ATTACHMENT B-6
UCL OUTPUT - SOUTH PARCEL SOIL
TOTAL PCBS 5-15FT BGS

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/17/2015 8:36:22 AM
From File	South Total PCBs 5-15ft UCL Input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Total-PCBs

General Statistics

Total Number of Observations	119	Number of Distinct Observations	35
Number of Detects	30	Number of Non-Detects	89
Number of Distinct Detects	29	Number of Distinct Non-Detects	6
Minimum Detect	0.058	Minimum Non-Detect	0.02
Maximum Detect	14.2	Maximum Non-Detect	0.5
Variance Detects	7.779	Percent Non-Detects	74.79%
Mean Detects	1.419	SD Detects	2.789
Median Detects	0.318	CV Detects	1.965
Skewness Detects	3.673	Kurtosis Detects	15.64
Mean of Logged Detects	-0.83	SD of Logged Detects	1.528

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.527	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.331	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.162	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.374	Standard Error of Mean	0.14
SD	1.505	95% KM (BCA) UCL	0.669
95% KM (t) UCL	0.606	95% KM (Percentile Bootstrap) UCL	0.632
95% KM (z) UCL	0.604	95% KM Bootstrap t UCL	0.847
90% KM Chebyshev UCL	0.795	95% KM Chebyshev UCL	0.985
97.5% KM Chebyshev UCL	1.25	99% KM Chebyshev UCL	1.77

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.434	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.806	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.181	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.169	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.533	k star (bias corrected MLE)	0.502
Theta hat (MLE)	2.663	Theta star (bias corrected MLE)	2.828
nu hat (MLE)	31.98	nu star (bias corrected)	30.11
MLE Mean (bias corrected)	1.419	MLE Sd (bias corrected)	2.004

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0617	nu hat (KM)	14.68
Approximate Chi Square Value (14.68, α)	7.037	Adjusted Chi Square Value (14.68, β)	6.972
95% Gamma Approximate KM-UCL (use when n>=50)	0.779	95% Gamma Adjusted KM-UCL (use when n<50)	0.787

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.365
Maximum	14.2	Median	0.01
SD	1.513	CV	4.142
k hat (MLE)	0.266	k star (bias corrected MLE)	0.265
Theta hat (MLE)	1.375	Theta star (bias corrected MLE)	1.38

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nu hat (MLE)	63.25	nu star (bias corrected)	62.99
MLE Mean (bias corrected)	0.365	MLE Sd (bias corrected)	0.71
		Adjusted Level of Significance (β)	0.048
Approximate Chi Square Value (62.99, α)	45.73	Adjusted Chi Square Value (62.99, β)	45.55
95% Gamma Approximate UCL (use when n>=50)	0.503	95% Gamma Adjusted UCL (use when n<50)	0.505

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.162	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.365	Mean in Log Scale	-4.867
SD in Original Scale	1.513	SD in Log Scale	3.123
95% t UCL (assumes normality of ROS data)	0.595	95% Percentile Bootstrap UCL	0.624
95% BCA Bootstrap UCL	0.703	95% Bootstrap t UCL	0.855
95% H-UCL (Log ROS)	4.011		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.12	95% H-UCL (KM -Log)	0.213
KM SD (logged)	1.537	95% Critical H Value (KM-Log)	2.784
KM Standard Error of Mean (logged)	0.144		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.383	Mean in Log Scale	-2.87
SD in Original Scale	1.509	SD in Log Scale	1.47
95% t UCL (Assumes normality)	0.613	95% H-Stat UCL	0.241

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.985

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.