MW-2 TCE

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	2
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.41	Minimum Non-Detect	0.2
Maximum Detect	1.1	Maximum Non-Detect	3.4
Variance Detects	0.0649	Percent Non-Detects	28.57%
Mean Detects	0.686	SD Detects	0.255
Median Detects	0.62	CV Detects	0.371
Skewness Detects	1.236	Kurtosis Detects	2.469
Mean of Logged Detects	-0.428	SD of Logged Detects	0.355

Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,
refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,
but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).
The Chebyshev UCL often results in gross overestimates of the mean.
Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.898	Shapiro Wilk GOF Test	
1% Shapiro Wilk Critical Value	0.686	Detected Data appear Normal at 1% Significance Level	
Lilliefors Test Statistic	0.278	Lilliefors GOF Test	
1% Lilliefors Critical Value	0.396	Detected Data appear Normal at 1% Significance Level	

Detected Data appear Normal at 1% Significance Level
Note GOF tests may be unreliable for small sample sizes

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

KM Mean	0.605	KM Standard Error of Mean	0.126
90KM SD	0.276	95% KM (BCA) UCL	0.8
95% KM (t) UCL	0.85	95% KM (Percentile Bootstrap) UCL	0.802
95% KM (z) UCL	0.812	95% KM Bootstrap t UCL	0.849
90% KM Chebyshev UCL	0.983	95% KM Chebyshev UCL	1.154
97.5% KM Chebyshev UCL	1.391	99% KM Chebyshev UCL	1.857

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.32	Anderson-Darling GOF Test	
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.233	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level
Note GOF tests may be unreliable for small sample sizes

Gamma Statistics on Detected Data Only

k hat (MLE)	9.875	k star (bias corrected MLE)	4.083
Theta hat (MLE)	0.0695	Theta star (bias corrected MLE)	0.168
nu hat (MLE)	98.75	nu star (bias corrected)	40.83
Mean (detects)	0.686		

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 detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.146	Mean	0.594
Maximum	1.1	Median	0.6
SD	0.289	CV	0.487
k hat (MLE)	3.81	k star (bias corrected MLE)	2.272
Theta hat (MLE)	0.156	Theta star (bias corrected MLE)	0.261
nu hat (MLE)	53.33	nu star (bias corrected)	31.81
Adjusted Level of Significance (β)	0.0158		
Approximate Chi Square Value (31.81, α)	19.92	Adjusted Chi Square Value (31.81, β)	17.14
95% Gamma Approximate UCL	0.948	95% Gamma Adjusted UCL	1.102

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.605	SD (KM)	0.276
Variance (KM)	0.0761	SE of Mean (KM)	0.126
k hat (KM)	4.812	k star (KM)	2.845
nu hat (KM)	67.37	nu star (KM)	39.83
theta hat (KM)	0.126	theta star (KM)	0.213
80% gamma percentile (KM)	0.868	90% gamma percentile (KM)	1.086
95% gamma percentile (KM)	1.289	99% gamma percentile (KM)	1.731

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (39.83, α)	26.37	Adjusted Chi Square Value (39.83, β)	23.12
95% KM Approximate Gamma UCL	0.914	95% KM Adjusted Gamma UCL	1.042

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.955	Shapiro Wilk GOF Test	
10% Shapiro Wilk Critical Value	0.806	Detected Data appear Lognormal at 10% Significance Level	
Lilliefors Test Statistic	0.22	Lilliefors GOF Test	
10% Lilliefors Critical Value	0.319	Detected Data appear Lognormal at 10% Significance Level	

Detected Data appear Lognormal at 10% Significance Level
Note GOF tests may be unreliable for small sample sizes

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.609	Mean in Log Scale	-0.576
SD in Original Scale	0.261	SD in Log Scale	0.442
95% t UCL (assumes normality of ROS data)	0.801	95% Percentile Bootstrap UCL	0.77
95% BCA Bootstrap UCL	0.784	95% Bootstrap t UCL	0.841
95% H-UCL (Log ROS)	0.947		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.625	KM Geo Mean	0.535
KM SD (logged)	0.527	95% Critical H Value (KM-Log)	2.518
KM Standard Error of Mean (logged)	0.24	95% H-UCL (KM -Log)	1.057
KM SD (logged)	0.527	95% Critical H Value (KM-Log)	2.518
KM Standard Error of Mean (logged)	0.24		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.747	Mean in Log Scale	-0.559
SD in Original Scale	0.517	SD in Log Scale	0.896
95% t UCL (Assumes normality)	1.127	95% H-Stat UCL	2.971

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

Nonparametric Distribution Free UCL Statistics
Detected Data appear Normal Distributed at 1% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.85

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 using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

MW-2 PCE

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
		Number of Missing Observations	0
Minimum	61	Mean	80
Maximum	110	Median	69
SD	21.56	Std. Error of Mean	8.147
Coefficient of Variation	0.269	Skewness	0.867

Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,
refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,
but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).
The Chebyshev UCL often results in gross overestimates of the mean.
Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.

