewness	0.479496

Gamma Statistics	
k hat	4.490631
k star (bias corrected)	3.210108
Theta hat	5.503681
Theta star	7.699117
nu hat	89.81262
nu star	64.20216
Approx.Chi Square Value (.05)	46.76435
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	44.18801

Log-transformed Statistics	
Minimum of log data	2.370244
Maximum of log data	3.835142
Mean of log data	3.091955
Standard Deviation of log data	0.51468
Variance of log data	0.264895

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.923583
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	31.77057

Gamma Distribution Test	
A-D Test Statistic	0.347604
A-D 5% Critical Value	0.729419
K-S Test Statistic	0.163968
K-S 5% Critical Value	0.267629
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	33.9309
Adjusted Gamma UCL	35.90921

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.934141
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	36.92209
95% Chebyshev (MVUE) UCL	42.68488
97.5% Chebyshev (MVUE) UCL	50.43384
99% Chebyshev (MVUE) UCL	65.65517

95% Non-parametric UCLs	
CLT UCL	31.04597
Adj-CLT UCL (Adjusted for skewness)	31.66957
Mod-t UCL (Adjusted for skewness)	31.86784
Jackknife UCL	31.77057
Standard Bootstrap UCL	30.83476
Bootstrap-t UCL	32.87378
Hall's Bootstrap UCL	31.17651
Percentile Bootstrap UCL	30.72
BCA Bootstrap UCL	31.15
95% Chebyshev (Mean, Sd) UCL	41.4922
97.5% Chebyshev (Mean, Sd) UCL	48.75171
99% Chebyshev (Mean, Sd) UCL	63.01161

AOC 18 and AOC 21 - Surface Soil

Variable: Aluminum

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	20
Minimum	3810
Maximum	50100
Mean	21303
Median	16050
Standard Deviation	12438.676
Variance	154720654
Coefficient of Variation	0.5838931
Skewness	1.0064363

Gamma Statistics	
k hat	3.2248938
k star (bias corrected)	2.7744931
Theta hat	6605.7989
Theta star	7678.1594
nu hat	128.99575
nu star	110.97972
Approx.Chi Square Value (.05)	87.65818
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	86.021026

Log-transformed Statistics	
Minimum of log data	8.2453845
Maximum of log data	10.821776
Mean of log data	9.8036203
Standard Deviation of log data	0.606098
Variance of log data	0.3673548

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.885483
Shapiro-Wilk 5% Critical Value	0.905
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	26112.36

Gamma Distribution Test	
A-D Test Statistic	0.537556
A-D 5% Critical Value	0.74708
K-S Test Statistic	0.171869
K-S 5% Critical Value	0.194942
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	26970.68
Adjusted Gamma UCL	27483.99

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.941465
Shapiro-Wilk 5% Critical Value	0.905
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	29153.28
95% Chebyshev (MVUE) UCL	34893.48
97.5% Chebyshev (MVUE) UCL	40680.62
99% Chebyshev (MVUE) UCL	52048.33

95% Non-parametric UCLs	
CLT UCL	25877.95
Adj-CLT UCL (Adjusted for skewness)	26546.77
Mod-t UCL (Adjusted for skewness)	26216.68
Jackknife UCL	26112.36
Standard Bootstrap UCL	25755.46
Bootstrap-t UCL	27157.58
Hall's Bootstrap UCL	26569.92
Percentile Bootstrap UCL	25755.5
BCA Bootstrap UCL	26363.5
95% Chebyshev (Mean, Sd) UCL	33426.72
97.5% Chebyshev (Mean, Sd) UCL	38672.67
99% Chebyshev (Mean, Sd) UCL	48977.31

AOC 18 and AOC 21 - Surface Soil **Variable: Arsenic**

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	20
Minimum	0.55
Maximum	18.4
Mean	7.7455
Median	6.97
Standard Deviation	3.991497
Variance	15.93205
Coefficient of Variation	0.515331
Skewness	0.751733

Gamma Statistics	
k hat	2.950214
k star (bias corrected)	2.541015
Theta hat	2.625403
Theta star	3.048191
nu hat	118.0085
nu star	101.6406
Approx.Chi Square Value (.05)	79.37529
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	77.82101

Log-transformed Statistics	
Minimum of log data	-0.597837
Maximum of log data	2.912351
Mean of log data	1.868163
Standard Deviation of log data	0.732454
Variance of log data	0.536489

RECOMMENDATION
Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.961005
Shapiro-Wilk 5% Critical Value	0.905
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	9.288795

Gamma Distribution Test	
A-D Test Statistic	0.4554
A-D 5% Critical Value	0.747773
K-S Test Statistic	0.172457
K-S 5% Critical Value	0.195084
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	9.918166
Adjusted Gamma UCL	10.11626

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.826611
Shapiro-Wilk 5% Critical Value	0.905
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	12.35577
95% Chebyshev (MVUE) UCL	14.70959
97.5% Chebyshev (MVUE) UCL	17.46958
99% Chebyshev (MVUE) UCL	22.89106

95% Non-parametric UCLs	
CLT UCL	9.213574
Adj-CLT UCL (Adjusted for skewness)	9.37388
Mod-t UCL (Adjusted for skewness)	9.3138
Jackknife UCL	9.288795
Standard Bootstrap UCL	9.147813
Bootstrap-t UCL	9.465642
Hall's Bootstrap UCL	9.607766
Percentile Bootstrap UCL	9.2575
BCA Bootstrap UCL	9.3645
95% Chebyshev (Mean, Sd) UCL	11.63593
97.5% Chebyshev (Mean, Sd) UCL	13.31932
99% Chebyshev (Mean, Sd) UCL	16.62602

AOC 18 and AOC 21 - Surface Soil

Variable: Benzo(a)anthracene

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	10
Minimum	0.015
Maximum	7.5
Mean	0.61375
Median	0.2
Standard Deviation	1.662562
Variance	2.764113
Coefficient of Variation	2.708859
Skewness	4.154739

Gamma Statistics	
k hat	0.537813
k star (bias corrected)	0.490474
Theta hat	1.141197
Theta star	1.251341
nu hat	21.5125
nu star	19.61896
Approx.Chi Square Value (.05)	10.56926
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	10.04576

Log-transformed Statistics	
Minimum of log data	-4.199705
Maximum of log data	2.014903
Mean of log data	-1.656049
Standard Deviation of log data	1.28285
Variance of log data	1.645703

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.331575
Shapiro-Wilk 5% Critical Value	0.905
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.256573

Gamma Distribution Test	
A-D Test Statistic	3.93689
A-D 5% Critical Value	0.799048
K-S Test Statistic	0.479361
K-S 5% Critical Value	0.204373
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.13926
Adjusted Gamma UCL	1.198629

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.738123
Shapiro-Wilk 5% Critical Value	0.905
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.055209
95% Chebyshev (MVUE) UCL	0.998087
97.5% Chebyshev (MVUE) UCL	1.254226
99% Chebyshev (MVUE) UCL	1.757363

95% Non-parametric UCLs	
CLT UCL	1.225241
Adj-CLT UCL (Adjusted for skewness)	1.59428
Mod-t UCL (Adjusted for skewness)	1.314135
Jackknife UCL	1.256573
Standard Bootstrap UCL	1.201798
Bootstrap-t UCL	12.90964
Hall's Bootstrap UCL	10.79321
Percentile Bootstrap UCL	1.3465
BCA Bootstrap UCL	1.71075
95% Chebyshev (Mean, Sd) UCL	2.234215
97.5% Chebyshev (Mean, Sd) UCL	2.935392
99% Chebyshev (Mean, Sd) UCL	4.312717

AOC 18 and AOC 21 - Surface Soil

Variable: Benzo(b)fluoranthene

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	9
Minimum	0.04
Maximum	7.4
Mean	0.64765
Median	0.2
Standard Deviation	1.65898
Variance	2.752214
Coefficient of Variation	2.561538
Skewness	3.976642

Gamma Statistics	
k hat	0.598014
k star (bias corrected)	0.541645
Theta hat	1.083002
Theta star	1.195709
nu hat	23.92056
nu star	21.66581
Approx.Chi Square Value (.05)	12.0865
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	11.52223

Log-transformed Statistics	
Minimum of log data	-3.218876
Maximum of log data	2.00148
Mean of log data	-1.468124
Standard Deviation of log data	1.106512
Variance of log data	1.22437

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.341328
Shapiro-Wilk 5% Critical Value	0.905
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.289088

Gamma Distribution Test	
A-D Test Statistic	4.897408
A-D 5% Critical Value	0.793505
K-S Test Statistic	0.508988
K-S 5% Critical Value	0.203518
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.160953
Adjusted Gamma UCL	1.217807

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.62184
Shapiro-Wilk 5% Critical Value	0.905
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.853129
95% Chebyshev (MVUE) UCL	0.903727
97.5% Chebyshev (MVUE) UCL	1.119139
99% Chebyshev (MVUE) UCL	1.542273

95% Non-parametric UCLs	
CLT UCL	1.257824
Adj-CLT UCL (Adjusted for skewness)	1.610282
Mod-t UCL (Adjusted for skewness)	1.344064
Jackknife UCL	1.289088
Standard Bootstrap UCL	1.236141
Bootstrap-t UCL	16.87376
Hall's Bootstrap UCL	23.46845
Percentile Bootstrap UCL	1.36965
BCA Bootstrap UCL	1.7194
95% Chebyshev (Mean, Sd) UCL	2.264624
97.5% Chebyshev (Mean, Sd) UCL	2.964289
99% Chebyshev (Mean, Sd) UCL	4.338647

AOC 18 and AOC 21 - Surface Soil

Variable: Benzo(k)fluoranthene

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	10
Minimum	0.032
Maximum	7.7
Mean	0.64865
Median	0.2
Standard Deviation	1.715084
Variance	2.941513
Coefficient of Variation	2.644082
Skewness	4.076763

Gamma Statistics	
k hat	0.581815
k star (bias corrected)	0.527876
Theta hat	1.114873
Theta star	1.228792
nu hat	23.27261
nu star	21.11505
Approx.Chi Square Value (.05)	11.67565
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	11.12216

Log-transformed Statistics	
Minimum of log data	-3.442019
Maximum of log data	2.04122
Mean of log data	-1.499699
Standard Deviation of log data	1.123107
Variance of log data	1.261368

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.333484
Shapiro-Wilk 5% Critical Value	0.905
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.31178

Gamma Distribution Test	
A-D Test Statistic	4.716373
A-D 5% Critical Value	0.794996
K-S Test Statistic	0.503165
K-S 5% Critical Value	0.203748
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.173064
Adjusted Gamma UCL	1.23144

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.650308
Shapiro-Wilk 5% Critical Value	0.905
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.856257
95% Chebyshev (MVUE) UCL	0.898943
97.5% Chebyshev (MVUE) UCL	1.114882
99% Chebyshev (MVUE) UCL	1.539052

95% Non-parametric UCLs	
CLT UCL	1.279459
Adj-CLT UCL (Adjusted for skewness)	1.653011
Mod-t UCL (Adjusted for skewness)	1.370047
Jackknife UCL	1.31178
Standard Bootstrap UCL	1.26355
Bootstrap-t UCL	18.01726
Hall's Bootstrap UCL	15.7101
Percentile Bootstrap UCL	1.31705
BCA Bootstrap UCL	1.7915
95% Chebyshev (Mean, Sd) UCL	2.320307
97.5% Chebyshev (Mean, Sd) UCL	3.043634
99% Chebyshev (Mean, Sd) UCL	4.464471

AOC 18 and AOC 21 - Surface Soil

Variable: Chromium (total)

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	19
Minimum	6.9
Maximum	51
Mean	22.405
Median	19.15
Standard Deviation	12.29366
Variance	151.1342
Coefficient of Variation	0.548702
Skewness	1.272711

Gamma Statistics	
k hat	4.057388
k star (bias corrected)	3.482113
Theta hat	5.522025
Theta star	6.434311
nu hat	162.2955
nu star	139.2845
Approx.Chi Square Value (.05)	113.0092
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	111.1402

Log-transformed Statistics	
Minimum of log data	1.931521
Maximum of log data	3.931826
Mean of log data	2.98102
Standard Deviation of log data	0.514358
Variance of log data	0.264564

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.859233
Shapiro-Wilk 5% Critical Value	0.905
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	27.15829

Gamma Distribution Test	
A-D Test Statistic	0.482586
A-D 5% Critical Value	0.745513
K-S Test Statistic	0.14074
K-S 5% Critical Value	0.19463
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	27.6143
Adjusted Gamma UCL	28.07869

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.965468
Shapiro-Wilk 5% Critical Value	0.905
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	28.53546
95% Chebyshev (MVUE) UCL	33.95807
97.5% Chebyshev (MVUE) UCL	38.9894
99% Chebyshev (MVUE) UCL	48.87247

95% Non-parametric UCLs	
CLT UCL	26.92662
Adj-CLT UCL (Adjusted for skewness)	27.76253
Mod-t UCL (Adjusted for skewness)	27.28868
Jackknife UCL	27.15829
Standard Bootstrap UCL	26.77502
Bootstrap-t UCL	28.62601
Hall's Bootstrap UCL	29.03598
Percentile Bootstrap UCL	26.99
BCA Bootstrap UCL	27.7
95% Chebyshev (Mean, Sd) UCL	34.38738
97.5% Chebyshev (Mean, Sd) UCL	39.57217
99% Chebyshev (Mean, Sd) UCL	49.75668

AOC 18 and AOC 21 - Surface Soil **Variable: Iron**

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	19
Minimum	6350
Maximum	47700
Mean	22599.5
Median	20100
Standard Deviation	10600.483
Variance	112370237
Coefficient of Variation	0.4690583
Skewness	0.7612538

Gamma Statistics	
k hat	4.6002592
k star (bias corrected)	3.9435536
Theta hat	4912.658
Theta star	5730.745
nu hat	184.01037
nu star	157.74214
Approx.Chi Square Value (.05)	129.70128
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	127.69354

Log-transformed Statistics	
Minimum of log data	8.7562101
Maximum of log data	10.772687
Mean of log data	9.9130739
Standard Deviation of log data	0.5087423
Variance of log data	0.2588187

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.940214
Shapiro-Wilk 5% Critical Value	0.905
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	26698.13

Gamma Distribution Test	
A-D Test Statistic	0.356103
A-D 5% Critical Value	0.74535
K-S Test Statistic	0.169322
K-S 5% Critical Value	0.194538
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	27485.42
Adjusted Gamma UCL	27917.57

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.948646
Shapiro-Wilk 5% Critical Value	0.905
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	29059.91
95% Chebyshev (MVUE) UCL	34561.11
97.5% Chebyshev (MVUE) UCL	39642.38
99% Chebyshev (MVUE) UCL	49623.55

95% Non-parametric UCLs	
CLT UCL	26498.36
Adj-CLT UCL (Adjusted for skewness)	26929.49
Mod-t UCL (Adjusted for skewness)	26765.38
Jackknife UCL	26698.13
Standard Bootstrap UCL	26377.16
Bootstrap-t UCL	27252.96
Hall's Bootstrap UCL	27164.54
Percentile Bootstrap UCL	26664.5
BCA Bootstrap UCL	26759
95% Chebyshev (Mean, Sd) UCL	32931.57
97.5% Chebyshev (Mean, Sd) UCL	37402.27
99% Chebyshev (Mean, Sd) UCL	46184.09

AOC 18 and AOC 21 - Surface Soil

Variable: Manganese

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	20
Minimum	332
Maximum	7570
Mean	2112.65
Median	1025
Standard Deviation	2234.441
Variance	4992725
Coefficient of Variation	1.057648
Skewness	1.46767

Gamma Statistics	
k hat	1.272243
k star (bias corrected)	1.11474
Theta hat	1660.571
Theta star	1895.195
nu hat	50.88973
nu star	44.5896
Approx.Chi Square Value (.05)	30.27099
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	29.33878

Log-transformed Statistics	
Minimum of log data	5.805135
Maximum of log data	8.931948
Mean of log data	7.213772
Standard Deviation of log data	0.919818
Variance of log data	0.846065

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.718229
Shapiro-Wilk 5% Critical Value	0.905
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2976.587

Gamma Distribution Test	
A-D Test Statistic	1.50578
A-D 5% Critical Value	0.762408
K-S Test Statistic	0.24102
K-S 5% Critical Value	0.19831
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3111.964
Adjusted Gamma UCL	3210.843

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.897818
Shapiro-Wilk 5% Critical Value	0.905
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	3501.988
95% Chebyshev (MVUE) UCL	4010.622
97.5% Chebyshev (MVUE) UCL	4874.194
99% Chebyshev (MVUE) UCL	6570.515

95% Non-parametric UCLs	
CLT UCL	2934.478
Adj-CLT UCL (Adjusted for skewness)	3109.684
Mod-t UCL (Adjusted for skewness)	3003.916
Jackknife UCL	2976.587
Standard Bootstrap UCL	2888.766
Bootstrap-t UCL	3329.356
Hall's Bootstrap UCL	2908.576
Percentile Bootstrap UCL	2935.5
BCA Bootstrap UCL	3090.1
95% Chebyshev (Mean, Sd) UCL	4290.513
97.5% Chebyshev (Mean, Sd) UCL	5232.876
99% Chebyshev (Mean, Sd) UCL	7083.966

AOC 18 and AOC 21 - Surface Soil **Variable: Thallium**

Raw Statistics	
Number of Valid Samples	9
Number of Unique Samples	8
Minimum	0.258
Maximum	1.14
Mean	0.623222
Median	0.585
Standard Deviation	0.300608
Variance	0.090365
Coefficient of Variation	0.482345
Skewness	0.778007

Gamma Statistics	
k hat	4.854072
k star (bias corrected)	3.310122
Theta hat	0.128392
Theta star	0.188278
nu hat	87.3733
nu star	59.5822
Approx.Chi Square Value (.05)	42.83014
Adjusted Level of Significance	0.02308
Adjusted Chi Square Value	39.85223

Log-transformed Statistics	
Minimum of log data	-1.354796
Maximum of log data	0.131028
Mean of log data	-0.57938
Standard Deviation of log data	0.499921
Variance of log data	0.249921

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.851017
Shapiro-Wilk 5% Critical Value	0.829
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.809554

Gamma Distribution Test	
A-D Test Statistic	0.61285
A-D 5% Critical Value	0.723081
K-S Test Statistic	0.264601
K-S 5% Critical Value	0.279926
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.866982
Adjusted Gamma UCL	0.931766

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.881476
Shapiro-Wilk 5% Critical Value	0.829
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.953492
95% Chebyshev (MVUE) UCL	1.086004
97.5% Chebyshev (MVUE) UCL	1.285347
99% Chebyshev (MVUE) UCL	1.676917

95% Non-parametric UCLs	
CLT UCL	0.788041
Adj-CLT UCL (Adjusted for skewness)	0.815808
Mod-t UCL (Adjusted for skewness)	0.813885
Jackknife UCL	0.809554
Standard Bootstrap UCL	0.780986
Bootstrap-t UCL	0.913289
Hall's Bootstrap UCL	2.163034
Percentile Bootstrap UCL	0.789444
BCA Bootstrap UCL	0.793889
95% Chebyshev (Mean, Sd) UCL	1.059996
97.5% Chebyshev (Mean, Sd) UCL	1.248988
99% Chebyshev (Mean, Sd) UCL	1.620226

AOC 18 and AOC 21 - Surface Soil **Variable: Vanadium**

Raw Statistics	
Number of Valid Samples	20
Number of Unique Samples	20
Minimum	12.2
Maximum	63.1
Mean	30.5175
Median	29.95
Standard Deviation	13.51443
Variance	182.6398
Coefficient of Variation	0.442842
Skewness	0.701769

Gamma Statistics	
k hat	5.365773
k star (bias corrected)	4.59424
Theta hat	5.687438
Theta star	6.642556
nu hat	214.6309
nu star	183.7696
Approx.Chi Square Value (.05)	153.4068
Adjusted Level of Significance	0.038
Adjusted Chi Square Value	151.2166

Log-transformed Statistics	
Minimum of log data	2.501436
Maximum of log data	4.144721
Mean of log data	3.322233
Standard Deviation of log data	0.458748
Variance of log data	0.21045

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.952064
Shapiro-Wilk 5% Critical Value	0.905
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	35.7428

Gamma Distribution Test	
A-D Test Statistic	0.182841
A-D 5% Critical Value	0.744982
K-S Test Statistic	0.100089
K-S 5% Critical Value	0.194425
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	36.55763
Adjusted Gamma UCL	37.08713

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.97339
Shapiro-Wilk 5% Critical Value	0.905
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	37.87358
95% Chebyshev (MVUE) UCL	44.74228
97.5% Chebyshev (MVUE) UCL	50.85204
99% Chebyshev (MVUE) UCL	62.85349

95% Non-parametric UCLs	
CLT UCL	35.48811
Adj-CLT UCL (Adjusted for skewness)	35.9948
Mod-t UCL (Adjusted for skewness)	35.82183
Jackknife UCL	35.7428
Standard Bootstrap UCL	35.28239
Bootstrap-t UCL	36.09476
Hall's Bootstrap UCL	36.16794
Percentile Bootstrap UCL	35.45
BCA Bootstrap UCL	35.625
95% Chebyshev (Mean, Sd) UCL	43.68974
97.5% Chebyshev (Mean, Sd) UCL	49.38937
99% Chebyshev (Mean, Sd) UCL	60.58521

AOC 19 - Surface Soil

Variable: Aluminum

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	5170
Maximum	21300
Mean	11766.15
Median	12000
Standard Deviation	4167.46
Variance	17367726
Coefficient of Variation	0.354191
Skewness	0.778388

