TECHNICAL MEMORANDUM

Date:	January 3, 2014	**Project No.:**	073-93074-04.0400
To:	Joel Bolduc	**Company:**	Holcim (US) Inc.
From:	Douglas Morell, PhD, LHg		
cc:	Frank Shuri, PE; Sarah Morgan, PE	**Email:**	dmorell@golder.com
RE:	**RAVENSDALE SITE GROUNDWATER AND SURFACE WATER STATISTICAL CHARACTERIZATION ARSENIC BACKGROUND LEVEL EVALUATION**		

1.0 BACKGROUND

In the 1970s and early 1980s, cement kiln dust (CKD) was disposed of at two locations on the Ravensdale Site ([Site]; Figure 1), the Lower Disposal Area (LDA) and the Dale Strip Pit (DSP), as shown in Figure 2. As part of environmental monitoring of these areas, groundwater and surface water sampling and analysis have been conducted at the Site for over a decade for targeted constituents of potential concern (COPCs). Golder Associates Inc. (Golder) has been conducting this monitoring since 2009. All monitoring results have been submitted to the Seattle-King County Public Health Department (SKCPH) and the Washington State Department of Ecology.

The agencies have requested (SKCPH 2012) that the monitoring results be statistically evaluated for each COPC to determine whether COPC trends are evident in the long-term data. The methods and results of this trend analysis are described in Sections 2.0 through 4.0 below. The agencies have also requested a determination of the background concentration of arsenic at the site; this evaluation is discussed in Section 5.0 of this memorandum.

2.0 STATISTICAL APPROACH

The analytical results for groundwater and surface water at the Site were compiled by date and COPC (Golder 2013a). Figure 2 shows the location of the LDA and DSP disposal areas and associated monitoring wells and surface water sampling locations. The twenty (20) sampling locations are grouped into the following categories:

- LDA Surface Waters:
  - Still Well, South Pond, Weir, and Infiltration Ponds #1
- LDA Shallow Groundwater (unconfined groundwater system):
  - MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, and MW-6A
- LDA Bedrock Groundwater:
  - MWB-1LDA, MWB-2LDA, and MWB-3LDA

Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA
Tel: (425) 883-0777 Fax: (425) 882-5498 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation

- DSP Bedrock Groundwater:
  - MWB-1SDSP, MWB-1DDSP, MWB-2DSP, MWB-4DDSP, MWB-5DSP, MWB-6DSP, and Portal

The analytical results for each COPC were statistically evaluated for trends using the Mann-Kendall Trend Test and the upper 95% confidence level based on the upper 95% limit of the true means (UCL). For the designated background locations at the LDA (MW-4A and MWB-3LDA), the upper tolerance limits (UTL) at the 95% confidence level and the upper 95th percentile of the observed population were calculated.

US Environmental Protection Agency's (USEPA) ProUCL (Version 4.1.00) (USEPA 2010) was used to calculate the statistics on the data. Before the data was entered and run in ProUCL, the data was reviewed. For duplicate results, the arithmetic average was used and entered as a single value into ProUCL. Analytical non-detect data was entered into the statistical analysis as half the non-detect value. Because some of the COPCs (e.g., lead in LDA groundwater samples) had mostly non-detect concentrations or were only analyzed a few times, statistics were not run or evaluated on these particular COPCs at the associated locations. COPCs not evaluated for certain sampling locations are shown in Table 1 with the "ID" (insufficient data) designation.

Statistical evaluation includes determining the most appropriate distribution of individual sample data sets using an accepted "goodness of fit" test (D'Agostino 1971, Gilbert 1987). Once the most appropriate distribution of the results is determined, outliers that do not fit into the distribution are evaluated and in some cases removed from the data set (Rosner 1975). The distribution of individual data sets was evaluated in ProUCL and the distribution that best represented the individual data sets was used for subsequent statistical analyses. Outliers that were identified as potentially erroneous at a high confidence level were removed from the data set before input to ProUCL for trend and UCL/UTL calculations.

The only other modification of the raw analytical results was for bedrock well MWB-1LDA. Inspection of the data shows elevated arsenic levels in groundwater immediately after well installation. The concentration of arsenic in bedrock groundwater declined every monitoring period for several years and has become stable after 2010. It is reasonable to assume that potential arsenic sources have not changed, and arsenic mobility is not expected to remove arsenic from a distant source at the observed rate. A plausible and likely scenario consistent with the observed trend is cross-contamination from the shallow groundwater into the bedrock groundwater during drilling and well installation. Cross-contamination from the shallow groundwater would provide a limited mass of arsenic and other COPCs to the bedrock in the immediate vicinity of the MWB-1LDA borehole. With time, groundwater advection would dissipate and reduce COPC concentrations in a manner observed in the data from MWB-1LDA. Therefore, none of the MWB-1LDA groundwater data before 2010 was used in the statistical evaluations.

3.0 STATISTICAL ANALYTICAL RESULTS

Table 1 summarizes the statistical results. Of the 18 locations with sufficient arsenic data, 4 locations show an increasing trend, 4 locations show a decreasing trend, and 10 locations show no trend. Of the 19 locations with sufficient pH data, 2 locations show an increasing trend, 3 show a decreasing trend, and 14 locations show no trend. An overall assessment of the trend data in Table 1 indicates that, with the exception of iron in one well, there have been no increases in the measured parameters in bedrock groundwater at the LDA.

The ProUCL runs for each COPC are presented in Appendix A and are organized as follows:

- COPC (pH, arsenic, etc.)
  - LDA Surface Waters
    - Trend Evaluations
    - UCL/UTL Determinations
- LDA Shallow / Alluvial Groundwater
  - Trend Evaluations
  - UCL/UTL Determinations
- LDA Bedrock Groundwater
  - Trend Evaluations
  - UCL/UTL Determinations
- DSP Bedrock Groundwater
  - Trend Evaluations
  - UCL/UTL Determinations

4.0 GROUNDWATER FLOW AND BACKGROUND LOCATIONS

4.1 LDA

4.1.1 Groundwater

Groundwater quality from monitoring wells MW-4A and MWB-3LDA are considered representative of background for the LDA shallow (unconsolidated) groundwater system and for the LDA bedrock groundwater system, respectively. Groundwater flow in the shallow groundwater system is toward the northwest and in the bedrock system is north to northwest (Golder 2013b), which is consistent with the north-south striking and west dipping bedrock formations. Groundwater from MW-4A originates south and west of the LDA and does not appear to receive groundwater from the LDA. Bedrock groundwater in MWB-3LDA is south and just up-gradient of the LDA. The static groundwater elevation in bedrock well MWB-3LDA is higher than the groundwater elevation in the overlying shallow unconsolidated (i.e., alluvial) system. Thus, the bedrock system would not receive groundwater from the shallow system, but rather would be discharging some groundwater to the overlying shallow system. Although the location of

MWB-3LDA is very close to the LDA, the upward gradient would prevent groundwater in the bedrock near MWB-3LDA from being impacted by shallow groundwater.

4.1.2 Surface Water

Surface water west of the LDA basically flows toward the north within the broad valley. The South Pond is the surface water monitoring station that is furthest south and up-gradient, but it contains elevated pH water from the LDA. The monitoring network and data do not have an identified LDA background surface water monitoring station. Therefore, background levels for LDA surface water cannot be determined.

4.2 DSP

4.2.1 Groundwater

The bedrock groundwater system beneath the DSP is complex. The DSP bedrock strikes generally north-south and also dips westerly at a high angle. Historic coal mining was conducted in the bedrock below the DSP and is suspected to have an influence on groundwater flow patterns. The Portal to the mine is located just east of the access road to the LDA (north of the LDA). Groundwater discharging from the collapsed Portal is perennial and is regularly sampled. Groundwater from the historic coal mine workings is believed to discharge from the Portal and represents bedrock groundwater beneath the DSP. The historic mine workings and Portal could be a significant groundwater discharge path for the bedrock system beneath the DSP. Groundwater elevations in DSP bedrock wells show a downward vertical gradient (in nested wells, lower well screen elevations have lower groundwater elevations). Therefore, the conceptual model for the DSP bedrock groundwater system is groundwater flowing downward toward the mine workings and discharging from the mine Portal. This model has been observed in many underground mines and is also observed at the inactive Landsburg/Rogers coal mines approximately 2 miles northeast of the Site in the same bedrock formation as the Site. Although DSP bedrock groundwater is anticipated to be flowing vertically downward, there is probably some horizontal component to flow in the bedrock that is migrating parallel to bedding planes.

4.2.2 Surface Water

There is no surface water monitoring associated with the DSP.

5.0 ARSENIC CONCENTRATION AND PH LEVEL COMPARISONS TO BACKGROUND

Arsenic and pH are the two COPCs that are of most concern at the Site. Potential impacts in environmental media typically are assessed by comparing the UCL (the upper limit on the true means) of potentially impacted media with the UTL (upper percentile) of the background concentrations. If the UCL of potentially impacted media is less than the UTL of the background population, the potentially impacted media may not be distinguishable from the background population and typically is not considered to be impacted.

As shown in Table 1, for the LDA shallow, unconfined groundwater system in the alluvium, the arsenic UTL from background well MW-4A was 0.005 mg/l. Arsenic UCLs from wells MW-1A and MW-2A are 0.003 mg/l and 0.002 mg/l, respectively, both below the background UTL. This indicates that groundwater at these locations has not been impacted by arsenic. In the other shallow groundwater monitoring wells (MW-3A, MW-5A, MW-6A), arsenic UCLs ranged from 0.007 mg/l to 0.017 mg/l, indicating that the shallow unconfined groundwater system down-gradient of the LDA may be impacted with arsenic to a minor degree.

The pH UTL from the shallow groundwater background well is 6.91 standard units (SU), while the pH UCLs from MW-1A and MW-2A are 7.05 SU and 7.55 SU, respectively, suggesting that the pH of the shallow groundwater has been impacted to a slight degree. Similarly, pH UCLs from the other groundwater monitoring wells (MW-3A, MW-5A, MW-6A) range from 7.08 to 7.93, indicating that the pH of the shallow groundwater may be impacted to a minor degree.

For bedrock wells MWB-1LDA and MWB-2LDA, the arsenic UCLs were 0.007 mg/l and 0.023 mg/l, respectively, while the arsenic background concentration UTL (from well MWB-3LDA) was 0.028 mg/l. The pH UCLs were 6.64 and 7.70, while pH UTL was 8.31. For both parameters, the UCLs are below respective background UTL. Based on these results, there is no indication of arsenic or pH impacts from the LDA to underlying bedrock groundwater.

The manner in which arsenic may have been introduced to the shallow LDA groundwater system is unknown, but could be a result of naturally occurring arsenic in the unconsolidated soils becoming solubilized by elevated pH groundwater. The pH UCLs of the LDA shallow groundwater are also slightly higher than the UTL for MW-4A groundwater, which supports this interpretation. It should also be noted that arsenic UCLs for the shallow groundwater system are similar to those for the bedrock system, which is not considered impacted, suggesting a relatively high degree of variability in naturally-occurring arsenic concentrations (i.e., the UTLs).

GOLDER ASSOCIATES INC.

Frank S. Shuri

Frank S. Shuri, PE, LG, LEG
Principal, Senior Consultant

Douglas Morell, PhD, LG, LHG
Principal

Attachments:

Table 1	Statistical and Trend Analysis
Figure1	Vicinity Map
Figure 2	Site Plan
Appendix A	ProUCL Statistical Results

FSS/DJM/sb

Golder Associates

6.0 REFERENCES

D'Agostino, R. B. 1971. "An Omnibus Test of Normality for Moderate and Large Size Samples". ***Biometrika***. Volume 58. pages 341-348.

Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold. New York, New York.

Golder Associates Inc. (Golder). 2013a. *Quarterly Monitoring Report – First Quarter*: Ravensdale Site. Prepared for Holcim (US), Inc., March 13.

Golder. 2013b. *Lower Disposal Area Hydrogeological Investigations: Ravensdale Site*. Prepared for Holcim (US), Inc., June 11.

Rosner, B. 1975. "On the Detection of Many Outliers". ***Technometrics***. Volume 17. pages 221-227.

Seattle-King County Public Health Department. 2012. *Approval Letter: Request for Public Health Variance, Reserve Silica Corporation, Service Request SR1221672*, May 16.

US Environmental Protection Agency. (USEPA). 2010. *ProUCL Version 4.1.00. Statistical Software for Environmental Applications – Technical Guide*. EPA/600/R-07/041.

TABLE

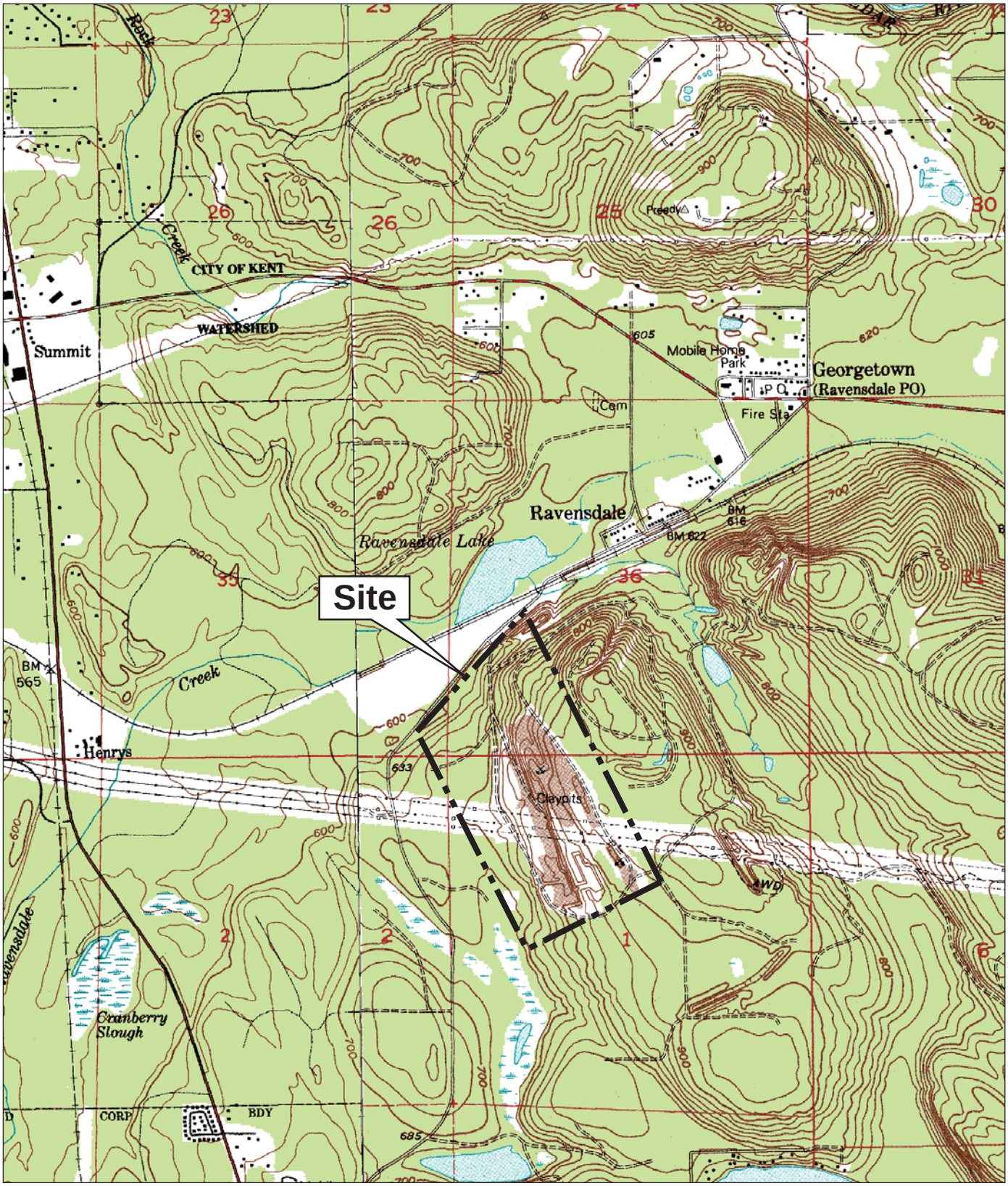
Table 1: Statistical and Trend Analysis Lower Disposal Area (LDA) and Dale Strip Pit (DSP) Sampling Locations Ravensdale Site, Ravensdale, Washington

