

Appendix Q  
ProUCL Output for Lead

	A	B	C	D	E	F	G	H	I	J	K	L
1	<b>UCL Statistics for Uncensored Full Data Sets</b>											
2												
3	User Selected Options											
4	Date/Time of Computation	1/13/2016 3:15:36 PM										
5	From File	WorkSheet.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	<b>Lead</b>											
12												
13	<b>General Statistics</b>											
14	Total Number of Observations	24			Number of Distinct Observations			21				
15					Number of Missing Observations			0				
16	Minimum	4.7			Mean			37.88				
17	Maximum	110			Median			32.5				
18	SD	26.43			Std. Error of Mean			5.395				
19	Coefficient of Variation	0.698			Skewness			1.188				
20												
21	<b>Normal GOF Test</b>											
22	Shapiro Wilk Test Statistic	0.893			<b>Shapiro Wilk GOF Test</b>							
23	5% Shapiro Wilk Critical Value	0.916			Data Not Normal at 5% Significance Level							
24	Lilliefors Test Statistic	0.218			<b>Lilliefors GOF Test</b>							
25	5% Lilliefors Critical Value	0.181			Data Not Normal at 5% Significance Level							
26	<b>Data Not Normal at 5% Significance Level</b>											
27												
28	<b>Assuming Normal Distribution</b>											
29	<b>95% Normal UCL</b>						<b>95% UCLs (Adjusted for Skewness)</b>					
30	95% Student's-t UCL	47.12			95% Adjusted-CLT UCL (Chen-1995)			48.15				
31					95% Modified-t UCL (Johnson-1978)			47.34				
32												
33	<b>Gamma GOF Test</b>											
34	A-D Test Statistic	0.235			<b>Anderson-Darling Gamma GOF Test</b>							
35	5% A-D Critical Value	0.754			Detected data appear Gamma Distributed at 5% Significance Level							
36	K-S Test Statistic	0.129			<b>Kolmogrov-Smirnoff Gamma GOF Test</b>							
37	5% K-S Critical Value	0.18			Detected data appear Gamma Distributed at 5% Significance Level							
38	<b>Detected data appear Gamma Distributed at 5% Significance Level</b>											
39												
40	<b>Gamma Statistics</b>											
41	k hat (MLE)	2.155			k star (bias corrected MLE)			1.913				
42	Theta hat (MLE)	17.58			Theta star (bias corrected MLE)			19.79				
43	nu hat (MLE)	103.4			nu star (bias corrected)			91.84				
44	MLE Mean (bias corrected)	37.88			MLE Sd (bias corrected)			27.38				
45					Approximate Chi Square Value (0.05)			70.74				
46	Adjusted Level of Significance	0.0392			Adjusted Chi Square Value			69.44				
47												
48	<b>Assuming Gamma Distribution</b>											
49	95% Approximate Gamma UCL (use when n>=50)	49.17			95% Adjusted Gamma UCL (use when n<50)			50.09				
50												
51	<b>Lognormal GOF Test</b>											
52	Shapiro Wilk Test Statistic	0.969			<b>Shapiro Wilk Lognormal GOF Test</b>							
53	5% Shapiro Wilk Critical Value	0.916			Data appear Lognormal at 5% Significance Level							
54	Lilliefors Test Statistic	0.121			<b>Lilliefors Lognormal GOF Test</b>							
55	5% Lilliefors Critical Value	0.181			Data appear Lognormal at 5% Significance Level							
56	<b>Data appear Lognormal at 5% Significance Level</b>											
57												
58	<b>Lognormal Statistics</b>											
59	Minimum of Logged Data	1.548			Mean of logged Data			3.385				
60	Maximum of Logged Data	4.7			SD of logged Data			0.769				
61												
62	<b>Assuming Lognormal Distribution</b>											
63	95% H-UCL	56.9			90% Chebyshev (MVUE) UCL			59.02				
64	95% Chebyshev (MVUE) UCL	68.07			97.5% Chebyshev (MVUE) UCL			80.62				

	A	B	C	D	E	F	G	H	I	J	K	L
65	99% Chebyshev (MVUE) UCL					105.3						
66												
67	<b>Nonparametric Distribution Free UCL Statistics</b>											
68	<b>Data appear to follow a Discernible Distribution at 5% Significance Level</b>											
69												
70	<b>Nonparametric Distribution Free UCLs</b>											
71	95% CLT UCL					46.75	95% Jackknife UCL					47.12
72	95% Standard Bootstrap UCL					46.55	95% Bootstrap-t UCL					49.14
73	95% Hall's Bootstrap UCL					49.25	95% Percentile Bootstrap UCL					46.78
74	95% BCA Bootstrap UCL					48.19						
75	90% Chebyshev(Mean, Sd) UCL					54.06	95% Chebyshev(Mean, Sd) UCL					61.39
76	97.5% Chebyshev(Mean, Sd) UCL					71.57	99% Chebyshev(Mean, Sd) UCL					91.55
77												
78	<b>Suggested UCL to Use</b>											
79	95% Adjusted Gamma UCL					50.09						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulation results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												