Gamma Statistics	
k hat	8.707017
k star (bias corrected)	6.748988
Theta hat	1351.342
Theta star	1743.395
nu hat	226.3824
nu star	175.4737
Approx.Chi Square Value (.05)	145.8319
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	141.9832

Log-transformed Statistics	
Minimum of log data	8.550628
Maximum of log data	9.966462
Mean of log data	9.31446
Standard Deviation of log data	0.362036
Variance of log data	0.13107

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.957661
Shapiro-Wilk 5% Critical Value	0.866
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	13826.2

Gamma Distribution Test	
A-D Test Statistic	0.175345
A-D 5% Critical Value	0.734306
K-S Test Statistic	0.107297
K-S 5% Critical Value	0.236891
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	14157.74
Adjusted Gamma UCL	14541.51

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.979332
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	14556.32
95% Chebyshev (MVUE) UCL	17018.85
97.5% Chebyshev (MVUE) UCL	19282.98
99% Chebyshev (MVUE) UCL	23730.41

95% Non-parametric UCLs	
CLT UCL	13667.35
Adj-CLT UCL (Adjusted for skewness)	13933.98
Mod-t UCL (Adjusted for skewness)	13867.79
Jackknife UCL	13826.2
Standard Bootstrap UCL	13609.43
Bootstrap-t UCL	14267.86
Hall's Bootstrap UCL	14656.13
Percentile Bootstrap UCL	13660.77
BCA Bootstrap UCL	13777.69
95% Chebyshev (Mean, Sd) UCL	16804.37
97.5% Chebyshev (Mean, Sd) UCL	18984.41
99% Chebyshev (Mean, Sd) UCL	23266.67

AOC 19 - Surface Soil

Variable: Arsenic

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	5.15
Maximum	101
Mean	17.90385
Median	10.3
Standard Deviation	25.20179
Variance	635.1302
Coefficient of Variation	1.407619
Skewness	3.489806

Gamma Statistics	
k hat	1.520372
k star (bias corrected)	1.220799
Theta hat	11.77597
Theta star	14.66568
nu hat	39.52967
nu star	31.74077
Approx.Chi Square Value (.05)	19.8645
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	18.53479

Log-transformed Statistics	
Minimum of log data	1.638997
Maximum of log data	4.615121
Mean of log data	2.521424
Standard Deviation of log data	0.704786
Variance of log data	0.496723

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.434948
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	30.36153

Gamma Distribution Test	
A-D Test Statistic	2.035364
A-D 5% Critical Value	0.750037
K-S Test Statistic	0.338843
K-S 5% Critical Value	0.240868
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	28.60791
Adjusted Gamma UCL	30.66028

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.746937
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	25.91958
95% Chebyshev (MVUE) UCL	29.50943
97.5% Chebyshev (MVUE) UCL	35.52944
99% Chebyshev (MVUE) UCL	47.35461

95% Non-parametric UCLs	
CLT UCL	29.40091
Adj-CLT UCL (Adjusted for skewness)	36.62977
Mod-t UCL (Adjusted for skewness)	31.48909
Jackknife UCL	30.36153
Standard Bootstrap UCL	28.86118
Bootstrap-t UCL	100.0713
Hall's Bootstrap UCL	87.00684
Percentile Bootstrap UCL	31.49231
BCA Bootstrap UCL	38.87692
95% Chebyshev (Mean, Sd) UCL	48.37132
97.5% Chebyshev (Mean, Sd) UCL	61.55463
99% Chebyshev (Mean, Sd) UCL	87.45067

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

AOC 19 - Surface Soil

Variable: Benzo(a)anthracene

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	10
Minimum	0.089
Maximum	4.25
Mean	0.769923
Median	0.4
Standard Deviation	1.136528
Variance	1.291697
Coefficient of Variation	1.476158
Skewness	2.814035

Gamma Statistics	
k hat	0.963806
k star (bias corrected)	0.792671
Theta hat	0.798836
Theta star	0.971302
nu hat	25.05895
nu star	20.60945
Approx.Chi Square Value (.05)	11.30012
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	10.3295

Log-transformed Statistics	
Minimum of log data	-2.419119
Maximum of log data	1.446919
Mean of log data	-0.86298
Standard Deviation of log data	1.042071
Variance of log data	1.085912

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.590097
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.331729

Gamma Distribution Test	
A-D Test Statistic	0.900428
A-D 5% Critical Value	0.759269
K-S Test Statistic	0.230828
K-S 5% Critical Value	0.243441
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.404205
Adjusted Gamma UCL	1.536154

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.933085
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.753896
95% Chebyshev (MVUE) UCL	1.618705
97.5% Chebyshev (MVUE) UCL	2.022732
99% Chebyshev (MVUE) UCL	2.816365

95% Non-parametric UCLs	
CLT UCL	1.288408
Adj-CLT UCL (Adjusted for skewness)	1.551281
Mod-t UCL (Adjusted for skewness)	1.372732
Jackknife UCL	1.331729
Standard Bootstrap UCL	1.255304
Bootstrap-t UCL	3.09698
Hall's Bootstrap UCL	3.673899
Percentile Bootstrap UCL	1.322846
BCA Bootstrap UCL	1.631462
95% Chebyshev (Mean, Sd) UCL	2.143919
97.5% Chebyshev (Mean, Sd) UCL	2.738448
99% Chebyshev (Mean, Sd) UCL	3.906285

AOC 19 - Surface Soil

Variable: Benzo(a)pyrene

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	11
Minimum	0.092
Maximum	3.05
Mean	0.699769
Median	0.35
Standard Deviation	0.878013
Variance	0.770907
Coefficient of Variation	1.254718
Skewness	2.161457

Gamma Statistics	
k hat	1.09534
k star (bias corrected)	0.893851
Theta hat	0.63886
Theta star	0.78287
nu hat	28.47883
nu star	23.24013
Approx.Chi Square Value (.05)	13.2706
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	12.20797

Log-transformed Statistics	
Minimum of log data	-2.385967
Maximum of log data	1.115142
Mean of log data	-0.878524
Standard Deviation of log data	1.00035
Variance of log data	1.0007

RECOMMENDATION
Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.666271
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.133787

Gamma Distribution Test	
A-D Test Statistic	0.821311
A-D 5% Critical Value	0.756052
K-S Test Statistic	0.198082
K-S 5% Critical Value	0.24263
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.22547
Adjusted Gamma UCL	1.33214

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.932627
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.564119
95% Chebyshev (MVUE) UCL	1.497358
97.5% Chebyshev (MVUE) UCL	1.864024
99% Chebyshev (MVUE) UCL	2.584269

95% Non-parametric UCLs	
CLT UCL	1.100319
Adj-CLT UCL (Adjusted for skewness)	1.256305
Mod-t UCL (Adjusted for skewness)	1.158117
Jackknife UCL	1.133787
Standard Bootstrap UCL	1.088645
Bootstrap-t UCL	2.19978
Hall's Bootstrap UCL	3.247031
Percentile Bootstrap UCL	1.119231
BCA Bootstrap UCL	1.274231
95% Chebyshev (Mean, Sd) UCL	1.761236
97.5% Chebyshev (Mean, Sd) UCL	2.220533
99% Chebyshev (Mean, Sd) UCL	3.122734

AOC 19 - Surface Soil

Variable: Benzo(b)fluoranthene

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	11
Minimum	0.087
Maximum	2.95
Mean	0.659
Median	0.33
Standard Deviation	0.84817
Variance	0.719393
Coefficient of Variation	1.287057
Skewness	2.211594

Gamma Statistics	
k hat	1.077348
k star (bias corrected)	0.880011
Theta hat	0.611687
Theta star	0.748854
nu hat	28.01104
nu star	22.88029
Approx.Chi Square Value (.05)	12.99874
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	11.94839

Log-transformed Statistics	
Minimum of log data	-2.441847
Maximum of log data	1.081805
Mean of log data	-0.948243
Standard Deviation of log data	0.997956
Variance of log data	0.995916

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.649296
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.078266

Gamma Distribution Test	
A-D Test Statistic	0.960703
A-D 5% Critical Value	0.756306
K-S Test Statistic	0.223997
K-S 5% Critical Value	0.242705
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.159967
Adjusted Gamma UCL	1.261937

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.91456
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.450687
95% Chebyshev (MVUE) UCL	1.391563
97.5% Chebyshev (MVUE) UCL	1.731936
99% Chebyshev (MVUE) UCL	2.400533

95% Non-parametric UCLs	
CLT UCL	1.045936
Adj-CLT UCL (Adjusted for skewness)	1.200115
Mod-t UCL (Adjusted for skewness)	1.102314
Jackknife UCL	1.078266
Standard Bootstrap UCL	1.024417
Bootstrap-t UCL	2.175649
Hall's Bootstrap UCL	3.155901
Percentile Bootstrap UCL	1.056154
BCA Bootstrap UCL	1.187692
95% Chebyshev (Mean, Sd) UCL	1.684388
97.5% Chebyshev (Mean, Sd) UCL	2.128074
99% Chebyshev (Mean, Sd) UCL	2.99961

AOC 19 - Surface Soil

Variable: Cadmium

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	11
Minimum	0.27
Maximum	7.4
Mean	1.044615
Median	0.31
Standard Deviation	1.948043
Variance	3.794873
Coefficient of Variation	1.864843
Skewness	3.372793

Gamma Statistics	
k hat	0.856617
k star (bias corrected)	0.710218
Theta hat	1.219466
Theta star	1.470837
nu hat	22.27205
nu star	18.46568
Approx.Chi Square Value (.05)	9.726844
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	8.835446

Log-transformed Statistics	
Minimum of log data	-1.309333
Maximum of log data	2.00148
Mean of log data	-0.643071
Standard Deviation of log data	0.982033
Variance of log data	0.964389

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.449549
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.007567

Gamma Distribution Test	
A-D Test Statistic	2.07257
A-D 5% Critical Value	0.764804
K-S Test Statistic	0.32075
K-S 5% Critical Value	0.244659
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.983124
Adjusted Gamma UCL	2.183199

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.714202
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.897436
95% Chebyshev (MVUE) UCL	1.844143
97.5% Chebyshev (MVUE) UCL	2.291772
99% Chebyshev (MVUE) UCL	3.171051

95% Non-parametric UCLs	
CLT UCL	1.933313
Adj-CLT UCL (Adjusted for skewness)	2.473353
Mod-t UCL (Adjusted for skewness)	2.091803
Jackknife UCL	2.007567
Standard Bootstrap UCL	1.899727
Bootstrap-t UCL	6.018011
Hall's Bootstrap UCL	5.064845
Percentile Bootstrap UCL	2.078846
BCA Bootstrap UCL	2.641923
95% Chebyshev (Mean, Sd) UCL	3.399685
97.5% Chebyshev (Mean, Sd) UCL	4.418725
99% Chebyshev (Mean, Sd) UCL	6.420433

AOC 19 - Surface Soil

Variable: Chromium (total)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	12
Minimum	13.8
Maximum	34.2
Mean	21.22308
Median	19.3
Standard Deviation	5.954852
Variance	35.46026
Coefficient of Variation	0.280584
Skewness	1.019916

Gamma Statistics	
k hat	15.08538
k star (bias corrected)	11.65542
Theta hat	1.406864
Theta star	1.820876
nu hat	392.2199
nu star	303.041
Approx.Chi Square Value (.05)	263.7072
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	258.4784

Log-transformed Statistics	
Minimum of log data	2.624669
Maximum of log data	3.532226
Mean of log data	3.021578
Standard Deviation of log data	0.26502
Variance of log data	0.070236

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.909082
Shapiro-Wilk 5% Critical Value	0.866
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	24.16666

Gamma Distribution Test	
A-D Test Statistic	0.358494
A-D 5% Critical Value	0.733531
K-S Test Statistic	0.17181
K-S 5% Critical Value	0.2364
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	24.38864
Adjusted Gamma UCL	24.88201

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.956762
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	24.54954
95% Chebyshev (MVUE) UCL	28.04355
97.5% Chebyshev (MVUE) UCL	31.0055
99% Chebyshev (MVUE) UCL	36.82368

95% Non-parametric UCLs	
CLT UCL	23.93968
Adj-CLT UCL (Adjusted for skewness)	24.43888
Mod-t UCL (Adjusted for skewness)	24.24453
Jackknife UCL	24.16666
Standard Bootstrap UCL	23.79779
Bootstrap-t UCL	24.96625
Hall's Bootstrap UCL	26.51876
Percentile Bootstrap UCL	23.89231
BCA Bootstrap UCL	24.36154
95% Chebyshev (Mean, Sd) UCL	28.42214
97.5% Chebyshev (Mean, Sd) UCL	31.53718
99% Chebyshev (Mean, Sd) UCL	37.65608

AOC 19 - Surface Soil

Variable: Copper

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	14.25
Maximum	540
Mean	69.41923
Median	28.6
Standard Deviation	142.0228
Variance	20170.47
Coefficient of Variation	2.045871
Skewness	3.549876

Gamma Statistics	
k hat	0.848043
k star (bias corrected)	0.703623
Theta hat	81.85814
Theta star	98.65971
nu hat	22.04912
nu star	18.2942
Approx.Chi Square Value (.05)	9.602421
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	8.717546

Log-transformed Statistics	
Minimum of log data	2.656757
Maximum of log data	6.291569
Mean of log data	3.545609
Standard Deviation of log data	0.926583
Variance of log data	0.858555

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.393009
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	139.6236

Gamma Distribution Test	
A-D Test Statistic	2.208243
A-D 5% Critical Value	0.765247
K-S Test Statistic	0.341577
K-S 5% Critical Value	0.244756
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	132.2551
Adjusted Gamma UCL	145.6797

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.745383
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	110.5861
95% Chebyshev (MVUE) UCL	112.1079
97.5% Chebyshev (MVUE) UCL	138.5602
99% Chebyshev (MVUE) UCL	190.5206

95% Non-parametric UCLs	
CLT UCL	134.2101
Adj-CLT UCL (Adjusted for skewness)	175.649
Mod-t UCL (Adjusted for skewness)	146.0872
Jackknife UCL	139.6236
Standard Bootstrap UCL	130.207
Bootstrap-t UCL	641.5123
Hall's Bootstrap UCL	410.5743
Percentile Bootstrap UCL	147.2038
BCA Bootstrap UCL	188.5846
95% Chebyshev (Mean, Sd) UCL	241.1164
97.5% Chebyshev (Mean, Sd) UCL	315.4099
99% Chebyshev (Mean, Sd) UCL	461.3451

AOC 19 - Surface Soil

Variable: Dioxin TEQ-HH

Raw Statistics	
Number of Valid Samples	7
Number of Unique Samples	7
Minimum	6.06E-08
Maximum	8.54E-06
Mean	3.16E-06
Median	2.66E-06
Standard Deviation	3.34E-06
Variance	1.12E-11
Coefficient of Variation	1.055725
Skewness	0.642721

Gamma Statistics	
k hat	0.546433
k star (bias corrected)	0.407486
Theta hat	5.79E-06
Theta star	7.77E-06
nu hat	7.650064
nu star	5.704799
Approx.Chi Square Value (.05)	1.490445
Adjusted Level of Significance	0.01584
Adjusted Chi Square Value	0.935392

Log-transformed Statistics	
Minimum of log data	-16.61946
Maximum of log data	-11.67092
Mean of log data	-13.81024
Standard Deviation of log data	2.077916
Variance of log data	4.317735

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.884959
Shapiro-Wilk 5% Critical Value	0.803
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	5.62E-06

Gamma Distribution Test	
A-D Test Statistic	0.437036
A-D 5% Critical Value	0.74868
K-S Test Statistic	0.207987
K-S 5% Critical Value	0.326389
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.21E-05
Adjusted Gamma UCL	1.93E-05

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.862641
Shapiro-Wilk 5% Critical Value	0.803
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.003284
95% Chebyshev (MVUE) UCL	1.96E-05
97.5% Chebyshev (MVUE) UCL	2.6E-05
99% Chebyshev (MVUE) UCL	3.87E-05

95% Non-parametric UCLs	
CLT UCL	5.24E-06
Adj-CLT UCL (Adjusted for skewness)	5.57E-06
Mod-t UCL (Adjusted for skewness)	5.67E-06
Jackknife UCL	5.62E-06
Standard Bootstrap UCL	5.11E-06
Bootstrap-t UCL	6.49E-06
Hall's Bootstrap UCL	5.62E-06
Percentile Bootstrap UCL	5.12E-06
BCA Bootstrap UCL	5.32E-06
95% Chebyshev (Mean, Sd) UCL	8.67E-06
97.5% Chebyshev (Mean, Sd) UCL	1.1E-05
99% Chebyshev (Mean, Sd) UCL	1.57E-05

AOC 19 - Surface Soil

Variable: Indeno(1,2,3-cd)pyrene

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	10
Minimum	0.063
Maximum	1.5
Mean	0.451577
Median	0.21
Standard Deviation	0.467671
Variance	0.218716
Coefficient of Variation	1.03564
Skewness	1.779609

Gamma Statistics	
k hat	1.438919
k star (bias corrected)	1.158143
Theta hat	0.313831
Theta star	0.389915
nu hat	37.41189
nu star	30.11171
Approx.Chi Square Value (.05)	18.57864
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	17.29712

Log-transformed Statistics	
Minimum of log data	-2.764621
Maximum of log data	0.405465
Mean of log data	-1.181112
Standard Deviation of log data	0.878832
Variance of log data	0.772346

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.692275
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.682755

Gamma Distribution Test	
A-D Test Statistic	1.052142
A-D 5% Critical Value	0.751194
K-S Test Statistic	0.242804
K-S 5% Critical Value	0.241187
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.731903
Adjusted Gamma UCL	0.786128

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.893301
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.885345
95% Chebyshev (MVUE) UCL	0.926744
97.5% Chebyshev (MVUE) UCL	1.139675
99% Chebyshev (MVUE) UCL	1.557935

95% Non-parametric UCLs	
CLT UCL	0.664929
Adj-CLT UCL (Adjusted for skewness)	0.733336
Mod-t UCL (Adjusted for skewness)	0.693425
Jackknife UCL	0.682755
Standard Bootstrap UCL	0.656009
Bootstrap-t UCL	1.078471
Hall's Bootstrap UCL	1.644597
Percentile Bootstrap UCL	0.672308
BCA Bootstrap UCL	0.729269
95% Chebyshev (Mean, Sd) UCL	1.016963
97.5% Chebyshev (Mean, Sd) UCL	1.261607
99% Chebyshev (Mean, Sd) UCL	1.742161

AOC 19 - Surface Soil **Variable: Iron**

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	12700
Maximum	37300
Mean	21834.62
Median	21000
Standard Deviation	6228.676
Variance	38796410
Coefficient of Variation	0.285266
Skewness	1.18018

Gamma Statistics	
k hat	14.56596
k star (bias corrected)	11.25587
Theta hat	1499.016
Theta star	1939.843
nu hat	378.715
nu star	292.6526
Approx.Chi Square Value (.05)	254.0197
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	248.8906

Log-transformed Statistics	
Minimum of log data	9.449357
Maximum of log data	10.52675
Mean of log data	9.956533
Standard Deviation of log data	0.271186
Variance of log data	0.073542

RECOMMENDATION
Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.921883
Shapiro-Wilk 5% Critical Value	0.866
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	24913.56

Gamma Distribution Test	
A-D Test Statistic	0.246704
A-D 5% Critical Value	0.733553
K-S Test Statistic	0.166815
K-S 5% Critical Value	0.236431
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	25155.36
Adjusted Gamma UCL	25673.75

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.979314
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	25363.11
95% Chebyshev (MVUE) UCL	29027.02
97.5% Chebyshev (MVUE) UCL	32147.29
99% Chebyshev (MVUE) UCL	38276.45

95% Non-parametric UCLs	
CLT UCL	24676.14
Adj-CLT UCL (Adjusted for skewness)	25280.34
Mod-t UCL (Adjusted for skewness)	25007.8
Jackknife UCL	24913.56
Standard Bootstrap UCL	24605.3
Bootstrap-t UCL	25935.93
Hall's Bootstrap UCL	27411.18
Percentile Bootstrap UCL	24769.23
BCA Bootstrap UCL	25107.69
95% Chebyshev (Mean, Sd) UCL	29364.72
97.5% Chebyshev (Mean, Sd) UCL	32623
99% Chebyshev (Mean, Sd) UCL	39023.26

AOC 19 - Surface Soil

Variable: Lead

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	12.5
Maximum	435
Mean	60.38462
Median	22.6
Standard Deviation	114.7473
Variance	13166.95
Coefficient of Variation	1.900274
Skewness	3.386474

Gamma Statistics	
k hat	0.854732
k star (bias corrected)	0.708768
Theta hat	70.64741
Theta star	85.19654
nu hat	22.22304
nu star	18.42798
Approx.Chi Square Value (.05)	9.699469
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	8.809503

Log-transformed Statistics	
Minimum of log data	2.525729
Maximum of log data	6.075346
Mean of log data	3.412307
Standard Deviation of log data	0.968568
Variance of log data	0.938123

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.444812
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	117.1062

Gamma Distribution Test	
A-D Test Statistic	1.918939
A-D 5% Critical Value	0.764902
K-S Test Statistic	0.306728
K-S 5% Critical Value	0.24468
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	114.7245
Adjusted Gamma UCL	126.3143