		Arsenic		pH		TDS		Iron		Manganese		Potassium		Lead	
Sample Area	**Sample Location ID**	**Trend Observed**	**UCL (mg/L)**	**Trend Observed**	**UCL (mg/L)**	**Trend Observed**	**UCL (mg/L)**	**Trend Observed**	**UCL (mg/L)**	**Trend Observed**	**UCL (mg/L)**	**Trend Observed**	**UCL (mg/L)**	**Trend Observed**	**UCL (mg/L)**
LDA - Shallow/Alluvial Groundwater	MW-1A	None	0.0028	None	7.05	↓	412	ID	ID	↓	0.018	↓	30	ID	ID
	MW-2A	↑	0.0018	↓	7.55	↓	462	ID	ID	↓	0.10	↓	50	ID	ID
	MW-3A	None	0.0070	None	7.08	↓	852	None	5.80	↓	2.4	↑	69	ID	ID
	MW-4A	↑	***UTL 0.005***	None	***UTL 6.91***	↓	***UTL 318***	ID	ID	↓	***UTL 0.19***	None	1.6	ID	ID
	MW-5A	None	0.017	None	7.93	None	544	ID	ID	↓	0.20	↑	129	ID	ID
	MW-6A	↑	0.015	None	7.68	None	555	ID	ID	None	0.23	None	113	ID	ID
LDA - Bedrock Groundwater	MWB-1LDA[a]	↓	0.023	None	7.70	None	241	None	0.14	None	0.056	↓	1.30	ID	ID
	MWB-2LDA	↓	0.007	None	7.64	None	210	↑	0.28	↓	0.026	↓	1.40	ID	ID
	MWB-3LDA	None	***UTL 0.028***	↓	***UTL 8.31***	↓	***UTL 283***	None	0.47	↓	0.090	↓	4.5	ID	ID
LDA- Surface Water	South Pond	↓	0.14	↓	10.90	↓	4040	↑	2.4	None	0.10	↓	694	None	0.039
	Still Well	↑	0.12	None	12.10	None	3240	ID	ID	ID	ID	None	846	↑	0.016
	Weir	None	0.16	None	10.40	None	1840	None	0.93	None	0.15	None	570	None	0.017
	Infiltration #1	None	0.090	↑	9.66	None	908	None	0.47	↑	0.047	None	306	↑	0.0052
DSP Bedrock Groundwater	MWB-1S DSP	None	0.008	None	7.07	↑	1130	NA	NA	NA	NA	None	5.8	ID	ID
	MWB-1D DSP	None	0.004	↑	7.61	↑	505	NA	NA	NA	NA	None	3.3	ID	ID
	MWB-2 DSP	NA	NA	None	6.95	↓	475	NA	NA	NA	NA	NA	NA	ID	ID
	MWB-4S DSP	NA	NA	ID	ID	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MWB-5D DSP	None	0.005	None	7.02	None	598	NA	NA	NA	NA	ID	ID	ID	ID
	MWB-6 DSP	↓	0.004	None	7.29	↓	374	NA	NA	NA	NA	None	1.4	ID	ID
	Portal DSP	None	0.004	None	7.38	↓	544	NA	NA	NA	NA	↓	36	ID	ID

Sample locations in bold and italics are interpreted to be background locations.

UTL	Upper Tolerance Limit
UCL	Upper Confidence Limit
mg/L	Milligrams per liter
NA	Not Analyzed
ID	Insufficient Data for Statistics
NN	Not Necessary - No Standard
a	Only data from 2010 and after used in the statistical analayses

FIGURES



Source: USGS 7.5 Minute Topographic Quadrangle Map, Cumberland, WA, 1993, Black Diamond, WA, 1994

FIGURE **1**

VICINITY MAP

HOLCIM/GROUNDWATER MONITORING/WA

NOTES

1. BASE TOPOGRAPHY OUTSIDE OF LDA FOOTPRINT PREPARED BY AERO-METRIC, INC., SEATTLE, WA FROM AERIAL PHOTOS FLOWN ON FEBRUARY 10, 2007.

   HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD 27 US FEET
   VERTICAL DATUM: NGVD 29
   CONTOUR INTERVAL: 5 FT

2. BASE TOPOGRAPHY INSIDE OF LDA FOOTPRINT PREPARED BY PACIFIC GEOMATIC SERVICES, INC., MOUNTLAKE TERRACE, WA FROM FIELD DATA TAKEN ON NOVEMBER 1, 2007.

   HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD 27 US FEET
   VERTICAL DATUM: NGVD 29
   CONTOUR INTERVAL: 1 FT

3. BASE TOPOGRAPHY INSIDE OF DSP FOOTPRINT PREPARED BY PARAMETRIX, INC., BELLEVUE, WA FROM FIELD DATA TAKEN ON JULY 6, 2011.

   HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE, NAD 27 US FEET
   VERTICAL DATUM: NGVD 29
   CONTOUR INTERVAL: 1 FT

4. MONITORING INCLUDES ONLY WATER LEVELS AND FIELD PARAMETERS.

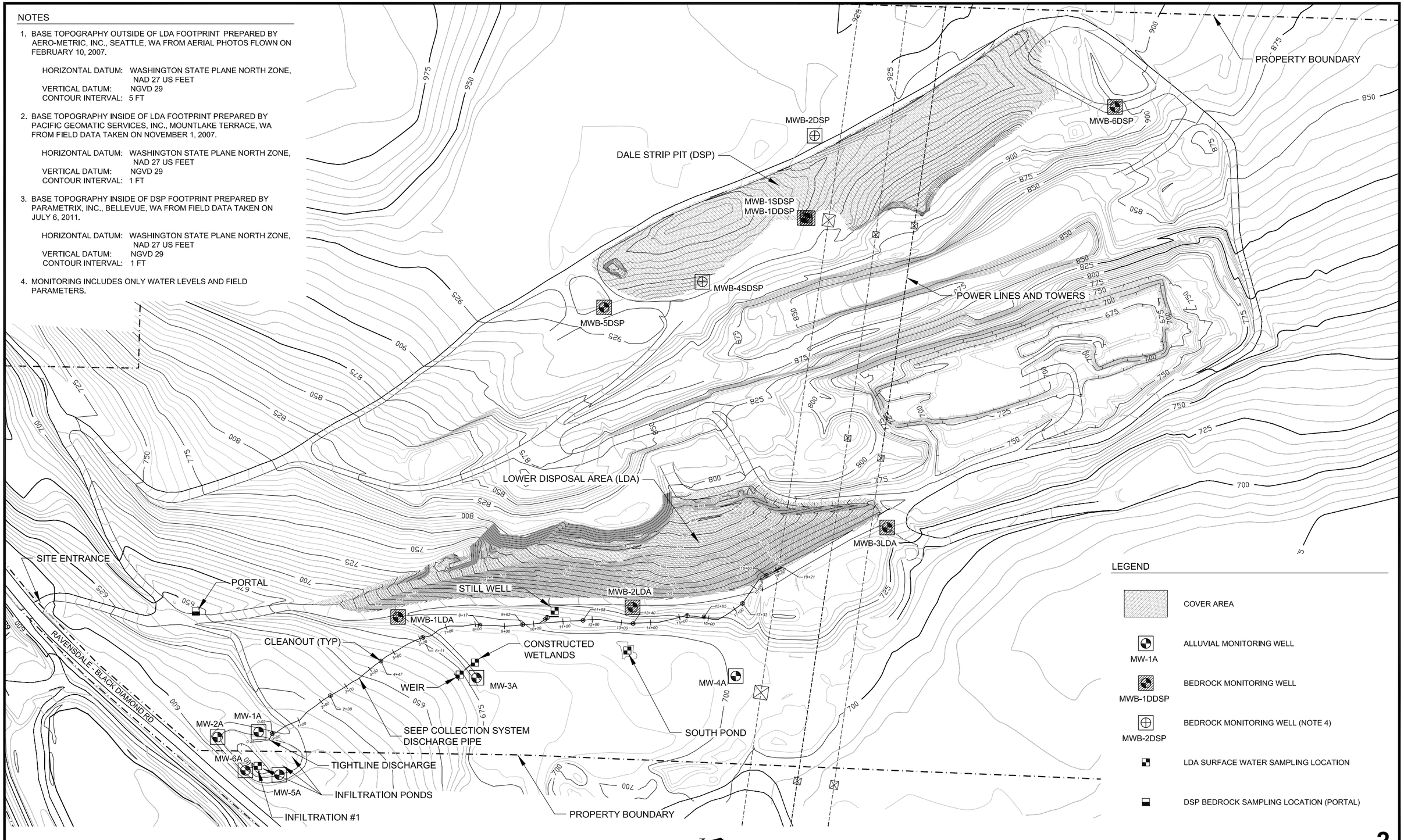


FIGURE **2**

SITE PLAN

HOLCIM / RAVENSDALE PROJECT / WA

Golder Associates

APPENDIX A
ProUCL STATISTICAL RESULTS

As

LDA SURFACE WATER

TREND EVALUATIONS

South Pond Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/5/2013 12:20
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	57
Minimum	0.00598
Maximum	0.34
Mean	0.126
Geometric Mean	0.0969
Median	0.12
Standard Deviation	0.0821
SEM	0.0109

Mann-Kendall Test	
Test Value (S)	-403
Critical Value (0.05)	-1.645
Standard Deviation of S	145.2
Standardized Value of S	-2.768
Approximate p-value	0.00282

Statistically significant evidence of a decreasing trend at the specified level of significance.

Still Well Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/5/2013 12:44
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	59
Minimum	0.00236
Maximum	0.43
Mean	0.0822
Geometric Mean	0.0578
Median	0.065
Standard Deviation	0.0706
SEM	0.00919

Mann-Kendall Test	
Test Value (S)	345
Critical Value (0.05)	1.645
Standard Deviation of S	152.9
Standardized Value of S	2.25
Approximate p-value	0.0122

Statistically significant evidence of an increasing trend at the specified level of significance.

Weir Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/5/2013 12:29	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	57
Minimum	0.027
Maximum	0.287
Mean	0.148
Geometric Mean	0.138
Median	0.131
Standard Deviation	0.0543
SEM	0.0072

Mann-Kendall Test	
Test Value (S)	68
Critical Value (0.05)	1.645
Standard Deviation of S	145.2
Standardized Value of S	0.462
Approximate p-value	0.322

Insufficient evidence to identify a significant trend at the specified level of significance.

Infiltration Pond #1 Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/5/2013 12:37	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	59
Minimum	0.0133
Maximum	0.196
Mean	0.083
Geometric Mean	0.074
Median	0.0776
Standard Deviation	0.0378
SEM	0.00492

Mann-Kendall Test	
Test Value (S)	122
Critical Value (0.05)	1.645
Standard Deviation of S	152.9
Standardized Value of S	0.791
Approximate p-value	0.214

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

South Pond Arsenic UCL_ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	57	Number of Distinct Observations	53
Raw Statistics		Log-transformed Statistics	
Minimum	0.00598	Minimum of Log Data	-5.119
Maximum	0.34	Maximum of Log Data	-1.079
Mean	0.126	Mean of log Data	-2.334
Geometric Mean	0.0969	SD of log Data	0.82
Median	0.12		
SD	0.0821		
Std. Error of Mean	0.0109		
Coefficient of Variation	0.652		
Skewness	0.784		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.116	Lilliefors Test Statistic	0.129
Lilliefors Critical Value	0.117	Lilliefors Critical Value	0.117
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.144	95% H-UCL	0.171
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.206
95% Adjusted-CLT UCL (Chen-1995)	0.145	97.5% Chebyshev (MVUE) UCL	0.237
95% Modified-t UCL (Johnson-1978)	0.144	99% Chebyshev (MVUE) UCL	0.299
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.96	Data appear Normal at 5% Significance Level	
Theta Star	0.0643		
MLE of Mean	0.126		
MLE of Standard Deviation	0.09		
nu star	223.4		
Approximate Chi Square Value (.05)	189.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0458	95% CLT UCL	0.144
Adjusted Chi Square Value	189	95% Jackknife UCL	0.144
		95% Standard Bootstrap UCL	0.144
Anderson-Darling Test Statistic	0.268	95% Bootstrap-t UCL	0.146
Anderson-Darling 5% Critical Value	0.763	95% Hall's Bootstrap UCL	0.145
Kolmogorov-Smirnov Test Statistic	0.0925	95% Percentile Bootstrap UCL	0.144
Kolmogorov-Smirnov 5% Critical Value	0.119	95% BCA Bootstrap UCL	0.144
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.173
		97.5% Chebyshev(Mean, Sd) UCL	0.194
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.234
95% Approximate Gamma UCL (Use when n >= 40)	0.148		
95% Adjusted Gamma UCL (Use when n < 40)	0.149		
Potential UCL to Use		Use 95% Student's-t UCL	0.144

Still Well Arsenic UCL_ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	57
Raw Statistics		Log-transformed Statistics	
Minimum	0.00236	Minimum of Log Data	-6.049
Maximum	0.43	Maximum of Log Data	-0.844
Mean	0.0822	Mean of log Data	-2.85
Geometric Mean	0.0578	SD of log Data	0.985
Median	0.065		
SD	0.0706		
Std. Error of Mean	0.00919		
Coefficient of Variation	0.859		
Skewness	2.709		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.198	Lilliefors Test Statistic	0.181
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	0.0976	95% H-UCL	0.127
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.154
95% Adjusted-CLT UCL (Chen-1995)	0.101	97.5% Chebyshev (MVUE) UCL	0.18
95% Modified-t UCL (Johnson-1978)	0.0981	99% Chebyshev (MVUE) UCL	0.232
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.499	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0549		
MLE of Mean	0.0822		
MLE of Standard Deviation	0.0672		
nu star	176.9		
Approximate Chi Square Value (.05)	147.1	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	0.0973
Adjusted Chi Square Value	146.4	95% Jackknife UCL	0.0976
		95% Standard Bootstrap UCL	0.0969
Anderson-Darling Test Statistic	0.983	95% Bootstrap-t UCL	0.105
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	0.109
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL	0.099
Kolmogorov-Smirnov 5% Critical Value	0.118	95% BCA Bootstrap UCL	0.102
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.122
		97.5% Chebyshev(Mean, Sd) UCL	0.14
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.174
95% Approximate Gamma UCL (Use when n >= 40)	0.0989		
95% Adjusted Gamma UCL (Use when n < 40)	0.0993		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	0.122

Weir Arsenic UCL_ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	57	Number of Distinct Observations	45
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.027	Minimum of Log Data	-3.612
Maximum	0.287	Maximum of Log Data	-1.248
Mean	0.148	Mean of log Data	-1.98
Geometric Mean	0.138	SD of log Data	0.397
Median	0.131		
SD	0.0543		
Std. Error of Mean	0.0072		
Coefficient of Variation	0.367		
Skewness	0.679		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.164	Lilliefors Test Statistic	0.1
Lilliefors Critical Value	0.117	Lilliefors Critical Value	0.117
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	0.16	95% H-UCL	0.165
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.185
95% Adjusted-CLT UCL (Chen-1995)	0.161	97.5% Chebyshev (MVUE) UCL	0.2
95% Modified-t UCL (Johnson-1978)	0.16	99% Chebyshev (MVUE) UCL	0.23
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.902	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	0.0215		
MLE of Mean	0.148		
MLE of Standard Deviation	0.0564		
nu star	786.8		
Approximate Chi Square Value (.05)	722.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0458	95% CLT UCL	0.16
Adjusted Chi Square Value	721.1	95% Jackknife UCL	0.16
		95% Standard Bootstrap UCL	0.16
Anderson-Darling Test Statistic	0.776	95% Bootstrap-t UCL	0.161
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	0.161
Kolmogorov-Smirnov Test Statistic	0.116	95% Percentile Bootstrap UCL	0.161
Kolmogorov-Smirnov 5% Critical Value	0.118	95% BCA Bootstrap UCL	0.161
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.18
		97.5% Chebyshev(Mean, Sd) UCL	0.193
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.22
95% Approximate Gamma UCL (Use when n >= 40)	0.161		
95% Adjusted Gamma UCL (Use when n < 40)	0.162		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.161

Infiltration Pond #1 Arsenic UCL_ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	53
Raw Statistics		Log-transformed Statistics	
Minimum	0.0133	Minimum of Log Data	-4.32
Maximum	0.196	Maximum of Log Data	-1.63
Mean	0.083	Mean of log Data	-2.603
Geometric Mean	0.074	SD of log Data	0.513
Median	0.0776		
SD	0.0378		
Std. Error of Mean	0.00492		
Coefficient of Variation	0.456		
Skewness	0.726		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.125	Lilliefors Test Statistic	0.128
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	0.0912	95% H-UCL	0.0959
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.11
95% Adjusted-CLT UCL (Chen-1995)	0.0916	97.5% Chebyshev (MVUE) UCL	0.121
95% Modified-t UCL (Johnson-1978)	0.0913	99% Chebyshev (MVUE) UCL	0.143
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.325	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.0192		
MLE of Mean	0.083		
MLE of Standard Deviation	0.0399		
nu star	510.4		
Approximate Chi Square Value (.05)	459	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	0.0911
Adjusted Chi Square Value	457.8	95% Jackknife UCL	0.0912
		95% Standard Bootstrap UCL	0.0909
Anderson-Darling Test Statistic	0.388	95% Bootstrap-t UCL	0.0921
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	0.0921
Kolmogorov-Smirnov Test Statistic	0.0957	95% Percentile Bootstrap UCL	0.0909
Kolmogorov-Smirnov 5% Critical Value	0.116	95% BCA Bootstrap UCL	0.0916
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.104
		97.5% Chebyshev(Mean, Sd) UCL	0.114
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.132
95% Approximate Gamma UCL (Use when n >= 40)	0.0922		
95% Adjusted Gamma UCL (Use when n < 40)	0.0925		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.0922

LDA SHALLOW GROUNDWATER

TREND EVALUATIONS

MW-1A Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	1/31/2013 16:53
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	37
Minimum	6.40E-04
Maximum	0.00847
Mean	0.00245
Geometric Mean	0.0022
Median	0.0023
Standard Deviation	0.00132
SEM	2.18E-04

Mann-Kendall Test	
Test Value (S)	-120
Critical Value (0.05)	-1.645
Standard Deviation of S	76.36
Standardized Value of S	-1.558
Approximate p-value	0.0596

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-2A Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	1/31/2013 17:01
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	37
Minimum	0.001
Maximum	0.0039
Mean	0.00158
Geometric Mean	0.00146
Median	0.0013
Standard Deviation	7.09E-04
SEM	1.17E-04

Mann-Kendall Test	
Test Value (S)	220
Critical Value (0.05)	1.645
Standard Deviation of S	76.17
Standardized Value of S	2.875
Approximate p-value	0.00202

Statistically significant evidence of an increasing trend at the specified level of significance.

