Tabla B1 - UCL95 de concentraciones en suelos en zona agrícola

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet_d.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

As

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5
Raw Statistics		**Log-transformed Statistics**	
Minimum	14.3	Minimum of Log Data	2.66
Maximum	31.2	Maximum of Log Data	3.44
Mean	23.26	Mean of log Data	3.115
Median	23.5	SD of log Data	0.292
SD	6.259		
Coefficient of Variation	0.269		
Skewness	-0.346		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.991	Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	29.23	95% H-UCL	33.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	36.53
95% Adjusted-CLT UCL (Chen-1995)	27.4	97.5% Chebyshev (MVUE) UCL	42.26
95% Modified-t UCL (Johnson-1978)	29.15	99% Chebyshev (MVUE) UCL	53.51
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.412	Data appear Normal at 5% Significance Level	
Theta Star	3.628		
MLE of Mean	23.26		
MLE of Standard Deviation	9.186		
nu star	64.12		
Approximate Chi Square Value (.05)	46.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0086	95% CLT UCL	27.86
Adjusted Chi Square Value	40.28	95% Jackknife UCL	29.23
		95% Standard Bootstrap UCL	27.35
Anderson-Darling Test Statistic	0.225	95% Bootstrap-t UCL	28.75
Anderson-Darling 5% Critical Value	0.679	95% Hall's Bootstrap UCL	27.68
Kolmogorov-Smirnov Test Statistic	0.184	95% Percentile Bootstrap UCL	27.18
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL	27.18
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	35.46
		97.5% Chebyshev(Mean, Sd) UCL	40.74
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	51.11

95% Approximate Gamma UCL	31.94
95% Adjusted Gamma UCL	37.03

Potential UCL to Use	Use 95% Student's-t UCL 29.23

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cd

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	0.578	Minimum of Log Data	-0.548
Maximum	1.04	Maximum of Log Data	0.0392
Mean	0.897	Mean of log Data	-0.13
Median	0.969	SD of log Data	0.243
SD	0.189		
Coefficient of Variation	0.211		
Skewness	-1.68		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.816	Shapiro Wilk Test Statistic	0.773
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.077	95% H-UCL	1.192
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.323
95% Adjusted-CLT UCL (Chen-1995)	0.968	97.5% Chebyshev (MVUE) UCL	1.507
95% Modified-t UCL (Johnson-1978)	1.066	99% Chebyshev (MVUE) UCL	1.867

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.52	Data appear Normal at 5% Significance Level	
Theta Star	0.0942		
MLE of Mean	0.897		
MLE of Standard Deviation	0.291		
nu star	95.2		
Approximate Chi Square Value (.05)	73.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0086	95% CLT UCL	1.036
Adjusted Chi Square Value	65.47	95% Jackknife UCL	1.077
		95% Standard Bootstrap UCL	1.02
Anderson-Darling Test Statistic	0.621	95% Bootstrap-t UCL	1.021
Anderson-Darling 5% Critical Value	0.679	95% Hall's Bootstrap UCL	0.976
Kolmogorov-Smirnov Test Statistic	0.285	95% Percentile Bootstrap UCL	1.004
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL	0.989
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.265
		97.5% Chebyshev(Mean, Sd) UCL	1.425
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.738
95% Approximate Gamma UCL	1.158		

95% Adjusted Gamma UCL	1.304

Potential UCL to Use — Use 95% Student's-t UCL: 1.077

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cu

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	18.1	Minimum of Log Data	2.896
Maximum	23.1	Maximum of Log Data	3.14
Mean	20.6	Mean of log Data	3.022
Median	21.1	SD of log Data	0.0964
SD	1.97		
Coefficient of Variation	0.0956		
Skewness	-0.103		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.969	Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	22.48	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	24.47
95% Adjusted-CLT UCL (Chen-1995)	22.01	97.5% Chebyshev (MVUE) UCL	26.14
95% Modified-t UCL (Johnson-1978)	22.47	99% Chebyshev (MVUE) UCL	29.43

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	54.33	Data appear Normal at 5% Significance Level	
Theta Star	0.379		
MLE of Mean	20.6		
MLE of Standard Deviation	2.795		
nu star	543.3		
Approximate Chi Square Value (.05)	490.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0086	95% CLT UCL	22.05
Adjusted Chi Square Value	467.9	95% Jackknife UCL	22.48
		95% Standard Bootstrap UCL	21.87
Anderson-Darling Test Statistic	0.24	95% Bootstrap-t UCL	22.56
Anderson-Darling 5% Critical Value	0.678	95% Hall's Bootstrap UCL	21.83
Kolmogorov-Smirnov Test Statistic	0.221	95% Percentile Bootstrap UCL	21.92
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL	21.78
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	24.44
		97.5% Chebyshev(Mean, Sd) UCL	26.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	29.36
95% Approximate Gamma UCL	22.83		

95% Adjusted Gamma UCL	23.92

Potential UCL to Use		Use 95% Student's-t UCL	22.48

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Hg

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	0.351	Minimum of Log Data	-1.047
Maximum	1.38	Maximum of Log Data	0.322
Mean	0.921	Mean of log Data	-0.183
Median	0.836	SD of log Data	0.539
SD	0.406		
Coefficient of Variation	0.441		
Skewness	-0.364		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

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Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.947	Shapiro Wilk Test Statistic	0.889
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.308	95% H-UCL	2.205
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.904
95% Adjusted-CLT UCL (Chen-1995)	1.188	97.5% Chebyshev (MVUE) UCL	2.324
95% Modified-t UCL (Johnson-1978)	1.303	99% Chebyshev (MVUE) UCL	3.148

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.185	Data appear Normal at 5% Significance Level	
Theta Star	0.421		
MLE of Mean	0.921		
MLE of Standard Deviation	0.623		
nu star	21.85		
Approximate Chi Square Value (.05)	12.23	Nonparametric Statistics	
Adjusted Level of Significance	0.0086	95% CLT UCL	1.22
Adjusted Chi Square Value	9.242	95% Jackknife UCL	1.308
		95% Standard Bootstrap UCL	1.186
Anderson-Darling Test Statistic	0.338	95% Bootstrap-t UCL	1.327
Anderson-Darling 5% Critical Value	0.681	95% Hall's Bootstrap UCL	1.405
Kolmogorov-Smirnov Test Statistic	0.233	95% Percentile Bootstrap UCL	1.187
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL	1.187
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.713
		97.5% Chebyshev(Mean, Sd) UCL	2.055
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2.728
95% Approximate Gamma UCL	1.646		
95% Adjusted Gamma UCL	2.178		