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.781009
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	106.196
95% Chebyshev (MVUE) UCL	104.3277
97.5% Chebyshev (MVUE) UCL	129.4836
99% Chebyshev (MVUE) UCL	178.8975

95% Non-parametric UCLs	
CLT UCL	112.7324
Adj-CLT UCL (Adjusted for skewness)	144.6718
Mod-t UCL (Adjusted for skewness)	122.0881
Jackknife UCL	117.1062
Standard Bootstrap UCL	110.4356
Bootstrap-t UCL	547.234
Hall's Bootstrap UCL	339.0533
Percentile Bootstrap UCL	119.7346
BCA Bootstrap UCL	155.3038
95% Chebyshev (Mean, Sd) UCL	199.1074
97.5% Chebyshev (Mean, Sd) UCL	259.1328
99% Chebyshev (Mean, Sd) UCL	377.0411

AOC 19 - Surface Soil

Variable: Manganese

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	329.5
Maximum	1119.5
Mean	748.1538
Median	822
Standard Deviation	278.1287
Variance	77355.6
Coefficient of Variation	0.371753
Skewness	-0.156533

Gamma Statistics	
k hat	6.902148
k star (bias corrected)	5.360627
Theta hat	108.3943
Theta star	139.5646
nu hat	179.4559
nu star	139.3763
Approx.Chi Square Value (.05)	113.0919
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	109.7208

Log-transformed Statistics	
Minimum of log data	5.797576
Maximum of log data	7.020637
Mean of log data	6.543422
Standard Deviation of log data	0.41706
Variance of log data	0.173939

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.924284
Shapiro-Wilk 5% Critical Value	0.866
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	885.6378

Gamma Distribution Test	
A-D Test Statistic	0.475184
A-D 5% Critical Value	0.735097
K-S Test Statistic	0.185574
K-S 5% Critical Value	0.237158
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	922.0368
Adjusted Gamma UCL	950.366

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.906725
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	966.9164
95% Chebyshev (MVUE) UCL	1138.824
97.5% Chebyshev (MVUE) UCL	1306.036
99% Chebyshev (MVUE) UCL	1634.493

95% Non-parametric UCLs	
CLT UCL	875.0363
Adj-CLT UCL (Adjusted for skewness)	871.4579
Mod-t UCL (Adjusted for skewness)	885.0796
Jackknife UCL	885.6378
Standard Bootstrap UCL	866.3866
Bootstrap-t UCL	885.898
Hall's Bootstrap UCL	865.2179
Percentile Bootstrap UCL	860.3462
BCA Bootstrap UCL	865.9615
95% Chebyshev (Mean, Sd) UCL	1084.395
97.5% Chebyshev (Mean, Sd) UCL	1229.887
99% Chebyshev (Mean, Sd) UCL	1515.678

AOC 19 - Surface Soil

Variable: Mercury

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	10
Minimum	0.02
Maximum	2.7
Mean	0.332692
Median	0.05
Standard Deviation	0.729471
Variance	0.532128
Coefficient of Variation	2.192629
Skewness	3.312482

Gamma Statistics	
k hat	0.499741
k star (bias corrected)	0.435698
Theta hat	0.665729
Theta star	0.763584
nu hat	12.99327
nu star	11.32815
Approx.Chi Square Value (.05)	4.786954
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	4.197219

Log-transformed Statistics	
Minimum of log data	-3.912023
Maximum of log data	0.993252
Mean of log data	-2.371661
Standard Deviation of log data	1.500307
Variance of log data	2.250921

RECOMMENDATION

Data are lognormal (0.05)

Use 99% Chebyshev (MVUE) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.475134
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.693283

Gamma Distribution Test	
A-D Test Statistic	1.238814
A-D 5% Critical Value	0.790002
K-S Test Statistic	0.286329
K-S 5% Critical Value	0.249818
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.787304
Adjusted Gamma UCL	0.897925

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.882172
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.492461
95% Chebyshev (MVUE) UCL	0.744798
97.5% Chebyshev (MVUE) UCL	0.960253
99% Chebyshev (MVUE) UCL	1.383473

95% Non-parametric UCLs	
CLT UCL	0.665477
Adj-CLT UCL (Adjusted for skewness)	0.864086
Mod-t UCL (Adjusted for skewness)	0.724261
Jackknife UCL	0.693283
Standard Bootstrap UCL	0.654429
Bootstrap-t UCL	1.795304
Hall's Bootstrap UCL	1.76813
Percentile Bootstrap UCL	0.696154
BCA Bootstrap UCL	0.918462
95% Chebyshev (Mean, Sd) UCL	1.214579
97.5% Chebyshev (Mean, Sd) UCL	1.596173
99% Chebyshev (Mean, Sd) UCL	2.345739

AOC 19 - Surface Soil

Variable: Vanadium

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	17.4
Maximum	56.2
Mean	30.84231
Median	29.3
Standard Deviation	10.02127
Variance	100.4258
Coefficient of Variation	0.324919
Skewness	1.31478

Gamma Statistics	
k hat	11.52448
k star (bias corrected)	8.916264
Theta hat	2.676244
Theta star	3.459107
nu hat	299.6364
nu star	231.8229
Approx.Chi Square Value (.05)	197.5712
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	193.0661

Log-transformed Statistics	
Minimum of log data	2.85647
Maximum of log data	4.028917
Mean of log data	3.384874
Standard Deviation of log data	0.303878
Variance of log data	0.092342

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.90923
Shapiro-Wilk 5% Critical Value	0.866
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	35.796

Gamma Distribution Test	
A-D Test Statistic	0.227047
A-D 5% Critical Value	0.733677
K-S Test Statistic	0.140313
K-S 5% Critical Value	0.23661
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	36.18925
Adjusted Gamma UCL	37.03369

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.981898
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	36.56417
95% Chebyshev (MVUE) UCL	42.22474
97.5% Chebyshev (MVUE) UCL	47.17023
99% Chebyshev (MVUE) UCL	56.88469

95% Non-parametric UCLs	
CLT UCL	35.41401
Adj-CLT UCL (Adjusted for skewness)	36.49697
Mod-t UCL (Adjusted for skewness)	35.96492
Jackknife UCL	35.796
Standard Bootstrap UCL	35.28074
Bootstrap-t UCL	37.73844
Hall's Bootstrap UCL	43.0867
Percentile Bootstrap UCL	35.61154
BCA Bootstrap UCL	36.60385
95% Chebyshev (Mean, Sd) UCL	42.95743
97.5% Chebyshev (Mean, Sd) UCL	48.19965
99% Chebyshev (Mean, Sd) UCL	58.49698

Block A - Surface Soil

Variable: Aluminum

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	15
Minimum	7020
Maximum	36400
Mean	28884.667
Median	34000
Standard Deviation	9682.6921
Variance	93754527
Coefficient of Variation	0.3352191
Skewness	-1.284971

Gamma Statistics	
k hat	6.0741686
k star (bias corrected)	4.9037794
Theta hat	4755.3284
Theta star	5890.2868
nu hat	182.22506
nu star	147.11338
Approx.Chi Square Value (.05)	120.07569
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	117.06988

Log-transformed Statistics	
Minimum of log data	8.8565185
Maximum of log data	10.502324
Mean of log data	10.186498
Standard Deviation of log data	0.4843667
Variance of log data	0.2346111

RECOMMENDATION

Data are Non-parametric (0.05)

Use Student's-t UCL
or Modified-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.771042
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	33288.05

Gamma Distribution Test	
A-D Test Statistic	1.761454
A-D 5% Critical Value	0.738301
K-S Test Statistic	0.330526
K-S 5% Critical Value	0.221958
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	35388.69
Adjusted Gamma UCL	36297.3

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.704055
Shapiro-Wilk 5% Critical Value	0.881
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	38924.05
95% Chebyshev (MVUE) UCL	46178.77
97.5% Chebyshev (MVUE) UCL	53356.06
99% Chebyshev (MVUE) UCL	67454.44

95% Non-parametric UCLs	
CLT UCL	32996.9
Adj-CLT UCL (Adjusted for skewness)	32110.6
Mod-t UCL (Adjusted for skewness)	33149.8
Jackknife UCL	33288.05
Standard Bootstrap UCL	32908.83
Bootstrap-t UCL	32650.23
Hall's Bootstrap UCL	32029.29
Percentile Bootstrap UCL	32516.67
BCA Bootstrap UCL	32223.33
95% Chebyshev (Mean, Sd) UCL	39782.18
97.5% Chebyshev (Mean, Sd) UCL	44497.54
99% Chebyshev (Mean, Sd) UCL	53759.95

Block A - Surface Soil

Variable: Arsenic

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	13
Minimum	0.55
Maximum	9.4
Mean	3.105
Median	1.775
Standard Deviation	3.006068
Variance	9.036446
Coefficient of Variation	0.968138
Skewness	1.260244

Gamma Statistics	
k hat	1.249158
k star (bias corrected)	1.043771
Theta hat	2.485675
Theta star	2.974792
nu hat	37.47473
nu star	31.31312
Approx.Chi Square Value (.05)	19.52606
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	18.38557

Log-transformed Statistics	
Minimum of log data	-0.597837
Maximum of log data	2.24071
Mean of log data	0.682082
Standard Deviation of log data	1.007062
Variance of log data	1.014174

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.809013
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4.472065

Gamma Distribution Test	
A-D Test Statistic	0.466176
A-D 5% Critical Value	0.758426
K-S Test Statistic	0.135646
K-S 5% Critical Value	0.226719
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	4.979357
Adjusted Gamma UCL	5.288235

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.923275
Shapiro-Wilk 5% Critical Value	0.881
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	6.894556
95% Chebyshev (MVUE) UCL	7.017971
97.5% Chebyshev (MVUE) UCL	8.698632
99% Chebyshev (MVUE) UCL	11.99996

95% Non-parametric UCLs	
CLT UCL	4.381675
Adj-CLT UCL (Adjusted for skewness)	4.651538
Mod-t UCL (Adjusted for skewness)	4.514158
Jackknife UCL	4.472065
Standard Bootstrap UCL	4.339474
Bootstrap-t UCL	5.090832
Hall's Bootstrap UCL	4.797423
Percentile Bootstrap UCL	4.408333
BCA Bootstrap UCL	4.563333
95% Chebyshev (Mean, Sd) UCL	6.488218
97.5% Chebyshev (Mean, Sd) UCL	7.952139
99% Chebyshev (Mean, Sd) UCL	10.82773

Block A - Surface Soil

Variable: Benzene

Raw Statistics	
Number of Valid Samples	19
Number of Unique Samples	17
Minimum	0.00039
Maximum	25
Mean	1.318534
Median	0.0022
Standard Deviation	5.734731
Variance	32.88714
Coefficient of Variation	4.349325
Skewness	4.358893

Gamma Statistics	
k hat	0.125146
k star (bias corrected)	0.140474
Theta hat	10.53599
Theta star	9.38635
nu hat	4.755535
nu star	5.337994
Approx.Chi Square Value (.05)	1.311034
Adjusted Level of Significance	0.03687
Adjusted Chi Square Value	1.14671

Log-transformed Statistics	
Minimum of log data	-7.849364
Maximum of log data	3.218876
Mean of log data	-6.024183
Standard Deviation of log data	2.476847
Variance of log data	6.13477

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.244463
Shapiro-Wilk 5% Critical Value	0.901
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3.599933

Gamma Distribution Test	
A-D Test Statistic	5.617496
A-D 5% Critical Value	0.915598
K-S Test Statistic	0.50035
K-S 5% Critical Value	0.222625
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	5.368531
Adjusted Gamma UCL	6.137843

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.61729
Shapiro-Wilk 5% Critical Value	0.901
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.051804
95% Chebyshev (MVUE) UCL	0.128406
97.5% Chebyshev (MVUE) UCL	0.170056
99% Chebyshev (MVUE) UCL	0.251869

95% Non-parametric UCLs	
CLT UCL	3.482565
Adj-CLT UCL (Adjusted for skewness)	4.888341
Mod-t UCL (Adjusted for skewness)	3.819205
Jackknife UCL	3.599933
Standard Bootstrap UCL	3.424399
Bootstrap-t UCL	6050.28
Hall's Bootstrap UCL	1526.271
Percentile Bootstrap UCL	3.949597
BCA Bootstrap UCL	5.265863
95% Chebyshev (Mean, Sd) UCL	7.053265
97.5% Chebyshev (Mean, Sd) UCL	9.534687
99% Chebyshev (Mean, Sd) UCL	14.40896

Block A - Surface Soil

Variable: Benzo(a)anthracene

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	15
Minimum	0.074
Maximum	3.1
Mean	0.465433
Median	0.22
Standard Deviation	0.760361
Variance	0.578149
Coefficient of Variation	1.633663
Skewness	3.406058

Gamma Statistics	
k hat	1.049529
k star (bias corrected)	0.884068
Theta hat	0.443469
Theta star	0.526468
nu hat	31.48588
nu star	26.52204
Approx.Chi Square Value (.05)	15.7801
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	14.76616

Log-transformed Statistics	
Minimum of log data	-2.60369
Maximum of log data	1.131402
Mean of log data	-1.311695
Standard Deviation of log data	0.905996
Variance of log data	0.820829

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.48292
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.811221

Gamma Distribution Test	
A-D Test Statistic	1.595319
A-D 5% Critical Value	0.762115
K-S Test Statistic	0.294689
K-S 5% Critical Value	0.227681
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.782266
Adjusted Gamma UCL	0.835982

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.877335
Shapiro-Wilk 5% Critical Value	0.881
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.761705
95% Chebyshev (MVUE) UCL	0.823273
97.5% Chebyshev (MVUE) UCL	1.010026
99% Chebyshev (MVUE) UCL	1.376867

95% Non-parametric UCLs	
CLT UCL	0.788358
Adj-CLT UCL (Adjusted for skewness)	0.972843
Mod-t UCL (Adjusted for skewness)	0.839997
Jackknife UCL	0.811221
Standard Bootstrap UCL	0.763441
Bootstrap-t UCL	2.578721
Hall's Bootstrap UCL	2.353115
Percentile Bootstrap UCL	0.836667
BCA Bootstrap UCL	1.060933
95% Chebyshev (Mean, Sd) UCL	1.321191
97.5% Chebyshev (Mean, Sd) UCL	1.691479
99% Chebyshev (Mean, Sd) UCL	2.418836

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Block A - Surface Soil

Variable: Benzo(a)pyrene

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	14
Minimum	0.086
Maximum	9.1
Mean	0.8819
Median	0.27
Standard Deviation	2.283974
Variance	5.216538
Coefficient of Variation	2.589834
Skewness	3.813917

Gamma Statistics	
k hat	0.592314
k star (bias corrected)	0.518295
Theta hat	1.488907
Theta star	1.70154
nu hat	17.76941
nu star	15.54886
Approx.Chi Square Value (.05)	7.643645
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	6.970319

Log-transformed Statistics	
Minimum of log data	-2.453408
Maximum of log data	2.208274
Mean of log data	-1.170824
Standard Deviation of log data	1.103063
Variance of log data	1.216747

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.353081
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.920579

Gamma Distribution Test	
A-D Test Statistic	2.633549
A-D 5% Critical Value	0.786388
K-S Test Statistic	0.377259
K-S 5% Critical Value	0.232484
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.793979
Adjusted Gamma UCL	1.967276

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.777533
Shapiro-Wilk 5% Critical Value	0.881
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.344218
95% Chebyshev (MVUE) UCL	1.273869
97.5% Chebyshev (MVUE) UCL	1.592683
99% Chebyshev (MVUE) UCL	2.218931

95% Non-parametric UCLs	
CLT UCL	1.851902
Adj-CLT UCL (Adjusted for skewness)	2.472416
Mod-t UCL (Adjusted for skewness)	2.017367
Jackknife UCL	1.920579
Standard Bootstrap UCL	1.84208
Bootstrap-t UCL	16.04167
Hall's Bootstrap UCL	6.984835
Percentile Bootstrap UCL	2.046467
BCA Bootstrap UCL	2.7025
95% Chebyshev (Mean, Sd) UCL	3.452428
97.5% Chebyshev (Mean, Sd) UCL	4.564698
99% Chebyshev (Mean, Sd) UCL	6.749536

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Block A - Surface Soil

Variable: Benzo(b)fluoranthene

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	15
Minimum	0.075
Maximum	11
Mean	1.030833
Median	0.3
Standard Deviation	2.766493
Variance	7.653485
Coefficient of Variation	2.683745
Skewness	3.832297

Gamma Statistics	
k hat	0.556316
k star (bias corrected)	0.489497
Theta hat	1.852965
Theta star	2.105904
nu hat	16.68947
nu star	14.68491
Approx.Chi Square Value (.05)	7.041723
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	6.399533

Log-transformed Statistics	
Minimum of log data	-2.590267
Maximum of log data	2.397895
Mean of log data	-1.092894
Standard Deviation of log data	1.150501
Variance of log data	1.323653

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.346478
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.288947

Gamma Distribution Test	
A-D Test Statistic	2.55531
A-D 5% Critical Value	0.788962
K-S Test Statistic	0.355454
K-S 5% Critical Value	0.233001
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.149714
Adjusted Gamma UCL	2.365437

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.804984
Shapiro-Wilk 5% Critical Value	0.881
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.629987
95% Chebyshev (MVUE) UCL	1.482963
97.5% Chebyshev (MVUE) UCL	1.86143
99% Chebyshev (MVUE) UCL	2.604854

95% Non-parametric UCLs	
CLT UCL	2.205761
Adj-CLT UCL (Adjusted for skewness)	2.960989
Mod-t UCL (Adjusted for skewness)	2.406747
Jackknife UCL	2.288947
Standard Bootstrap UCL	2.173301
Bootstrap-t UCL	16.7574
Hall's Bootstrap UCL	8.845465
Percentile Bootstrap UCL	2.442
BCA Bootstrap UCL	3.204167
95% Chebyshev (Mean, Sd) UCL	4.144419
97.5% Chebyshev (Mean, Sd) UCL	5.49167
99% Chebyshev (Mean, Sd) UCL	8.138083

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Block A - Surface Soil

Variable: Benzo(k)fluoranthene

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	14
Minimum	0.083
Maximum	7.7
Mean	0.7847
Median	0.28
Standard Deviation	1.921581
Variance	3.692472
Coefficient of Variation	2.448809
Skewness	3.814998

Gamma Statistics	
k hat	0.650623
k star (bias corrected)	0.564943
Theta hat	1.206074
Theta star	1.388989
nu hat	19.5187
nu star	16.9483
Approx.Chi Square Value (.05)	8.633979
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	7.911898

Log-transformed Statistics	
Minimum of log data	-2.488915
Maximum of log data	2.04122
Mean of log data	-1.180991
Standard Deviation of log data	1.069943
Variance of log data	1.144778

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.362091
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.658574

Gamma Distribution Test	
A-D Test Statistic	2.311078
A-D 5% Critical Value	0.782217
K-S Test Statistic	0.303802
K-S 5% Critical Value	0.231647
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.540347
Adjusted Gamma UCL	1.680928

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.818523
Shapiro-Wilk 5% Critical Value	0.881
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.231559
95% Chebyshev (MVUE) UCL	1.19822
97.5% Chebyshev (MVUE) UCL	1.493789
99% Chebyshev (MVUE) UCL	2.074378

95% Non-parametric UCLs	
CLT UCL	1.600794
Adj-CLT UCL (Adjusted for skewness)	2.123
Mod-t UCL (Adjusted for skewness)	1.740028
Jackknife UCL	1.658574
Standard Bootstrap UCL	1.568501
Bootstrap-t UCL	9.005805
Hall's Bootstrap UCL	5.13261
Percentile Bootstrap UCL	1.7566
BCA Bootstrap UCL	2.2845
95% Chebyshev (Mean, Sd) UCL	2.947368
97.5% Chebyshev (Mean, Sd) UCL	3.883156
99% Chebyshev (Mean, Sd) UCL	5.72133

Block A - Surface Soil

Variable: Cadmium

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	12
Minimum	0.27
Maximum	11.95
Mean	2.167833
Median	0.7
Standard Deviation	3.066491
Variance	9.403367
Coefficient of Variation	1.414542
Skewness	2.621036

Gamma Statistics	
k hat	0.797197
k star (bias corrected)	0.682202
Theta hat	2.719321
Theta star	3.177702
nu hat	23.9159
nu star	20.46605
Approx.Chi Square Value (.05)	11.19391
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	10.35712

Log-transformed Statistics	
Minimum of log data	-1.309333
Maximum of log data	2.480731
Mean of log data	0.02891
Standard Deviation of log data	1.257185
Variance of log data	1.580513

RECOMMENDATION
Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.658343
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3.562376

Gamma Distribution Test	
A-D Test Statistic	0.774243
A-D 5% Critical Value	0.772829
K-S Test Statistic	0.207458
K-S 5% Critical Value	0.229786
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3.963493
Adjusted Gamma UCL	4.283719

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.888779
Shapiro-Wilk 5% Critical Value	0.881
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	6.593729
95% Chebyshev (MVUE) UCL	5.399188
97.5% Chebyshev (MVUE) UCL	6.832361
99% Chebyshev (MVUE) UCL	9.647551

95% Non-parametric UCLs	
CLT UCL	3.47017
Adj-CLT UCL (Adjusted for skewness)	4.042708
Mod-t UCL (Adjusted for skewness)	3.65168
Jackknife UCL	3.562376
Standard Bootstrap UCL	3.457457
Bootstrap-t UCL	5.173475
Hall's Bootstrap UCL	8.927731
Percentile Bootstrap UCL	3.615667
BCA Bootstrap UCL	4.203833
95% Chebyshev (Mean, Sd) UCL	5.619055
97.5% Chebyshev (Mean, Sd) UCL	7.112401
99% Chebyshev (Mean, Sd) UCL	10.04579