MW-3A Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	1/31/2013 16:57
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	30
Minimum	0.001
Maximum	0.013
Mean	0.00635
Geometric Mean	0.00547
Median	0.00547
Standard Deviation	0.00329
SEM	6.01E-04

Mann-Kendall Test	
Test Value (S)	-36
Critical Value (0.05)	-1.645
Standard Deviation of S	56.02
Standardized Value of S	-0.625
Approximate p-value	0.266

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-4A Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/1/2013 8:49
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	47
Minimum	3.50E-04
Maximum	0.0048
Mean	9.07E-04
Geometric Mean	7.04E-04
Median	5.00E-04
Standard Deviation	8.93E-04
SEM	1.30E-04

Mann-Kendall Test	
Test Value (S)	336
Critical Value (0.05)	1.645
Standard Deviation of S	89.87
Standardized Value of S	3.728
Approximate p-value	9.66E-05

Statistically significant evidence of an increasing trend at the specified level of significance.

MW-5A-Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	1/31/2013 16:49	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	36
Minimum	7.60E-04
Maximum	0.063
Mean	0.0125
Geometric Mean	0.00675
Median	0.00765
Standard Deviation	0.0147
SEM	0.00245

Mann-Kendall Test	
Test Value (S)	47
Critical Value (0.05)	1.645
Standard Deviation of S	73.41
Standardized Value of S	0.627
Approximate p-value	0.265

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-6A Arsenic Trend Test - Mann Kendall (ProUCL)

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	1/31/2013 16:37
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	37
Minimum	2.80E-04
Maximum	0.047
Mean	0.0107
Geometric Mean	0.00536
Median	0.0062
Standard Deviation	0.0122
SEM	0.00201

Mann-Kendall Test	
Test Value (S)	207
Critical Value (0.05)	1.645
Standard Deviation of S	76.42
Standardized Value of S	2.696
Approximate p-value	0.00351

Statistically significant evidence of an increasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MW - 1A Arsenic UTL with all data (ProUCL)

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

C1

General Statistics			
Number of Valid Observations	37	Number of Distinct Observations	29
Raw Statistics		**Log-transformed Statistics**	
Minimum	6.40E-04	Minimum of Log Data	-7.354
Maximum	0.00847	Maximum of Log Data	-4.771
Mean	0.00245	Mean of log Data	-6.118
Geometric Mean	0.0022	SD of log Data	0.459
Median	0.0023		
SD	0.00132		
Std. Error of Mean	2.18E-04		
Coefficient of Variation	0.54		
Skewness	2.856		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.744	Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
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	0.00282	95% H-UCL	0.00283
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00327
95% Adjusted-CLT UCL (Chen-1995)	0.00292	97.5% Chebyshev (MVUE) UCL	0.00363
95% Modified-t UCL (Johnson-1978)	0.00283	99% Chebyshev (MVUE) UCL	0.00434

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.5	Data appear Lognormal at 5% Significance Level	
Theta Star	5.44E-04		
MLE of Mean	0.00245		
MLE of Standard Deviation	0.00115		
nu star	333		
Approximate Chi Square Value (.05)	291.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0431	95% CLT UCL	0.00281
Adjusted Chi Square Value	290	95% Jackknife UCL	0.00282
		95% Standard Bootstrap UCL	0.00279
Anderson-Darling Test Statistic	1.207	95% Bootstrap-t UCL	0.00302
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	0.00469
Kolmogorov-Smirnov Test Statistic	0.199	95% Percentile Bootstrap UCL	0.00284
Kolmogorov-Smirnov 5% Critical Value	0.145	95% BCA Bootstrap UCL	0.00293
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0034
		97.5% Chebyshev(Mean, Sd) UCL	0.00381
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.00461
95% Approximate Gamma UCL (Use when n >= 40)	0.0028		
95% Adjusted Gamma UCL (Use when n < 40)	0.00281		

Potential UCL to Use		
	Use 95% Student's-t UCL	0.00282
	or 95% Modified-t UCL	0.00283
	or 95% H-UCL	0.00283

MW - 2A Arsenic UTL with all data (ProUCL)

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

C0

General Statistics			
Number of Valid Observations	37	Number of Distinct Observations	23
Raw Statistics		Log-transformed Statistics	
Minimum	0.001	Minimum of Log Data	-6.908
Maximum	0.0039	Maximum of Log Data	-5.547
Mean	0.00158	Mean of log Data	-6.528
Geometric Mean	0.00146	SD of log Data	0.377
Median	0.0013		
SD	7.09E-04		
Std. Error of Mean	1.17E-04		
Coefficient of Variation	0.449		
Skewness	1.655		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.781	Shapiro Wilk Test Statistic	0.862
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
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	0.00178	95% H-UCL	0.00176
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.002
95% Adjusted-CLT UCL (Chen-1995)	0.0018	97.5% Chebyshev (MVUE) UCL	0.00219
95% Modified-t UCL (Johnson-1978)	0.00178	99% Chebyshev (MVUE) UCL	0.00256
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	6.119	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2.58E-04		
MLE of Mean	0.00158		
MLE of Standard Deviation	6.38E-04		
nu star	452.8		
Approximate Chi Square Value (.05)	404.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0431	95% CLT UCL	0.00177
Adjusted Chi Square Value	402.5	95% Jackknife UCL	0.00178
		95% Standard Bootstrap UCL	0.00177
Anderson-Darling Test Statistic	2.087	95% Bootstrap-t UCL	0.00181
Anderson-Darling 5% Critical Value	0.75	95% Hall's Bootstrap UCL	0.0018
Kolmogorov-Smirnov Test Statistic	0.19	95% Percentile Bootstrap UCL	0.00178
Kolmogorov-Smirnov 5% Critical Value	0.145	95% BCA Bootstrap UCL	0.00181
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.00209
		97.5% Chebyshev(Mean, Sd) UCL	0.00231
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.00274
95% Approximate Gamma UCL (Use when n >= 40)	0.00177		
95% Adjusted Gamma UCL (Use when n < 40)	0.00178		
Potential UCL to Use		Use 95% Student's-t UCL	0.00178
		or 95% Modified-t UCL	0.00178

MW - 3A Arsenic UTL with all data (ProUCL)

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

C0

General Statistics			
Number of Valid Observations	30	Number of Distinct Observations	28
Raw Statistics		Log-transformed Statistics	
Minimum	0.001	Minimum of Log Data	-6.908
Maximum	0.013	Maximum of Log Data	-4.343
Mean	0.00635	Mean of log Data	-5.208
Geometric Mean	0.00547	SD of log Data	0.592
Median	0.00547		
SD	0.00329		
Std. Error of Mean	6.01E-04		
Coefficient of Variation	5.18E-01		
Skewness	0.507		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.941	Shapiro Wilk Test Statistic	0.953
Shapiro Wilk Critical Value	0.927	Shapiro Wilk Critical Value	0.927
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	0.00738	95% H-UCL	0.00815
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00971
95% Adjusted-CLT UCL (Chen-1995)	0.0074	97.5% Chebyshev (MVUE) UCL	0.0111
95% Modified-t UCL (Johnson-1978)	0.00739	99% Chebyshev (MVUE) UCL	0.0139
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.176	Data appear Normal at 5% Significance Level	
Theta Star	0.002		
MLE of Mean	0.00635		
MLE of Standard Deviation	0.00357		
nu star	190.6		
Approximate Chi Square Value (.05)	159.6	Nonparametric Statistics	
Adjusted Level of Significance	0.041	95% CLT UCL	0.00734
Adjusted Chi Square Value	158	95% Jackknife UCL	0.00738
		95% Standard Bootstrap UCL	0.00732
Anderson-Darling Test Statistic	0.25	95% Bootstrap-t UCL	0.00742
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	0.0074
Kolmogorov-Smirnov Test Statistic	0.0894	95% Percentile Bootstrap UCL	0.00732
Kolmogorov-Smirnov 5% Critical Value	0.161	95% BCA Bootstrap UCL	0.00742
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.00898
		97.5% Chebyshev(Mean, Sd) UCL	0.0101
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0123
95% Approximate Gamma UCL (Use when n >= 40)	0.00759		
95% Adjusted Gamma UCL (Use when n < 40)	0.00766		

Potential UCL to Use	Use 95% Student's-t UCL	0.00738

MW - 4A Arsenic UTL with all data (ProUCL)

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C1

General Statistics			
Total Number of Observations	45	Number of Distinct Observations	11
Tolerance Factor	1.662		
Raw Statistics		Log-Transformed Statistics	
Minimum	3.50E-04	Minimum	-7.958
Maximum	0.0048	Maximum	-5.339
Second Largest	0.0036	Second Largest	-5.627
First Quartile	5.00E-04	First Quartile	-7.601
Median	5.00E-04	Median	-7.601
Third Quartile	0.001	Third Quartile	-6.908
Mean	9.14E-04	Mean	-7.259
Geometric Mean	7.04E-04	SD	0.632
SD	9.11E-04		
Coefficient of Variation	0.996		
Skewness	2.772		
Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.557	Shapiro Wilk Test Statistic	0.663
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	0.00243	95% UTL with 90% Coverage	0.00201
95% UPL (t)	0.00246	95% UPL (t)	0.00206
90% Percentile (z)	0.00208	90% Percentile (z)	0.00158
95% Percentile (z)	0.00241	95% Percentile (z)	0.00199
99% Percentile (z)	0.00303	99% Percentile (z)	0.00306
Gamma Distribution Test		Data Distribution Test	
k star	1.935	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4.73E-04		
MLE of Mean	9.14E-04		
MLE of Standard Deviation	6.57E-04		
nu star	174.2		
A-D Test Statistic	7.651	Nonparametric Statistics	
5% A-D Critical Value	0.76	90% Percentile	0.00214
K-S Test Statistic	0.418	95% Percentile	0.0025
5% K-S Critical Value	0.133	99% Percentile	0.00427
Data not Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	0.0025
90% Percentile	0.00179	95% Percentile Bootstrap UTL with 90% Coverage	0.00316
95% Percentile	0.00219	95% BCA Bootstrap UTL with 90% Coverage	0.0025
99% Percentile	0.00308	95% UPL	0.00327
		95% Chebyshev UPL	0.00493
95% WH Approx. Gamma UPL	0.00217	Upper Threshold Limit Based upon IQR	0.00175
95% HW Approx. Gamma UPL	0.00214		
95% WH Approx. Gamma UTL with 90% Coverage	0.00213		
95% HW Approx. Gamma UTL with 90% Coverage	0.0021		

MW - 5A Arsenic UCL with all data (ProUCL)

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

C0

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	35
Raw Statistics		Log-transformed Statistics	
Minimum	7.60E-04	Minimum of Log Data	-7.182
Maximum	0.063	Maximum of Log Data	-2.765
Mean	0.0125	Mean of log Data	-4.998
Geometric Mean	0.00675	SD of log Data	1.173
Median	0.00765		
SD	0.0147		
Std. Error of Mean	0.00245		
Coefficient of Variation	1.182		
Skewness	2.075		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.738	Shapiro Wilk Test Statistic	0.968
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
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	0.0166	95% H-UCL	0.0224
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0264
95% Adjusted-CLT UCL (Chen-1995)	0.0174	97.5% Chebyshev (MVUE) UCL	0.0322
95% Modified-t UCL (Johnson-1978)	0.0167	99% Chebyshev (MVUE) UCL	0.0436
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.889	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.014		
MLE of Mean	0.0125		
MLE of Standard Deviation	0.0132		
nu star	64		
Approximate Chi Square Value (.05)	46.59	Nonparametric Statistics	
Adjusted Level of Significance	0.0428	95% CLT UCL	0.0165
Adjusted Chi Square Value	45.92	95% Jackknife UCL	0.0166
		95% Standard Bootstrap UCL	0.0165
Anderson-Darling Test Statistic	0.524	95% Bootstrap-t UCL	0.0181
Anderson-Darling 5% Critical Value	0.779	95% Hall's Bootstrap UCL	0.0183
Kolmogorov-Smirnov Test Statistic	0.11	95% Percentile Bootstrap UCL	0.0167
Kolmogorov-Smirnov 5% Critical Value	0.151	95% BCA Bootstrap UCL	0.0176
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0231
		97.5% Chebyshev(Mean, Sd) UCL	0.0278
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0369
95% Approximate Gamma UCL (Use when n >= 40)	0.0171		
95% Adjusted Gamma UCL (Use when n < 40)	0.0174		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.0171

MW - 6A Arsenic UCL with all data (ProUCL)

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

C0

General Statistics			
Number of Valid Observations	37	Number of Distinct Observations	33
Raw Statistics		Log-transformed Statistics	
Minimum	2.80E-04	Minimum of Log Data	-8.181
Maximum	0.047	Maximum of Log Data	-3.058
Mean	0.0107	Mean of log Data	-5.229
Geometric Mean	0.00536	SD of log Data	1.289
Median	0.0062		
SD	0.0122		
Std. Error of Mean	0.00201		
Coefficient of Variation	1.149		
Skewness	1.761		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.765	Shapiro Wilk Test Statistic	0.959
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
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	0.0141	95% H-UCL	0.0222
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0254
95% Adjusted-CLT UCL (Chen-1995)	0.0146	97.5% Chebyshev (MVUE) UCL	0.0312
95% Modified-t UCL (Johnson-1978)	0.0141	99% Chebyshev (MVUE) UCL	0.0427
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.805	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.0132		
MLE of Mean	0.0107		
MLE of Standard Deviation	0.0119		
nu star	59.54		
Approximate Chi Square Value (.05)	42.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0431	95% CLT UCL	0.014
Adjusted Chi Square Value	42.18	95% Jackknife UCL	0.0141
		95% Standard Bootstrap UCL	0.0139
Anderson-Darling Test Statistic	0.634	95% Bootstrap-t UCL	0.0147
Anderson-Darling 5% Critical Value	0.783	95% Hall's Bootstrap UCL	0.0147
Kolmogorov-Smirnov Test Statistic	0.134	95% Percentile Bootstrap UCL	0.014
Kolmogorov-Smirnov 5% Critical Value	0.15	95% BCA Bootstrap UCL	0.0145
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0194
		97.5% Chebyshev(Mean, Sd) UCL	0.0232
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0307
95% Approximate Gamma UCL (Use when n >= 40)	0.0148		
95% Adjusted Gamma UCL (Use when n < 40)	0.015		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.0148

LDA BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1LDA Arsenic Trend_ProUCL (data after 2010)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/1/2013 8:59
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	12
Minimum	0.015
Maximum	0.027
Mean	0.0213
Geometric Mean	0.021
Median	0.022
Standard Deviation	0.00325
SEM	9.38E-04

Mann-Kendall Test	
Test Value (S)	-38
Tabulated p-value	0.004
Standard Deviation of S	14.28
Standardized Value of S	-2.591
Approximate p-value	0.00479

Statistically significant evidence of a decreasing trend at the specified level of significance.

MWB-1LDA Arsenic Trend_ProUCL (all data)

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	25
Minimum	0.015
Maximum	0.16
Mean	0.0519
Geometric Mean	0.0395
Median	0.027
Standard Deviation	0.0422
SEM	0.00844

Mann-Kendall Test	
Test Value (S)	-267
Critical Value (0.05)	-1.645
Standard Deviation of S	42.7
Standardized Value of S	-6.229
Approximate p-value	2.35E-10

Statistically significant evidence of a decreasing trend at the specified level of significance.