Potential UCL to Use		Use 95% Student's-t UCL	1.308

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	5	Number of Distinct Observations	5
Raw Statistics		Log-transformed Statistics	
Minimum	13	Minimum of Log Data	2.565
Maximum	19.7	Maximum of Log Data	2.981
Mean	16.24	Mean of log Data	2.777
Median	15.4	SD of log Data	0.164
SD	2.654		
Coefficient of Variation	0.163		
Skewness	0.253		

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Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.96	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	18.77	95% H-UCL	19.39
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	21.42
95% Adjusted-CLT UCL (Chen-1995)	18.34	97.5% Chebyshev (MVUE) UCL	23.66
95% Modified-t UCL (Johnson-1978)	18.79	99% Chebyshev (MVUE) UCL	28.06
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	18.9	Data appear Normal at 5% Significance Level	
Theta Star	0.859		
MLE of Mean	16.24		
MLE of Standard Deviation	3.736		
nu star	189		
Approximate Chi Square Value (.05)	158.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0086	95% CLT UCL	18.19
Adjusted Chi Square Value	145.8	95% Jackknife UCL	18.77
		95% Standard Bootstrap UCL	17.97
Anderson-Darling Test Statistic	0.249	95% Bootstrap-t UCL	20.58
Anderson-Darling 5% Critical Value	0.678	95% Hall's Bootstrap UCL	23.75
Kolmogorov-Smirnov Test Statistic	0.222	95% Percentile Bootstrap UCL	18.04
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL	18.04
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	21.41
		97.5% Chebyshev(Mean, Sd) UCL	23.65
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	28.05
95% Approximate Gamma UCL	19.4		
95% Adjusted Gamma UCL	21.05		

Potential UCL to Use		Use 95% Student's-t UCL	18.77

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Sb

General Statistics

Number of Valid Observations	5	Number of Distinct Observations	5
Raw Statistics		Log-transformed Statistics	
Minimum	0.661	Minimum of Log Data	-0.414
Maximum	1.94	Maximum of Log Data	0.663
Mean	1.268	Mean of log Data	0.18
Median	1.27	SD of log Data	0.39
SD	0.461		
Coefficient of Variation	0.363		
Skewness	0.327		

Warning: A sample size of 'n' = 5 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 5 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.966	Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical Value	0.762	Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.707	95% H-UCL	2.155
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.233
95% Adjusted-CLT UCL (Chen-1995)	1.639	97.5% Chebyshev (MVUE) UCL	2.649
95% Modified-t UCL (Johnson-1978)	1.712	99% Chebyshev (MVUE) UCL	3.467
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.685	Data appear Normal at 5% Significance Level	
Theta Star	0.344		
MLE of Mean	1.268		
MLE of Standard Deviation	0.661		
nu star	36.85		
Approximate Chi Square Value (.05)	23.95	Nonparametric Statistics	
Adjusted Level of Significance	0.0086	95% CLT UCL	1.607
Adjusted Chi Square Value	19.54	95% Jackknife UCL	1.707
		95% Standard Bootstrap UCL	1.573
Anderson-Darling Test Statistic	0.264	95% Bootstrap-t UCL	1.696
Anderson-Darling 5% Critical Value	0.679	95% Hall's Bootstrap UCL	1.799
Kolmogorov-Smirnov Test Statistic	0.201	95% Percentile Bootstrap UCL	1.554
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL	1.55
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2.166
		97.5% Chebyshev(Mean, Sd) UCL	2.555
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3.318
95% Approximate Gamma UCL	1.951		
95% Adjusted Gamma UCL	2.392		

Potential UCL to Use		Use 95% Student's-t UCL	1.707

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Concentraciones en mg/kg					
As	**Cd**	**Cu**	**Hg**	**Pb**	**Sb**
14.3	0.578	19.2	1.24	19.7	0.661
21.1	0.877	21.1	0.351	15	1.12
26.2	1.02	21.5	0.798	18.1	1.27
23.5	0.969	18.1	0.836	13	1.35
31.2	1.04	23.1	1.38	15.4	1.94

Tabla B2 - UCL95 de concentraciones en suelos superficiales de la zona industrial histórica

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

As

General Statistics			
Number of Valid Observations	26	Number of Distinct Observations	26
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	12	Minimum of Log Data	2.485
Maximum	861	Maximum of Log Data	6.758
Mean	255.3	Mean of log Data	4.908
Median	138	SD of log Data	1.266
SD	258.2		
Coefficient of Variation	1.011		
Skewness	1.04		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.835	Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical Value	0.92	Shapiro Wilk Critical Value	0.92
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	341.8	95% H-UCL	624.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	657.6
95% Adjusted-CLT UCL (Chen-1995)	349.7	97.5% Chebyshev (MVUE) UCL	818.1
95% Modified-t UCL (Johnson-1978)	343.6	99% Chebyshev (MVUE) UCL	1133
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.839	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	304.5		
MLE of Mean	255.3		
MLE of Standard Deviation	278.8		
nu star	43.6		
Approximate Chi Square Value (.05)	29.46	Nonparametric Statistics	
Adjusted Level of Significance	0.0398	95% CLT UCL	338.6
Adjusted Chi Square Value	28.69	95% Jackknife UCL	341.8
		95% Standard Bootstrap UCL	338.9
Anderson-Darling Test Statistic	0.522	95% Bootstrap-t UCL	356.8
Anderson-Darling 5% Critical Value	0.777	95% Hall's Bootstrap UCL	342.5
Kolmogorov-Smirnov Test Statistic	0.115	95% Percentile Bootstrap UCL	340.2
Kolmogorov-Smirnov 5% Critical Value	0.177	95% BCA Bootstrap UCL	347.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	476.1
		97.5% Chebyshev(Mean, Sd) UCL	571.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	759.2
95% Approximate Gamma UCL	377.9		
95% Adjusted Gamma UCL	388		
Potential UCL to Use		Use 95% Approximate Gamma UCL	377.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cd

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	27
Number of Missing Values	1		