Block A - Surface Soil

Variable: Chromium (total)

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	15
Minimum	9.5
Maximum	170
Mean	39.03333
Median	27.8
Standard Deviation	39.19331
Variance	1536.115
Coefficient of Variation	1.004098
Skewness	2.991194

Gamma Statistics	
k hat	1.945492
k star (bias corrected)	1.600838
Theta hat	20.06348
Theta star	24.38307
nu hat	58.36475
nu star	48.02513
Approx.Chi Square Value (.05)	33.11629
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	31.59602

Log-transformed Statistics	
Minimum of log data	2.251292
Maximum of log data	5.135798
Mean of log data	3.385917
Standard Deviation of log data	0.711052
Variance of log data	0.505595

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.633354
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	56.85721

Gamma Distribution Test	
A-D Test Statistic	0.646023
A-D 5% Critical Value	0.747598
K-S Test Statistic	0.185758
K-S 5% Critical Value	0.224485
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	56.606
Adjusted Gamma UCL	59.32965

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.955329
Shapiro-Wilk 5% Critical Value	0.881
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	59.12802
95% Chebyshev (MVUE) UCL	68.76711
97.5% Chebyshev (MVUE) UCL	82.39093
99% Chebyshev (MVUE) UCL	109.1523

95% Non-parametric UCLs	
CLT UCL	55.67871
Adj-CLT UCL (Adjusted for skewness)	64.02984
Mod-t UCL (Adjusted for skewness)	58.15981
Jackknife UCL	56.85721
Standard Bootstrap UCL	55.239
Bootstrap-t UCL	80.74508
Hall's Bootstrap UCL	123.7473
Percentile Bootstrap UCL	57.89333
BCA Bootstrap UCL	65.96
95% Chebyshev (Mean, Sd) UCL	83.14394
97.5% Chebyshev (Mean, Sd) UCL	102.2306
99% Chebyshev (Mean, Sd) UCL	139.7228

Block A - Surface Soil

Variable: Dibenz(a,h)anthracene

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	14
Minimum	0.044
Maximum	2
Mean	0.2681
Median	0.185
Standard Deviation	0.483554
Variance	0.233825
Coefficient of Variation	1.803633
Skewness	3.750828

Gamma Statistics	
k hat	1.021849
k star (bias corrected)	0.861924
Theta hat	0.262368
Theta star	0.311048
nu hat	30.65547
nu star	25.85771
Approx.Chi Square Value (.05)	15.26802
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	14.27248

Log-transformed Statistics	
Minimum of log data	-3.123566
Maximum of log data	0.693147
Mean of log data	-1.879847
Standard Deviation of log data	0.892072
Variance of log data	0.795793

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.405385
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.488005

Gamma Distribution Test	
A-D Test Statistic	1.819182
A-D 5% Critical Value	0.762626
K-S Test Statistic	0.334742
K-S 5% Critical Value	0.227815
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.45405
Adjusted Gamma UCL	0.485722

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.836799
Shapiro-Wilk 5% Critical Value	0.881
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.419988
95% Chebyshev (MVUE) UCL	0.457145
97.5% Chebyshev (MVUE) UCL	0.559999
99% Chebyshev (MVUE) UCL	0.762034

95% Non-parametric UCLs	
CLT UCL	0.473465
Adj-CLT UCL (Adjusted for skewness)	0.602665
Mod-t UCL (Adjusted for skewness)	0.508158
Jackknife UCL	0.488005
Standard Bootstrap UCL	0.469614
Bootstrap-t UCL	1.35221
Hall's Bootstrap UCL	1.465791
Percentile Bootstrap UCL	0.509167
BCA Bootstrap UCL	0.6423
95% Chebyshev (Mean, Sd) UCL	0.812322
97.5% Chebyshev (Mean, Sd) UCL	1.047807
99% Chebyshev (Mean, Sd) UCL	1.510373

Block A - Surface Soil

Variable: Dioxin TEQ-HH

Raw Statistics	
Number of Valid Samples	6
Number of Unique Samples	6
Minimum	2.85173E-07
Maximum	1.42377E-05
Mean	2.94562E-06
Median	5.50737E-07
Standard Deviation	5.55257E-06
Variance	3.0831E-11
Coefficient of Variation	1.885027239
Skewness	2.410055654

Gamma Statistics	
k hat	0.563465689
k star (bias corrected)	0.392843956
Theta hat	5.22768E-06
Theta star	7.49818E-06
nu hat	6.761588268
nu star	4.714127468
Approx.Chi Square Value (.05)	1.022106516
Adjusted Level of Significance	0.01222
Adjusted Chi Square Value	0.535242258

Log-transformed Statistics	
Minimum of log data	-15.07016982
Maximum of log data	-11.15961718
Mean of log data	-13.84206813
Standard Deviation of log data	1.434922331
Variance of log data	2.059002097

RECOMMENDATION

Data are lognormal (0.05)

Use 95% Chebyshev (MVUE) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.562227072
Shapiro-Wilk 5% Critical Value	0.788
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	7.51338E-06

Gamma Distribution Test	
A-D Test Statistic	0.936688972
A-D 5% Critical Value	0.732077599
K-S Test Statistic	0.359971954
K-S 5% Critical Value	0.347300068
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.35857E-05
Adjusted Gamma UCL	2.59434E-05

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.812360618
Shapiro-Wilk 5% Critical Value	0.788
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.000120587
95% Chebyshev (MVUE) UCL	7.2197E-06
97.5% Chebyshev (MVUE) UCL	9.43062E-06
99% Chebyshev (MVUE) UCL	1.37736E-05

95% Non-parametric UCLs	
CLT UCL	6.67421E-06
Adj-CLT UCL (Adjusted for skewness)	9.05736E-06
Mod-t UCL (Adjusted for skewness)	7.8851E-06
Jackknife UCL	7.51338E-06
Standard Bootstrap UCL	6.36775E-06
Bootstrap-t UCL	0.000126789
Hall's Bootstrap UCL	7.07757E-05
Percentile Bootstrap UCL	7.33054E-06
BCA Bootstrap UCL	7.70722E-06
95% Chebyshev (Mean, Sd) UCL	1.28265E-05
97.5% Chebyshev (Mean, Sd) UCL	1.71019E-05
99% Chebyshev (Mean, Sd) UCL	2.55003E-05

Block A - Surface Soil

Variable: Indeno(1,2,3-cd)pyrene

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	12
Minimum	0.058
Maximum	6.9
Mean	0.669133
Median	0.2105
Standard Deviation	1.728476
Variance	2.987628
Coefficient of Variation	2.583156
Skewness	3.836854

Gamma Statistics	
k hat	0.61094
k star (bias corrected)	0.533197
Theta hat	1.095251
Theta star	1.254946
nu hat	18.32821
nu star	15.9959
Approx.Chi Square Value (.05)	7.958029
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	7.268911

Log-transformed Statistics	
Minimum of log data	-2.847312
Maximum of log data	1.931521
Mean of log data	-1.41044
Standard Deviation of log data	1.083737
Variance of log data	1.174486

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.344723
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.455189

Gamma Distribution Test	
A-D Test Statistic	2.657239
A-D 5% Critical Value	0.785056
K-S Test Statistic	0.371302
K-S 5% Critical Value	0.232217
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.34498
Adjusted Gamma UCL	1.472489

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.787108
Shapiro-Wilk 5% Critical Value	0.881
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.010834
95% Chebyshev (MVUE) UCL	0.97296
97.5% Chebyshev (MVUE) UCL	1.214437
99% Chebyshev (MVUE) UCL	1.688771

95% Non-parametric UCLs	
CLT UCL	1.403216
Adj-CLT UCL (Adjusted for skewness)	1.875635
Mod-t UCL (Adjusted for skewness)	1.528877
Jackknife UCL	1.455189
Standard Bootstrap UCL	1.364412
Bootstrap-t UCL	11.28801
Hall's Bootstrap UCL	5.761832
Percentile Bootstrap UCL	1.541133
BCA Bootstrap UCL	2.015333
95% Chebyshev (Mean, Sd) UCL	2.614469
97.5% Chebyshev (Mean, Sd) UCL	3.456217
99% Chebyshev (Mean, Sd) UCL	5.109668

Block A - Surface Soil

Variable: Iron

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	15
Minimum	8200
Maximum	231500
Mean	54046.6667
Median	21200
Standard Deviation	58928.5023
Variance	3472568381
Coefficient of Variation	1.0903263
Skewness	2.12927884

Gamma Statistics	
k hat	1.19310223
k star (bias corrected)	0.99892623
Theta hat	45299.2755
Theta star	54104.7628
nu hat	35.7930669
nu star	29.9677869
Approx.Chi Square Value (.05)	18.4654824
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	17.3595128

Log-transformed Statistics	
Minimum of log data	9.01188943
Maximum of log data	12.3523352
Mean of log data	10.423229
Standard Deviation of log data	0.99995411
Variance of log data	0.99990823

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.736273
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	80845.48

Gamma Distribution Test	
A-D Test Statistic	0.767773
A-D 5% Critical Value	0.759461
K-S Test Statistic	0.245442
K-S 5% Critical Value	0.226989
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	87712.79
Adjusted Gamma UCL	93300.95

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.914565
Shapiro-Wilk 5% Critical Value	0.881
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	115438.7
95% Chebyshev (MVUE) UCL	118061.2
97.5% Chebyshev (MVUE) UCL	146234.8
99% Chebyshev (MVUE) UCL	201576.3

95% Non-parametric UCLs	
CLT UCL	79073.57
Adj-CLT UCL (Adjusted for skewness)	88011.7
Mod-t UCL (Adjusted for skewness)	82239.65
Jackknife UCL	80845.48
Standard Bootstrap UCL	78419.72
Bootstrap-t UCL	99386.99
Hall's Bootstrap UCL	176939.4
Percentile Bootstrap UCL	79600
BCA Bootstrap UCL	89126.67
95% Chebyshev (Mean, Sd) UCL	120368.5
97.5% Chebyshev (Mean, Sd) UCL	149066
99% Chebyshev (Mean, Sd) UCL	205436.7

Block A - Surface Soil

Variable: Manganese

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	15
Minimum	1910
Maximum	7650
Mean	4733.333
Median	5110
Standard Deviation	1702.916
Variance	2899924
Coefficient of Variation	0.359771
Skewness	-0.027265

Gamma Statistics	
k hat	7.200763
k star (bias corrected)	5.805055
Theta hat	657.3377
Theta star	815.3813
nu hat	216.0229
nu star	174.1517
Approx.Chi Square Value (.05)	144.6264
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	141.3151

Log-transformed Statistics	
Minimum of log data	7.554859
Maximum of log data	8.942461
Mean of log data	8.391344
Standard Deviation of log data	0.410052
Variance of log data	0.168143

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.958541
Shapiro-Wilk 5% Critical Value	0.881
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	5507.766

Gamma Distribution Test	
A-D Test Statistic	0.408142
A-D 5% Critical Value	0.738039
K-S Test Statistic	0.163366
K-S 5% Critical Value	0.221829
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	5699.637
Adjusted Gamma UCL	5833.189

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.922202
Shapiro-Wilk 5% Critical Value	0.881
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	5955.812
95% Chebyshev (MVUE) UCL	7012.294
97.5% Chebyshev (MVUE) UCL	7983.922
99% Chebyshev (MVUE) UCL	9892.498

95% Non-parametric UCLs	
CLT UCL	5456.561
Adj-CLT UCL (Adjusted for skewness)	5453.253
Mod-t UCL (Adjusted for skewness)	5507.25
Jackknife UCL	5507.766
Standard Bootstrap UCL	5435.308
Bootstrap-t UCL	5485.669
Hall's Bootstrap UCL	5456.613
Percentile Bootstrap UCL	5405.333
BCA Bootstrap UCL	5435.333
95% Chebyshev (Mean, Sd) UCL	6649.902
97.5% Chebyshev (Mean, Sd) UCL	7479.203
99% Chebyshev (Mean, Sd) UCL	9108.204

Block A - Surface Soil

Variable: Toluene

Raw Statistics	
Number of Valid Samples	19
Number of Unique Samples	19
Minimum	0.00038
Maximum	190
Mean	10.00267
Median	0.00169
Standard Deviation	43.58834
Variance	1899.944
Coefficient of Variation	4.357669
Skewness	4.358899

Gamma Statistics	
k hat	0.10027
k star (bias corrected)	0.119525
Theta hat	99.75766
Theta star	83.6866
nu hat	3.810249
nu star	4.541964
Approx.Chi Square Value (.05)	0.946419
Adjusted Level of Significance	0.03687
Adjusted Chi Square Value	0.814681

Log-transformed Statistics	
Minimum of log data	-7.875339
Maximum of log data	5.247024
Mean of log data	-5.793725
Standard Deviation of log data	2.856001
Variance of log data	8.156741

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.244063
Shapiro-Wilk 5% Critical Value	0.901
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	27.34305

Gamma Distribution Test	
A-D Test Statistic	5.951991
A-D 5% Critical Value	0.924869
K-S Test Statistic	0.515469
K-S 5% Critical Value	0.22355
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	48.00388
Adjusted Gamma UCL	55.76636

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.572881
Shapiro-Wilk 5% Critical Value	0.901
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	9.275006
95% Chebyshev (MVUE) UCL	0.374155
97.5% Chebyshev (MVUE) UCL	0.49891
99% Chebyshev (MVUE) UCL	0.743968

95% Non-parametric UCLs	
CLT UCL	26.45097
Adj-CLT UCL (Adjusted for skewness)	37.13595
Mod-t UCL (Adjusted for skewness)	29.00969
Jackknife UCL	27.34305
Standard Bootstrap UCL	25.91683
Bootstrap-t UCL	206774.1
Hall's Bootstrap UCL	130184.4
Percentile Bootstrap UCL	30.00173
BCA Bootstrap UCL	40.0031
95% Chebyshev (Mean, Sd) UCL	53.59102
97.5% Chebyshev (Mean, Sd) UCL	72.45173
99% Chebyshev (Mean, Sd) UCL	109.4999

Block A - Surface Soil

Variable: Vanadium

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	15
Minimum	14.8
Maximum	85.2
Mean	29.26
Median	21.9
Standard Deviation	18.43494
Variance	339.8469
Coefficient of Variation	0.630039
Skewness	2.235465

Gamma Statistics	
k hat	3.923918
k star (bias corrected)	3.183579
Theta hat	7.456833
Theta star	9.190915
nu hat	117.7175
nu star	95.50736
Approx.Chi Square Value (.05)	73.96244
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	71.63044

Log-transformed Statistics	
Minimum of log data	2.694627
Maximum of log data	4.445001
Mean of log data	3.24342
Standard Deviation of log data	0.498673
Variance of log data	0.248675

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.745955
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	37.64362

Gamma Distribution Test	
A-D Test Statistic	0.678222
A-D 5% Critical Value	0.740371
K-S Test Statistic	0.181109
K-S 5% Critical Value	0.222606
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	37.78331
Adjusted Gamma UCL	39.01338

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.906306
Shapiro-Wilk 5% Critical Value	0.881
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	38.21326
95% Chebyshev (MVUE) UCL	45.36641
97.5% Chebyshev (MVUE) UCL	52.55631
99% Chebyshev (MVUE) UCL	66.67949

95% Non-parametric UCLs	
CLT UCL	37.08931
Adj-CLT UCL (Adjusted for skewness)	40.02492
Mod-t UCL (Adjusted for skewness)	38.10152
Jackknife UCL	37.64362
Standard Bootstrap UCL	36.79588
Bootstrap-t UCL	44.1383
Hall's Bootstrap UCL	71.31774
Percentile Bootstrap UCL	36.68667
BCA Bootstrap UCL	40.66
95% Chebyshev (Mean, Sd) UCL	50.00784
97.5% Chebyshev (Mean, Sd) UCL	58.98544
99% Chebyshev (Mean, Sd) UCL	76.62021

General UCL Statistics for Full Data Sets

User Selected Options

From File	J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\EPCs\Surface Soil\ProUCL files\
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum (aoc 13)

General Statistics

Number of Valid Observations 27

Number of Distinct Observations 25

Raw Statistics

Minimum	4920
Maximum	36100
Mean	12181
Median	12600
SD	6901
Coefficient of Variation	0.567
Skewness	1.675

Log-transformed Statistics

Minimum of Log Data	8.501
Maximum of Log Data	10.49
Mean of log Data	9.274
SD of log Data	0.519

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.846
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	14446

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	14823
95% Modified-t UCL	14518

Assuming Lognormal Distribution

95% H-UCL	14894
95% Chebyshev (MVUE) UCL	17649
97.5% Chebyshev (MVUE) UCL	20038
99% Chebyshev (MVUE) UCL	24732

Gamma Distribution Test

k star (bias corrected)	3.488
Theta Star	3492
nu star	188.4
Approximate Chi Square Value (.05)	157.6
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	155.8
Anderson-Darling Test Statistic	0.597
Anderson-Darling 5% Critical Value	0.749
Kolmogorov-Smirnov Test Statistic	0.142
Kolmogorov-Smirnov 5% Critical Value	0.169

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	14366
95% Jackknife UCL	14446
95% Standard Bootstrap UCL	14317
95% Bootstrap-t UCL	15175
95% Hall's Bootstrap UCL	15896
95% Percentile Bootstrap UCL	14410
95% BCA Bootstrap UCL	15035
95% Chebyshev(Mean, Sd) UCL	17971
97.5% Chebyshev(Mean, Sd) UCL	20476
99% Chebyshev(Mean, Sd) UCL	25396

Assuming Gamma Distribution

95% Approximate Gamma UCL	14558
95% Adjusted Gamma UCL	14725

Potential UCL to Use

Use 95% Approximate Gamma UCL 14558

Arsenic (aoc 13)

General Statistics

Number of Valid Observations 27

Number of Distinct Observations 26

Raw Statistics

Minimum	0.178
Maximum	14.8
Mean	7.238
Median	6.9
SD	2.975
Coefficient of Variation	0.411
Skewness	0.291

Log-transformed Statistics

Minimum of Log Data	-1.726
Maximum of Log Data	2.695
Mean of log Data	1.821
SD of log Data	0.788

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.971
Shapiro Wilk Critical Value	0.923

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.616
Shapiro Wilk Critical Value	0.923

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	8.215

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	8.214
95% Modified-t UCL	8.22

Assuming Lognormal Distribution

95% H-UCL	11.88
95% Chebyshev (MVUE) UCL	14.32
97.5% Chebyshev (MVUE) UCL	16.92
99% Chebyshev (MVUE) UCL	22.03

Gamma Distribution Test

k star (bias corrected)	2.973
Theta Star	2.434
nu star	160.6
Approximate Chi Square Value (.05)	132.3
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	130.6

Anderson-Darling Test Statistic	1.334
Anderson-Darling 5% Critical Value	0.751
Kolmogorov-Smirnov Test Statistic	0.217
Kolmogorov-Smirnov 5% Critical Value	0.169

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	8.787
95% Adjusted Gamma UCL	8.897

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	8.18
95% Jackknife UCL	8.215
95% Standard Bootstrap UCL	8.157
95% Bootstrap-t UCL	8.277
95% Hall's Bootstrap UCL	8.296
95% Percentile Bootstrap UCL	8.175
95% BCA Bootstrap UCL	8.134
95% Chebyshev(Mean, Sd) UCL	9.734
97.5% Chebyshev(Mean, Sd) UCL	10.81
99% Chebyshev(Mean, Sd) UCL	12.94

Potential UCL to Use

Use 95% Student's-t UCL 8.215

Chromium (total) (aoc 13)

General Statistics

Number of Valid Observations 27

Number of Distinct Observations 25

Raw Statistics

Minimum 5.65
Maximum 28.1
Mean 17.26
Median 16.2
SD 5.654
Coefficient of Variation 0.328
Skewness 0.212

Log-transformed Statistics

Minimum of Log Data 1.732
Maximum of Log Data 3.336
Mean of log Data 2.791
SD of log Data 0.362

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.968
Shapiro Wilk Critical Value 0.923
Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.946
Shapiro Wilk Critical Value 0.923
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 19.12

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 19.1
95% Modified-t UCL 19.13

Assuming Lognormal Distribution

95% H-UCL 19.83
95% Chebyshev (MVUE) UCL 22.75
97.5% Chebyshev (MVUE) UCL 25.08
99% Chebyshev (MVUE) UCL 29.66

Gamma Distribution Test

k star (bias corrected) 7.858
Theta Star 2.197
nu star 424.4
Approximate Chi Square Value (.05) 377.6
Adjusted Level of Significance 0.0401
Adjusted Chi Square Value 374.8

Anderson-Darling Test Statistic 0.29
Anderson-Darling 5% Critical Value 0.744
Kolmogorov-Smirnov Test Statistic 0.0974
Kolmogorov-Smirnov 5% Critical Value 0.168
Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 19.4
95% Adjusted Gamma UCL 19.55

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 19.05
95% Jackknife UCL 19.12
95% Standard Bootstrap UCL 19.05
95% Bootstrap-t UCL 19.13
95% Hall's Bootstrap UCL 19.04
95% Percentile Bootstrap UCL 19.09
95% BCA Bootstrap UCL 19.05
95% Chebyshev(Mean, Sd) UCL 22.01
97.5% Chebyshev(Mean, Sd) UCL 24.06
99% Chebyshev(Mean, Sd) UCL 28.09