MWB-2LDA Arsenic - Mann-Kendall Trend Analysis

	Mann-Kendall Trend Test Analysis	
User Selected Options		
Date/Time of Computation	1/30/2013 17:06	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	25
Minimum	0.0025
Maximum	0.0088
Mean	0.00609
Geometric Mean	0.00582
Median	0.00636
Standard Deviation	0.00162
SEM	3.24E-04

Mann-Kendall Test	
Test Value (S)	-80
Critical Value (0.05)	-1.645
Standard Deviation of S	42.76
Standardized Value of S	-1.847
Approximate p-value	0.0323

Statistically significant evidence of a decreasing trend at the specified level of significance.

MWB-3LDA Arsenic Trend_ProUCL (all data)

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	2/1/2013 9:03
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	37
Minimum	0.011
Maximum	0.0379
Mean	0.02
Geometric Mean	0.0196
Median	0.019
Standard Deviation	0.00453
SEM	7.46E-04

Mann-Kendall Test	
Test Value (S)	-19
Critical Value (0.05)	-1.645
Standard Deviation of S	76.38
Standardized Value of S	-0.236
Approximate p-value	0.407

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1LDA Arsenic UCL with all data (ProUCL)

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

C1

General Statistics			
Number of Valid Observations	25	Number of Distinct Observations	21
Raw Statistics		Log-transformed Statistics	
Minimum	0.015	Minimum of Log Data	-4.2
Maximum	0.16	Maximum of Log Data	-1.833
Mean	0.0519	Mean of log Data	-3.231
Geometric Mean	0.0395	SD of log Data	0.733
Median	0.027		
SD	0.0422		
Std. Error of Mean	0.00844		
Coefficient of Variation	0.813		
Skewness	1.403		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.793	Shapiro Wilk Test Statistic	0.896
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	0.0664	95% H-UCL	0.0716
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0862
95% Adjusted-CLT UCL (Chen-1995)	0.0684	97.5% Chebyshev (MVUE) UCL	0.101
95% Modified-t UCL (Johnson-1978)	0.0668	99% Chebyshev (MVUE) UCL	0.131
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.766	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0294		
MLE of Mean	0.0519		
MLE of Standard Deviation	0.0391		
nu star	88.3		
Approximate Chi Square Value (.05)	67.63	Nonparametric Statistics	
Adjusted Level of Significance	0.0395	95% CLT UCL	0.0658
Adjusted Chi Square Value	66.4	95% Jackknife UCL	0.0664
		95% Standard Bootstrap UCL	0.0656
Anderson-Darling Test Statistic	1.278	95% Bootstrap-t UCL	0.0719
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	0.0693
Kolmogorov-Smirnov Test Statistic	0.239	95% Percentile Bootstrap UCL	0.0657
Kolmogorov-Smirnov 5% Critical Value	0.177	95% BCA Bootstrap UCL	0.0694
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0887
		97.5% Chebyshev(Mean, Sd) UCL	0.105
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.136
95% Approximate Gamma UCL (Use when n >= 40)	0.0678		
95% Adjusted Gamma UCL (Use when n < 40)	0.0691		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	0.0887

MWB-1LDA Arsenic UCL Since 2010 (ProUCL Program)

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

C1

General Statistics			
Number of Valid Observations	12	Number of Distinct Observations	9
Raw Statistics		Log-transformed Statistics	
Minimum	0.015	Minimum of Log Data	-4.2
Maximum	0.027	Maximum of Log Data	-3.612
Mean	0.0213	Mean of log Data	-3.863
Geometric Mean	0.021	SD of log Data	0.16
Median	0.022		
SD	0.00325		
Std. Error of Mean	9.38E-04		
Coefficient of Variation	0.153		
Skewness	-0.268		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.963	Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.859	Shapiro Wilk Critical Value	0.859
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	0.0229	95% H-UCL	0.0232
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0255
95% Adjusted-CLT UCL (Chen-1995)	0.0227	97.5% Chebyshev (MVUE) UCL	0.0274
95% Modified-t UCL (Johnson-1978)	0.0229	99% Chebyshev (MVUE) UCL	0.031
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	33.28	Data appear Normal at 5% Significance Level	
Theta Star	6.39E-04		
MLE of Mean	0.0213		
MLE of Standard Deviation	0.00368		
nu star	798.7		
Approximate Chi Square Value (.05)	734.2	Nonparametric Statistics	
Adjusted Level of Significance	0.029	95% CLT UCL	0.0228
Adjusted Chi Square Value	724.7	95% Jackknife UCL	0.0229
		95% Standard Bootstrap UCL	0.0227
Anderson-Darling Test Statistic	0.383	95% Bootstrap-t UCL	0.0228
Anderson-Darling 5% Critical Value	0.73	95% Hall's Bootstrap UCL	0.0229
Kolmogorov-Smirnov Test Statistic	0.194	95% Percentile Bootstrap UCL	0.0228
Kolmogorov-Smirnov 5% Critical Value	0.245	95% BCA Bootstrap UCL	0.0225
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0253
		97.5% Chebyshev(Mean, Sd) UCL	0.0271
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0306
95% Approximate Gamma UCL (Use when n >= 40)	0.0231		
95% Adjusted Gamma UCL (Use when n < 40)	0.0234		

Potential UCL to Use		Use 95% Student's-t UCL	0.0229

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.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

MWB-2LDA Arsenic UCL with all data (ProUCL)

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

C1

General Statistics			
Number of Valid Observations	25	Number of Distinct Observations	22
Raw Statistics		Log-transformed Statistics	
Minimum	0.0025	Minimum of Log Data	-5.991
Maximum	0.0088	Maximum of Log Data	-4.733
Mean	0.00609	Mean of log Data	-5.147
Geometric Mean	0.00582	SD of log Data	0.335
Median	0.00636		
SD	0.00162		
Std. Error of Mean	3.24E-04		
Coefficient of Variation	0.266		
Skewness	-0.927		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.9	Shapiro Wilk Test Statistic	0.788
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	0.00664	95% H-UCL	0.00698
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00797
95% Adjusted-CLT UCL (Chen-1995)	0.00656	97.5% Chebyshev (MVUE) UCL	0.00876
95% Modified-t UCL (Johnson-1978)	0.00663	99% Chebyshev (MVUE) UCL	0.0103
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.795	Data do not follow a Discernable Distribution (0.05)	
Theta Star	6.22E-04		
MLE of Mean	0.00609		
MLE of Standard Deviation	0.00195		
nu star	489.8		
Approximate Chi Square Value (.05)	439.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0395	95% CLT UCL	0.00662
Adjusted Chi Square Value	436.2	95% Jackknife UCL	0.00664
		95% Standard Bootstrap UCL	0.00661
Anderson-Darling Test Statistic	1.685	95% Bootstrap-t UCL	0.00655
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	0.00656
Kolmogorov-Smirnov Test Statistic	0.231	95% Percentile Bootstrap UCL	0.00661
Kolmogorov-Smirnov 5% Critical Value	0.174	95% BCA Bootstrap UCL	0.00655
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0075
		97.5% Chebyshev(Mean, Sd) UCL	0.00811
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.00931
95% Approximate Gamma UCL (Use when n >= 40)	0.00679		
95% Adjusted Gamma UCL (Use when n < 40)	0.00684		
Potential UCL to Use		Use 95% Student's-t UCL	0.00664
		or 95% Modified-t UCL	0.00663

MWB-3LDA Arsenic UTL Using All Data (ProUCL)

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C0

General Statistics			
Total Number of Observations	37	Number of Distinct Observations	27
Tolerance Factor	1.709		
Raw Statistics		Log-Transformed Statistics	
Minimum	0.011	Minimum	-4.51
Maximum	0.0379	Maximum	-3.273
Second Largest	0.027	Second Largest	-3.612
First Quartile	0.0178	First Quartile	-4.029
Median	0.019	Median	-3.963
Third Quartile	0.022	Third Quartile	-3.817
Mean	0.02	Mean	-3.934
Geometric Mean	0.0196	SD	0.211
SD	0.00453		
Coefficient of Variation	0.227		
Skewness	1.685		
Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.87	Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	0.0278	95% UTL with 90% Coverage	0.0281
95% UPL (t)	0.0278	95% UPL (t)	0.0281
90% Percentile (z)	0.0258	90% Percentile (z)	0.0256
95% Percentile (z)	0.0275	95% Percentile (z)	0.0277
99% Percentile (z)	0.0305	99% Percentile (z)	0.032
Gamma Distribution Test		Data Distribution Test	
k star	20.69	Data appear Lognormal at 5% Significance Level	
Theta Star	9.67E-04		
MLE of Mean	0.02		
MLE of Standard Deviation	0.0044		
nu star	1531		
A-D Test Statistic	1.068	Nonparametric Statistics	
5% A-D Critical Value	0.747	90% Percentile	0.0246
K-S Test Statistic	0.148	95% Percentile	0.027
5% K-S Critical Value	0.145	99% Percentile	0.034
Data not Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	0.027
90% Percentile	0.0258	95% Percentile Bootstrap UTL with 90% Coverage	0.027
95% Percentile	0.0277	95% BCA Bootstrap UTL with 90% Coverage	0.027
99% Percentile	0.0316	95% UPL	0.0281
		95% Chebyshev UPL	0.04
95% WH Approx. Gamma UPL	0.0279	Upper Threshold Limit Based upon IQR	0.0283
95% HW Approx. Gamma UPL	0.0279		
95% WH Approx. Gamma UTL with 90% Coverage	0.0278		
95% HW Approx. Gamma UTL with 90% Coverage	0.0279		

DSP BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1SDSP Arsenic Trend_ProUCL (0.0466 removed form data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/1/2013 16:04
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	21
Minimum	0.0034
Maximum	0.012
Mean	0.00813
Geometric Mean	0.00777
Median	0.0079
Standard Deviation	0.00227
SEM	4.96E-04

Mann-Kendall Test	
Test Value (S)	-20
Tabulated p-value	0.285
Standard Deviation of S	33.05
Standardized Value of S	-0.575
Approximate p-value	0.283

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-1DDSP Arsenic Trend_ProUCL (0.0327 removed from data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/1/2013 16:15
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	21
Minimum	7.00E-04
Maximum	0.00708
Mean	0.00339
Geometric Mean	0.00299
Median	0.00308
Standard Deviation	0.00165
SEM	3.61E-04

Mann-Kendall Test	
Test Value (S)	-17
Tabulated p-value	0.327
Standard Deviation of S	33.1
Standardized Value of S	-0.483
Approximate p-value	0.314

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-5DSP Arsenic Trend_ProUCL (all data)

	Mann-Kendall Trend Test Analysis
User Selected Options	
Date/Time of Computation	2/1/2013 15:04
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	35
Minimum	0.0017
Maximum	0.0082
Mean	0.00474
Geometric Mean	0.00457
Median	0.00475
Standard Deviation	0.00122
SEM	2.06E-04

Mann-Kendall Test	
Test Value (S)	-15
Critical Value (0.05)	-1.645
Standard Deviation of S	70.39
Standardized Value of S	-0.199
Approximate p-value	0.421

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-6DSP Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/1/2013 10:27
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	23
Minimum	9.10E-04
Maximum	0.0101
Mean	0.00289
Geometric Mean	0.00243
Median	0.0025
Standard Deviation	0.00202
SEM	4.21E-04

Mann-Kendall Test	
Test Value (S)	-73
Critical Value (0.05)	-1.645
Standard Deviation of S	37.69
Standardized Value of S	-1.91
Approximate p-value	0.028

Statistically significant evidence of a decreasing trend at the specified level of significance.

Portal Arsenic Trend_ProUCL (all data)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/5/2013 12:51
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	22
Minimum	0.001
Maximum	0.0059
Mean	0.00335
Geometric Mean	0.003
Median	0.00327
Standard Deviation	0.00138
SEM	2.94E-04

Mann-Kendall Test	
Test Value (S)	23
Tabulated p-value	0.27
Standard Deviation of S	35.4
Standardized Value of S	0.622
Approximate p-value	0.267

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1SDSP Arsenic UCL_ProUCL (0.0466 removed from data)

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

C1

General Statistics			
Number of Valid Observations	21	Number of Distinct Observations	18
Raw Statistics		Log-transformed Statistics	
Minimum	0.0034	Minimum of Log Data	-5.684
Maximum	0.012	Maximum of Log Data	-4.423
Mean	0.00813	Mean of log Data	-4.857
Geometric Mean	0.00777	SD of log Data	0.325
Median	0.0079		
SD	0.00227		
Std. Error of Mean	4.96E-04		
Coefficient of Variation	0.28		
Skewness	-0.451		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.961	Shapiro Wilk Test Statistic	0.901
Shapiro Wilk Critical Value	0.908	Shapiro Wilk Critical Value	0.908
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.00899	95% H-UCL	0.00937
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0107
95% Adjusted-CLT UCL (Chen-1995)	0.00889	97.5% Chebyshev (MVUE) UCL	0.0118
95% Modified-t UCL (Johnson-1978)	0.00898	99% Chebyshev (MVUE) UCL	0.014
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.698	Data appear Normal at 5% Significance Level	
Theta Star	8.38E-04		
MLE of Mean	0.00813		
MLE of Standard Deviation	0.00261		
nu star	407.3		
Approximate Chi Square Value (.05)	361.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0383	95% CLT UCL	0.00895
Adjusted Chi Square Value	358.2	95% Jackknife UCL	0.00899
		95% Standard Bootstrap UCL	0.00891
Anderson-Darling Test Statistic	0.618	95% Bootstrap-t UCL	0.00896
Anderson-Darling 5% Critical Value	0.743	95% Hall's Bootstrap UCL	0.0089
Kolmogorov-Smirnov Test Statistic	0.151	95% Percentile Bootstrap UCL	0.00888
Kolmogorov-Smirnov 5% Critical Value	0.189	95% BCA Bootstrap UCL	0.00888
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0103
		97.5% Chebyshev(Mean, Sd) UCL	0.0112
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0131
95% Approximate Gamma UCL (Use when n >= 40)	0.00916		
95% Adjusted Gamma UCL (Use when n < 40)	0.00924		
Potential UCL to Use		Use 95% Student's-t UCL	0.00899

MWB-1DDSP Arsenic UCL_ProUCL (0.0327 removed from data)

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

C1

General Statistics			
Number of Valid Observations	21	Number of Distinct Observations	20
Raw Statistics		Log-transformed Statistics	
Minimum	7.00E-04	Minimum of Log Data	-7.264
Maximum	0.00708	Maximum of Log Data	-4.95
Mean	0.00339	Mean of log Data	-5.813
Geometric Mean	0.00299	SD of log Data	0.544
Median	0.00308		
SD	0.00165		
Std. Error of Mean	3.61E-04		
Coefficient of Variation	0.488		
Skewness	0.664		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.949	Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.908	Shapiro Wilk Critical Value	0.908
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	0.00401	95% H-UCL	0.00444
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0053
95% Adjusted-CLT UCL (Chen-1995)	0.00404	97.5% Chebyshev (MVUE) UCL	0.0061
95% Modified-t UCL (Johnson-1978)	0.00402	99% Chebyshev (MVUE) UCL	0.00768
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.573	Data appear Normal at 5% Significance Level	
Theta Star	9.49E-04		
MLE of Mean	0.00339		
MLE of Standard Deviation	0.00179		
nu star	150.1		
Approximate Chi Square Value (.05)	122.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0383	95% CLT UCL	0.00398
Adjusted Chi Square Value	120.9	95% Jackknife UCL	0.00401
		95% Standard Bootstrap UCL	0.00398
Anderson-Darling Test Statistic	0.236	95% Bootstrap-t UCL	0.00408
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	0.00402
Kolmogorov-Smirnov Test Statistic	0.113	95% Percentile Bootstrap UCL	0.00398
Kolmogorov-Smirnov 5% Critical Value	0.19	95% BCA Bootstrap UCL	0.004
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.00496
		97.5% Chebyshev(Mean, Sd) UCL	0.00564
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.00698
95% Approximate Gamma UCL (Use when n >= 40)	0.00414		
95% Adjusted Gamma UCL (Use when n < 40)	0.00421		
Potential UCL to Use		Use 95% Student's-t UCL	0.00401

MWB-3LDA Arsenic UCL ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	37	Number of Distinct Observations	27
Raw Statistics		Log-transformed Statistics	
Minimum	0.011	Minimum of Log Data	-4.51
Maximum	0.0379	Maximum of Log Data	-3.273
Mean	0.02	Mean of log Data	-3.934
Geometric Mean	0.0196	SD of log Data	0.211
Median	0.019		
SD	0.00453		
Std. Error of Mean	7.46E-04		
Coefficient of Variation	0.227		
Skewness	1.685		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.87	Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
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	0.0213	95% H-UCL	0.0213
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.023
95% Adjusted-CLT UCL (Chen-1995)	0.0214	97.5% Chebyshev (MVUE) UCL	0.0244
95% Modified-t UCL (Johnson-1978)	0.0213	99% Chebyshev (MVUE) UCL	0.027
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	20.69	Data appear Lognormal at 5% Significance Level	
Theta Star	9.67E-04		
MLE of Mean	0.02		
MLE of Standard Deviation	0.0044		
nu star	1531		
Approximate Chi Square Value (.05)	1441	Nonparametric Statistics	
Adjusted Level of Significance	0.0431	95% CLT UCL	0.0212
Adjusted Chi Square Value	1437	95% Jackknife UCL	0.0213
		95% Standard Bootstrap UCL	0.0212
Anderson-Darling Test Statistic	1.068	95% Bootstrap-t UCL	0.0216
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	0.022
Kolmogorov-Smirnov Test Statistic	0.148	95% Percentile Bootstrap UCL	0.0212
Kolmogorov-Smirnov 5% Critical Value	0.145	95% BCA Bootstrap UCL	0.0215
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0232
		97.5% Chebyshev(Mean, Sd) UCL	0.0247
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0274
95% Approximate Gamma UCL (Use when n >= 40)	0.0212		
95% Adjusted Gamma UCL (Use when n < 40)	0.0213		