Raw Statistics		Log-transformed Statistics	
Minimum	0.481	Minimum of Log Data	-0.732
Maximum	13.3	Maximum of Log Data	2.588
Mean	4.027	Mean of log Data	0.948
Median	3.06	SD of log Data	1.019
SD	3.628		
Coefficient of Variation	0.901		
Skewness	1.053		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.849	Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.923	Shapiro Wilk Critical Value	0.923
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	5.218	95% H-UCL	7.215
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.352
95% Adjusted-CLT UCL (Chen-1995)	5.327	97.5% Chebyshev (MVUE) UCL	10.14
95% Modified-t UCL (Johnson-1978)	5.242	99% Chebyshev (MVUE) UCL	13.65

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.147	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	3.51		
MLE of Mean	4.027		
MLE of Standard Deviation	3.76		
nu star	61.96		
Approximate Chi Square Value (.05)	44.85	Nonparametric Statistics	
Adjusted Level of Significance	0.0401	95% CLT UCL	5.176
Adjusted Chi Square Value	43.92	95% Jackknife UCL	5.218
		95% Standard Bootstrap UCL	5.153
Anderson-Darling Test Statistic	0.562	95% Bootstrap-t UCL	5.372
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	5.342
Kolmogorov-Smirnov Test Statistic	0.125	95% Percentile Bootstrap UCL	5.187
Kolmogorov-Smirnov 5% Critical Value	0.172	95% BCA Bootstrap UCL	5.313
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7.07
		97.5% Chebyshev(Mean, Sd) UCL	8.387
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	10.97
95% Approximate Gamma UCL	5.563		
95% Adjusted Gamma UCL	5.681		

Potential UCL to Use		Use 95% Approximate Gamma UCL	5.563

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cu

General Statistics

Number of Valid Observations	28	Number of Distinct Observations	28

Raw Statistics		Log-transformed Statistics	
Minimum	16.7	Minimum of Log Data	2.815
Maximum	1868	Maximum of Log Data	7.533
Mean	212.9	Mean of log Data	4.754
Median	144	SD of log Data	1.086
SD	345.8		
Coefficient of Variation	1.624		
Skewness	4.35		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.487	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.924	Shapiro Wilk Critical Value	0.924
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	324.2	95% H-UCL	357.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	413.8
95% Adjusted-CLT UCL (Chen-1995)	377.8	97.5% Chebyshev (MVUE) UCL	505.1
95% Modified-t UCL (Johnson-1978)	333.1	99% Chebyshev (MVUE) UCL	684.5
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.877	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	242.7		
MLE of Mean	212.9		
MLE of Standard Deviation	227.3		
nu star	49.13		
Approximate Chi Square Value (.05)	34.03	Nonparametric Statistics	
Adjusted Level of Significance	0.0404	95% CLT UCL	320.4
Adjusted Chi Square Value	33.26	95% Jackknife UCL	324.2
		95% Standard Bootstrap UCL	318
Anderson-Darling Test Statistic	0.795	95% Bootstrap-t UCL	503.3
Anderson-Darling 5% Critical Value	0.776	95% Hall's Bootstrap UCL	741
Kolmogorov-Smirnov Test Statistic	0.144	95% Percentile Bootstrap UCL	338
Kolmogorov-Smirnov 5% Critical Value	0.171	95% BCA Bootstrap UCL	395
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	497.7
		97.5% Chebyshev(Mean, Sd) UCL	621
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	863.1
95% Approximate Gamma UCL	307.3		
95% Adjusted Gamma UCL	314.5		
Potential UCL to Use		Use 95% Approximate Gamma UCL	307.3

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Hg

General Statistics			
Number of Valid Observations	32	Number of Distinct Observations	31
Raw Statistics		Log-transformed Statistics	
Minimum	0.873	Minimum of Log Data	-0.136
Maximum	408	Maximum of Log Data	6.011
Mean	60.4	Mean of log Data	3.324
Median	36.95	SD of log Data	1.413
SD	81.7		
Coefficient of Variation	1.353		
Skewness	2.9		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.679	Shapiro Wilk Test Statistic	0.976
Shapiro Wilk Critical Value	0.93	Shapiro Wilk Critical Value	0.93
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	84.89	95% H-UCL	160.1
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	168.1
95% Adjusted-CLT UCL (Chen-1995)	92.07	97.5% Chebyshev (MVUE) UCL	210.1
95% Modified-t UCL (Johnson-1978)	86.12	99% Chebyshev (MVUE) UCL	292.5
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.717	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	84.27		

MLE of Mean	60.4		
MLE of Standard Deviation	71.34		
nu star	45.87		
Approximate Chi Square Value (.05)	31.33	Nonparametric Statistics	
Adjusted Level of Significance	0.0416	95% CLT UCL	84.16
Adjusted Chi Square Value	30.69	95% Jackknife UCL	84.89
		95% Standard Bootstrap UCL	83.96
Anderson-Darling Test Statistic	0.245	95% Bootstrap-t UCL	103.6
Anderson-Darling 5% Critical Value	0.787	95% Hall's Bootstrap UCL	173.1
Kolmogorov-Smirnov Test Statistic	0.077	95% Percentile Bootstrap UCL	85.8
Kolmogorov-Smirnov 5% Critical Value	0.161	95% BCA Bootstrap UCL	92.35
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	123.4
		97.5% Chebyshev(Mean, Sd) UCL	150.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	204.1
95% Approximate Gamma UCL	88.43		
95% Adjusted Gamma UCL	90.28		
Potential UCL to Use		Use 95% Approximate Gamma UCL	88.43

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	25	Number of Distinct Observations	25
Number of Missing Values	3		
Raw Statistics		Log-transformed Statistics	
Minimum	16.5	Minimum of Log Data	2.803
Maximum	828	Maximum of Log Data	6.719
Mean	295.8	Mean of log Data	5.13
Median	214	SD of log Data	1.236
SD	264		
Coefficient of Variation	0.893		
Skewness	0.809		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.872	Shapiro Wilk Test Statistic	0.915
Shapiro Wilk Critical Value	0.918	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	
95% Student's-t UCL	386.1	95% H-UCL	737.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	786.3
95% Adjusted-CLT UCL (Chen-1995)	391.8	97.5% Chebyshev (MVUE) UCL	977.2
95% Modified-t UCL (Johnson-1978)	387.5	99% Chebyshev (MVUE) UCL	1352
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.932	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	317.5		
MLE of Mean	295.8		
MLE of Standard Deviation	306.5		
nu star	46.58		
Approximate Chi Square Value (.05)	31.92	Nonparametric Statistics	
Adjusted Level of Significance	0.0395	95% CLT UCL	382.6
Adjusted Chi Square Value	31.09	95% Jackknife UCL	386.1
		95% Standard Bootstrap UCL	381.2
Anderson-Darling Test Statistic	0.476	95% Bootstrap-t UCL	395.1
Anderson-Darling 5% Critical Value	0.772	95% Hall's Bootstrap UCL	387.4
Kolmogorov-Smirnov Test Statistic	0.115	95% Percentile Bootstrap UCL	384.2
Kolmogorov-Smirnov 5% Critical Value	0.179	95% BCA Bootstrap UCL	395.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	525.9
		97.5% Chebyshev(Mean, Sd) UCL	625.5

Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	821.1
95% Approximate Gamma UCL	431.6		
95% Adjusted Gamma UCL	443.1		
Potential UCL to Use		Use 95% Approximate Gamma UCL	431.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Sb

General Statistics			
Number of Valid Observations	28	Number of Distinct Observations	28
Raw Statistics		Log-transformed Statistics	
Minimum	0.452	Minimum of Log Data	-0.794
Maximum	14	Maximum of Log Data	2.639
Mean	3.266	Mean of log Data	0.786
Median	2.335	SD of log Data	0.889
SD	3.434		
Coefficient of Variation	1.051		
Skewness	2.278		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.706	Shapiro Wilk Test Statistic	0.974
Shapiro Wilk Critical Value	0.924	Shapiro Wilk Critical Value	0.924
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	4.372	95% H-UCL	4.851
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.82
95% Adjusted-CLT UCL (Chen-1995)	4.632	97.5% Chebyshev (MVUE) UCL	6.955
95% Modified-t UCL (Johnson-1978)	4.418	99% Chebyshev (MVUE) UCL	9.183
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.276	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.56		
MLE of Mean	3.266		
MLE of Standard Deviation	2.892		
nu star	71.44		
Approximate Chi Square Value (.05)	52.98	Nonparametric Statistics	
Adjusted Level of Significance	0.0404	95% CLT UCL	4.334
Adjusted Chi Square Value	52	95% Jackknife UCL	4.372
		95% Standard Bootstrap UCL	4.301
Anderson-Darling Test Statistic	0.632	95% Bootstrap-t UCL	5.017
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	5.871
Kolmogorov-Smirnov Test Statistic	0.133	95% Percentile Bootstrap UCL	4.4
Kolmogorov-Smirnov 5% Critical Value	0.169	95% BCA Bootstrap UCL	4.76
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	6.095
		97.5% Chebyshev(Mean, Sd) UCL	7.319
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	9.723
95% Approximate Gamma UCL	4.404		
95% Adjusted Gamma UCL	4.488		
Potential UCL to Use		Use 95% Approximate Gamma UCL	4.404

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zn

General Statistics

Number of Valid Observations	28	Number of Distinct Observations	26

Raw Statistics		Log-transformed Statistics	
Minimum	18.9	Minimum of Log Data	2.939
Maximum	368	Maximum of Log Data	5.908
Mean	103.9	Mean of log Data	4.342
Median	79.75	SD of log Data	0.802
SD	86.36		
Coefficient of Variation	0.831		
Skewness	1.62		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.824	Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.924	Shapiro Wilk Critical Value	0.924
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	131.7	95% H-UCL	149.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	180.4
95% Adjusted-CLT UCL (Chen-1995)	136.1	97.5% Chebyshev (MVUE) UCL	213.3
95% Modified-t UCL (Johnson-1978)	132.6	99% Chebyshev (MVUE) UCL	277.9

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.635	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	63.58		
MLE of Mean	103.9		
MLE of Standard Deviation	81.29		
nu star	91.54		
Approximate Chi Square Value (.05)	70.48	Nonparametric Statistics	
Adjusted Level of Significance	0.0404	95% CLT UCL	130.8
Adjusted Chi Square Value	69.34	95% Jackknife UCL	131.7
		95% Standard Bootstrap UCL	129.8
Anderson-Darling Test Statistic	0.394	95% Bootstrap-t UCL	139.8
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL	139.8
Kolmogorov-Smirnov Test Statistic	0.113	95% Percentile Bootstrap UCL	130.6
Kolmogorov-Smirnov 5% Critical Value	0.168	95% BCA Bootstrap UCL	134.3
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	175.1
		97.5% Chebyshev(Mean, Sd) UCL	205.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	266.3
95% Approximate Gamma UCL	135		
95% Adjusted Gamma UCL	137.2		

Potential UCL to Use		Use 95% Approximate Gamma UCL	135

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Concentraciones en mg/kg

As	Cd	Cu	Hg	Pb	Sb	Zn
40.1	0.802	62.2	6.34	33.1	1.28	29.2
529	2.1	231	21.9	344	1.22	58.4
502	1.98	240	21.6	357	1.18	56.2
25.3	0.649	42.7	3.87	32.5	0.656	27.2
19.9	0.513	18.6	0.873	20.6	0.582	20
153	8.59	161	84	1 330	6.44	211
150	9.11	159	88.7	1 440	6.46	223
31.4	1.72	47.1	11.5	206	1.71	48.9
808	13.3	422	207	1 890	13.7	368
106	1.58	58.1	48.2	123	0.988	79.8
116	3.59	90.3	12.4	202	1.94	103
424.2	<1	1868	23.5	312.3	14	105.7
126	2.4	124	81.3	118	1.38	62.3
579	3.57	306	37	470	3.39	99.1
28.5	0.669	38.1	60.8	32.6	2.51	25.6
230	3.44	145	6.05	306	2.6	95.3

193	3.67	142	25.3	296	2.63	103
35.4	0.78	28.2	70.9	41.3	0.75	69.1
87.5	10.4	160	113	828	3.05	298
334	3.06	165	25.3	410	2.9	79.7
475	9.22	297	4.62	714	6.02	211
12	0.481	16.7	67.2	16.5	0.452	18.9
99.4	1.41	64.2	43.5	96.4	1.76	44.9
56.2	0.851	21.5	130	55.4	0.779	29.4
1 840	3.32	491	2.18	214	2.16	58.5
1 410	8.44	213	45.3	752	3.81	130
861	6.76	143	12.9	637	4.24	112
617	6.33	206	4.46	777	2.87	143
			36.9			
			190			
			408			
			38.2			