Potential UCL to Use

Use 95% Student's-t UCL 19.12

Iron (soc 13)

General Statistics

Number of Valid Observations 27

Number of Distinct Observations 25

Raw Statistics

Minimum 2200
Maximum 185000
Mean 22602
Median 15000
SD 33010
Coefficient of Variation 1.46
Skewness 4.92

Log-transformed Statistics

Minimum of Log Data 7.696
Maximum of Log Data 12.13
Mean of log Data 9.706
SD of log Data 0.685

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.353
Shapiro Wilk Critical Value 0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.783
Shapiro Wilk Critical Value 0.923

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 33437

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 39479
95% Modified-t UCL 34440

Assuming Lognormal Distribution

95% H-UCL 27559
95% Chebyshev (MVUE) UCL 33211
97.5% Chebyshev (MVUE) UCL 38698
99% Chebyshev (MVUE) UCL 49477

Gamma Distribution Test

k star (bias corrected) 1.544
Theta Star 14641
nu star 83.36
Approximate Chi Square Value (.05) 63.32
Adjusted Level of Significance 0.0401
Adjusted Chi Square Value 62.2

Anderson-Darling Test Statistic 3.156
Anderson-Darling 5% Critical Value 0.76
Kolmogorov-Smirnov Test Statistic 0.248
Kolmogorov-Smirnov 5% Critical Value 0.171

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 29756
95% Adjusted Gamma UCL 30290

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 33051
95% Jackknife UCL 33437
95% Standard Bootstrap UCL 32557
95% Bootstrap-t UCL 67710
95% Hall's Bootstrap UCL 76642
95% Percentile Bootstrap UCL 34933
95% BCA Bootstrap UCL 42306
95% Chebyshev(Mean, Sd) UCL 50293
97.5% Chebyshev(Mean, Sd) UCL 62274
99% Chebyshev(Mean, Sd) UCL 85810

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 50293

Lead (aoc 13)

General Statistics

Number of Valid Observations 27

Number of Distinct Observations 26

Raw Statistics

Minimum 1.53
Maximum 464
Mean 53.95
Median 20.3
SD 105.3
Coefficient of Variation 1.952
Skewness 3.327

Log-transformed Statistics

Minimum of Log Data 0.425
Maximum of Log Data 6.14
Mean of log Data 3.193
SD of log Data 1.11

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.449
Shapiro Wilk Critical Value 0.923
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.874
Shapiro Wilk Critical Value 0.923
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 88.52

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 101.2
95% Modified-t UCL 90.68

Assuming Lognormal Distribution

95% H-UCL 79.55
95% Chebyshev (MVUE) UCL 90.83
97.5% Chebyshev (MVUE) UCL 111.3
99% Chebyshev (MVUE) UCL 151.5

Gamma Distribution Test

k star (bias corrected) 0.694
Theta Star 77.77
nu star 37.46
Approximate Chi Square Value (.05) 24.45
Adjusted Level of Significance 0.0401
Adjusted Chi Square Value 23.78

Anderson-Darling Test Statistic 3.1
Anderson-Darling 5% Critical Value 0.784
Kolmogorov-Smirnov Test Statistic 0.295
Kolmogorov-Smirnov 5% Critical Value 0.175
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 82.67
95% Adjusted Gamma UCL 85.01

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 87.29
95% Jackknife UCL 88.52
95% Standard Bootstrap UCL 87.14
95% Bootstrap-t UCL 200.3
95% Hall's Bootstrap UCL 209.5
95% Percentile Bootstrap UCL 90.61
95% BCA Bootstrap UCL 109.7
95% Chebyshev(Mean, Sd) UCL 142.3
97.5% Chebyshev(Mean, Sd) UCL 180.5
99% Chebyshev(Mean, Sd) UCL 255.6

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 255.6

Manganese (aoc 13)

General Statistics

Number of Valid Observations 27

Number of Distinct Observations 27

Raw Statistics

Minimum 318
Maximum 4200
Mean 991.6
Median 755
SD 871.5
Coefficient of Variation 0.879
Skewness 2.256

Log-transformed Statistics

Minimum of Log Data 5.762
Maximum of Log Data 8.343
Mean of log Data 6.632
SD of log Data 0.703

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.734
Shapiro Wilk Critical Value 0.923
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.917
Shapiro Wilk Critical Value 0.923
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1278

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 1345
95% Modified-t UCL 1290

Assuming Lognormal Distribution

95% H-UCL 1303
95% Chebyshev (MVUE) UCL 1572
97.5% Chebyshev (MVUE) UCL 1836
99% Chebyshev (MVUE) UCL 2355

Gamma Distribution Test

k star (bias corrected) 1.821
Theta Star 544.4
nu star 98.35
Approximate Chi Square Value (.05) 76.47
Adjusted Level of Significance 0.0401
Adjusted Chi Square Value 75.24

Anderson-Darling Test Statistic 1.165
Anderson-Darling 5% Critical Value 0.756
Kolmogorov-Smirnov Test Statistic 0.179
Kolmogorov-Smirnov 5% Critical Value 0.17
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 1275
95% Adjusted Gamma UCL 1296

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 1267
95% Jackknife UCL 1278
95% Standard Bootstrap UCL 1265
95% Bootstrap-t UCL 1427
95% Hall's Bootstrap UCL 1479
95% Percentile Bootstrap UCL 1271
95% BCA Bootstrap UCL 1365
95% Chebyshev(Mean, Sd) UCL 1723
97.5% Chebyshev(Mean, Sd) UCL 2039
99% Chebyshev(Mean, Sd) UCL 2660

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 1723

Vanadium (aoc 13)

General Statistics

Number of Valid Observations 27

Number of Distinct Observations 27

Raw Statistics

Minimum 5.24
Maximum 45
Mean 22.36
Median 18.1
SD 10.25
Coefficient of Variation 0.458
Skewness 0.771

Log-transformed Statistics

Minimum of Log Data 1.656
Maximum of Log Data 3.807
Mean of log Data 3.002
SD of log Data 0.484

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.925
Shapiro Wilk Critical Value 0.923
Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.955
Shapiro Wilk Critical Value 0.923
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 25.72

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 25.92
95% Modified-t UCL 25.77

Assuming Lognormal Distribution

95% H-UCL 27.19
95% Chebyshev (MVUE) UCL 32.03
97.5% Chebyshev (MVUE) UCL 36.14
99% Chebyshev (MVUE) UCL 44.22

Gamma Distribution Test

k star (bias corrected) 4.394
Theta Star 5.089
nu star 237.3
Approximate Chi Square Value (.05) 202.6
Adjusted Level of Significance 0.0401
Adjusted Chi Square Value 200.6

Anderson-Darling Test Statistic 0.428
Anderson-Darling 5% Critical Value 0.748
Kolmogorov-Smirnov Test Statistic 0.136
Kolmogorov-Smirnov 5% Critical Value 0.169
Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 26.18
95% Adjusted Gamma UCL 26.45

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 25.6
95% Jackknife UCL 25.72
95% Standard Bootstrap UCL 25.66
95% Bootstrap-t UCL 26.2
95% Hall's Bootstrap UCL 26.1
95% Percentile Bootstrap UCL 25.67
95% BCA Bootstrap UCL 25.79
95% Chebyshev(Mean, Sd) UCL 30.96
97.5% Chebyshev(Mean, Sd) UCL 34.68
99% Chebyshev(Mean, Sd) UCL 41.99

Potential UCL to Use

Use 95% Student's-t UCL 25.72

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\EPCs\Surface Soil\ProUCL files
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

2-Methylnaphthalene (aoc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	11
Number of Distinct Detected Data	11	Number of Non-Detect Data	16
		Percent Non-Detects	59.26%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.06	Minimum Detected	-2.813
Maximum Detected	6	Maximum Detected	1.792
Mean of Detected	0.715	Mean of Detected	-1.741
SD of Detected	1.785	SD of Detected	1.428
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	3.9	Maximum Non-Detect	1.361

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	26
Number treated as Detected	1
Single DL Non-Detect Percentage	96.30%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.426	Shapiro Wilk Test Statistic	0.761
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.538	Mean	-1.446
SD	1.164	SD	1.088
95% DL/2 (t) UCL	0.92	95% H-Stat (DL/2) UCL	1.317
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.063
		SD in Log Scale	1.014
		Mean in Original Scale	0.36
		SD in Original Scale	1.136
		95% Percentile Bootstrap UCL	0.785
		95% BCA Bootstrap UCL	1.044

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.394	Data do not follow a Discernable Distribution (0.05)
Theta Star	1.816	
nu star	8.663	
A-D Test Statistic	1.813	
5% A-D Critical Value	0.789	
K-S Test Statistic	0.789	
5% K-S Critical Value	0.27	
Data not Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.35
SD	1.118
SE of Mean	0.226
95% KM (t) UCL	0.736
95% KM (z) UCL	0.722
95% KM (jackknife) UCL	0.725
95% KM (bootstrap t) UCL	3.245
95% KM (BCA) UCL	0.801
95% KM (Percentile Bootstrap) UCL	0.779
95% KM (Chebyshev) UCL	1.338
97.5% KM (Chebyshev) UCL	1.762
99% KM (Chebyshev) UCL	2.599

Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.06
Maximum	6
Mean	0.682
Median	0.547
SD	1.131
k star	0.814
Theta star	0.837
Nu star	43.97
AppChi2	29.77
95% Gamma Approximate UCL	1.008
95% Adjusted Gamma UCL	1.033

Potential UCLs to Use	
95% KM (BCA) UCL	0.801

Note: DL/2 is not a recommended method.

Benzo(a)anthracene (soc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	25	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.066	Minimum Detected	-2.718
Maximum Detected	45.5	Maximum Detected	3.818
Mean of Detected	5.073	Mean of Detected	-0.205
SD of Detected	10.74	SD of Detected	1.949
Minimum Non-Detect	0.39	Minimum Non-Detect	-0.942
Maximum Non-Detect	0.41	Maximum Non-Detect	-0.892

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	14
Number treated as Detected	13
Single DL Non-Detect Percentage	51.85%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.535	Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.712	Mean	-0.309
SD	10.4	SD	1.91
95% DL/2 (t) UCL	8.125	95% H-Stat (DL/2) UCL	19.76
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.316
		SD in Log Scale	1.915
		Mean in Original Scale	4.711
		SD in Original Scale	10.4
		95% Percentile Bootstrap UCL	8.274
		95% BCA Bootstrap UCL	9.193

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.348	Data do not follow a Discernable Distribution (0.05)
Theta Star	14.58	
nu star	17.4	
A-D Test Statistic	1.845	**Nonparametric Statistics**
5% A-D Critical Value	0.837	Kaplan-Meier (KM) Method
K-S Test Statistic	0.837	Mean 4.711
5% K-S Critical Value	0.188	SD 10.2
Data not Gamma Distributed at 5% Significance Level		SE of Mean 2.004
		95% KM (t) UCL 8.129
Assuming Gamma Distribution		95% KM (z) UCL 8.007
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 8.123
Minimum	1E-09	95% KM (bootstrap t) UCL 11.95
Maximum	45.5	95% KM (BCA) UCL 8.31
Mean	4.697	95% KM (Percentile Bootstrap) UCL 8.052
Median	0.39	95% KM (Chebyshev) UCL 13.45
SD	10.4	97.5% KM (Chebyshev) UCL 17.23
k star	0.221	99% KM (Chebyshev) UCL 24.65
Theta star	21.21	
Nu star	11.96	**Potential UCLs to Use**
AppChi2	5.199	99% KM (Chebyshev) UCL 24.65
95% Gamma Approximate UCL	10.8	
95% Adjusted Gamma UCL	11.43	

Note: DL/2 is not a recommended method.

Benzo(a)pyrene (soc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	24	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.088	Minimum Detected	-2.688
Maximum Detected	41.35	Maximum Detected	3.722
Mean of Detected	4.703	Mean of Detected	-0.218
SD of Detected	9.635	SD of Detected	1.914
Minimum Non-Detect	0.39	Minimum Non-Detect	-0.942
Maximum Non-Detect	0.41	Maximum Non-Detect	-0.892

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	51.85%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.553	Shapiro Wilk Test Statistic	0.911
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.37	Mean	-0.321
SD	9.335	SD	1.876
95% DL/2 (t) UCL	7.434	95% H-Stat (DL/2) UCL	17.49
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.322
		SD in Log Scale	1.876
		Mean in Original Scale	4.369
		SD in Original Scale	9.335
		95% Percentile Bootstrap UCL	7.642
		95% BCA Bootstrap UCL	8.566

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.358	Data do not follow a Discernable Distribution (0.05)	
Theta Star	13.14		
nu star	17.89		
A-D Test Statistic	1.9	Nonparametric Statistics	
5% A-D Critical Value	0.835	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.835	Mean	4.369
5% K-S Critical Value	0.188	SD	9.161
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.799
		95% KM (t) UCL	7.438
Assuming Gamma Distribution		95% KM (z) UCL	7.328
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	7.433
Minimum	1E-09	95% KM (bootstrap t) UCL	10.69
Maximum	41.35	95% KM (BCA) UCL	7.888
Mean	4.355	95% KM (Percentile Bootstrap) UCL	7.679
Median	0.33	95% KM (Chebyshev) UCL	12.21
SD	9.342	97.5% KM (Chebyshev) UCL	15.61
k star	0.225	99% KM (Chebyshev) UCL	22.27
Theta star	19.37		
Nu star	12.14	Potential UCLs to Use	
AppChi2	5.32	99% KM (Chebyshev) UCL	22.27
95% Gamma Approximate UCL	9.938		
95% Adjusted Gamma UCL	10.51		

Note: DL/2 is not a recommended method.

Benzo(b)fluoranthene (aoc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	24	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.066	Minimum Detected	-2.718
Maximum Detected	34.8	Maximum Detected	3.55
Mean of Detected	4.163	Mean of Detected	-0.3
SD of Detected	8.351	SD of Detected	1.9
Minimum Non-Detect	0.39	Minimum Non-Detect	-0.942
Maximum Non-Detect	0.41	Maximum Non-Detect	-0.892

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	51.85%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.562	Shapiro Wilk Test Statistic	0.916
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.869	Mean	-0.397
SD	8.093	SD	1.859
95% DL/2 (t) UCL	6.525	95% H-Stat (DL/2) UCL	15.41
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.404
		SD in Log Scale	1.863
		Mean in Original Scale	3.868
		SD in Original Scale	8.093
		95% Percentile Bootstrap UCL	6.474
		95% BCA Bootstrap UCL	7.672

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.364	Data do not follow a Discernable Distribution (0.05)	
Theta Star	11.42		
nu star	18.22		
A-D Test Statistic	1.803	Nonparametric Statistics	
5% A-D Critical Value	0.833	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.833	Mean	3.867
5% K-S Critical Value	0.187	SD	7.942
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.56
		95% KM (t) UCL	6.528
Assuming Gamma Distribution		95% KM (z) UCL	6.433
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	6.524
Minimum	1E-09	95% KM (bootstrap t) UCL	9.256
Maximum	34.8	95% KM (BCA) UCL	6.571
Mean	3.854	95% KM (Percentile Bootstrap) UCL	6.628
Median	0.32	95% KM (Chebyshev) UCL	10.67
SD	8.1	97.5% KM (Chebyshev) UCL	13.61
k star	0.227	99% KM (Chebyshev) UCL	19.39
Theta star	16.95		
Nu star	12.28	Potential UCLs to Use	
AppChi2	5.409	99% KM (Chebyshev) UCL	19.39
95% Gamma Approximate UCL	8.747		
95% Adjusted Gamma UCL	9.242		

Note: DL/2 is not a recommended method.

Benzo(k)fluoranthene (sec 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	24	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.066	Minimum Detected	-2.718
Maximum Detected	38.85	Maximum Detected	3.66
Mean of Detected	4.358	Mean of Detected	-0.289
SD of Detected	9.116	SD of Detected	1.893
Minimum Non-Detect	0.39	Minimum Non-Detect	-0.942
Maximum Non-Detect	0.41	Maximum Non-Detect	-0.892

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	51.85%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.541	Shapiro Wilk Test Statistic	0.913
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.05	Mean	-0.387
SD	8.828	SD	1.852
95% DL/2 (t) UCL	6.948	95% H-Stat (DL/2) UCL	15.2
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.392
		SD in Log Scale	1.856
		Mean in Original Scale	4.049
		SD in Original Scale	8.829
		95% Percentile Bootstrap UCL	6.981
		95% BCA Bootstrap UCL	8.435

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.359	Data do not follow a Discernable Distribution (0.05)	
Theta Star	12.15		
nu star	17.93		
A-D Test Statistic	1.926	Nonparametric Statistics	
5% A-D Critical Value	0.834	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.834	Mean	4.048
5% K-S Critical Value	0.188	SD	8.664
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.702
		95% KM (t) UCL	6.951
Assuming Gamma Distribution		95% KM (z) UCL	6.848
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	6.946
Minimum	1E-09	95% KM (bootstrap t) UCL	10.41
Maximum	38.85	95% KM (BCA) UCL	7.474
Mean	4.035	95% KM (Percentile Bootstrap) UCL	6.954
Median	0.3	95% KM (Chebyshev) UCL	11.47
SD	8.835	97.5% KM (Chebyshev) UCL	14.68
k star	0.225	99% KM (Chebyshev) UCL	20.98
Theta star	17.9		
Nu star	12.17	Potential UCLs to Use	
AppChi2	5.339	99% KM (Chebyshev) UCL	20.98
95% Gamma Approximate UCL	9.197		
95% Adjusted Gamma UCL	9.721		

Note: DL/2 is not a recommended method.

Cadmium (aoc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	11
Number of Distinct Detected Data	11	Number of Non-Detect Data	16
		Percent Non-Detects	59.26%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.144	Minimum Detected	-1.938
Maximum Detected	4.1	Maximum Detected	1.411
Mean of Detected	1.085	Mean of Detected	-0.252
SD of Detected	1.067	SD of Detected	0.872
Minimum Non-Detect	0.117	Minimum Non-Detect	-2.146
Maximum Non-Detect	0.61	Maximum Non-Detect	-0.494

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	18
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	9
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	66.67%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.685	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.601	Mean	-0.91
SD	0.779	SD	0.831
95% DL/2 (t) UCL	0.857	95% H-Stat (DL/2) UCL	0.663
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.338
		SD in Log Scale	1.143
		Mean in Original Scale	0.526
		SD in Original Scale	0.815
		95% Percentile Bootstrap UCL	0.802
		95% BCA Bootstrap UCL	0.937

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.256	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.864		
nu star	27.63		
A-D Test Statistic	0.496	Nonparametric Statistics	
5% A-D Critical Value	0.741	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.741	Mean	0.548
5% K-S Critical Value	0.259	SD	0.788
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.16
		95% KM (t) UCL	0.822
Assuming Gamma Distribution		95% KM (z) UCL	0.812
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.797
Minimum	0.144	95% KM (bootstrap t) UCL	1.061
Maximum	4.1	95% KM (BCA) UCL	1.089
Mean	1.083	95% KM (Percentile Bootstrap) UCL	0.938
Median	1.058	95% KM (Chebyshev) UCL	1.247
SD	0.674	97.5% KM (Chebyshev) UCL	1.549
k star	3.272	99% KM (Chebyshev) UCL	2.143
Theta star	0.331		
Nu star	176.7	Potential UCLs to Use	
AppChi2	146.9	95% KM (t) UCL	0.822
95% Gamma Approximate UCL	1.302		
95% Adjusted Gamma UCL	1.318		

Note: DL/2 is not a recommended method.

Dibenz(a,h)anthracene (soc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	20
Number of Distinct Detected Data	20	Number of Non-Detect Data	7
		Percent Non-Detects	25.93%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0281	Minimum Detected	-3.572
Maximum Detected	7.45	Maximum Detected	2.008
Mean of Detected	1.141	Mean of Detected	-1.349
SD of Detected	1.997	SD of Detected	1.801
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	0.41	Maximum Non-Detect	-0.892

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	20
Number treated as Detected	7
Single DL Non-Detect Percentage	74.07%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.628	Shapiro Wilk Test Statistic	0.904
5% Shapiro Wilk Critical Value	0.905	5% Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.895	Mean	-1.425
SD	1.759	SD	1.546
95% DL/2 (t) UCL	1.472	95% H-Stat (DL/2) UCL	2.238
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.59
		SD in Log Scale	1.63
		Mean in Original Scale	0.877
		SD in Original Scale	1.767
		95% Percentile Bootstrap UCL	1.467
		95% BCA Bootstrap UCL	1.66

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.406	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2.812		
nu star	16.22		
A-D Test Statistic	1.327	Nonparametric Statistics	
5% A-D Critical Value	0.816	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.816	Mean	0.872
5% K-S Critical Value	0.207	SD	1.736
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.343
		95% KM (t) UCL	1.457
Assuming Gamma Distribution		95% KM (z) UCL	1.436
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.453
Minimum	0.0281	95% KM (bootstrap t) UCL	1.96
Maximum	7.45	95% KM (BCA) UCL	1.508
Mean	1.136	95% KM (Percentile Bootstrap) UCL	1.452
Median	0.75	95% KM (Chebyshev) UCL	2.367
SD	1.707	97.5% KM (Chebyshev) UCL	3.014
k star	0.529	99% KM (Chebyshev) UCL	4.284
Theta star	2.147		
Nu star	28.58	Potential UCLs to Use	
AppChi2	17.38	99% KM (Chebyshev) UCL	4.284
95% Gamma Approximate UCL	1.869		
95% Adjusted Gamma UCL	1.931		

Note: DL/2 is not a recommended method.