Potential UCL to Use		
	Use 95% Student's-t UCL	0.0213
	or 95% Modified-t UCL	0.0213
	or 95% H-UCL	0.0213

MWB-5DSP Arsenic UCL_ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	35	Number of Distinct Observations	31
Raw Statistics		Log-transformed Statistics	
Minimum	0.0017	Minimum of Log Data	-6.377
Maximum	0.0082	Maximum of Log Data	-4.804
Mean	0.00474	Mean of log Data	-5.389
Geometric Mean	0.00457	SD of log Data	0.295
Median	0.00475		
SD	0.00122		
Std. Error of Mean	2.06E-04		
Coefficient of Variation	0.257		
Skewness	0.0883		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.938	Shapiro Wilk Test Statistic	0.868
Shapiro Wilk Critical Value	0.934	Shapiro Wilk Critical Value	0.934
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.00509	95% H-UCL	0.00522
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00581
95% Adjusted-CLT UCL (Chen-1995)	0.00508	97.5% Chebyshev (MVUE) UCL	0.00627
95% Modified-t UCL (Johnson-1978)	0.00509	99% Chebyshev (MVUE) UCL	0.00716
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	12.35	Data appear Normal at 5% Significance Level	
Theta Star	3.84E-04		
MLE of Mean	0.00474		
MLE of Standard Deviation	0.00135		
nu star	864.7		
Approximate Chi Square Value (.05)	797.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0425	95% CLT UCL	0.00508
Adjusted Chi Square Value	794.4	95% Jackknife UCL	0.00509
		95% Standard Bootstrap UCL	0.00508
Anderson-Darling Test Statistic	1.456	95% Bootstrap-t UCL	0.00509
Anderson-Darling 5% Critical Value	0.748	95% Hall's Bootstrap UCL	0.0051
Kolmogorov-Smirnov Test Statistic	0.191	95% Percentile Bootstrap UCL	0.00507
Kolmogorov-Smirnov 5% Critical Value	0.149	95% BCA Bootstrap UCL	0.00508
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.00564
		97.5% Chebyshev(Mean, Sd) UCL	0.00603
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.00679
95% Approximate Gamma UCL (Use when n >= 40)	0.00514		
95% Adjusted Gamma UCL (Use when n < 40)	0.00516		
Potential UCL to Use		Use 95% Student's-t UCL	0.00509

MWB-6DSP Arsenic UCL_ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	23	Number of Distinct Observations	17
Raw Statistics		Log-transformed Statistics	
Minimum	9.10E-04	Minimum of Log Data	-7.002
Maximum	0.0101	Maximum of Log Data	-4.595
Mean	0.00289	Mean of log Data	-6.021
Geometric Mean	0.00243	SD of log Data	0.585
Median	0.0025		
SD	0.00202		
Std. Error of Mean	4.21E-04		
Coefficient of Variation	0.698		
Skewness	2.368		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.748	Shapiro Wilk Test Statistic	0.935
Shapiro Wilk Critical Value	0.914	Shapiro Wilk Critical Value	0.914
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	0.00361	95% H-UCL	0.00372
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00446
95% Adjusted-CLT UCL (Chen-1995)	0.0038	97.5% Chebyshev (MVUE) UCL	0.00515
95% Modified-t UCL (Johnson-1978)	0.00365	99% Chebyshev (MVUE) UCL	0.00651
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.664	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	0.00108		
MLE of Mean	0.00289		
MLE of Standard Deviation	0.00177		
nu star	122.6		
Approximate Chi Square Value (.05)	97.99	Nonparametric Statistics	
Adjusted Level of Significance	0.0389	95% CLT UCL	0.00358
Adjusted Chi Square Value	96.4	95% Jackknife UCL	0.00361
		95% Standard Bootstrap UCL	0.00357
Anderson-Darling Test Statistic	0.829	95% Bootstrap-t UCL	0.00411
Anderson-Darling 5% Critical Value	0.75	95% Hall's Bootstrap UCL	0.0068
Kolmogorov-Smirnov Test Statistic	0.181	95% Percentile Bootstrap UCL	0.0036
Kolmogorov-Smirnov 5% Critical Value	0.183	95% BCA Bootstrap UCL	0.00382
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.00472
		97.5% Chebyshev(Mean, Sd) UCL	0.00552
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.00707
95% Approximate Gamma UCL (Use when n >= 40)	0.00361		
95% Adjusted Gamma UCL (Use when n < 40)	0.00367		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.00361

Portal Arsenic UCL_ProUCL (all data)

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

C1

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	19
Raw Statistics		Log-transformed Statistics	
Minimum	0.001	Minimum of Log Data	-6.908
Maximum	0.0059	Maximum of Log Data	-5.133
Mean	0.00335	Mean of log Data	-5.808
Geometric Mean	0.003	SD of log Data	0.524
Median	0.00327		
SD	0.00138		
Std. Error of Mean	2.94E-04		
Coefficient of Variation	0.412		
Skewness	-0.163		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.964	Shapiro Wilk Test Statistic	0.863
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.00386	95% H-UCL	0.00434
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00516
95% Adjusted-CLT UCL (Chen-1995)	0.00382	97.5% Chebyshev (MVUE) UCL	0.00591
95% Modified-t UCL (Johnson-1978)	0.00386	99% Chebyshev (MVUE) UCL	0.00739
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.124	Data appear Normal at 5% Significance Level	
Theta Star	8.13E-04		
MLE of Mean	0.00335		
MLE of Standard Deviation	0.00165		
nu star	181.4		
Approximate Chi Square Value (.05)	151.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	0.00384
Adjusted Chi Square Value	149.2	95% Jackknife UCL	0.00386
		95% Standard Bootstrap UCL	0.00381
Anderson-Darling Test Statistic	0.691	95% Bootstrap-t UCL	0.00386
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	0.00382
Kolmogorov-Smirnov Test Statistic	0.145	95% Percentile Bootstrap UCL	0.00384
Kolmogorov-Smirnov 5% Critical Value	0.186	95% BCA Bootstrap UCL	0.00384
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.00463
		97.5% Chebyshev(Mean, Sd) UCL	0.00519
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.00628
95% Approximate Gamma UCL (Use when n >= 40)	0.00402		
95% Adjusted Gamma UCL (Use when n < 40)	0.00407		
Potential UCL to Use		Use 95% Student's-t UCL	0.00386

pH

LDA SURFACE WATER

TREND EVALUATIONS

South Pond LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	3/7/2013 16:22
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	55
Minimum	9.34
Maximum	13.13
Mean	11.46
Geometric Mean	11.41
Median	11.63
Standard Deviation	1.094
SEM	0.147

Mann-Kendall Test	
Test Value (S)	-621
Critical Value (0.05)	-1.645
Standard Deviation of S	137.7
Standardized Value of S	-4.501
Approximate p-value	3.38E-06

Statistically significant evidence of a decreasing trend at the specified level of significance.

Still Well LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 11:43
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	58
Minimum	9.83
Maximum	14.31
Mean	12.51
Geometric Mean	12.5
Median	12.56
Standard Deviation	0.621
SEM	0.0816

Mann-Kendall Test	
Test Value (S)	20
Critical Value (0.05)	1.645
Standard Deviation of S	149
Standardized Value of S	0.127
Approximate p-value	0.449

Insufficient evidence to identify a significant trend at the specified level of significance.

Weir LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 11:26
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	22
Minimum	9.64
Maximum	11.64
Mean	10.35
Geometric Mean	10.34
Median	10.37
Standard Deviation	0.469
SEM	0.1

Mann-Kendall Test	
Test Value (S)	51
Tabulated p-value	0.08
Standard Deviation of S	35.44
Standardized Value of S	1.411
Approximate p-value	0.0791

Insufficient evidence to identify a significant trend at the specified level of significance.

Infiltration Pond LDA pH Trend (outliers 8.0 & 8.27 removed)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	3/7/2013 12:08	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	56
Minimum	8.54
Maximum	11.73
Mean	9.696
Geometric Mean	9.677
Median	9.73
Standard Deviation	0.622
SEM	0.0831

Mann-Kendall Test	
Test Value (S)	361
Critical Value (0.05)	1.645
Standard Deviation of S	141.5
Standardized Value of S	2.545
Approximate p-value	0.00547

Statistically significant evidence of an increasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

South Pond LDA pH UCL (actual H conc)

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

C3

General Statistics			
Number of Valid Observations	55	Number of Distinct Observations	51

Raw Statistics		Log-transformed Statistics	
Minimum	7.41E-14	Minimum of Log Data	-30.23
Maximum	4.57E-10	Maximum of Log Data	-21.51
Mean	3.62E-11	Mean of log Data	-26.38
Geometric Mean	3.48E-12	SD of log Data	2.518
Median	2.34E-12		
SD	7.62E-11		
Std. Error of Mean	1.03E-11		
Coefficient of Variation	N/A		
Skewness	3.652		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.323	Lilliefors Test Statistic	0.141
Lilliefors Critical Value	0.119	Lilliefors Critical Value	0.119
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	5.34E-11	95% H-UCL	3.96E-10
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.25E-10
95% Adjusted-CLT UCL (Chen-1995)	5.85E-11	97.5% Chebyshev (MVUE) UCL	2.93E-10
95% Modified-t UCL (Johnson-1978)	5.42E-11	99% Chebyshev (MVUE) UCL	4.26E-10

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.291	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.24E-10		
MLE of Mean	3.62E-11		
MLE of Standard Deviation	6.71E-11		
nu star	32.04		
Approximate Chi Square Value (.05)	20.1	Nonparametric Statistics	
Adjusted Level of Significance	0.0456	95% CLT UCL	5.31E-11
Adjusted Chi Square Value	19.85	95% Jackknife UCL	5.34E-11
		95% Standard Bootstrap UCL	5.30E-11
Anderson-Darling Test Statistic	2.414	95% Bootstrap-t UCL	6.47E-11
Anderson-Darling 5% Critical Value	0.865	95% Hall's Bootstrap UCL	7.71E-11
Kolmogorov-Smirnov Test Statistic	0.184	95% Percentile Bootstrap UCL	5.43E-11
Kolmogorov-Smirnov 5% Critical Value	0.13	95% BCA Bootstrap UCL	6.12E-11
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.10E-11
		97.5% Chebyshev(Mean, Sd) UCL	1.00E-10
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.38E-10
95% Approximate Gamma UCL (Use when n >= 40)	5.77E-11		
95% Adjusted Gamma UCL (Use when n < 40)	5.85E-11		

Potential UCL to Use	Use 97.5% Chebyshev (Mean, Sd) UCL	1.00E-10
	pH =	10.00
	mean =	3.62E-11
	mean pH =	10.44
	mean-LCL	-6.41E-11
	UCL =	-2.79E-11
	UCL pH =	10.88

Still Well LDA pH UCL (actual H conc)

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

C2

General Statistics			
Number of Valid Observations	58	Number of Distinct Observations	45

Raw Statistics		Log-transformed Statistics	
Minimum	4.90E-15	Minimum of Log Data	-32.95
Maximum	1.48E-10	Maximum of Log Data	-22.63
Mean	3.32E-12	Mean of log Data	-28.81
Geometric Mean	3.08E-13	SD of log Data	1.43
Median	2.76E-13		
SD	1.95E-11		
Std. Error of Mean	2.56E-12		
Coefficient of Variation	N/A		
Skewness	7.439		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.456	Lilliefors Test Statistic	0.219
Lilliefors Critical Value	0.116	Lilliefors Critical Value	0.116
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	7.60E-12	95% H-UCL	1.52E-12
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.72E-12
95% Adjusted-CLT UCL (Chen-1995)	1.02E-11	97.5% Chebyshev (MVUE) UCL	2.11E-12
95% Modified-t UCL (Johnson-1978)	8.02E-12	99% Chebyshev (MVUE) UCL	2.87E-12

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.288	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.16E-11		
MLE of Mean	3.32E-12		
MLE of Standard Deviation	6.20E-12		
nu star	33.37		
Approximate Chi Square Value (.05)	21.16	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	7.53E-12
Adjusted Chi Square Value	20.91	95% Jackknife UCL	7.60E-12
		95% Standard Bootstrap UCL	7.55E-12
Anderson-Darling Test Statistic	12.4	95% Bootstrap-t UCL	7.65E-11
Anderson-Darling 5% Critical Value	0.867	95% Hall's Bootstrap UCL	5.94E-11
Kolmogorov-Smirnov Test Statistic	0.41	95% Percentile Bootstrap UCL	8.37E-12
Kolmogorov-Smirnov 5% Critical Value	0.127	95% BCA Bootstrap UCL	1.32E-11
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.45E-11
		97.5% Chebyshev(Mean, Sd) UCL	1.93E-11
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2.88E-11
95% Approximate Gamma UCL (Use when n >= 40)	5.24E-12		
95% Adjusted Gamma UCL (Use when n < 40)	5.30E-12		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	1.45E-11
	pH =	10.84
	mean =	3.08E-13
	mean pH =	12.51
	mean-LCL	-1.42E-11
	UCL =	-1.39E-11
	UCL pH =	#NUM!

Weir LDA pH UCL (actual H Conc)

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

C0

General Statistics			
Number of Valid Observations	22	Number of Distinct Observations	20
Raw Statistics		**Log-transformed Statistics**	
Minimum	2.29E-12	Minimum of Log Data	-26.8
Maximum	2.29E-10	Maximum of Log Data	-22.2
Mean	7.06E-11	Mean of log Data	-23.83
Geometric Mean	4.50E-11	SD of log Data	1.081
Median	4.32E-11		
SD	6.48E-11		
Std. Error of Mean	1.38E-11		
Coefficient of Variation	N/A		
Skewness	1.334		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.833	Shapiro Wilk Test Statistic	0.943
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	9.44E-11	95% H-UCL	1.52E-10
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.66E-10
95% Adjusted-CLT UCL (Chen-1995)	9.75E-11	97.5% Chebyshev (MVUE) UCL	2.05E-10
95% Modified-t UCL (Johnson-1978)	9.50E-11	99% Chebyshev (MVUE) UCL	2.80E-10

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.108	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	6.37E-11		
MLE of Mean	7.06E-11		
MLE of Standard Deviation	6.71E-11		
nu star	48.74		
Approximate Chi Square Value (.05)	33.71	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	9.33E-11
Adjusted Chi Square Value	32.78	95% Jackknife UCL	9.44E-11
		95% Standard Bootstrap UCL	9.27E-11
Anderson-Darling Test Statistic	0.351	95% Bootstrap-t UCL	1.00E-10
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	1.00E-10
Kolmogorov-Smirnov Test Statistic	0.119	95% Percentile Bootstrap UCL	9.30E-11
Kolmogorov-Smirnov 5% Critical Value	0.19	95% BCA Bootstrap UCL	9.71E-11
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.31E-10
		97.5% Chebyshev(Mean, Sd) UCL	1.57E-10
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2.08E-10
95% Approximate Gamma UCL (Use when n >= 40)	1.02E-10		
95% Adjusted Gamma UCL (Use when n < 40)	1.05E-10		

Potential UCL to Use	Use 95% Approximate Gamma UCL		1.02E-10
		pH =	9.99
		mean =	7.06E-11
		mean pH =	10.15
		mean-LCL	-3.15E-11
		UCL =	3.91E-11
		UCL pH =	10.41

Infiltration Pond #1 LDA pH UCL (actual H conc, outliers 8 & 8.27 removed)

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

C3

General Statistics			
Number of Valid Observations	56	Number of Distinct Observations	51