Tabla B3 - UCL95 de concentraciones en suelos profundos de la zona industrial histórica

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

As

General Statistics			
Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		**Log-transformed Statistics**	
Minimum	20.4	Minimum of Log Data	3.016
Maximum	635	Maximum of Log Data	6.454
Mean	260.2	Mean of log Data	4.767
Median	129	SD of log Data	1.532
SD	274.2		
Coefficient of Variation	1.053		
Skewness	0.598		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.814	Shapiro Wilk Test Statistic	0.856
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	461.6	95% H-UCL	10330
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1004
95% Adjusted-CLT UCL (Chen-1995)	455.7	97.5% Chebyshev (MVUE) UCL	1313
95% Modified-t UCL (Johnson-1978)	465.5	99% Chebyshev (MVUE) UCL	1920
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.525	Data appear Normal at 5% Significance Level	
Theta Star	495.2		
MLE of Mean	260.2		
MLE of Standard Deviation	359		
nu star	7.357		
Approximate Chi Square Value (.05)	2.369	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0158	95% CLT UCL	430.7
Adjusted Chi Square Value	1.606	95% Jackknife UCL	461.6
		95% Standard Bootstrap UCL	416.6
Anderson-Darling Test Statistic	0.507	95% Bootstrap-t UCL	567.3
Anderson-Darling 5% Critical Value	0.736	95% Hall's Bootstrap UCL	424.4
Kolmogorov-Smirnov Test Statistic	0.234	95% Percentile Bootstrap UCL	418.4
Kolmogorov-Smirnov 5% Critical Value	0.323	95% BCA Bootstrap UCL	433.4
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	711.9
		97.5% Chebyshev(Mean, Sd) UCL	907.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1291

95% Approximate Gamma UCL	808.3
95% Adjusted Gamma UCL	1192

Potential UCL to Use	Use 95% Student's-t UCL 461.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cd

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	0.569	Minimum of Log Data	-0.564
Maximum	10.5	Maximum of Log Data	2.351
Mean	3.389	Mean of log Data	0.723
Median	2.41	SD of log Data	1.114
SD	3.543		
Coefficient of Variation	1.045		
Skewness	1.586		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.815	Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	5.991	95% H-UCL	23.93
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9.647
95% Adjusted-CLT UCL (Chen-1995)	6.449	97.5% Chebyshev (MVUE) UCL	12.35
95% Modified-t UCL (Johnson-1978)	6.124	99% Chebyshev (MVUE) UCL	17.66

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.748	Data appear Normal at 5% Significance Level	
Theta Star	4.529		
MLE of Mean	3.389		
MLE of Standard Deviation	3.918		
nu star	10.48		
Approximate Chi Square Value (.05)	4.242	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	5.591
Adjusted Chi Square Value	3.13	95% Jackknife UCL	5.991
		95% Standard Bootstrap UCL	5.449
Anderson-Darling Test Statistic	0.372	95% Bootstrap-t UCL	7.823
Anderson-Darling 5% Critical Value	0.726	95% Hall's Bootstrap UCL	13.84
Kolmogorov-Smirnov Test Statistic	0.246	95% Percentile Bootstrap UCL	5.594
Kolmogorov-Smirnov 5% Critical Value	0.319	95% BCA Bootstrap UCL	6.193
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.225
		97.5% Chebyshev(Mean, Sd) UCL	11.75
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	16.71
95% Approximate Gamma UCL	8.37		

95% Adjusted Gamma UCL	11.34

Potential UCL to Use	Use 95% Student's-t UCL 5.991

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cu

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	18.3	Minimum of Log Data	2.907
Maximum	639	Maximum of Log Data	6.46
Mean	199.1	Mean of log Data	4.538
Median	128	SD of log Data	1.422
SD	235.9		
Coefficient of Variation	1.185		
Skewness	1.361		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	372.4	95% H-UCL	4546
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	680.7
95% Adjusted-CLT UCL (Chen-1995)	394.8	97.5% Chebyshev (MVUE) UCL	886
95% Modified-t UCL (Johnson-1978)	380	99% Chebyshev (MVUE) UCL	1289

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.545	Data appear Normal at 5% Significance Level	
Theta Star	365.5		
MLE of Mean	199.1		
MLE of Standard Deviation	269.8		
nu star	7.629		
Approximate Chi Square Value (.05)	2.522	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	345.8
Adjusted Chi Square Value	1.727	95% Jackknife UCL	372.4
		95% Standard Bootstrap UCL	330.3
Anderson-Darling Test Statistic	0.412	95% Bootstrap-t UCL	685.8
Anderson-Darling 5% Critical Value	0.735	95% Hall's Bootstrap UCL	1301
Kolmogorov-Smirnov Test Statistic	0.257	95% Percentile Bootstrap UCL	341.4
Kolmogorov-Smirnov 5% Critical Value	0.322	95% BCA Bootstrap UCL	360.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	587.8
		97.5% Chebyshev(Mean, Sd) UCL	756
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1086
95% Approximate Gamma UCL	602.4		
95% Adjusted Gamma UCL	879.6		

Potential UCL to Use		Use 95% Student's-t UCL	372.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Hg

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7

Raw Statistics		Log-transformed Statistics	
Minimum	1.38	Minimum of Log Data	0.322
Maximum	409	Maximum of Log Data	6.014
Mean	89.92	Mean of log Data	3.102
Median	35.1	SD of log Data	2.082
SD	145.7		
Coefficient of Variation	1.62		
Skewness	2.292		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.672	Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
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	196.9	95% H-UCL	74925
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	436.8
95% Adjusted-CLT UCL (Chen-1995)	231.5	97.5% Chebyshev (MVUE) UCL	580
95% Modified-t UCL (Johnson-1978)	204.9	99% Chebyshev (MVUE) UCL	861.2

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.358	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	250.8		
MLE of Mean	89.92		
MLE of Standard Deviation	150.2		
nu star	5.019		
Approximate Chi Square Value (.05)	1.161	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	180.5
Adjusted Chi Square Value	0.697	95% Jackknife UCL	196.9
		95% Standard Bootstrap UCL	174.3
Anderson-Darling Test Statistic	0.283	95% Bootstrap-t UCL	433
Anderson-Darling 5% Critical Value	0.758	95% Hall's Bootstrap UCL	512.8
Kolmogorov-Smirnov Test Statistic	0.194	95% Percentile Bootstrap UCL	190.6
Kolmogorov-Smirnov 5% Critical Value	0.329	95% BCA Bootstrap UCL	227.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	330
		97.5% Chebyshev(Mean, Sd) UCL	433.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	637.9
95% Approximate Gamma UCL	388.7		
95% Adjusted Gamma UCL	647.3		