Indeno(1,2,3-cd)pyrene (soc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	24	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.041	Minimum Detected	-3.194
Maximum Detected	24.2	Maximum Detected	3.186
Mean of Detected	3.043	Mean of Detected	-0.671
SD of Detected	6.079	SD of Detected	1.926
Minimum Non-Detect	0.39	Minimum Non-Detect	-0.942
Maximum Non-Detect	0.41	Maximum Non-Detect	-0.892

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	12
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	55.56%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.566	Shapiro Wilk Test Statistic	0.914
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.833	Mean	-0.741
SD	5.89	SD	1.868
95% DL/2 (t) UCL	4.766	95% H-Stat (DL/2) UCL	11.62
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.767
		SD in Log Scale	1.882
		Mean in Original Scale	2.828
		SD in Original Scale	5.892
		95% Percentile Bootstrap UCL	4.696
		95% BCA Bootstrap UCL	5.402

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.355	Data do not follow a Discernable Distribution (0.05)	
Theta Star	8.575		
nu star	17.75		
A-D Test Statistic	1.926	Nonparametric Statistics	
5% A-D Critical Value	0.835	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.835	Mean	2.828
5% K-S Critical Value	0.188	SD	5.782
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.136
		95% KM (t) UCL	4.765
Assuming Gamma Distribution		95% KM (z) UCL	4.696
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	4.762
Minimum	1E-09	95% KM (bootstrap t) UCL	6.651
Maximum	24.2	95% KM (BCA) UCL	4.873
Mean	2.818	95% KM (Percentile Bootstrap) UCL	4.806
Median	0.23	95% KM (Chebyshev) UCL	7.779
SD	5.897	97.5% KM (Chebyshev) UCL	9.921
k star	0.226	99% KM (Chebyshev) UCL	14.13
Theta star	12.49		
Nu star	12.19	Potential UCLs to Use	
AppChi2	5.35	99% KM (Chebyshev) UCL	14.13
95% Gamma Approximate UCL	6.419		
95% Adjusted Gamma UCL	6.784		

Note: DL/2 is not a recommended method.

Mercury (sec 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	21
Number of Distinct Detected Data	15	Number of Non-Detect Data	6
		Percent Non-Detects	22.22%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0157	Minimum Detected	-4.154
Maximum Detected	2.465	Maximum Detected	0.902
Mean of Detected	0.422	Mean of Detected	-2.103
SD of Detected	0.738	SD of Detected	1.531
Minimum Non-Detect	0.04	Minimum Non-Detect	-3.219
Maximum Non-Detect	0.114	Maximum Non-Detect	-2.172

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	20
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	7
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	74.07%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.595	Shapiro Wilk Test Statistic	0.879
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.334	Mean	-2.466
SD	0.668	SD	1.522
95% DL/2 (t) UCL	0.553	95% H-Stat (DL/2) UCL	0.577
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.637
		SD in Log Scale	1.727
		Mean in Original Scale	0.332
		SD in Original Scale	0.67
		95% Percentile Bootstrap UCL	0.565
		95% BCA Bootstrap UCL	0.619

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.469	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.899		
nu star	19.71		
A-D Test Statistic	1.984	Nonparametric Statistics	
5% A-D Critical Value	0.804	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.804	Mean	0.333
5% K-S Critical Value	0.2	SD	0.656
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.129
		95% KM (t) UCL	0.554
Assuming Gamma Distribution		95% KM (z) UCL	0.546
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.553
Minimum	1E-09	95% KM (bootstrap t) UCL	0.775
Maximum	2.465	95% KM (BCA) UCL	0.566
Mean	0.339	95% KM (Percentile Bootstrap) UCL	0.557
Median	0.06	95% KM (Chebyshev) UCL	0.897
SD	0.668	97.5% KM (Chebyshev) UCL	1.142
k star	0.198	99% KM (Chebyshev) UCL	1.621
Theta star	1.714		
Nu star	10.68	Potential UCLs to Use	
AppChi2	4.369	99% KM (Chebyshev) UCL	1.621
95% Gamma Approximate UCL	0.828		
95% Adjusted Gamma UCL	0.88		

Note: DL/2 is not a recommended method.

Naphthalene (soc 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	19
Number of Distinct Detected Data	19	Number of Non-Detect Data	8
		Percent Non-Detects	29.63%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.056	Minimum Detected	-2.882
Maximum Detected	8.795	Maximum Detected	2.174
Mean of Detected	1.041	Mean of Detected	-0.917
SD of Detected	2	SD of Detected	1.338
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	0.41	Maximum Non-Detect	-0.892

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	18
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	9
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	66.67%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.505	Shapiro Wilk Test Statistic	0.964
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.79	Mean	-1.133
SD	1.71	SD	1.164
95% DL/2 (t) UCL	1.351	95% H-Stat (DL/2) UCL	1.273
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.198
		SD in Log Scale	1.222
		Mean in Original Scale	0.783
		SD in Original Scale	1.713
		95% Percentile Bootstrap UCL	1.352
		95% BCA Bootstrap UCL	1.75

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.574	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	1.815	
nu star	21.79	
A-D Test Statistic	0.931	
5% A-D Critical Value	0.789	
K-S Test Statistic	0.789	
5% K-S Critical Value	0.208	
Data follow Appr. Gamma Distribution at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	0.782
Maximum	8.795	SD	1.682
Mean	0.979	SE of Mean	0.333
Median	0.54	95% KM (t) UCL	1.35
SD	1.705	95% KM (z) UCL	1.33
k star	0.422	95% KM (jackknife) UCL	1.345
Theta star	2.322	95% KM (bootstrap t) UCL	2.517
Nu star	22.76	95% KM (BCA) UCL	1.441
AppChi2	12.91	95% KM (Percentile Bootstrap) UCL	1.371
95% Gamma Approximate UCL	1.725	95% KM (Chebyshev) UCL	2.233
95% Adjusted Gamma UCL	1.791	97.5% KM (Chebyshev) UCL	2.86
		99% KM (Chebyshev) UCL	4.093
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	2.233

Note: DL/2 is not a recommended method.

Total PCBs (sec 13)

General Statistics

Number of Valid Data	27	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	11
		Percent Non-Detects	40.74%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0508	Minimum Detected	-2.98
Maximum Detected	12.2	Maximum Detected	2.501
Mean of Detected	1.381	Mean of Detected	-0.96
SD of Detected	3.019	SD of Detected	1.505
Minimum Non-Detect	0.0546	Minimum Non-Detect	-2.908
Maximum Non-Detect	0.123	Maximum Non-Detect	-2.096

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	12
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	55.56%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.477	Shapiro Wilk Test Statistic	0.899
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.841	Mean	-1.756
SD	2.387	SD	1.511
95% DL/2 (t) UCL	1.625	95% H-Stat (DL/2) UCL	1.002
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.96
		SD in Log Scale	1.738
		Mean in Original Scale	0.835
		SD in Original Scale	2.389
		95% Percentile Bootstrap UCL	1.718
		95% BCA Bootstrap UCL	2.194

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.444	Data appear Lognormal at 5% Significance Level	
Theta Star	3.108		
nu star	14.22		
A-D Test Statistic	1.514	Nonparametric Statistics	
5% A-D Critical Value	0.797	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.797	Mean	0.847
5% K-S Critical Value	0.227	SD	2.341
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.465
		95% KM (t) UCL	1.641
Assuming Gamma Distribution		95% KM (z) UCL	1.613
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.624
Minimum	1E-09	95% KM (bootstrap t) UCL	3.553
Maximum	12.2	95% KM (BCA) UCL	1.766
Mean	1.106	95% KM (Percentile Bootstrap) UCL	1.687
Median	0.206	95% KM (Chebyshev) UCL	2.875
SD	2.404	97.5% KM (Chebyshev) UCL	3.753
k star	0.171	99% KM (Chebyshev) UCL	5.476
Theta star	6.451		
Nu star	9.258	Potential UCLs to Use	
AppChi2	3.483	99% KM (Chebyshev) UCL	5.476
95% Gamma Approximate UCL	2.939		
95% Adjusted Gamma UCL	3.141		

Note: DL/2 is not a recommended method.

General UCL Statistics for Full Data Sets

User Selected Options

From File	J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\EPCs\Surface Soil\ProUCL files\So
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum (southern parcel)

General Statistics

Number of Valid Observations	121	Number of Distinct Observations	106
Number of Missing Values	5		

Raw Statistics		Log-transformed Statistics	
Minimum	4260	Minimum of Log Data	8.357
Maximum	90200	Maximum of Log Data	11.41
Mean	19217	Mean of log Data	9.707
Median	16700	SD of log Data	0.579
SD	11216		
Coefficient of Variation	0.584		
Skewness	2.286		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.105	Lilliefors Test Statistic	0.0837
Lilliefors Critical Value	0.0805	Lilliefors Critical Value	0.0805
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	20907	95% H-UCL	21459
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	24197
95% Adjusted-CLT UCL	21121	97.5% Chebyshev (MVUE) UCL	26269
95% Modified-t UCL	20943	99% Chebyshev (MVUE) UCL	30340

Gamma Distribution Test		Data Distribution
k star (bias corrected)	3.278	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	5863	
nu star	793.2	
Approximate Chi Square Value (.05)	728.8	**Nonparametric Statistics**
Adjusted Level of Significance	0.048	95% CLT UCL 20894
Adjusted Chi Square Value	728.1	95% Jackknife UCL 20907
		95% Standard Bootstrap UCL 20927
Anderson-Darling Test Statistic	0.665	95% Bootstrap-t UCL 21118
Anderson-Darling 5% Critical Value	0.758	95% Hall's Bootstrap UCL 21352
Kolmogorov-Smirnov Test Statistic	0.0732	95% Percentile Bootstrap UCL 20982
Kolmogorov-Smirnov 5% Critical Value	0.0845	95% BCA Bootstrap UCL 21045
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 23662
		97.5% Chebyshev(Mean, Sd) UCL 25585
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 29362
95% Approximate Gamma UCL	20914	
95% Adjusted Gamma UCL	20935	

Potential UCL to Use	Use 95% Approximate Gamma UCL 20914

Barium (southern parcel)

General Statistics

Number of Valid Observations	121	Number of Distinct Observations	108
Number of Missing Values	5		

Raw Statistics

Minimum	46.9
Maximum	689
Mean	184.3
Median	163
SD	110.4
Coefficient of Variation	0.599
Skewness	1.221

Log-transformed Statistics

Minimum of Log Data	3.848
Maximum of Log Data	6.535
Mean of log Data	5.04
SD of log Data	0.608

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.124
Lilliefors Critical Value	0.0805

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.102
Lilliefors Critical Value	0.0805

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	200.9

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	202
95% Modified-t UCL	201.1

Assuming Lognormal Distribution

95% H-UCL	206.5
95% Chebyshev (MVUE) UCL	234
97.5% Chebyshev (MVUE) UCL	255
99% Chebyshev (MVUE) UCL	296.1

Gamma Distribution Test

k star (bias corrected)	2.927
Theta Star	62.98
nu star	708.2
Approximate Chi Square Value (.05)	647.5
Adjusted Level of Significance	0.048
Adjusted Chi Square Value	646.8
Anderson-Darling Test Statistic	1.11
Anderson-Darling 5% Critical Value	0.759
Kolmogorov-Smirnov Test Statistic	0.0852
Kolmogorov-Smirnov 5% Critical Value	0.0846

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	201.6
95% Adjusted Gamma UCL	201.8

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	200.8
95% Jackknife UCL	200.9
95% Standard Bootstrap UCL	201
95% Bootstrap-t UCL	202.8
95% Hall's Bootstrap UCL	202.5
95% Percentile Bootstrap UCL	200.1
95% BCA Bootstrap UCL	201.6
95% Chebyshev(Mean, Sd) UCL	228
97.5% Chebyshev(Mean, Sd) UCL	247
99% Chebyshev(Mean, Sd) UCL	284.1

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 228

Chromium (total) (southern parcel)

General Statistics

Number of Valid Observations	121	Number of Distinct Observations	109
Number of Missing Values	5		

Raw Statistics		Log-transformed Statistics	
Minimum	11.4	Minimum of Log Data	2.434
Maximum	3730	Maximum of Log Data	8.224
Mean	71.55	Mean of log Data	3.394
Median	22.7	SD of log Data	0.853
SD	340.1		
Coefficient of Variation	4.754		
Skewness	10.56		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.43	Lilliefors Test Statistic	0.149
Lilliefors Critical Value	0.0805	Lilliefors Critical Value	0.0805
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	122.8	95% H-UCL	50.27
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	59.26
95% Adjusted-CLT UCL	154.1	97.5% Chebyshev (MVUE) UCL	66.45
95% Modified-t UCL	127.7	99% Chebyshev (MVUE) UCL	80.58

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.679	Data do not follow a Discernable Distribution (0.05)	
Theta Star	105.4		
nu star	164.3		
Approximate Chi Square Value (.05)	135.7	Nonparametric Statistics	
Adjusted Level of Significance	0.048	95% CLT UCL	122.4
Adjusted Chi Square Value	135.4	95% Jackknife UCL	122.8
		95% Standard Bootstrap UCL	121.9
Anderson-Darling Test Statistic	16.56	95% Bootstrap-t UCL	384
Anderson-Darling 5% Critical Value	0.801	95% Hall's Bootstrap UCL	308.1
Kolmogorov-Smirnov Test Statistic	0.251	95% Percentile Bootstrap UCL	130.8
Kolmogorov-Smirnov 5% Critical Value	0.0877	95% BCA Bootstrap UCL	176.4
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	206.3
		97.5% Chebyshev(Mean, Sd) UCL	264.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	379.2
95% Approximate Gamma UCL	86.65		
95% Adjusted Gamma UCL	86.85		

Potential UCL to Use		
	Use 95% Chebyshev (Mean, Sd) UCL	206.3

Dioxin TEQ-HH (southern parcel)

General Statistics

Number of Valid Observations	43	Number of Distinct Observations	43
Number of Missing Values	83		

Raw Statistics		Log-transformed Statistics	
Minimum	9.1656E-08	Minimum of Log Data	-16.21
Maximum	7.1958E-05	Maximum of Log Data	-9.539
Mean	6.8026E-06	Mean of log Data	-13.01
Median	2.3448E-06	SD of log Data	1.599
SD	1.2289E-05		
Coefficient of Variation	N/A		
Skewness	3.985		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.555	Shapiro Wilk Test Statistic	0.972
Shapiro Wilk Critical Value	0.943	Shapiro Wilk Critical Value	0.943
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	9.9547E-06	95% H-UCL	1.7205E-05
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.8342E-05
95% Adjusted-CLT UCL	1.1102E-05	97.5% Chebyshev (MVUE) UCL	0.000023
95% Modified-t UCL	1.0145E-05	99% Chebyshev (MVUE) UCL	3.2148E-05

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.539	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	1.2611E-05	
nu star	46.39	
Approximate Chi Square Value (.05)	31.76	**Nonparametric Statistics**
Adjusted Level of Significance	0.0444	95% CLT UCL 9.8852E-06
Adjusted Chi Square Value	31.34	95% Jackknife UCL 9.9547E-06
		95% Standard Bootstrap UCL 9.8401E-06
Anderson-Darling Test Statistic	0.906	95% Bootstrap-t UCL 1.2526E-05
Anderson-Darling 5% Critical Value	0.807	95% Hall's Bootstrap UCL 2.3255E-05
Kolmogorov-Smirnov Test Statistic	0.132	95% Percentile Bootstrap UCL 0.00001009
Kolmogorov-Smirnov 5% Critical Value	0.142	95% BCA Bootstrap UCL 0.00001149
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.4972E-05
		97.5% Chebyshev(Mean, Sd) UCL 1.8506E-05
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.00002545
95% Approximate Gamma UCL	9.9355E-06	
95% Adjusted Gamma UCL	1.0069E-05	

Potential UCL to Use	Use 95% Approximate Gamma UCL 9.9355E-06

Iron (southern parcel)

General Statistics

Number of Valid Observations	121	Number of Distinct Observations	110
Number of Missing Values	5		

Raw Statistics

Minimum	4805
Maximum	170000
Mean	45797
Median	27100
SD	39323
Coefficient of Variation	0.859
Skewness	1.301

Log-transformed Statistics

Minimum of Log Data	8.477
Maximum of Log Data	12.04
Mean of log Data	10.38
SD of log Data	0.852

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.204
Lilliefors Critical Value	0.0805

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.1
Lilliefors Critical Value	0.0805

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	51723

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	52129
95% Modified-t UCL	51793

Assuming Lognormal Distribution

95% H-UCL	54466
95% Chebyshev (MVUE) UCL	64199
97.5% Chebyshev (MVUE) UCL	71980
99% Chebyshev (MVUE) UCL	87266

Gamma Distribution Test

k star (bias corrected)	1.542
Theta Star	29692
nu star	373.3
Approximate Chi Square Value (.05)	329.5
Adjusted Level of Significance	0.048
Adjusted Chi Square Value	329
Anderson-Darling Test Statistic	2.368
Anderson-Darling 5% Critical Value	0.769
Kolmogorov-Smirnov Test Statistic	0.143
Kolmogorov-Smirnov 5% Critical Value	0.0855

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	51882
95% Adjusted Gamma UCL	51959

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	51677
95% Jackknife UCL	51723
95% Standard Bootstrap UCL	51640
95% Bootstrap-t UCL	52154
95% Hall's Bootstrap UCL	52120
95% Percentile Bootstrap UCL	51833
95% BCA Bootstrap UCL	52304
95% Chebyshev(Mean, Sd) UCL	61379
97.5% Chebyshev(Mean, Sd) UCL	68122
99% Chebyshev(Mean, Sd) UCL	81366

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 61379

Manganese (southern parcel)

General Statistics

Number of Valid Observations	121	Number of Distinct Observations	116
Number of Missing Values	5		

Raw Statistics		Log-transformed Statistics	
Minimum	337	Minimum of Log Data	5.82
Maximum	20700	Maximum of Log Data	9.938
Mean	3031	Mean of log Data	7.637
Median	2160	SD of log Data	0.905
SD	2976		
Coefficient of Variation	0.982		
Skewness	3.319		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.183	Lilliefors Test Statistic	0.105
Lilliefors Critical Value	0.0805	Lilliefors Critical Value	0.0805
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	3480	95% H-UCL	3716
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4414
95% Adjusted-CLT UCL	3584	97.5% Chebyshev (MVUE) UCL	4978
95% Modified-t UCL	3494	99% Chebyshev (MVUE) UCL	6087

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.431	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2119		
nu star	346.2		
Approximate Chi Square Value (.05)	304.1	Nonparametric Statistics	
Adjusted Level of Significance	0.048	95% CLT UCL	3476
Adjusted Chi Square Value	303.6	95% Jackknife UCL	3480
		95% Standard Bootstrap UCL	3484
Anderson-Darling Test Statistic	1.375	95% Bootstrap-t UCL	3635
Anderson-Darling 5% Critical Value	0.771	95% Hall's Bootstrap UCL	3754
Kolmogorov-Smirnov Test Statistic	0.091	95% Percentile Bootstrap UCL	3482
Kolmogorov-Smirnov 5% Critical Value	0.0857	95% BCA Bootstrap UCL	3615
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4211
		97.5% Chebyshev(Mean, Sd) UCL	4721
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5724
95% Approximate Gamma UCL	3451		
95% Adjusted Gamma UCL	3457		

Potential UCL to Use		
	Use 95% Chebyshev (Mean, Sd) UCL	4211

Vanadium (southern parcel)

General Statistics

Number of Valid Observations	121	Number of Distinct Observations	107
Number of Missing Values	5		

Raw Statistics		Log-transformed Statistics	
Minimum	8.4	Minimum of Log Data	2.128
Maximum	485	Maximum of Log Data	6.184
Mean	33.23	Mean of log Data	3.272
Median	25.6	SD of log Data	0.565
SD	45.32		
Coefficient of Variation	1.364		
Skewness	8.558		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.3	Lilliefors Test Statistic	0.0734
Lilliefors Critical Value	0.0805	Lilliefors Critical Value	0.0805
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	40.06	95% H-UCL	34.05
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	38.3
95% Adjusted-CLT UCL	43.44	97.5% Chebyshev (MVUE) UCL	41.5
95% Modified-t UCL	40.6	99% Chebyshev (MVUE) UCL	47.8

Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.264	Data appear Lognormal at 5% Significance Level
Theta Star	14.68	
nu star	548	
Approximate Chi Square Value (.05)	494.7	**Nonparametric Statistics**
Adjusted Level of Significance	0.048	95% CLT UCL 40.01
Adjusted Chi Square Value	494.1	95% Jackknife UCL 40.06
		95% Standard Bootstrap UCL 39.7
Anderson-Darling Test Statistic	5.069	95% Bootstrap-t UCL 51.01
Anderson-Darling 5% Critical Value	0.763	95% Hall's Bootstrap UCL 65.92
Kolmogorov-Smirnov Test Statistic	0.142	95% Percentile Bootstrap UCL 40.72
Kolmogorov-Smirnov 5% Critical Value	0.085	95% BCA Bootstrap UCL 45.67
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 51.19
		97.5% Chebyshev(Mean, Sd) UCL 58.96
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 74.23
95% Approximate Gamma UCL	36.82	
95% Adjusted Gamma UCL	36.86	

Potential UCL to Use		Use 95% H-UCL 34.05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	J:\Indl_Service\Project Files\AKSteel (see Rem-Eng P00)\Hamilton, Ohio\HHRA\EPCs\Surface Soil\ProUCL files\S
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Antimony (southern parcel)

General Statistics

Number of Valid Data	109	Number of Detected Data	17
Number of Distinct Detected Data	16	Number of Non-Detect Data	92
Number of Missing Values	17	Percent Non-Detects	84.40%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.483	Minimum Detected	-0.728
Maximum Detected	105	Maximum Detected	4.654
Mean of Detected	12.35	Mean of Detected	1.503
SD of Detected	24.65	SD of Detected	1.492
Minimum Non-Detect	6.2	Minimum Non-Detect	1.825
Maximum Non-Detect	19.2	Maximum Non-Detect	2.955

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	107
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	98.17%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.45	Lilliefors Test Statistic	0.872
5% Lilliefors Critical Value	0.892	5% Lilliefors Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.925	Mean	1.294
SD	10.04	SD	0.594
95% DL/2 (t) UCL	6.52	95% H-Stat (DL/2) UCL	5.224
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.37
		SD in Log Scale	1.071
		Mean in Original Scale	3.284
		SD in Original Scale	10.33
		95% Percentile Bootstrap UCL	5.08
		95% BCA Bootstrap UCL	6.249

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.542	Data do not follow a Discernible Distribution (0.05)	
Theta Star	22.8		
nu star	18.41		
A-D Test Statistic	1.269	Nonparametric Statistics	
5% A-D Critical Value	0.788	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.788	Mean	3.894
5% K-S Critical Value	0.219	SD	10.4
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.238
		95% KM (t) UCL	5.949
Assuming Gamma Distribution		95% KM (z) UCL	5.931
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5.976
Minimum	0.483	95% KM (bootstrap t) UCL	7.724
Maximum	105	95% KM (BCA) UCL	6.305
Mean	14.42	95% KM (Percentile Bootstrap) UCL	6.222
Median	12.39	95% KM (Chebyshev) UCL	9.292
SD	11.28	97.5% KM (Chebyshev) UCL	11.63
k star	2.181	99% KM (Chebyshev) UCL	16.22
Theta star	6.67		
Nu star	471.1	Potential UCLs to Use	
AppChi2	421.8	95% KM (BCA) UCL	6.305
95% Gamma Approximate UCL	16.1		
95% Adjusted Gamma UCL	16.12		

Note: DL/2 is not a recommended method.