Raw Statistics		Log-transformed Statistics	
Minimum	1.86E-12	Minimum of Log Data	-27.01
Maximum	2.88E-09	Maximum of Log Data	-19.66
Mean	4.71E-10	Mean of log Data	-22.33
Geometric Mean	2.01E-10	SD of log Data	1.433
Median	1.86E-10		
SD	6.73E-10		
Std. Error of Mean	8.99E-11		
Coefficient of Variation	N/A		
Skewness	2.296		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.297	Lilliefors Test Statistic	0.11
Lilliefors Critical Value	0.118	Lilliefors Critical Value	0.118
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	6.21E-10	95% H-UCL	9.97E-10
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.14E-09
95% Adjusted-CLT UCL (Chen-1995)	6.48E-10	97.5% Chebyshev (MVUE) UCL	1.40E-09
95% Modified-t UCL (Johnson-1978)	6.26E-10	99% Chebyshev (MVUE) UCL	1.90E-09
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.683	Data appear Lognormal at 5% Significance Level	
Theta Star	6.89E-10		
MLE of Mean	4.71E-10		
MLE of Standard Deviation	5.70E-10		
nu star	76.53		
Approximate Chi Square Value (.05)	57.38	Nonparametric Statistics	
Adjusted Level of Significance	0.0457	95% CLT UCL	6.19E-10
Adjusted Chi Square Value	56.94	95% Jackknife UCL	6.21E-10
		95% Standard Bootstrap UCL	6.21E-10
Anderson-Darling Test Statistic	1.444	95% Bootstrap-t UCL	6.77E-10
Anderson-Darling 5% Critical Value	0.796	95% Hall's Bootstrap UCL	6.54E-10
Kolmogorov-Smirnov Test Statistic	0.186	95% Percentile Bootstrap UCL	6.15E-10
Kolmogorov-Smirnov 5% Critical Value	0.124	95% BCA Bootstrap UCL	6.48E-10
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8.63E-10
		97.5% Chebyshev(Mean, Sd) UCL	1.03E-09
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.37E-09
95% Approximate Gamma UCL (Use when n >= 40)	6.28E-10		
95% Adjusted Gamma UCL (Use when n < 40)	6.33E-10		

Potential UCL to Use	Use 95% H-UCL		9.97E-10
		pH =	9.00
		mean =	4.71E-10
		mean pH =	9.33
		UCL pH =	9.66

LDA SHALLOW GROUNDWATER

TREND EVALUATIONS

MW-1A LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 13:50
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	6.48
Maximum	7.89
Mean	7.041
Geometric Mean	7.034
Median	6.995
Standard Deviation	0.336
SEM	0.0685

Mann-Kendall Test	
Test Value (S)	-1
Critical Value (0.05)	-1.645
Standard Deviation of S	40.28
Standardized Value of S	0
Approximate p-value	0.5

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-2A LDA pH Trend (outlier 6.05 & 6.57 removed)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	3/7/2013 10:24
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	34
Minimum	6.92
Maximum	8.07
Mean	7.398
Geometric Mean	7.393
Median	7.375
Standard Deviation	0.268
SEM	0.0459

Mann-Kendall Test	
Test Value (S)	-115
Critical Value (0.05)	-1.645
Standard Deviation of S	67.39
Standardized Value of S	-1.692
Approximate p-value	0.0453

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-3A LDA pH Trend (witout outlier 6.33)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	3/7/2013 11:17	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C2

General Statistics		
Number of Values		0
Minimum	N/A	
Maximum	N/A	
Mean	N/A	
Geometric Mean	N/A	
Median	N/A	
Standard Deviation	N/A	
SEM	N/A	

Mann-Kendall Test		
Test Value (S)		0
Tabulated p-value	N/A	
Standard Deviation of S		0
Standardized Value of S	N/A	
Approximate p-value	N/A	

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-4A LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 10:44
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	46
Minimum	6.03
Maximum	9.87
Mean	6.461
Geometric Mean	6.438
Median	6.305
Standard Deviation	0.607
SEM	0.0895

Mann-Kendall Test	
Test Value (S)	0
Critical Value (0.05)	N/A
Standard Deviation of S	105.5
Standardized Value of S	N/A
Approximate p-value	N/A

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-5A LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/27/2013 12:36	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient		0.95
Level of Significance		0.05

C1

General Statistics	
Number of Values	35
Minimum	7.1
Maximum	9.52
Mean	7.76
Geometric Mean	7.741
Median	7.6
Standard Deviation	0.56
SEM	0.0947

Mann-Kendall Test	
Test Value (S)	40
Critical Value (0.05)	1.645
Standard Deviation of S	70.38
Standardized Value of S	0.554
Approximate p-value	0.29

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-6A LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/27/2013 13:39
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	35
Minimum	7.1
Maximum	9.35
Mean	7.713
Geometric Mean	7.696
Median	7.51
Standard Deviation	0.526
SEM	0.0889

Mann-Kendall Test	
Test Value (S)	58
Critical Value (0.05)	1.645
Standard Deviation of S	70.38
Standardized Value of S	0.81
Approximate p-value	0.209

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MW-1A LDA pH UCL (using actual H conc)

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	21

Raw Statistics		Log-transformed Statistics	
Minimum	1.29E-08	Minimum of Log Data	-18.17
Maximum	3.31E-07	Maximum of Log Data	-14.92
Mean	1.15E-07	Mean of log Data	-16.21
Geometric Mean	9.09E-08	SD of log Data	0.773
Median	1.01E-07		
SD	7.40E-08		
Std. Error of Mean	1.51E-08		
Coefficient of Variation	N/A		
Skewness	1.034		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.927	Shapiro Wilk Test Statistic	0.941
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	1.41E-07	95% H-UCL	1.76E-07
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.11E-07
95% Adjusted-CLT UCL (Chen-1995)	1.43E-07	97.5% Chebyshev (MVUE) UCL	2.50E-07
95% Modified-t UCL (Johnson-1978)	1.42E-07	99% Chebyshev (MVUE) UCL	3.27E-07

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.017	Data appear Normal at 5% Significance Level	
Theta Star	5.71E-08		
MLE of Mean	1.15E-07		
MLE of Standard Deviation	8.10E-08		
nu star	96.84		
Approximate Chi Square Value (.05)	75.14	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	1.40E-07
Adjusted Chi Square Value	73.79	95% Jackknife UCL	1.41E-07
		95% Standard Bootstrap UCL	1.40E-07
Anderson-Darling Test Statistic	0.235	95% Bootstrap-t UCL	1.45E-07
Anderson-Darling 5% Critical Value	0.754	95% Hall's Bootstrap UCL	1.48E-07
Kolmogorov-Smirnov Test Statistic	0.0877	95% Percentile Bootstrap UCL	1.41E-07
Kolmogorov-Smirnov 5% Critical Value	0.18	95% BCA Bootstrap UCL	1.43E-07
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.81E-07
		97.5% Chebyshev(Mean, Sd) UCL	2.09E-07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2.65E-07
95% Approximate Gamma UCL (Use when n >= 40)	1.48E-07		
95% Adjusted Gamma UCL (Use when n < 40)	1.51E-07		

Potential UCL to Use	Use 95% Student's-t UCL		1.41E-07
		pH =	6.85
		mean =	1.15E-07
		mean pH =	6.94
		mean-LCL	-2.59E-08
		UCL =	8.92E-08
		UCL pH =	7.05

MW-2A LDA pH UCL (outlier 6.57 removed)

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

C2

General Statistics			
Number of Valid Observations	34	Number of Distinct Observations	28
Raw Statistics		**Log-transformed Statistics**	
Minimum	8.51E-09	Minimum of Log Data	-18.58
Maximum	1.20E-07	Maximum of Log Data	-15.93
Mean	4.72E-08	Mean of log Data	-17.03
Geometric Mean	4.00E-08	SD of log Data	0.617
Median	4.22E-08		
SD	2.66E-08		
Std. Error of Mean	4.56E-09		
Coefficient of Variation	N/A		
Skewness	1.08		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.92	Shapiro Wilk Test Statistic	0.964
Shapiro Wilk Critical Value	0.933	Shapiro Wilk Critical Value	0.933
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	5.49E-08	95% H-UCL	6.03E-08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7.18E-08
95% Adjusted-CLT UCL (Chen-1995)	5.56E-08	97.5% Chebyshev (MVUE) UCL	8.20E-08
95% Modified-t UCL (Johnson-1978)	5.51E-08	99% Chebyshev (MVUE) UCL	1.02E-07
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.924	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.61E-08		
MLE of Mean	4.72E-08		
MLE of Standard Deviation	2.76E-08		
nu star	198.8		
Approximate Chi Square Value (.05)	167.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0422	95% CLT UCL	5.47E-08
Adjusted Chi Square Value	165.8	95% Jackknife UCL	5.49E-08
		95% Standard Bootstrap UCL	5.46E-08
Anderson-Darling Test Statistic	0.219	95% Bootstrap-t UCL	5.61E-08
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	5.61E-08
Kolmogorov-Smirnov Test Statistic	0.104	95% Percentile Bootstrap UCL	5.50E-08
Kolmogorov-Smirnov 5% Critical Value	0.152	95% BCA Bootstrap UCL	5.56E-08
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	6.71E-08
		97.5% Chebyshev(Mean, Sd) UCL	7.57E-08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	9.26E-08
95% Approximate Gamma UCL (Use when n >= 40)	5.61E-08		
95% Adjusted Gamma UCL (Use when n < 40)	5.66E-08		

Potential UCL to Use	Use 95% Approximate Gamma UCL		5.61E-08
		pH =	7.25
		mean =	4.22E-08
		mean pH =	7.37
		mean-LCL	-1.39E-08
		UCL =	2.83E-08
		UCL pH =	7.55

MW-3A LDA ph UCL(actual H conc, without 6.33 outlier)

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

C3

General Statistics			
Number of Valid Observations	28	Number of Distinct Observations	24

Raw Statistics		Log-transformed Statistics	
Minimum	3.72E-09	Minimum of Log Data	-19.41
Maximum	1.86E-07	Maximum of Log Data	-15.5
Mean	9.85E-08	Mean of log Data	-16.37
Geometric Mean	7.75E-08	SD of log Data	0.937
Median	1.06E-07		
SD	4.51E-08		
Std. Error of Mean	8.53E-09		
Coefficient of Variation	N/A		
Skewness	-0.495		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.952	Shapiro Wilk Test Statistic	0.685
Shapiro Wilk Critical Value	0.924	Shapiro Wilk Critical Value	0.924
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.13E-07	95% H-UCL	1.85E-07
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.20E-07
95% Adjusted-CLT UCL (Chen-1995)	1.12E-07	97.5% Chebyshev (MVUE) UCL	2.65E-07
95% Modified-t UCL (Johnson-1978)	1.13E-07	99% Chebyshev (MVUE) UCL	3.52E-07

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.023	Data appear Normal at 5% Significance Level	
Theta Star	4.87E-08		
MLE of Mean	9.85E-08		
MLE of Standard Deviation	6.92E-08		
nu star	113.3		
Approximate Chi Square Value (.05)	89.73	Nonparametric Statistics	
Adjusted Level of Significance	0.0404	95% CLT UCL	1.13E-07
Adjusted Chi Square Value	88.44	95% Jackknife UCL	1.13E-07
		95% Standard Bootstrap UCL	1.12E-07
Anderson-Darling Test Statistic	2.288	95% Bootstrap-t UCL	1.12E-07
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	1.13E-07
Kolmogorov-Smirnov Test Statistic	0.243	95% Percentile Bootstrap UCL	1.11E-07
Kolmogorov-Smirnov 5% Critical Value	0.167	95% BCA Bootstrap UCL	1.12E-07
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.36E-07
		97.5% Chebyshev(Mean, Sd) UCL	1.52E-07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.83E-07
95% Approximate Gamma UCL (Use when n >= 40)	1.24E-07		
95% Adjusted Gamma UCL (Use when n < 40)	1.26E-07		

Potential UCL to Use	Use 95% Student's-t UCL	1.13E-07
	pH =	6.95
	mean =	9.85E-08
	mean pH =	7.01
	mean-LCL	-1.45E-08
	UCL =	8.40E-08
	UCL pH =	7.08

MW-4A LDA pH UTL (actual H conc)

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C1

General Statistics			
Total Number of Observations	46	Number of Distinct Observations	36
Tolerance Factor	1.658		

Raw Statistics		Log-Transformed Statistics	
Minimum	1.35E-10	Minimum	-22.73
Maximum	9.33E-07	Maximum	-13.88
Second Largest	8.71E-07	Second Largest	-13.95
First Quartile	3.10E-07	First Quartile	-14.99
Median	4.95E-07	Median	-14.52
Third Quartile	6.84E-07	Third Quartile	-14.2
Mean	4.88E-07	Mean	-14.88
Geometric Mean	3.46E-07	SD	1.397
SD	2.45E-07		
Coefficient of Variation	N/A		
Skewness	-0.255		

Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Test Statistic	0.568
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	8.93E-07	95% UTL with 90% Coverage	3.51E-06
95% UPL (t)	9.03E-07	95% UPL (t)	3.71E-06
90% Percentile (z)	8.01E-07	90% Percentile (z)	2.07E-06
95% Percentile (z)	8.90E-07	95% Percentile (z)	3.45E-06
99% Percentile (z)	1.06E-06	99% Percentile (z)	8.93E-06

Gamma Distribution Test		Data Distribution Test	
k star	1.517	Data appear Normal at 5% Significance Level	
Theta Star	3.21E-07		
MLE of Mean	4.88E-07		
MLE of Standard Deviation	3.96E-07		
nu star	139.6		

A-D Test Statistic	2.829	Nonparametric Statistics	
5% A-D Critical Value	0.766	90% Percentile	7.85E-07
K-S Test Statistic	0.237	95% Percentile	8.46E-07
5% K-S Critical Value	0.133	99% Percentile	9.05E-07
Data not Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
		95% UTL with 90% Coverage	8.51E-07
90% Percentile	1.01E-06	95% Percentile Bootstrap UTL with 90% Coverage	8.51E-07
95% Percentile	1.27E-06	95% BCA Bootstrap UTL with 90% Coverage	8.51E-07
99% Percentile	1.83E-06	95% UPL	8.64E-07
		95% Chebyshev UPL	1.57E-06
95% WH Approx. Gamma UPL	1.22E-06	Upper Threshold Limit Based upon IQR	1.25E-06
95% HW Approx. Gamma UPL	1.37E-06		
95% WH Approx. Gamma UTL with 90% Coverage	1.19E-06		
95% HW Approx. Gamma UTL with 90% Coverage	1.34E-06		

pH =	6.07
mean =	4.88E-07
mean pH =	6.31
mean-LCL	-3.64E-07
UCL =	1.24E-07
UCL pH =	6.91

MW-5A LDA pH UCL (using actual H conc)

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

C2

General Statistics			
Number of Valid Observations	35	Number of Distinct Observations	31
Raw Statistics		Log-transformed Statistics	
Minimum	3.02E-10	Minimum of Log Data	-21.92
Maximum	7.94E-08	Maximum of Log Data	-16.35
Mean	2.87E-08	Mean of log Data	-17.87
Geometric Mean	1.74E-08	SD of log Data	1.29
Median	2.51E-08		
SD	2.22E-08		
Std. Error of Mean	3.75E-09		
Coefficient of Variation	N/A		
Skewness	0.696		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.922	Shapiro Wilk Test Statistic	0.875
Shapiro Wilk Critical Value	0.934	Shapiro Wilk Critical Value	0.934
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	3.51E-08	95% H-UCL	7.49E-08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.33E-08
95% Adjusted-CLT UCL (Chen-1995)	3.54E-08	97.5% Chebyshev (MVUE) UCL	1.03E-07
95% Modified-t UCL (Johnson-1978)	3.52E-08	99% Chebyshev (MVUE) UCL	1.41E-07
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.055	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.72E-08		
MLE of Mean	2.87E-08		
MLE of Standard Deviation	2.80E-08		
nu star	73.84		
Approximate Chi Square Value (.05)	55.05	Nonparametric Statistics	
Adjusted Level of Significance	0.0425	95% CLT UCL	3.49E-08
Adjusted Chi Square Value	54.28	95% Jackknife UCL	3.51E-08
		95% Standard Bootstrap UCL	3.48E-08
Anderson-Darling Test Statistic	0.56	95% Bootstrap-t UCL	3.56E-08
Anderson-Darling 5% Critical Value	0.773	95% Hall's Bootstrap UCL	3.55E-08
Kolmogorov-Smirnov Test Statistic	0.103	95% Percentile Bootstrap UCL	3.45E-08
Kolmogorov-Smirnov 5% Critical Value	0.153	95% BCA Bootstrap UCL	3.52E-08
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4.51E-08
		97.5% Chebyshev(Mean, Sd) UCL	5.22E-08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	6.60E-08
95% Approximate Gamma UCL (Use when n >= 40)	3.85E-08		
95% Adjusted Gamma UCL (Use when n < 40)	3.91E-08		

Potential UCL to Use	Use 95% Approximate Gamma UCL		3.85E-08
		pH =	7.41
		mean =	2.51E-08
		mean pH =	7.60
		mean-LCL	-1.34E-08
		UCL =	1.17E-08
		UCL pH =	7.93

MW-6A LDA pH UCL (actual H conc)