Potential UCL to Use		Use 95% Approximate Gamma UCL	388.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		Log-transformed Statistics	
Minimum	27.3	Minimum of Log Data	3.307
Maximum	1680	Maximum of Log Data	7.427
Mean	387.6	Mean of log Data	4.969
Median	115	SD of log Data	1.559
SD	594.9		
Coefficient of Variation	1.535		
Skewness	2.225		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.682	Shapiro Wilk Test Statistic	0.924
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
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	824.5	95% H-UCL	14745
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1279
95% Adjusted-CLT UCL (Chen-1995)	959.5	97.5% Chebyshev (MVUE) UCL	1674
95% Modified-t UCL (Johnson-1978)	856.1	99% Chebyshev (MVUE) UCL	2450
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.45	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	862		
MLE of Mean	387.6		
MLE of Standard Deviation	578		
nu star	6.296		
Approximate Chi Square Value (.05)	1.793	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	757.5
Adjusted Chi Square Value	1.161	95% Jackknife UCL	824.5
		95% Standard Bootstrap UCL	727.5
Anderson-Darling Test Statistic	0.42	95% Bootstrap-t UCL	1856
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	2035
Kolmogorov-Smirnov Test Statistic	0.207	95% Percentile Bootstrap UCL	788.1
Kolmogorov-Smirnov 5% Critical Value	0.325	95% BCA Bootstrap UCL	905.8
Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1368
		97.5% Chebyshev(Mean, Sd) UCL	1792
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2625
95% Approximate Gamma UCL	1361		
95% Adjusted Gamma UCL	2101		

Potential UCL to Use		Use 95% Approximate Gamma UCL	1361

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Sb

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		Log-transformed Statistics	
Minimum	0.556	Minimum of Log Data	-0.587
Maximum	8.32	Maximum of Log Data	2.119
Mean	3.139	Mean of log Data	0.638
Median	1.34	SD of log Data	1.11
SD	3.233		
Coefficient of Variation	1.03		
Skewness	1.056		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

ıal Distribution Test		**Lognormal Distribution Test**	
Test Statistic	**0.793**	**Test Statistic**	0.897
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
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	5.513	95% H-UCL	21.63
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.81
95% Adjusted-CLT UCL (Chen-1995)	5.67	97.5% Chebyshev (MVUE) UCL	11.28
95% Modified-t UCL (Johnson-1978)	5.595	99% Chebyshev (MVUE) UCL	16.12
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.738	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4.252		
MLE of Mean	3.139		
MLE of Standard Deviation	3.653		
nu star	10.34		
Approximate Chi Square Value (.05)	4.153	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	5.149
Adjusted Chi Square Value	3.057	95% Jackknife UCL	5.513
		95% Standard Bootstrap UCL	5.025
Anderson-Darling Test Statistic	0.466	95% Bootstrap-t UCL	10.63
Anderson-Darling 5% Critical Value	0.726	95% Hall's Bootstrap UCL	7.204
Kolmogorov-Smirnov Test Statistic	0.248	95% Percentile Bootstrap UCL	5.019
Kolmogorov-Smirnov 5% Critical Value	0.319	95% BCA Bootstrap UCL	5.573
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.465
		97.5% Chebyshev(Mean, Sd) UCL	10.77
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	15.3
95% Approximate Gamma UCL	7.813		
95% Adjusted Gamma UCL	10.62		

Potential UCL to Use		Use 95% Approximate Gamma UCL	7.813

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zn

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		Log-transformed Statistics	
Minimum	22.9	Minimum of Log Data	3.131
Maximum	328	Maximum of Log Data	5.793
Mean	97.26	Mean of log Data	4.174
Median	59.7	SD of log Data	0.926
SD	107.2		
Coefficient of Variation	1.102		
Skewness	2.14		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.727	Shapiro Wilk Test Statistic	0.947
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
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	176	95% H-UCL	373.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	234.1
95% Adjusted-CLT UCL (Chen-1995)	198.9	97.5% Chebyshev (MVUE) UCL	295.5
95% Modified-t UCL (Johnson-1978)	181.4	99% Chebyshev (MVUE) UCL	416
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.885	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	110		
MLE of Mean	97.26		
MLE of Standard Deviation	103.4		
nu star	12.38		
Approximate Chi Square Value (.05)	5.481	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	163.9
Adjusted Chi Square Value	4.178	95% Jackknife UCL	176
		95% Standard Bootstrap UCL	159.6
Anderson-Darling Test Statistic	0.39	95% Bootstrap-t UCL	281.6
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL	419.3
Kolmogorov-Smirnov Test Statistic	0.172	95% Percentile Bootstrap UCL	167.5
Kolmogorov-Smirnov 5% Critical Value	0.318	95% BCA Bootstrap UCL	200.1
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	273.8
		97.5% Chebyshev(Mean, Sd) UCL	350.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	500.2
95% Approximate Gamma UCL	219.8		
95% Adjusted Gamma UCL	288.3		
Potential UCL to Use		Use 95% Approximate Gamma UCL	219.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Concentraciones en mg/kg						
As	**Cd**	**Cu**	**Hg**	**Pb**	**Sb**	**Zn**
20.4	0.569	18.3	1.38	27.3	1.2	22.9
37.4	0.803	25.7	6.6	50.3	0.556	37.9
129	2.41	128	35.1	115	1.34	59.7
378	4.11	401	77.9	349	7.08	115
600	10.5	639	409	1 680	8.32	328
635	4.61	156	96.7	462	2.91	89.4
21.9	0.72	26	2.74	29.8	0.567	27.9

Tabla B4 - UCL95 de concentraciones en suelos de la zona urbana

General UCL Statistics for Full Data Sets

User Selected Options	
From File	Sheet1_a.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