Normal GOF Test

Shapiro Wilk Test Statistic	0.8	Shapiro Wilk GOF Test
1% Shapiro Wilk Critical Value	0.73	Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.267	Lilliefors GOF Test
1% Lilliefors Critical Value	0.35	Data appear Normal at 1% Significance Level

Data appear Normal at 1% Significance Level
Note GOF tests may be unreliable for small sample sizes

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	95.83	95% Adjusted-CLT UCL (Chen-1995)	96.25
		95% Modified-t UCL (Johnson-1978)	96.28

Gamma GOF Test

A-D Test Statistic	0.641	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.27	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.312	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level
Note GOF tests may be unreliable for small sample sizes

Gamma Statistics

k hat (MLE)	17.37	k star (bias corrected MLE)	10.02
Theta hat (MLE)	4.605	Theta star (bias corrected MLE)	7.983
nu hat (MLE)	243.2	nu star (bias corrected)	140.3
MLE Mean (bias corrected)	80	MLE Sd (bias corrected)	25.27
		Approximate Chi Square Value (0.05)	113.9
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	106.8

Assuming Gamma Distribution

95% Approximate Gamma UCL	98.52	95% Adjusted Gamma UCL	105.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.83	Shapiro Wilk Lognormal GOF Test
10% Shapiro Wilk Critical Value	0.838	Data Not Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.25	Lilliefors Lognormal GOF Test
10% Lilliefors Critical Value	0.28	Data appear Lognormal at 10% Significance Level

Data appear Approximate Lognormal at 10% Significance Level
Note GOF tests may be unreliable for small sample sizes

Lognormal Statistics

Minimum of Logged Data	4.111	Mean of logged Data	4.353
Maximum of Logged Data	4.7	SD of logged Data	0.256

Assuming Lognormal Distribution

95% H-UCL	99.99	90% Chebyshev (MVUE) UCL	103.1
95% Chebyshev (MVUE) UCL	113.6	97.5% Chebyshev (MVUE) UCL	128.2
99% Chebyshev (MVUE) UCL	156.9		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	93.4	95% BCA Bootstrap UCL	94.71
95% Standard Bootstrap UCL	92.73	95% Bootstrap-t UCL	118.4
95% Hall's Bootstrap UCL	109.9	95% Percentile Bootstrap UCL	93
90% Chebyshev(Mean, Sd) UCL	104.4	95% Chebyshev(Mean, Sd) UCL	115.5
97.5% Chebyshev(Mean, Sd) UCL	130.9	99% Chebyshev(Mean, Sd) UCL	161.1

Suggested UCL to Use

95% Student's-t UCL	95.83

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 using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

MW-14 PCE

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	1.8	Mean	3.971
Maximum	7.6	Median	3.8
SD	2.066	Std. Error of Mean	0.781
Coefficient of Variation	0.52	Skewness	0.872

Note: Sample size is small (e.g., <10), if data are collected using incremental sampling methodology (ISM) approach,
refer also to ITRC Tech Reg Guide on ISM (ITRC 2020 and ITRC 2012) for additional guidance,
but note that ITRC may recommend the t-UCL or the Chebyshev UCL for small sample sizes (n < 7).
The Chebyshev UCL often results in gross overestimates of the mean.
Refer to the ProUCL 5.2 Technical Guide for a discussion of the Chebyshev UCL.

Normal GOF Test

Shapiro Wilk Test Statistic	0.928	Shapiro Wilk GOF Test
1% Shapiro Wilk Critical Value	0.73	Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.189	Lilliefors GOF Test
1% Lilliefors Critical Value	0.35	Data appear Normal at 1% Significance Level

Data appear Normal at 1% Significance Level
Note GOF tests may be unreliable for small sample sizes

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	5.489	95% Adjusted-CLT UCL (Chen-1995)	5.531
		95% Modified-t UCL (Johnson-1978)	5.532

Gamma GOF Test

A-D Test Statistic	0.208	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.158	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level
Note GOF tests may be unreliable for small sample sizes

Gamma Statistics

k hat (MLE)	4.474	k star (bias corrected MLE)	2.652
Theta hat (MLE)	0.888	Theta star (bias corrected MLE)	1.498
nu hat (MLE)	62.63	nu star (bias corrected)	37.12
MLE Mean (bias corrected)	3.971	MLE Sd (bias corrected)	2.439
		Approximate Chi Square Value (0.05)	24.18
Adjusted Level of Significance	0.0158	Adjusted Chi Square Value	21.08

Assuming Gamma Distribution

95% Approximate Gamma UCL	6.099	95% Adjusted Gamma UCL	6.995

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.963	Shapiro Wilk Lognormal GOF Test
10% Shapiro Wilk Critical Value	0.838	Data appear Lognormal at 10% Significance Level
Lilliefors Test Statistic	0.148	Lilliefors Lognormal GOF Test
10% Lilliefors Critical Value	0.28	Data appear Lognormal at 10% Significance Level

Data appear Lognormal at 10% Significance Level
Note GOF tests may be unreliable for small sample sizes

Lognormal Statistics

Minimum of Logged Data	0.588	Mean of logged Data	1.263
Maximum of Logged Data	2.028	SD of logged Data	0.523

Assuming Lognormal Distribution

95% H-UCL	6.937	90% Chebyshev (MVUE) UCL	6.34
95% Chebyshev (MVUE) UCL	7.413	97.5% Chebyshev (MVUE) UCL	8.902
99% Chebyshev (MVUE) UCL	11.83		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution

Nonparametric Distribution Free UCLs

95% CLT UCL	5.256	95% BCA Bootstrap UCL	5.343
95% Standard Bootstrap UCL	5.161	95% Bootstrap-t UCL	6.301
95% Hall's Bootstrap UCL	7.477	95% Percentile Bootstrap UCL	5.171
90% Chebyshev(Mean, Sd) UCL	6.314	95% Chebyshev(Mean, Sd) UCL	7.375
97.5% Chebyshev(Mean, Sd) UCL	8.848	99% Chebyshev(Mean, Sd) UCL	11.74

Suggested UCL to Use

95% Student's-t UCL	5.489

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 using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.