Arsenic (southern parcel)

General Statistics

Number of Valid Data	121	Number of Detected Data	113
Number of Distinct Detected Data	83	Number of Non-Detect Data	8
Number of Missing Values	5	Percent Non-Detects	6.61%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.474	Minimum Detected	-0.747
Maximum Detected	33.6	Maximum Detected	3.515
Mean of Detected	9.28	Mean of Detected	2.009
SD of Detected	6.067	SD of Detected	0.73
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	5.5	Maximum Non-Detect	1.705

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	38
Number treated as Detected	83
Single DL Non-Detect Percentage	31.40%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.171	Lilliefors Test Statistic	0.135
5% Lilliefors Critical Value	0.0833	5% Lilliefors Critical Value	0.0833
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	8.723	Mean	1.852
SD	6.23	SD	0.93
95% DL/2 (t) UCL	9.682	95% H-Stat (DL/2) UCL	10.64
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	8.009	Mean in Log Scale	1.912
SD	7.197	SD in Log Scale	0.797
95% MLE (t) UCL	9.094	Mean in Original Scale	8.788
95% MLE (Tiku) UCL	9.161	SD in Original Scale	6.153
		95% Percentile Bootstrap UCL	9.752
		95% BCA Bootstrap UCL	9.785

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.379	Data do not follow a Discernible Distribution (0.05)	
Theta Star	3.901		
nu star	537.7		
A-D Test Statistic	1.694	Nonparametric Statistics	
5% A-D Critical Value	0.762	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.762	Mean	8.72
5% K-S Critical Value	0.087	SD	6.21
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.567
		95% KM (t) UCL	9.661
Assuming Gamma Distribution		95% KM (z) UCL	9.654
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	9.635
Minimum	1E-09	95% KM (bootstrap t) UCL	9.812
Maximum	33.6	95% KM (BCA) UCL	9.695
Mean	8.7	95% KM (Percentile Bootstrap) UCL	9.732
Median	8.7	95% KM (Chebyshev) UCL	11.19
SD	6.265	97.5% KM (Chebyshev) UCL	12.26
k star	0.529	99% KM (Chebyshev) UCL	14.37
Theta star	16.45		
Nu star	128	Potential UCLs to Use	
AppChi2	102.9	95% KM (BCA) UCL	9.695
95% Gamma Approximate UCL	10.83		
95% Adjusted Gamma UCL	10.85		

Note: DL/2 is not a recommended method.

Benzo(a)anthracene (southern parcel)

General Statistics

Number of Valid Data	119	Number of Detected Data	111
Number of Distinct Detected Data	81	Number of Non-Detect Data	8
Number of Missing Values	7	Percent Non-Detects	6.72%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.043	Minimum Detected	-3.147
Maximum Detected	36	Maximum Detected	3.584
Mean of Detected	2.067	Mean of Detected	-0.454
SD of Detected	4.4	SD of Detected	1.513
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	39	Maximum Non-Detect	3.664

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	119
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.323	Lilliefors Test Statistic	0.075
5% Lilliefors Critical Value	0.0841	5% Lilliefors Critical Value	0.0841
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.103	Mean	-0.496
SD	4.564	SD	1.522
95% DL/2 (t) UCL	2.797	95% H-Stat (DL/2) UCL	2.776
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.531
		SD in Log Scale	1.498
		Mean in Original Scale	1.944
		SD in Original Scale	4.273
		95% Percentile Bootstrap UCL	2.633
		95% BCA Bootstrap UCL	2.811

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.525	Data appear Lognormal at 5% Significance Level
Theta Star	3.94	
nu star	116.5	
A-D Test Statistic	4.541	Nonparametric Statistics
5% A-D Critical Value	0.816	Kaplan-Meier (KM) Method
K-S Test Statistic	0.816	Mean
5% K-S Critical Value	0.0914	SD
Data not Gamma Distributed at 5% Significance Level		SE of Mean
		95% KM (t) UCL
Assuming Gamma Distribution		95% KM (z) UCL
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL
Minimum	1E-09	95% KM (bootstrap t) UCL
Maximum	36	95% KM (BCA) UCL
Mean	1.942	95% KM (Percentile Bootstrap) UCL
Median	0.456	95% KM (Chebyshev) UCL
SD	4.276	97.5% KM (Chebyshev) UCL
k star	0.298	99% KM (Chebyshev) UCL
Theta star	6.523	
Nu star	70.85	Potential UCLs to Use
AppChi2	52.47	97.5% KM (Chebyshev) UCL
95% Gamma Approximate UCL	2.622	
95% Adjusted Gamma UCL	2.632	

Mean	0.955
SD	4.272
SE of Mean	0.395
95% KM (t) UCL	2.61
95% KM (z) UCL	2.605
95% KM (jackknife) UCL	2.61
95% KM (bootstrap t) UCL	2.987
95% KM (BCA) UCL	2.674
95% KM (Percentile Bootstrap) UCL	2.668
95% KM (Chebyshev) UCL	3.677
97.5% KM (Chebyshev) UCL	4.422
99% KM (Chebyshev) UCL	5.886

Note: DL/2 is not a recommended method.

Benzo(a)pyrene (southern parcel)

General Statistics

Number of Valid Data	119	Number of Detected Data	112
Number of Distinct Detected Data	85	Number of Non-Detect Data	7
Number of Missing Values	7	Percent Non-Detects	5.88%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.043	Minimum Detected	-3.147
Maximum Detected	27	Maximum Detected	3.296
Mean of Detected	1.92	Mean of Detected	-0.452
SD of Detected	3.647	SD of Detected	1.495
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	39	Maximum Non-Detect	3.664

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	119
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.303	Lilliefors Test Statistic	0.0858
5% Lilliefors Critical Value	0.0837	5% Lilliefors Critical Value	0.0837
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.98	Mean	-0.484
SD	3.909	SD	1.509
95% DL/2 (t) UCL	2.574	95% H-Stat (DL/2) UCL	2.74
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.518
		SD in Log Scale	1.481
		Mean in Original Scale	1.822
		SD in Original Scale	3.559
		95% Percentile Bootstrap UCL	2.406
		95% BCA Bootstrap UCL	2.541

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.565	Data appear Lognormal at 5% Significance Level
Theta Star	3.457	
nu star	124.4	
A-D Test Statistic	3.697	
5% A-D Critical Value	0.813	
K-S Test Statistic	0.813	
5% K-S Critical Value	0.0909	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	1.832
Maximum	27	SD	3.557
Mean	1.821	SE of Mean	0.329
Median	0.53	95% KM (t) UCL	2.377
SD	3.561	95% KM (z) UCL	2.373
k star	0.349	95% KM (jackknife) UCL	2.377
Theta star	5.223	95% KM (bootstrap t) UCL	2.596
Nu star	83	95% KM (BCA) UCL	2.411
AppChi2	63	95% KM (Percentile Bootstrap) UCL	2.405
95% Gamma Approximate UCL	2.399	95% KM (Chebyshev) UCL	3.265
95% Adjusted Gamma UCL	2.408	97.5% KM (Chebyshev) UCL	3.886
		99% KM (Chebyshev) UCL	5.105
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	3.265

Note: DL/2 is not a recommended method.

Benzo(b)fluoranthene (southern parcel)

General Statistics

Number of Valid Data	119	Number of Detected Data	111
Number of Distinct Detected Data	85	Number of Non-Detect Data	8
Number of Missing Values	7	Percent Non-Detects	6.72%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.04	Minimum Detected	-3.219
Maximum Detected	25	Maximum Detected	3.219
Mean of Detected	1.807	Mean of Detected	-0.43
SD of Detected	3.322	SD of Detected	1.449
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	39	Maximum Non-Detect	3.664

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	119
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.297	Lilliefors Test Statistic	0.0674
5% Lilliefors Critical Value	0.0841	5% Lilliefors Critical Value	0.0841
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.861	Mean	-0.474
SD	3.619	SD	1.464
95% DL/2 (t) UCL	2.411	95% H-Stat (DL/2) UCL	2.538
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.509
		SD in Log Scale	1.438
		Mean in Original Scale	1.701
		SD in Original Scale	3.232
		95% Percentile Bootstrap UCL	2.198
		95% BCA Bootstrap UCL	2.405

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.594	Data appear Lognormal at 5% Significance Level
Theta Star	3.044	
nu star	131.8	
A-D Test Statistic	3.032	**Nonparametric Statistics**
5% A-D Critical Value	0.809	Kaplan-Meier (KM) Method
K-S Test Statistic	0.809	Mean 1.71
5% K-S Critical Value	0.0909	SD 3.231
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.299
		95% KM (t) UCL 2.206
Assuming Gamma Distribution		95% KM (z) UCL 2.202
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 2.205
Minimum	1E-09	95% KM (bootstrap t) UCL 2.401
Maximum	25	95% KM (BCA) UCL 2.251
Mean	1.7	95% KM (Percentile Bootstrap) UCL 2.211
Median	0.49	95% KM (Chebyshev) UCL 3.013
SD	3.235	97.5% KM (Chebyshev) UCL 3.576
k star	0.337	99% KM (Chebyshev) UCL 4.683
Theta star	5.05	
Nu star	80.13	**Potential UCLs to Use**
AppChi2	60.5	95% KM (Chebyshev) UCL 3.013
95% Gamma Approximate UCL	2.252	
95% Adjusted Gamma UCL	2.259	

Note: DL/2 is not a recommended method.

Benzo(k)fluoranthene (southern parcel)

General Statistics

Number of Valid Data	119	Number of Detected Data	110
Number of Distinct Detected Data	81	Number of Non-Detect Data	9
Number of Missing Values	7	Percent Non-Detects	7.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.043	Minimum Detected	-3.147
Maximum Detected	27	Maximum Detected	3.298
Mean of Detected	1.808	Mean of Detected	-0.481
SD of Detected	3.48	SD of Detected	1.476
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	39	Maximum Non-Detect	3.664

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	119
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.306	Lilliefors Test Statistic	0.067
5% Lilliefors Critical Value	0.0845	5% Lilliefors Critical Value	0.0845
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.848	Mean	-0.531
SD	3.743	SD	1.485
95% DL/2 (t) UCL	2.416	95% H-Stat (DL/2) UCL	2.498
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.569
		SD in Log Scale	1.46
		Mean in Original Scale	1.688
		SD in Original Scale	3.371
		95% Percentile Bootstrap UCL	2.238
		95% BCA Bootstrap UCL	2.4

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.569	Data appear Lognormal at 5% Significance Level
Theta Star	3.176	
nu star	125.2	
A-D Test Statistic	3.338	
5% A-D Critical Value	0.811	
K-S Test Statistic	0.811	
5% K-S Critical Value	0.0914	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	1.697
Maximum	27	SD	3.389
Mean	1.687	SE of Mean	0.312
Median	0.45	95% KM (t) UCL	2.214
SD	3.374	95% KM (z) UCL	2.21
k star	0.31	95% KM (jackknife) UCL	2.213
Theta star	5.438	95% KM (bootstrap t) UCL	2.482
Nu star	73.86	95% KM (BCA) UCL	2.22
AppChi2	55.07	95% KM (Percentile Bootstrap) UCL	2.223
95% Gamma Approximate UCL	2.263	95% KM (Chebyshev) UCL	3.055
95% Adjusted Gamma UCL	2.271	97.5% KM (Chebyshev) UCL	3.643
		99% KM (Chebyshev) UCL	4.797
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	3.055

Note: DL/2 is not a recommended method.

Cadmium (southern parcel)

General Statistics

Number of Valid Data	121	Number of Detected Data	77
Number of Distinct Detected Data	55	Number of Non-Detect Data	44
Number of Missing Values	5	Percent Non-Detects	36.36%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.228	Minimum Detected	-1.478
Maximum Detected	10.8	Maximum Detected	2.38
Mean of Detected	2.343	Mean of Detected	0.497
SD of Detected	2.253	SD of Detected	0.837
Minimum Non-Detect	0.52	Minimum Non-Detect	-0.654
Maximum Non-Detect	1.2	Maximum Non-Detect	0.182

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	75
Number treated as Detected	46
Single DL Non-Detect Percentage	61.98%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.221	Lilliefors Test Statistic	0.0867
5% Lilliefors Critical Value	0.101	5% Lilliefors Critical Value	0.101
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.605	Mean	-0.116
SD	2.044	SD	1.059
95% DL/2 (t) UCL	1.913	95% H-Stat (DL/2) UCL	1.5
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.126
		SD in Log Scale	1.093
		Mean in Original Scale	1.609
		SD in Original Scale	2.043
		95% Percentile Bootstrap UCL	1.932
		95% BCA Bootstrap UCL	1.948

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.503	Data appear Lognormal at 5% Significance Level	
Theta Star	1.559		
nu star	231.4		
A-D Test Statistic	1.503	Nonparametric Statistics	
5% A-D Critical Value	0.769	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.769	Mean	1.606
5% K-S Critical Value	0.104	SD	2.035
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.187
		95% KM (t) UCL	1.918
Assuming Gamma Distribution		95% KM (z) UCL	1.913
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.916
Minimum	1E-09	95% KM (bootstrap t) UCL	1.968
Maximum	10.8	95% KM (BCA) UCL	1.934
Mean	2.016	95% KM (Percentile Bootstrap) UCL	1.942
Median	1.589	95% KM (Chebyshev) UCL	2.42
SD	1.911	97.5% KM (Chebyshev) UCL	2.772
k star	0.853	99% KM (Chebyshev) UCL	3.464
Theta star	2.364		
Nu star	206.4	Potential UCLs to Use	
AppChi2	174.2	95% KM (BCA) UCL	1.934
95% Gamma Approximate UCL	2.389		
95% Adjusted Gamma UCL	2.394		

Note: DL/2 is not a recommended method.

Copper (southern parcel)

General Statistics

Number of Valid Data	121	Number of Detected Data	120
Number of Distinct Detected Data	108	Number of Non-Detect Data	1
Number of Missing Values	5	Percent Non-Detects	0.83%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.585	Minimum Detected	0.95
Maximum Detected	1360	Maximum Detected	7.215
Mean of Detected	65.78	Mean of Detected	3.355
SD of Detected	154.1	SD of Detected	1.115
Minimum Non-Detect	2.1	Minimum Non-Detect	0.742
Maximum Non-Detect	2.1	Maximum Non-Detect	0.742

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.341	Lilliefors Test Statistic	0.146
5% Lilliefors Critical Value	0.0809	5% Lilliefors Critical Value	0.0809
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	65.25	Mean	3.327
SD	153.5	SD	1.15
95% DL/2 (t) UCL	88.38	95% H-Stat (DL/2) UCL	67.96
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	64.41	Mean in Log Scale	3.329
SD	153.7	SD in Log Scale	1.144
95% MLE (t) UCL	87.57	Mean in Original Scale	65.25
95% MLE (Tiku) UCL	84.95	SD in Original Scale	153.5
		95% Percentile Bootstrap UCL	90.71
		95% BCA Bootstrap UCL	99.82

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.711	Data do not follow a Discernable Distribution (0.05)
Theta Star	92.56	
nu star	170.6	
A-D Test Statistic	8.711	
5% A-D Critical Value	0.798	
K-S Test Statistic	0.798	
5% K-S Critical Value	0.0878	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	65.26
Maximum	1360	SD	152.9
Mean	65.24	SE of Mean	13.96
Median	19.7	95% KM (t) UCL	88.4
SD	153.5	95% KM (z) UCL	88.22
k star	0.594	95% KM (jackknife) UCL	88.39
Theta star	109.8	95% KM (bootstrap t) UCL	113
Nu star	143.8	95% KM (BCA) UCL	90.99
AppChi2	117.1	95% KM (Percentile Bootstrap) UCL	90.01
95% Gamma Approximate UCL	80.12	95% KM (Chebyshev) UCL	128.1
95% Adjusted Gamma UCL	80.32	97.5% KM (Chebyshev) UCL	152.4
		99% KM (Chebyshev) UCL	204.1
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	128.1

Note: DL/2 is not a recommended method.

Dibenz(a,h)anthracene (southern parcel)

General Statistics

Number of Valid Data	119	Number of Detected Data	84
Number of Distinct Detected Data	68	Number of Non-Detect Data	35
Number of Missing Values	7	Percent Non-Detects	29.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0263	Minimum Detected	-3.638
Maximum Detected	4.9	Maximum Detected	1.589
Mean of Detected	0.52	Mean of Detected	-1.378
SD of Detected	0.764	SD of Detected	1.19
Minimum Non-Detect	0.36	Minimum Non-Detect	-1.022
Maximum Non-Detect	39	Maximum Non-Detect	3.664

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	119
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.259	Lilliefors Test Statistic	0.0855
5% Lilliefors Critical Value	0.0967	5% Lilliefors Critical Value	0.0967
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.631	Mean	-1.349
SD	1.887	SD	1.124
95% DL/2 (t) UCL	0.918	95% H-Stat (DL/2) UCL	0.651
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.543
		SD in Log Scale	1.072
		Mean in Original Scale	0.415
		SD in Original Scale	0.662
		95% Percentile Bootstrap UCL	0.523
		95% BCA Bootstrap UCL	0.54

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.797	Data appear Lognormal at 5% Significance Level	
Theta Star	0.652		
nu star	133.9		
A-D Test Statistic	2.343	Nonparametric Statistics	
5% A-D Critical Value	0.79	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.79	Mean	0.419
5% K-S Critical Value	0.101	SD	0.667
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0625
		95% KM (t) UCL	0.523
Assuming Gamma Distribution		95% KM (z) UCL	0.522
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.523
Minimum	0.0263	95% KM (bootstrap t) UCL	0.562
Maximum	4.9	95% KM (BCA) UCL	0.529
Mean	0.52	95% KM (Percentile Bootstrap) UCL	0.527
Median	0.35	95% KM (Chebyshev) UCL	0.692
SD	0.648	97.5% KM (Chebyshev) UCL	0.81
k star	1.056	99% KM (Chebyshev) UCL	1.041
Theta star	0.492		
Nu star	251.4	Potential UCLs to Use	
AppChi2	215.7	95% KM (Chebyshev) UCL	0.692
95% Gamma Approximate UCL	0.608		
95% Adjusted Gamma UCL	0.607		

Note: DL/2 is not a recommended method.

Indeno(1,2,3-cd)pyrene (southern parcel)

General Statistics

Number of Valid Data	119	Number of Detected Data	109
Number of Distinct Detected Data	83	Number of Non-Detect Data	10
Number of Missing Values	7	Percent Non-Detects	8.40%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.048	Minimum Detected	-3.037
Maximum Detected	17	Maximum Detected	2.833
Mean of Detected	1.268	Mean of Detected	-0.743
SD of Detected	2.281	SD of Detected	1.407
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	39	Maximum Non-Detect	3.664

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	119
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.296	Lilliefors Test Statistic	0.0783
5% Lilliefors Critical Value	0.0849	5% Lilliefors Critical Value	0.0849
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.34	Mean	-0.781
SD	2.768	SD	1.411
95% DL/2 (t) UCL	1.781	95% H-Stat (DL/2) UCL	1.714
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.823
		SD in Log Scale	1.38
		Mean in Original Scale	1.179
		SD in Original Scale	2.202
		95% Percentile Bootstrap UCL	1.526
		95% BCA Bootstrap UCL	1.631

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.615	Data appear Lognormal at 5% Significance Level	
Theta Star	2.063		
nu star	134		
A-D Test Statistic	3.097	Nonparametric Statistics	
5% A-D Critical Value	0.807	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.807	Mean	1.184
5% K-S Critical Value	0.0913	SD	2.202
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.204
		95% KM (t) UCL	1.522
Assuming Gamma Distribution		95% KM (z) UCL	1.519
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.522
Minimum	1E-09	95% KM (bootstrap t) UCL	1.692
Maximum	17	95% KM (BCA) UCL	1.571
Mean	1.185	95% KM (Percentile Bootstrap) UCL	1.533
Median	0.35	95% KM (Chebyshev) UCL	2.072
SD	2.202	97.5% KM (Chebyshev) UCL	2.456
k star	0.374	99% KM (Chebyshev) UCL	3.211
Theta star	3.167		
Nu star	89.01	Potential UCLs to Use	
AppChi2	68.26	95% KM (Chebyshev) UCL	2.072
95% Gamma Approximate UCL	1.545		
95% Adjusted Gamma UCL	1.55		

Note: DL/2 is not a recommended method.