As

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	22
Raw Statistics		Log-transformed Statistics	
Minimum	9.72	Minimum of Log Data	2.274
Maximum	348.9	Maximum of Log Data	5.855
Mean	46.28	Mean of log Data	3.336
Median	24.2	SD of log Data	0.885
SD	71.74		
Coefficient of Variation	1.55		
Skewness	3.901		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.489	Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
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	72.6	95% H-UCL	66.45
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	77.49
95% Adjusted-CLT UCL (Chen-1995)	85.03	97.5% Chebyshev (MVUE) UCL	93.45
95% Modified-t UCL (Johnson-1978)	74.72	99% Chebyshev (MVUE) UCL	124.8
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.015	Data Follow Appr. Gamma Distrib. at 5% Significance Level	
Theta Star	45.61		
MLE of Mean	46.28		
MLE of Standard Deviation	45.94		
nu star	44.65		
Approximate Chi Square Value (.05)	30.32	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	71.44
Adjusted Chi Square Value	29.44	95% Jackknife UCL	72.6
		95% Standard Bootstrap UCL	71.28
Anderson-Darling Test Statistic	1.359	95% Bootstrap-t UCL	122.5
Anderson-Darling 5% Critical Value	0.767	95% Hall's Bootstrap UCL	158.7
Kolmogorov-Smirnov Test Statistic	0.181	95% Percentile Bootstrap UCL	73.75
Kolmogorov-Smirnov 5% Critical Value	0.19	95% BCA Bootstrap UCL	86.29
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	113
		97.5% Chebyshev(Mean, Sd) UCL	141.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	198.5
95% Approximate Gamma UCL	68.15		
95% Adjusted Gamma UCL	70.19		
Potential UCL to Use		Use 95% Approximate Gamma UCL	68.15

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cd

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	22

Raw Statistics		Log-transformed Statistics	
Minimum	0.418	Minimum of Log Data	-0.872
Maximum	1.75	Maximum of Log Data	0.56
Mean	0.78	Mean of log Data	-0.314
Median	0.683	SD of log Data	0.361
SD	0.315		
Coefficient of Variation	0.404		
Skewness	1.589		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.859	Shapiro Wilk Test Statistic	0.956
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
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	0.896	95% H-UCL	0.904
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.043
95% Adjusted-CLT UCL (Chen-1995)	0.915	97.5% Chebyshev (MVUE) UCL	1.158
95% Modified-t UCL (Johnson-1978)	0.9	99% Chebyshev (MVUE) UCL	1.384

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	6.72	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.116		
MLE of Mean	0.78		
MLE of Standard Deviation	0.301		
nu star	295.7		
Approximate Chi Square Value (.05)	256.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	0.891
Adjusted Chi Square Value	254.2	95% Jackknife UCL	0.896
		95% Standard Bootstrap UCL	0.887
Anderson-Darling Test Statistic	0.527	95% Bootstrap-t UCL	0.933
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	0.959
Kolmogorov-Smirnov Test Statistic	0.179	95% Percentile Bootstrap UCL	0.9
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	0.909
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.073
		97.5% Chebyshev(Mean, Sd) UCL	1.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.449
95% Approximate Gamma UCL	0.898		
95% Adjusted Gamma UCL	0.908		

Potential UCL to Use		Use 95% Approximate Gamma UCL	0.898

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cu

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	22

Raw Statistics		Log-transformed Statistics	
Minimum	16.8	Minimum of Log Data	2.821
Maximum	161.3	Maximum of Log Data	5.083
Mean	44.73	Mean of log Data	3.669
Median	40.3	SD of log Data	0.484
SD	29.77		
Coefficient of Variation	0.666		
Skewness	3.092		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.668	Shapiro Wilk Test Statistic	0.938

Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
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	55.65	95% H-UCL	54.37
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	64.28
95% Adjusted-CLT UCL (Chen-1995)	59.64	97.5% Chebyshev (MVUE) UCL	73.13
95% Modified-t UCL (Johnson-1978)	56.35	99% Chebyshev (MVUE) UCL	90.5
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.447	Data Follow Appr. Gamma Distrib. at 5% Significance Level	
Theta Star	12.98		
MLE of Mean	44.73		
MLE of Standard Deviation	24.09		
nu star	151.7		
Approximate Chi Square Value (.05)	124.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	55.17
Adjusted Chi Square Value	122.4	95% Jackknife UCL	55.65
		95% Standard Bootstrap UCL	54.76
Anderson-Darling Test Statistic	0.793	95% Bootstrap-t UCL	66.5
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	102.1
Kolmogorov-Smirnov Test Statistic	0.164	95% Percentile Bootstrap UCL	55.54
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	61
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	72.4
		97.5% Chebyshev(Mean, Sd) UCL	84.37
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	107.9
95% Approximate Gamma UCL	54.62		
95% Adjusted Gamma UCL	55.45		
Potential UCL to Use		Use 95% Approximate Gamma UCL	54.62

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Hg

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	14
Raw Statistics		Log-transformed Statistics	
Minimum	<0.04	Minimum of Log Data	-3.912
Maximum	19.4	Maximum of Log Data	2.965
Mean	3.057	Mean of log Data	-0.966
Median	1.38	SD of log Data	2.642
SD	5.43		
Coefficient of Variation	1.776		
Skewness	2.472		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.592	Shapiro Wilk Test Statistic	0.81
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
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	5.049	95% H-UCL	269
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	30.2
95% Adjusted-CLT UCL (Chen-1995)	5.613	97.5% Chebyshev (MVUE) UCL	40.06
95% Modified-t UCL (Johnson-1978)	5.151	99% Chebyshev (MVUE) UCL	59.44
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.312	Data do not follow a Discernable Distribution (0.05)	
Theta Star	9.789		
MLE of Mean	3.057		
MLE of Standard Deviation	5.47		

nu star	13.74		
Approximate Chi Square Value (.05)	6.394	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	4.961
Adjusted Chi Square Value	6.022	95% Jackknife UCL	5.049
		95% Standard Bootstrap UCL	4.93
Anderson-Darling Test Statistic	1.272	95% Bootstrap-t UCL	7.707
Anderson-Darling 5% Critical Value	0.842	95% Hall's Bootstrap UCL	12.76
Kolmogorov-Smirnov Test Statistic	0.259	95% Percentile Bootstrap UCL	5.029
Kolmogorov-Smirnov 5% Critical Value	0.2	95% BCA Bootstrap UCL	5.599
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.104
		97.5% Chebyshev(Mean, Sd) UCL	10.29
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	14.58
95% Approximate Gamma UCL	6.569		
95% Adjusted Gamma UCL	6.975		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	14.58