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

C2

General Statistics			
Number of Valid Observations	35	Number of Distinct Observations	31
Raw Statistics		Log-transformed Statistics	
Minimum	4.47E-10	Minimum of Log Data	-21.53
Maximum	7.94E-08	Maximum of Log Data	-16.35
Mean	3.09E-08	Mean of log Data	-17.76
Geometric Mean	1.94E-08	SD of log Data	1.212
Median	3.09E-08		
SD	2.29E-08		
Std. Error of Mean	3.86E-09		
Coefficient of Variation	N/A		
Skewness	0.43		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.932	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.934	Shapiro Wilk Critical Value	0.934
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	3.74E-08	95% H-UCL	7.12E-08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.13E-08
95% Adjusted-CLT UCL (Chen-1995)	3.75E-08	97.5% Chebyshev (MVUE) UCL	9.95E-08
95% Modified-t UCL (Johnson-1978)	3.74E-08	99% Chebyshev (MVUE) UCL	1.35E-07
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.129	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.73E-08		
MLE of Mean	3.09E-08		
MLE of Standard Deviation	2.90E-08		
nu star	79.04		
Approximate Chi Square Value (.05)	59.56	Nonparametric Statistics	
Adjusted Level of Significance	0.0425	95% CLT UCL	3.72E-08
Adjusted Chi Square Value	58.75	95% Jackknife UCL	3.74E-08
		95% Standard Bootstrap UCL	3.72E-08
Anderson-Darling Test Statistic	0.649	95% Bootstrap-t UCL	3.77E-08
Anderson-Darling 5% Critical Value	0.772	95% Hall's Bootstrap UCL	3.73E-08
Kolmogorov-Smirnov Test Statistic	0.144	95% Percentile Bootstrap UCL	3.74E-08
Kolmogorov-Smirnov 5% Critical Value	0.152	95% BCA Bootstrap UCL	3.77E-08
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4.77E-08
		97.5% Chebyshev(Mean, Sd) UCL	5.50E-08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	6.93E-08
95% Approximate Gamma UCL (Use when n >= 40)	4.10E-08		
95% Adjusted Gamma UCL (Use when n < 40)	4.15E-08		
Potential UCL to Use		Use 95% Approximate Gamma UCL	4.10E-08
		pH =	7.39
		mean =	3.09E-08
		mean pH =	7.51
		mean-LCL	-1.01E-08
		UCL =	2.08E-08
		UCL pH =	7.68

LDA BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1 LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/6/2013 12:15	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	24
Minimum	7.28
Maximum	8.2
Mean	7.669
Geometric Mean	7.666
Median	7.65
Standard Deviation	0.214
SEM	0.0438

Mann-Kendall Test	
Test Value (S)	0
Critical Value (0.05)	N/A
Standard Deviation of S	40.2
Standardized Value of S	N/A
Approximate p-value	N/A

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-2LDA pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 13:16
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	25
Minimum	7.21
Maximum	8.28
Mean	7.618
Geometric Mean	7.615
Median	7.59
Standard Deviation	0.236
SEM	0.0473

Mann-Kendall Test	
Test Value (S)	23
Critical Value (0.05)	1.645
Standard Deviation of S	42.68
Standardized Value of S	0.515
Approximate p-value	0.303

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-3 LDA pH Trend (outlier 9.23 removed)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	3/8/2013 9:47
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	36
Minimum	7.13
Maximum	8.63
Mean	7.614
Geometric Mean	7.609
Median	7.54
Standard Deviation	0.27
SEM	0.0451

Mann-Kendall Test	
Test Value (S)	-188
Critical Value (0.05)	-1.645
Standard Deviation of S	73.34
Standardized Value of S	-2.55
Approximate p-value	0.00539

Statistically significant evidence of a decreasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1 LDA pH UCL (using actual H conc)

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	18

Raw Statistics		Log-transformed Statistics	
Minimum	6.31E-09	Minimum of Log Data	-18.88
Maximum	5.25E-08	Maximum of Log Data	-16.76
Mean	2.38E-08	Mean of log Data	-17.66
Geometric Mean	2.14E-08	SD of log Data	0.494
Median	2.24E-08		
SD	1.06E-08		
Std. Error of Mean	2.16E-09		
Coefficient of Variation	N/A		
Skewness	0.809		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.939	Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	2.75E-08	95% H-UCL	2.97E-08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3.51E-08
95% Adjusted-CLT UCL (Chen-1995)	2.77E-08	97.5% Chebyshev (MVUE) UCL	3.98E-08
95% Modified-t UCL (Johnson-1978)	2.76E-08	99% Chebyshev (MVUE) UCL	4.92E-08

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.347	Data appear Normal at 5% Significance Level	
Theta Star	5.48E-09		
MLE of Mean	2.38E-08		
MLE of Standard Deviation	1.14E-08		
nu star	208.6		
Approximate Chi Square Value (.05)	176.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	2.74E-08
Adjusted Chi Square Value	174.1	95% Jackknife UCL	2.75E-08
		95% Standard Bootstrap UCL	2.72E-08
Anderson-Darling Test Statistic	0.475	95% Bootstrap-t UCL	2.80E-08
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	2.86E-08
Kolmogorov-Smirnov Test Statistic	0.16	95% Percentile Bootstrap UCL	2.74E-08
Kolmogorov-Smirnov 5% Critical Value	0.178	95% BCA Bootstrap UCL	2.79E-08
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.32E-08
		97.5% Chebyshev(Mean, Sd) UCL	3.73E-08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4.53E-08
95% Approximate Gamma UCL (Use when n >= 40)	2.82E-08		
95% Adjusted Gamma UCL (Use when n < 40)	2.85E-08		

Potential UCL to Use	Use 95% Student's-t UCL		2.75E-08
		pH =	7.56
		mean =	2.38E-08
		mean pH =	7.62
		mean-LCL	-3.70E-09
		UCL =	2.01E-08
		UCL pH =	7.70

MWB-2 LDA pH UCL

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

C0

General Statistics			
Number of Valid Observations	25	Number of Distinct Observations	19
Raw Statistics		Log-transformed Statistics	
Minimum	5.25E-09	Minimum of Log Data	-19.07
Maximum	6.17E-08	Maximum of Log Data	-16.6
Mean	2.73E-08	Mean of log Data	-17.54
Geometric Mean	2.41E-08	SD of log Data	0.545
Median	2.57E-08		
SD	1.30E-08		
Std. Error of Mean	2.59E-09		
Coefficient of Variation	N/A		
Skewness	0.798		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical Value	0.918	Shapiro Wilk Critical Value	0.918
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	3.17E-08	95% H-UCL	3.49E-08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.15E-08
95% Adjusted-CLT UCL (Chen-1995)	3.20E-08	97.5% Chebyshev (MVUE) UCL	4.75E-08
95% Modified-t UCL (Johnson-1978)	3.18E-08	99% Chebyshev (MVUE) UCL	5.92E-08

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.721	Data appear Normal at 5% Significance Level	
Theta Star	7.32E-09		
MLE of Mean	2.73E-08		
MLE of Standard Deviation	1.41E-08		
nu star	186.1		
Approximate Chi Square Value (.05)	155.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0395	95% CLT UCL	3.15E-08
Adjusted Chi Square Value	153.6	95% Jackknife UCL	3.17E-08
		95% Standard Bootstrap UCL	3.15E-08
Anderson-Darling Test Statistic	0.443	95% Bootstrap-t UCL	3.25E-08
Anderson-Darling 5% Critical Value	0.748	95% Hall's Bootstrap UCL	3.27E-08
Kolmogorov-Smirnov Test Statistic	0.184	95% Percentile Bootstrap UCL	3.14E-08
Kolmogorov-Smirnov 5% Critical Value	0.175	95% BCA Bootstrap UCL	3.18E-08
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.86E-08
		97.5% Chebyshev(Mean, Sd) UCL	4.34E-08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5.30E-08
95% Approximate Gamma UCL (Use when n >= 40)	3.26E-08		
95% Adjusted Gamma UCL (Use when n < 40)	3.30E-08		

Potential UCL to Use		Use 95% Student's-t UCL	3.17E-08
		pH =	7.50
		mean =	2.73E-08
		mean pH =	7.56
		mean-LCL	-4.44E-09
		UCL =	2.28E-08
		UCL pH =	7.64

MWB-3 LDA pH UTL (actual H conc, outlier 9.23 removed)

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C2

General Statistics			
Total Number of Observations	36	Number of Distinct Observations	28
Tolerance Factor	1.716		
Raw Statistics		Log-Transformed Statistics	
Minimum	2.34E-09	Minimum	-19.87
Maximum	7.41E-08	Maximum	-16.42
Second Largest	5.01E-08	Second Largest	-16.81
First Quartile	1.90E-08	First Quartile	-17.78
Median	2.88E-08	Median	-17.36
Third Quartile	3.47E-08	Third Quartile	-17.18
Mean	2.81E-08	Mean	-17.53
Geometric Mean	2.43E-08	SD	0.622
SD	1.35E-08		
Coefficient of Variation	N/A		
Skewness	0.878		
Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.95	Shapiro Wilk Test Statistic	0.879
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	5.14E-08	95% UTL with 90% Coverage	7.09E-08
95% UPL (t)	5.13E-08	95% UPL (t)	7.07E-08
90% Percentile (z)	4.55E-08	90% Percentile (z)	5.41E-08
95% Percentile (z)	5.04E-08	95% Percentile (z)	6.78E-08
99% Percentile (z)	5.96E-08	99% Percentile (z)	1.04E-07
Gamma Distribution Test		Data Distribution Test	
k star	3.334	Data appear Normal at 5% Significance Level	
Theta Star	8.44E-09		
MLE of Mean	2.81E-08		
MLE of Standard Deviation	1.54E-08		
nu star	240.1		
A-D Test Statistic	0.701	Nonparametric Statistics	
5% A-D Critical Value	0.753	90% Percentile	4.03E-08
K-S Test Statistic	0.116	95% Percentile	4.68E-08
5% K-S Critical Value	0.148	99% Percentile	6.57E-08
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	5.01E-08
90% Percentile	4.88E-08	95% Percentile Bootstrap UTL with 90% Coverage	5.01E-08
95% Percentile	5.73E-08	95% BCA Bootstrap UTL with 90% Coverage	4.79E-08
99% Percentile	7.56E-08	95% UPL	5.37E-08
		95% Chebyshev UPL	8.79E-08
95% WH Approx. Gamma UPL	5.80E-08	Upper Threshold Limit Based upon IQR	5.82E-08
95% HW Approx. Gamma UPL	6.00E-08		
95% WH Approx. Gamma UTL with 90% Coverage	5.81E-08		
95% HW Approx. Gamma UTL with 90% Coverage	6.01E-08		

pH =	7.29
mean =	2.81E-08
mean pH =	7.55
mean-LCL	-2.32E-08
UCL =	4.95E-09
UCL pH =	8.31

DSP BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1S DSP pH Trend (without outlier 6.51)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/27/2013 16:59	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient		0.95
Level of Significance		0.05

C1

General Statistics	
Number of Values	36
Minimum	6.64
Maximum	7.7
Mean	7.054
Geometric Mean	7.051
Median	7.01
Standard Deviation	0.212
SEM	0.0354

Mann-Kendall Test	
Test Value (S)	-4
Critical Value (0.05)	-1.645
Standard Deviation of S	73.34
Standardized Value of S	-0.0409
Approximate p-value	0.484

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-1D DSP pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 12:24
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	37
Minimum	6.99
Maximum	8.1
Mean	7.479
Geometric Mean	7.476
Median	7.47
Standard Deviation	0.225
SEM	0.037

Mann-Kendall Test	
Test Value (S)	145
Critical Value (0.05)	1.645
Standard Deviation of S	76.4
Standardized Value of S	1.885
Approximate p-value	0.0297

Statistically significant evidence of an increasing trend at the specified level of significance.

MWB-2 DSP pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 12:31
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	6.44
Maximum	7.58
Mean	6.933
Geometric Mean	6.927
Median	6.895
Standard Deviation	0.289
SEM	0.0589

Mann-Kendall Test	
Test Value (S)	-16
Critical Value (0.05)	-1.645
Standard Deviation of S	40.26
Standardized Value of S	-0.373
Approximate p-value	0.355

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-4S DSP pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 12:36
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	4
Minimum	7.21
Maximum	7.68
Mean	7.383
Geometric Mean	7.38
Median	7.32
Standard Deviation	0.206
SEM	0.103

Mann-Kendall Test	
Test Value (S)	2
Tabulated p-value	0.375
Standard Deviation of S	2.944
Standardized Value of S	0.34
Approximate p-value	0.367

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-5D DSP pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 13:06	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	35
Minimum	6.52
Maximum	7.68
Mean	6.99
Geometric Mean	6.987
Median	6.97
Standard Deviation	0.22
SEM	0.0372

Mann-Kendall Test	
Test Value (S)	6
Critical Value (0.05)	1.645
Standard Deviation of S	70.34
Standardized Value of S	0.0711
Approximate p-value	0.472

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-6 DSP pH Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 13:14
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	23
Minimum	6.8
Maximum	7.78
Mean	7.257
Geometric Mean	7.254
Median	7.26
Standard Deviation	0.242
SEM	0.0504

Mann-Kendall Test	
Test Value (S)	15
Critical Value (0.05)	1.645
Standard Deviation of S	37.78
Standardized Value of S	0.371
Approximate p-value	0.355

Insufficient evidence to identify a significant trend at the specified level of significance.

Portal DSP pH Trend (outlier 6.49 removed)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	3/8/2013 8:57
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	40
Minimum	6.57
Maximum	7.74
Mean	7.156
Geometric Mean	7.15
Median	7.145
Standard Deviation	0.284
SEM	0.0449

Mann-Kendall Test	
Test Value (S)	-79
Critical Value (0.05)	-1.645
Standard Deviation of S	85.79
Standardized Value of S	-0.909
Approximate p-value	0.182

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1S DSP pH UCL (actual H conc without outlier 6.51)

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

C2

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	28
Raw Statistics		**Log-transformed Statistics**	
Minimum	2.00E-08	Minimum of Log Data	-17.73
Maximum	2.29E-07	Maximum of Log Data	-15.29
Mean	9.76E-08	Mean of log Data	-16.24
Geometric Mean	8.83E-08	SD of log Data	0.489
Median	9.77E-08		
SD	4.09E-08		
Std. Error of Mean	6.82E-09		
Coefficient of Variation	N/A		
Skewness	0.759		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.961	Shapiro Wilk Test Statistic	0.921
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1.09E-07	95% H-UCL	1.17E-07
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.36E-07
95% Adjusted-CLT UCL (Chen-1995)	1.10E-07	97.5% Chebyshev (MVUE) UCL	1.52E-07
95% Modified-t UCL (Johnson-1978)	1.09E-07	99% Chebyshev (MVUE) UCL	1.83E-07
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.767	Data appear Normal at 5% Significance Level	
Theta Star	2.05E-08		
MLE of Mean	9.76E-08		
MLE of Standard Deviation	4.47E-08		
nu star	343.2		
Approximate Chi Square Value (.05)	301.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0428	95% CLT UCL	1.09E-07
Adjusted Chi Square Value	299.5	95% Jackknife UCL	1.09E-07
		95% Standard Bootstrap UCL	1.09E-07
Anderson-Darling Test Statistic	0.536	95% Bootstrap-t UCL	1.10E-07
Anderson-Darling 5% Critical Value	0.75	95% Hall's Bootstrap UCL	1.12E-07
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL	1.09E-07
Kolmogorov-Smirnov 5% Critical Value	0.147	95% BCA Bootstrap UCL	1.10E-07
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.27E-07
		97.5% Chebyshev(Mean, Sd) UCL	1.40E-07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.65E-07
95% Approximate Gamma UCL (Use when n >= 40)	1.11E-07		
95% Adjusted Gamma UCL (Use when n < 40)	1.12E-07		

Potential UCL to Use	Use 95% Student's-t UCL		1.09E-07
		pH =	6.96
		mean =	9.76E-08
		mean pH =	7.01
		mean-LCL	-1.15E-08
		UCL =	8.61E-08
		UCL pH =	7.07

MWB-1D DSP pH UCL

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

C0

General Statistics			
Number of Valid Observations	37	Number of Distinct Observations	29
Raw Statistics		**Log-transformed Statistics**	
Minimum	7.94E-09	Minimum of Log Data	-18.65
Maximum	1.02E-07	Maximum of Log Data	-16.1
Mean	3.76E-08	Mean of log Data	-17.22
Geometric Mean	3.32E-08	SD of log Data	0.518
Median	3.39E-08		
SD	1.95E-08		
Std. Error of Mean	3.21E-09		
Coefficient of Variation	N/A		
Skewness	1.358		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.903	Shapiro Wilk Test Statistic	0.981
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
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	4.30E-08	95% H-UCL	4.48E-08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.25E-08
95% Adjusted-CLT UCL (Chen-1995)	4.36E-08	97.5% Chebyshev (MVUE) UCL	5.88E-08
95% Modified-t UCL (Johnson-1978)	4.31E-08	99% Chebyshev (MVUE) UCL	7.14E-08