Lead (southern parcel)

General Statistics

Number of Valid Data	121	Number of Detected Data	119
Number of Distinct Detected Data	112	Number of Non-Detect Data	2
Number of Missing Values	5	Percent Non-Detects	1.65%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.88	Minimum Detected	0.621
Maximum Detected	1330	Maximum Detected	7.193
Mean of Detected	77.1	Mean of Detected	3.556
SD of Detected	144.4	SD of Detected	1.217
Minimum Non-Detect	5.1	Minimum Non-Detect	1.629
Maximum Non-Detect	5.7	Maximum Non-Detect	1.74

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	10
Number treated as Detected	111
Single DL Non-Detect Percentage	8.26%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.301	Lilliefors Test Statistic	0.103
5% Lilliefors Critical Value	0.0812	5% Lilliefors Critical Value	0.0812
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	75.87	Mean	3.513
SD	143.5	SD	1.25
95% DL/2 (t) UCL	97.49	95% H-Stat (DL/2) UCL	95.16
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	67.72	Mean in Log Scale	3.518
SD	151.2	SD in Log Scale	1.242
95% MLE (t) UCL	90.5	Mean in Original Scale	75.88
95% MLE (Tiku) UCL	88.73	SD in Original Scale	143.5
		95% Percentile Bootstrap UCL	99.83
		95% BCA Bootstrap UCL	107.7

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.744	Data do not follow a Discernable Distribution (0.05)	
Theta Star	103.6		
nu star	177.1		
A-D Test Statistic	4.067	Nonparametric Statistics	
5% A-D Critical Value	0.795	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.795	Mean	75.89
5% K-S Critical Value	0.0878	SD	142.9
Data not Gamma Distributed at 5% Significance Level		SE of Mean	13.04
		95% KM (t) UCL	97.51
Assuming Gamma Distribution		95% KM (z) UCL	97.34
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	97.51
Minimum	1E-09	95% KM (bootstrap t) UCL	113.7
Maximum	1330	95% KM (BCA) UCL	99.81
Mean	75.83	95% KM (Percentile Bootstrap) UCL	99.51
Median	25.6	95% KM (Chebyshev) UCL	132.7
SD	143.5	97.5% KM (Chebyshev) UCL	157.3
k star	0.528	99% KM (Chebyshev) UCL	205.7
Theta star	143.7		
Nu star	127.7	Potential UCLs to Use	
AppChi2	102.6	95% KM (Chebyshev) UCL	132.7
95% Gamma Approximate UCL	94.38		
95% Adjusted Gamma UCL	94.63		

Note: DL/2 is not a recommended method.

Mercury (southern parcel)

General Statistics

Number of Valid Data	121	Number of Detected Data	75
Number of Distinct Detected Data	35	Number of Non-Detect Data	46
Number of Missing Values	5	Percent Non-Detects	38.02%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0271	Minimum Detected	-3.608
Maximum Detected	14.4	Maximum Detected	2.667
Mean of Detected	0.437	Mean of Detected	-2.154
SD of Detected	1.736	SD of Detected	1.207
Minimum Non-Detect	0.03	Minimum Non-Detect	-3.507
Maximum Non-Detect	0.503	Maximum Non-Detect	-0.687

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	115
Number treated as Detected	6
Single DL Non-Detect Percentage	95.04%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.407	Lilliefors Test Statistic	0.162
5% Lilliefors Critical Value	0.102	5% Lilliefors Critical Value	0.102
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.281	Mean	-2.789
SD	1.378	SD	1.28
95% DL/2 (t) UCL	0.489	95% H-Stat (DL/2) UCL	0.149
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.147
		SD in Log Scale	1.68
		Mean in Original Scale	0.275
		SD in Original Scale	1.379
		95% Percentile Bootstrap UCL	0.515
		95% BCA Bootstrap UCL	0.665

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.471	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.928	
nu star	70.7	
A-D Test Statistic	9.663	
5% A-D Critical Value	0.822	
K-S Test Statistic	0.822	
5% K-S Critical Value	0.109	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	0.283
Maximum	14.4	SD	1.372
Mean	0.31	SE of Mean	0.126
Median	0.06	95% KM (t) UCL	0.491
SD	1.379	95% KM (z) UCL	0.489
k star	0.143	95% KM (jackknife) UCL	0.488
Theta star	2.172	95% KM (bootstrap t) UCL	1.199
Nu star	34.5	95% KM (BCA) UCL	0.554
AppChi2	22.07	95% KM (Percentile Bootstrap) UCL	0.527
95% Gamma Approximate UCL	0.484	95% KM (Chebyshev) UCL	0.83
95% Adjusted Gamma UCL	0.487	97.5% KM (Chebyshev) UCL	1.067
		99% KM (Chebyshev) UCL	1.532
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	0.83

Note: DL/2 is not a recommended method.

Total PCBs (southern parcel)

General Statistics

Number of Valid Data	118	Number of Detected Data	76
Number of Distinct Detected Data	68	Number of Non-Detect Data	42
Number of Missing Values	8	Percent Non-Detects	35.59%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0488	Minimum Detected	-3.02
Maximum Detected	7.28	Maximum Detected	1.985
Mean of Detected	0.596	Mean of Detected	-1.2
SD of Detected	1.061	SD of Detected	1.02
Minimum Non-Detect	0.0531	Minimum Non-Detect	-2.936
Maximum Non-Detect	0.129	Maximum Non-Detect	-2.048

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	61
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	57
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	51.69%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.348	Lilliefors Test Statistic	0.132
5% Lilliefors Critical Value	0.102	5% Lilliefors Critical Value	0.102
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.404	Mean	-1.797
SD	0.888	SD	1.153
95% DL/2 (t) UCL	0.54	95% H-Stat (DL/2) UCL	0.309
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.885
		SD in Log Scale	1.283
		Mean in Original Scale	0.402
		SD in Original Scale	0.889
		95% Percentile Bootstrap UCL	0.548
		95% BCA Bootstrap UCL	0.606

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.837	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.712		
nu star	127.2		
A-D Test Statistic	5.825	Nonparametric Statistics	
5% A-D Critical Value	0.788	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.788	Mean	0.414
5% K-S Critical Value	0.106	SD	0.881
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0817
		95% KM (t) UCL	0.55
Assuming Gamma Distribution		95% KM (z) UCL	0.549
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.545
Minimum	1E-09	95% KM (bootstrap t) UCL	0.628
Maximum	7.28	95% KM (BCA) UCL	0.559
Mean	0.47	95% KM (Percentile Bootstrap) UCL	0.57
Median	0.228	95% KM (Chebyshev) UCL	0.77
SD	0.882	97.5% KM (Chebyshev) UCL	0.924
k star	0.229	99% KM (Chebyshev) UCL	1.227
Theta star	2.047		
Nu star	54.14	Potential UCLs to Use	
AppChi2	38.23	95% KM (Chebyshev) UCL	0.77
95% Gamma Approximate UCL	0.665		
95% Adjusted Gamma UCL	0.668		

Note: DL/2 is not a recommended method.

Zinc (southern parcel)

General Statistics

Number of Valid Data	121	Number of Detected Data	119
Number of Distinct Detected Data	114	Number of Non-Detect Data	2
Number of Missing Values	5	Percent Non-Detects	1.65%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	4.9	Minimum Detected	1.589
Maximum Detected	7240	Maximum Detected	8.887
Mean of Detected	316	Mean of Detected	4.696
SD of Detected	813	SD of Detected	1.317
Minimum Non-Detect	13.45	Minimum Non-Detect	2.599
Maximum Non-Detect	13.6	Maximum Non-Detect	2.61

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	6
Number treated as Detected	115
Single DL Non-Detect Percentage	4.96%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.351	Lilliefors Test Statistic	0.148
5% Lilliefors Critical Value	0.0812	5% Lilliefors Critical Value	0.0812
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	310.9	Mean	4.65
SD	807.2	SD	1.353
95% DL/2 (t) UCL	432.6	95% H-Stat (DL/2) UCL	350.4
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	282.8	Mean in Log Scale	4.651
SD	829.8	SD in Log Scale	1.351
95% MLE (t) UCL	407.9	Mean in Original Scale	310.9
95% MLE (Tiku) UCL	395.4	SD in Original Scale	807.2
		95% Percentile Bootstrap UCL	440.9
		95% BCA Bootstrap UCL	486.5

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.576	Data do not follow a Discernible Distribution (0.05)
Theta Star	548.8	
nu star	137.1	
A-D Test Statistic	7.844	Nonparametric Statistics
5% A-D Critical Value	0.811	Kaplan-Meier (KM) Method
K-S Test Statistic	0.811	Mean 310.9
5% K-S Critical Value	0.0889	SD 803.8
Data not Gamma Distributed at 5% Significance Level		SE of Mean 73.38
		95% KM (t) UCL 432.6
Assuming Gamma Distribution		95% KM (z) UCL 431.6
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 432.5
Minimum	1E-09	95% KM (bootstrap t) UCL 556.6
Maximum	7240	95% KM (BCA) UCL 446.4
Mean	310.8	95% KM (Percentile Bootstrap) UCL 442.1
Median	69.8	95% KM (Chebyshev) UCL 630.8
SD	807.2	97.5% KM (Chebyshev) UCL 769.2
k star	0.437	99% KM (Chebyshev) UCL 1041
Theta star	711.3	
Nu star	105.7	Potential UCLs to Use
AppChi2	83.01	95% KM (Chebyshev) UCL 630.8
95% Gamma Approximate UCL	395.9	
95% Adjusted Gamma UCL	397.1	

Note: DL/2 is not a recommended method.

Surface Water UCLs

AOC 7 - Surface Water

Variable: Aluminum

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	866
Maximum	3790
Mean	1926.5
Median	1525
Standard Deviation	1316.681
Variance	1733649
Coefficient of Variation	0.683458
Skewness	1.404891

Gamma Statistics	
k hat	3.221233
k star (bias corrected)	0.971975
Theta hat	598.063
Theta star	1982.047
nu hat	25.76986
nu star	7.775799
Approx.Chi Square Value (.05)	2.605222
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	6.763885
Maximum of log data	8.240121
Mean of log data	7.400283
Standard Deviation of log data	0.647321
Variance of log data	0.419024

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.876543
Shapiro-Wilk 5% Critical Value	0.748
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3475.814

Gamma Distribution Test	
A-D Test Statistic	0.295883
A-D 5% Critical Value	0.659293
K-S Test Statistic	0.245059
K-S 5% Critical Value	0.396472
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	5750.019
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.960228
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	18607.23
95% Chebyshev (MVUE) UCL	4511.939
97.5% Chebyshev (MVUE) UCL	5639.537
99% Chebyshev (MVUE) UCL	7854.484

95% Non-parametric UCLs	
CLT UCL	3009.374
Adj-CLT UCL (Adjusted for skewness)	3503.506
Mod-t UCL (Adjusted for skewness)	3552.889
Jackknife UCL	3475.814
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	4796.14
97.5% Chebyshev (Mean, Sd) UCL	6037.835
99% Chebyshev (Mean, Sd) UCL	8476.906

AOC 7 - Surface Water

Variable: Iron

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	616
Maximum	2650
Mean	1477.125
Median	1321.25
Standard Deviation	956.7774
Variance	915423.1
Coefficient of Variation	0.647729
Skewness	0.529662

Gamma Statistics	
k hat	3.034035
k star (bias corrected)	0.925175
Theta hat	486.8517
Theta star	1596.589
nu hat	24.27228
nu star	7.401402
Approx.Chi Square Value (.05)	2.392841
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	6.423247
Maximum of log data	7.882315
Mean of log data	7.124097
Standard Deviation of log data	0.693438
Variance of log data	0.480856

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.907246
Shapiro-Wilk 5% Critical Value	0.748
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2602.947

Gamma Distribution Test	
A-D Test Statistic	0.351449
A-D 5% Critical Value	0.659392
K-S Test Statistic	0.288104
K-S 5% Critical Value	0.396546
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	4568.96
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.913379
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	19946.51
95% Chebyshev (MVUE) UCL	3632.4
97.5% Chebyshev (MVUE) UCL	4564.685
99% Chebyshev (MVUE) UCL	6395.979

95% Non-parametric UCLs	
CLT UCL	2264.004
Adj-CLT UCL (Adjusted for skewness)	2399.377
Mod-t UCL (Adjusted for skewness)	2624.063
Jackknife UCL	2602.947
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	3562.373
97.5% Chebyshev (Mean, Sd) UCL	4464.662
99% Chebyshev (Mean, Sd) UCL	6237.033

AOC 7 - Surface Water

Variable: Naphthalene

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	3
Minimum	0.095
Maximum	0.75
Mean	0.26
Median	0.0975
Standard Deviation	0.326675
Variance	0.106717
Coefficient of Variation	1.256443
Skewness	1.999688

Gamma Statistics	
k hat	1.186188
k star (bias corrected)	0.463214
Theta hat	0.21919
Theta star	0.561296
nu hat	9.4895
nu star	3.705708
Approx.Chi Square Value (.05)	0.608743
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	-2.353878
Maximum of log data	-0.287682
Mean of log data	-1.824506
Standard Deviation of log data	1.024835
Variance of log data	1.050286

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.635202
Shapiro-Wilk 5% Critical Value	0.748
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.644393
Gamma Distribution Test	
A-D Test Statistic	0.928642
A-D 5% Critical Value	0.665031
K-S Test Statistic	0.466278
K-S 5% Critical Value	0.401348
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.582743
Adjusted Gamma UCL	N/A
Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.64763
Shapiro-Wilk 5% Critical Value	0.748
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	62.83372
95% Chebyshev (MVUE) UCL	0.713839
97.5% Chebyshev (MVUE) UCL	0.921999
99% Chebyshev (MVUE) UCL	1.330889
95% Non-parametric UCLs	
CLT UCL	0.528666
Adj-CLT UCL (Adjusted for skewness)	0.703168
Mod-t UCL (Adjusted for skewness)	0.671611
Jackknife UCL	0.644393
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	0.971972
97.5% Chebyshev (Mean, Sd) UCL	1.280043
99% Chebyshev (Mean, Sd) UCL	1.885188

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Recommended UCL exceeds the maximum observation

Consider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

AOC 7 - Surface Water

Variable: Vanadium

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	1.2
Maximum	4.7
Mean	2.7875
Median	2.625
Standard Deviation	1.731269
Variance	2.997292
Coefficient of Variation	0.621083
Skewness	0.210675

Gamma Statistics	
k hat	3.168353
k star (bias corrected)	0.958755
Theta hat	0.879795
Theta star	2.907416
nu hat	25.34683
nu star	7.67004
Approx.Chi Square Value (.05)	2.54481
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	0.182322
Maximum of log data	1.547563
Mean of log data	0.859112
Standard Deviation of log data	0.682198
Variance of log data	0.465394

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.871459
Shapiro-Wilk 5% Critical Value	0.748
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4.824652

Gamma Distribution Test	
A-D Test Statistic	0.443447
A-D 5% Critical Value	0.659321
K-S Test Statistic	0.302998
K-S 5% Critical Value	0.396493
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	8.401505
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.866273
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	34.78963
95% Chebyshev (MVUE) UCL	6.809074
97.5% Chebyshev (MVUE) UCL	8.545861
99% Chebyshev (MVUE) UCL	11.95744

95% Non-parametric UCLs	
CLT UCL	4.211342
Adj-CLT UCL (Adjusted for skewness)	4.308773
Mod-t UCL (Adjusted for skewness)	4.83985
Jackknife UCL	4.824652
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	6.560713
97.5% Chebyshev (Mean, Sd) UCL	8.193385
99% Chebyshev (Mean, Sd) UCL	11.40045

Recommended UCL exceeds the maximum observation

Surface Water - Great Miami River

Variable: Iron

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	686
Maximum	773
Mean	727.8
Median	728
Standard Deviation	39.96498
Variance	1597.2
Coefficient of Variation	0.054912
Skewness	0.034611

Gamma Statistics	
k hat	414.3792
k star (bias corrected)	165.885
Theta hat	1.756362
Theta star	4.387377
nu hat	4143.792
nu star	1658.85
Approx.Chi Square Value (.05)	1565.238
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	1524.724

Log-transformed Statistics	
Minimum of log data	6.530878
Maximum of log data	6.650279
Mean of log data	6.588819
Standard Deviation of log data	0.054943
Variance of log data	0.003019

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.885003
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	765.9022

Gamma Distribution Test	
A-D Test Statistic	0.395881
A-D 5% Critical Value	0.67808
K-S Test Statistic	0.255356
K-S 5% Critical Value	0.35682
Data follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	771.3274
Adjusted Gamma UCL	791.8226

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.883792
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	N/A
95% Chebyshev (MVUE) UCL	805.7425
97.5% Chebyshev (MVUE) UCL	839.4683
99% Chebyshev (MVUE) UCL	905.716

95% Non-parametric UCLs	
CLT UCL	757.1983
Adj-CLT UCL (Adjusted for skewness)	757.4939
Mod-t UCL (Adjusted for skewness)	765.9483
Jackknife UCL	765.9022
Standard Bootstrap UCL	754.1318
Bootstrap-t UCL	771.1044
Hall's Bootstrap UCL	761.9086
Percentile Bootstrap UCL	753.4
BCA Bootstrap UCL	752
95% Chebyshev (Mean, Sd) UCL	805.7061
97.5% Chebyshev (Mean, Sd) UCL	839.4161
99% Chebyshev (Mean, Sd) UCL	905.633

Surface Water - Great Miami River

Variable: Mercury

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	3
Minimum	0.01
Maximum	0.19
Mean	0.062
Median	0.01
Standard Deviation	0.079498
Variance	0.00632
Coefficient of Variation	1.282233
Skewness	1.407559

Gamma Statistics	
k hat	0.751627
k star (bias corrected)	0.433984
Theta hat	0.082488
Theta star	0.142862
nu hat	7.516275
nu star	4.339843
Approx.Chi Square Value (.05)	0.860047
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	0.369781

Log-transformed Statistics	
Minimum of log data	-4.60517
Maximum of log data	-1.660731
Mean of log data	-3.576837
Standard Deviation of log data	1.43267
Variance of log data	2.052544

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.763532
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.137793

Gamma Distribution Test	
A-D Test Statistic	0.71046
A-D 5% Critical Value	0.698205
K-S Test Statistic	0.388462
K-S 5% Critical Value	0.366655
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.312855
Adjusted Gamma UCL	0.727648

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.753393
Shapiro-Wilk 5% Critical Value	0.762
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	10.30098
95% Chebyshev (MVUE) UCL	0.205827
97.5% Chebyshev (MVUE) UCL	0.269731
99% Chebyshev (MVUE) UCL	0.395258

95% Non-parametric UCLs	
CLT UCL	0.120479
Adj-CLT UCL (Adjusted for skewness)	0.144392
Mod-t UCL (Adjusted for skewness)	0.141523
Jackknife UCL	0.137793
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	0.216971
97.5% Chebyshev (Mean, Sd) UCL	0.284027
99% Chebyshev (Mean, Sd) UCL	0.415746

Sediment and Hydric Soil UCLs

AOC 7 - Sediment

Variable: Aluminum

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	6030
Maximum	17500
Mean	10455
Median	9145
Standard Deviation	4928.019
Variance	24285367
Coefficient of Variation	0.471355
Skewness	1.435437

Gamma Statistics	
k hat	6.736429
k star (bias corrected)	1.850774
Theta hat	1552.009
Theta star	5648.988
nu hat	53.89143
nu star	14.80619
Approx.Chi Square Value (.05)	7.125754
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	8.704502
Maximum of log data	9.769956
Mean of log data	9.17878
Standard Deviation of log data	0.441131
Variance of log data	0.194596

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.87651
Shapiro-Wilk 5% Critical Value	0.748
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	16253.71

Gamma Distribution Test	
A-D Test Statistic	0.34231
A-D 5% Critical Value	0.65836
K-S Test Statistic	0.298861
K-S 5% Critical Value	0.395557
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	21723.84
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.948444
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	31490.18
95% Chebyshev (MVUE) UCL	20277.38
97.5% Chebyshev (MVUE) UCL	24546.12
99% Chebyshev (MVUE) UCL	32931.24

95% Non-parametric UCLs	
CLT UCL	14507.93
Adj-CLT UCL (Adjusted for skewness)	16397.57
Mod-t UCL (Adjusted for skewness)	16548.45
Jackknife UCL	16253.71
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	21195.37
97.5% Chebyshev (Mean, Sd) UCL	25842.73
99% Chebyshev (Mean, Sd) UCL	34971.58