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Pb

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	22
Raw Statistics		Log-transformed Statistics	
Minimum	6.18	Minimum of Log Data	1.821
Maximum	332.2	Maximum of Log Data	5.806
Mean	37.62	Mean of log Data	2.84
Median	10.45	SD of log Data	1.095
SD	71.72		
Coefficient of Variation	1.906		
Skewness	3.69		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.474	Shapiro Wilk Test Statistic	0.828
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
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	63.93	95% H-UCL	59.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	64.82
95% Adjusted-CLT UCL (Chen-1995)	75.62	97.5% Chebyshev (MVUE) UCL	79.91
95% Modified-t UCL (Johnson-1978)	65.93	99% Chebyshev (MVUE) UCL	109.6
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.686	Data do not follow a Discernable Distribution (0.05)	
Theta Star	54.84		
MLE of Mean	37.62		
MLE of Standard Deviation	45.42		
nu star	30.18		
Approximate Chi Square Value (.05)	18.64	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	62.77
Adjusted Chi Square Value	17.96	95% Jackknife UCL	63.93
		95% Standard Bootstrap UCL	62.26
Anderson-Darling Test Statistic	2.266	95% Bootstrap-t UCL	126.6
Anderson-Darling 5% Critical Value	0.783	95% Hall's Bootstrap UCL	158.8
Kolmogorov-Smirnov Test Statistic	0.283	95% Percentile Bootstrap UCL	66.73
Kolmogorov-Smirnov 5% Critical Value	0.193	95% BCA Bootstrap UCL	80.66
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	104.3
		97.5% Chebyshev(Mean, Sd) UCL	133.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	189.8
95% Approximate Gamma UCL	60.92		
95% Adjusted Gamma UCL	63.22		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	104.3

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Sb

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	21
Raw Statistics		Log-transformed Statistics	
Minimum	0.423	Minimum of Log Data	-0.86
Maximum	3.67	Maximum of Log Data	1.3
Mean	1.439	Mean of log Data	0.215
Median	1.34	SD of log Data	0.58
SD	0.79		
Coefficient of Variation	0.549		
Skewness	1.1		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.911	Shapiro Wilk Test Statistic	0.945
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
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	1.729	95% H-UCL	1.907
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.277
95% Adjusted-CLT UCL (Chen-1995)	1.758	97.5% Chebyshev (MVUE) UCL	2.633
95% Modified-t UCL (Johnson-1978)	1.735	99% Chebyshev (MVUE) UCL	3.332
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.069	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.469		
MLE of Mean	1.439		
MLE of Standard Deviation	0.821		
nu star	135		
Approximate Chi Square Value (.05)	109.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	1.716
Adjusted Chi Square Value	107.4	95% Jackknife UCL	1.729
		95% Standard Bootstrap UCL	1.705
Anderson-Darling Test Statistic	0.377	95% Bootstrap-t UCL	1.786
Anderson-Darling 5% Critical Value	0.748	95% Hall's Bootstrap UCL	1.818
Kolmogorov-Smirnov Test Statistic	0.125	95% Percentile Bootstrap UCL	1.72
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	1.756
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2.173
		97.5% Chebyshev(Mean, Sd) UCL	2.49
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3.114
95% Approximate Gamma UCL	1.779		
95% Adjusted Gamma UCL	1.808		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1.779

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zn

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	22
Raw Statistics		Log-transformed Statistics	

Minimum	12.5	Minimum of Log Data	2.526
Maximum	215	Maximum of Log Data	5.371
Mean	47.1	Mean of log Data	3.538
Median	30.05	SD of log Data	0.704
SD	53.01		
Coefficient of Variation	1.125		
Skewness	2.803		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.545	Shapiro Wilk Test Statistic	0.867
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
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	66.55	95% H-UCL	61.89
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	73.98
95% Adjusted-CLT UCL (Chen-1995)	72.91	97.5% Chebyshev (MVUE) UCL	87.17
95% Modified-t UCL (Johnson-1978)	67.68	99% Chebyshev (MVUE) UCL	113.1

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.533	Data do not follow a Discernable Distribution (0.05)	
Theta Star	30.73		
MLE of Mean	47.1		
MLE of Standard Deviation	38.04		
nu star	67.45		
Approximate Chi Square Value (.05)	49.55	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	65.7
Adjusted Chi Square Value	48.41	95% Jackknife UCL	66.55
		95% Standard Bootstrap UCL	64.7
Anderson-Darling Test Statistic	1.912	95% Bootstrap-t UCL	117.6
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	177.1
Kolmogorov-Smirnov Test Statistic	0.245	95% Percentile Bootstrap UCL	66.25
Kolmogorov-Smirnov 5% Critical Value	0.188	95% BCA Bootstrap UCL	74.71
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	96.37
		97.5% Chebyshev(Mean, Sd) UCL	117.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	159.6
95% Approximate Gamma UCL	64.12		
95% Adjusted Gamma UCL	65.64		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	96.37

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Concentraciones en mg/kg

As	Cd	Cu	Hg	Pb	Sb	Zn
20.4	0.569	18.3	1.38	27.3	1.2	39.8
129	2.41	128	35.1	115	1.34	55.9
126	2.4	124	37	118	1.38	23.2
378	4.11	401	77.9	349	7.08	12.5
37.4	0.803	25.7	6.6	50.3	0.556	47.1
600	10.5	639	409	1680	8.32	27.8
21.9	0.72	26	2.74	29.8	0.567	17.7
635	4.61	156	96.7	462	2.91	198.2
38.2	0.718	51.4	1.4	23.3	1.29	38.1
18.4	0.604	43	0.02	10.8	0.931	22.5
90.6	1.75	77.2	19.4	128	2.35	215
25.3	0.454	42.5	0.02	6.81	1.01	19.6
47.7	0.69	28.1	2.43	36.5	1.19	48.8
16.5	0.466	28.3	0.02	7.42	1.34	14.5
15	0.625	42.2	2.86	6.46	1.55	22.7
33.7	1.01	62.8	3.47	7.75	2.49	26.6
79.7	0.74	35.5	8.3	41.4	1.34	44.5
13.2	0.675	35.7	0.02	6.18	1.49	27.7

20.1	0.749	24.6	0.02	10.1	1.51	32.3
15.8	0.919	42.6	0.02	8.76	1.6	36.1
23.1	1.13	57.9	0.02	7.53	3.67	43.1
10.8	0.67	21.9	3.19	13.1	0.958	22.6