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.845	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	9.77E-09		
MLE of Mean	3.76E-08		
MLE of Standard Deviation	1.92E-08		
nu star	284.6		
Approximate Chi Square Value (.05)	246.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0431	95% CLT UCL	4.28E-08
Adjusted Chi Square Value	244.9	95% Jackknife UCL	4.30E-08
		95% Standard Bootstrap UCL	4.28E-08
Anderson-Darling Test Statistic	0.308	95% Bootstrap-t UCL	4.37E-08
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	4.43E-08
Kolmogorov-Smirnov Test Statistic	0.0933	95% Percentile Bootstrap UCL	4.30E-08
Kolmogorov-Smirnov 5% Critical Value	0.146	95% BCA Bootstrap UCL	4.40E-08
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5.16E-08
		97.5% Chebyshev(Mean, Sd) UCL	5.76E-08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	6.95E-08
95% Approximate Gamma UCL (Use when n >= 40)	4.34E-08		
95% Adjusted Gamma UCL (Use when n < 40)	4.36E-08		

Potential UCL to Use		Use 95% Approximate Gamma UCL	4.34E-08
		pH =	7.36
		mean =	3.39E-08
		mean pH	7.47
		mean-LC	-9.48E-09
		UCL =	2.44E-08
		UCL pH =	7.61

MWB-2 DSP pH UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	21

Raw Statistics		Log-transformed Statistics	
Minimum	2.63E-08	Minimum of Log Data	-17.45
Maximum	3.63E-07	Maximum of Log Data	-14.83
Mean	1.40E-07	Mean of log Data	-15.96
Geometric Mean	1.17E-07	SD of log Data	0.665
Median	1.27E-07		
SD	8.27E-08		
Std. Error of Mean	1.69E-08		
Coefficient of Variation	N/A		
Skewness	1.073		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.918	Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	1.69E-07	95% H-UCL	1.96E-07
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.35E-07
95% Adjusted-CLT UCL (Chen-1995)	1.72E-07	97.5% Chebyshev (MVUE) UCL	2.75E-07
95% Modified-t UCL (Johnson-1978)	1.70E-07	99% Chebyshev (MVUE) UCL	3.52E-07

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.538	Data appear Normal at 5% Significance Level	
Theta Star	5.53E-08		
MLE of Mean	1.40E-07		
MLE of Standard Deviation	8.82E-08		
nu star	121.8		
Approximate Chi Square Value (.05)	97.35	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	1.68E-07
Adjusted Chi Square Value	95.81	95% Jackknife UCL	1.69E-07
		95% Standard Bootstrap UCL	1.68E-07
Anderson-Darling Test Statistic	0.316	95% Bootstrap-t UCL	1.75E-07
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	1.79E-07
Kolmogorov-Smirnov Test Statistic	0.103	95% Percentile Bootstrap UCL	1.70E-07
Kolmogorov-Smirnov 5% Critical Value	0.179	95% BCA Bootstrap UCL	1.72E-07
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2.14E-07
		97.5% Chebyshev(Mean, Sd) UCL	2.46E-07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3.08E-07
95% Approximate Gamma UCL (Use when n >= 40)	1.76E-07		
95% Adjusted Gamma UCL (Use when n < 40)	1.79E-07		

Potential UCL to Use		Use 95% Student's-t UCL	1.69E-07
		pH =	6.77
		mean =	1.40E-07
		mean pH	6.85
		mean-LCL	-2.89E-08
		UCL =	1.12E-07
		UCL pH =	6.95

MWB-5D DSP UCL (actual H conc, without 6.52 outlier)

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

C2

General Statistics			
Number of Valid Observations	34	Number of Distinct Observations	28
Raw Statistics		**Log-transformed Statistics**	
Minimum	2.09E-08	Minimum of Log Data	-17.68
Maximum	2.40E-07	Maximum of Log Data	-15.24
Mean	1.09E-07	Mean of log Data	-16.13
Geometric Mean	9.91E-08	SD of log Data	0.477
Median	1.06E-07		
SD	4.36E-08		
Std. Error of Mean	7.47E-09		
Coefficient of Variation	N/A		
Skewness	0.696		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.946	Shapiro Wilk Test Statistic	0.895
Shapiro Wilk Critical Value	0.933	Shapiro Wilk Critical Value	0.933
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1.21E-07	95% H-UCL	1.30E-07
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.52E-07
95% Adjusted-CLT UCL (Chen-1995)	1.22E-07	97.5% Chebyshev (MVUE) UCL	1.70E-07
95% Modified-t UCL (Johnson-1978)	1.22E-07	99% Chebyshev (MVUE) UCL	2.05E-07

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.073	Data appear Normal at 5% Significance Level	
Theta Star	2.14E-08		
MLE of Mean	1.09E-07		
MLE of Standard Deviation	4.83E-08		
nu star	345		
Approximate Chi Square Value (.05)	302.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0422	95% CLT UCL	1.21E-07
Adjusted Chi Square Value	301	95% Jackknife UCL	1.21E-07
		95% Standard Bootstrap UCL	1.21E-07
Anderson-Darling Test Statistic	0.754	95% Bootstrap-t UCL	1.22E-07
Anderson-Darling 5% Critical Value	0.749	95% Hall's Bootstrap UCL	1.25E-07
Kolmogorov-Smirnov Test Statistic	0.135	95% Percentile Bootstrap UCL	1.21E-07
Kolmogorov-Smirnov 5% Critical Value	0.151	95% BCA Bootstrap UCL	1.23E-07
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.41E-07
		97.5% Chebyshev(Mean, Sd) UCL	1.55E-07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.83E-07
95% Approximate Gamma UCL (Use when n >= 40)	1.24E-07		
95% Adjusted Gamma UCL (Use when n < 40)	1.25E-07		

Potential UCL to Use	Use 95% Student's-t UCL		1.21E-07
		pH =	6.92
		mean =	1.09E-07
		mean pH =	6.96
		mean-LCL	-1.27E-08
		UCL =	9.61E-08
		UCL pH =	7.02

MWB-6 DSP pH UCL (actual H conc)

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

C0

General Statistics			
Number of Valid Observations	23	Number of Distinct Observations	18

Raw Statistics		Log-transformed Statistics	
Minimum	1.66E-08	Minimum of Log Data	-17.91
Maximum	1.58E-07	Maximum of Log Data	-15.66
Mean	6.33E-08	Mean of log Data	-16.71
Geometric Mean	5.53E-08	SD of log Data	0.556
Median	5.50E-08		
SD	3.28E-08		
Std. Error of Mean	6.84E-09		
Coefficient of Variation	N/A		
Skewness	1.137		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.92	Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical Value	0.914	Shapiro Wilk Critical Value	0.914
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	7.50E-08	95% H-UCL	8.21E-08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9.80E-08
95% Adjusted-CLT UCL (Chen-1995)	7.62E-08	97.5% Chebyshev (MVUE) UCL	1.13E-07
95% Modified-t UCL (Johnson-1978)	7.53E-08	99% Chebyshev (MVUE) UCL	1.42E-07

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.396	Data appear Normal at 5% Significance Level	
Theta Star	1.86E-08		
MLE of Mean	6.33E-08		
MLE of Standard Deviation	3.43E-08		
nu star	156.2		
Approximate Chi Square Value (.05)	128.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0389	95% CLT UCL	7.45E-08
Adjusted Chi Square Value	126.5	95% Jackknife UCL	7.50E-08
		95% Standard Bootstrap UCL	7.39E-08
Anderson-Darling Test Statistic	0.352	95% Bootstrap-t UCL	7.75E-08
Anderson-Darling 5% Critical Value	0.749	95% Hall's Bootstrap UCL	8.05E-08
Kolmogorov-Smirnov Test Statistic	0.161	95% Percentile Bootstrap UCL	7.41E-08
Kolmogorov-Smirnov 5% Critical Value	0.182	95% BCA Bootstrap UCL	7.65E-08
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	9.31E-08
		97.5% Chebyshev(Mean, Sd) UCL	1.06E-07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.31E-07
95% Approximate Gamma UCL (Use when n >= 40)	7.70E-08		
95% Adjusted Gamma UCL (Use when n < 40)	7.81E-08		

Potential UCL to Use	Use 95% Student's-t UCL		7.50E-08
		pH =	7.12
		mean =	6.33E-08
		mean pH =	7.20
		mean-LCL	-1.18E-08
		UCL =	5.15E-08
		UCL pH =	7.29

Portal DSP pH (actual H conc, outlier 6.49 removed)

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

C2

General Statistics			
Number of Valid Observations	40	Number of Distinct Observations	33
Raw Statistics		Log-transformed Statistics	
Minimum	1.82E-08	Minimum of Log Data	-17.82
Maximum	2.69E-07	Maximum of Log Data	-15.13
Mean	8.56E-08	Mean of log Data	-16.48
Geometric Mean	6.99E-08	SD of log Data	0.654
Median	7.17E-08		
SD	5.67E-08		
Std. Error of Mean	8.96E-09		
Coefficient of Variation	N/A		
Skewness	1.32		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.887	Shapiro Wilk Test Statistic	0.983
Shapiro Wilk Critical Value	0.94	Shapiro Wilk Critical Value	0.94
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	1.01E-07	95% H-UCL	1.07E-07
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.28E-07
95% Adjusted-CLT UCL (Chen-1995)	1.02E-07	97.5% Chebyshev (MVUE) UCL	1.46E-07
95% Modified-t UCL (Johnson-1978)	1.01E-07	99% Chebyshev (MVUE) UCL	1.81E-07
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.439	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	3.51E-08		
MLE of Mean	8.56E-08		
MLE of Standard Deviation	5.48E-08		
nu star	195.1		
Approximate Chi Square Value (.05)	163.8	Nonparametric Statistics	
Adjusted Level of Significance	0.044	95% CLT UCL	1.00E-07
Adjusted Chi Square Value	162.7	95% Jackknife UCL	1.01E-07
		95% Standard Bootstrap UCL	1.00E-07
Anderson-Darling Test Statistic	0.255	95% Bootstrap-t UCL	1.03E-07
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	1.03E-07
Kolmogorov-Smirnov Test Statistic	0.0778	95% Percentile Bootstrap UCL	9.97E-08
Kolmogorov-Smirnov 5% Critical Value	0.141	95% BCA Bootstrap UCL	1.02E-07
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.25E-07
		97.5% Chebyshev(Mean, Sd) UCL	1.42E-07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.75E-07
95% Approximate Gamma UCL (Use when n >= 40)	1.02E-07		
95% Adjusted Gamma UCL (Use when n < 40)	1.03E-07		
Potential UCL to Use		Use 95% Approximate Gamma UCL	1.02E-07
		pH =	6.99
		mean =	7.17E-08
		mean pH =	7.14
		mean-LCL	-3.02E-08
		UCL =	4.15E-08
		UCL pH =	7.38

TDS

LDA SURFACE WATER

TREND EVALUATIONS

South Pond LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 8:15
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	59
Minimum	730
Maximum	6600
Mean	3630
Geometric Mean	3238
Median	3780
Standard Deviation	1564
SEM	203.6

Mann-Kendall Test	
Test Value (S)	-754
Critical Value (0.05)	-1.645
Standard Deviation of S	152.8
Standardized Value of S	-4.928
Approximate p-value	4.15E-07

Statistically significant evidence of a decreasing trend at the specified level of significance.

Still Well TDS Trend (without 6000 & 550 outliers)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/19/2013 9:36
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	59
Minimum	1900
Maximum	5200
Mean	3107
Geometric Mean	3052
Median	3000
Standard Deviation	614.8
SEM	80.03

Mann-Kendall Test	
Test Value (S)	-220
Critical Value (0.05)	-1.645
Standard Deviation of S	152.6
Standardized Value of S	-1.435
Approximate p-value	0.0756

Insufficient evidence to identify a significant trend at the specified level of significance.

Weir TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 9:47
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	58
Minimum	410
Maximum	3300
Mean	1701
Geometric Mean	1574
Median	1600
Standard Deviation	640.9
SEM	84.15

Mann-Kendall Test	
Test Value (S)	-220
Critical Value (0.05)	-1.645
Standard Deviation of S	148.8
Standardized Value of S	-1.472
Approximate p-value	0.0706

Insufficient evidence to identify a significant trend at the specified level of significance.

Infiltration Pond #1 LDA TDS Trend (without 4600 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 9:05
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	60
Minimum	470
Maximum	1700
Mean	849.1
Geometric Mean	808.5
Median	808
Standard Deviation	276.6
SEM	35.71

Mann-Kendall Test	
Test Value (S)	-129
Critical Value (0.05)	-1.645
Standard Deviation of S	156.7
Standardized Value of S	-0.817
Approximate p-value	0.207

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

South Pond LDA TDS UCL

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	41
Raw Statistics		Log-transformed Statistics	
Minimum	730	Minimum of Log Data	6.593
Maximum	6600	Maximum of Log Data	8.795
Mean	3630	Mean of log Data	8.083
Geometric Mean	3238	SD of log Data	0.523
Median	3780		
SD	1564		
Std. Error of Mean	203.6		
Coefficient of Variation	0.431		
Skewness	0.0894		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.12	Lilliefors Test Statistic	0.125
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	3970	95% H-UCL	4229
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4861
95% Adjusted-CLT UCL (Chen-1995)	3967	97.5% Chebyshev (MVUE) UCL	5363
95% Modified-t UCL (Johnson-1978)	3971	99% Chebyshev (MVUE) UCL	6349
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.311	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	842		
MLE of Mean	3630		
MLE of Standard Deviation	1748		
nu star	508.7		
Approximate Chi Square Value (.05)	457.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	3965
Adjusted Chi Square Value	456.2	95% Jackknife UCL	3970
		95% Standard Bootstrap UCL	3967
Anderson-Darling Test Statistic	0.808	95% Bootstrap-t UCL	3979
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	3985
Kolmogorov-Smirnov Test Statistic	0.107	95% Percentile Bootstrap UCL	3957
Kolmogorov-Smirnov 5% Critical Value	0.116	95% BCA Bootstrap UCL	3986
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4517
		97.5% Chebyshev(Mean, Sd) UCL	4901
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5656
95% Approximate Gamma UCL (Use when n >= 40)	4037		
95% Adjusted Gamma UCL (Use when n < 40)	4048		

Potential UCL to Use	Use 95% Approximate Gamma UCL	4037

Still Well LDA TDS UCL (withot 6000 & 550 outliers)

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	26
Raw Statistics		Log-transformed Statistics	
Minimum	1900	Minimum of Log Data	7.55
Maximum	5200	Maximum of Log Data	8.556
Mean	3107	Mean of log Data	8.023
Geometric Mean	3052	SD of log Data	0.19
Median	3000		
SD	614.8		
Std. Error of Mean	80.03		
Coefficient of Variation	0.198		
Skewness	0.974		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.133	Lilliefors Test Statistic	0.0981
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	3241	95% H-UCL	3244
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3444
95% Adjusted-CLT UCL (Chen-1995)	3250	97.5% Chebyshev (MVUE) UCL	3590
95% Modified-t UCL (Johnson-1978)	3243	99% Chebyshev (MVUE) UCL	3876
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	26.39	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	117.8		
MLE of Mean	3107		
MLE of Standard Deviation	604.9		
nu star	3114		
Approximate Chi Square Value (.05)	2985	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	3239
Adjusted Chi Square Value	2982	95% Jackknife UCL	3241
		95% Standard Bootstrap UCL	3239
Anderson-Darling Test Statistic	0.605	95% Bootstrap-t UCL	3250
Anderson-Darling 5% Critical Value	0.749	95% Hall's Bootstrap UCL	3256
Kolmogorov-Smirnov Test Statistic	0.111	95% Percentile Bootstrap UCL	3240
Kolmogorov-Smirnov 5% Critical Value	0.115	95% BCA Bootstrap UCL	3252
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3456
		97.5% Chebyshev(Mean, Sd) UCL	3607
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3904
95% Approximate Gamma UCL (Use when n >= 40)	3241		
95% Adjusted Gamma UCL (Use when n < 40)	3245		
Potential UCL to Use		Use 95% Approximate Gamma UCL	3241

Weir TDS UCL

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

C1

General Statistics			
Number of Valid Observations	58	Number of Distinct Observations	31
Raw Statistics		**Log-transformed Statistics**	
Minimum	410	Minimum of Log Data	6.016
Maximum	3300	Maximum of Log Data	8.102
Mean	1701	Mean of log Data	7.362
Geometric Mean	1574	SD of log Data	0.418
Median	1600		
SD	640.9		
Std. Error of Mean	84.15		
Coefficient of Variation	0.377		
Skewness	0.508		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.0969	Lilliefors Test Statistic	0.0918
Lilliefors Critical Value	0.116	Lilliefors Critical Value	0.116
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	1841	95% H-UCL	1902
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2140
95% Adjusted-CLT UCL (Chen-1995)	1845	97.5% Chebyshev (MVUE) UCL	2324
95% Modified-t UCL (Johnson-1978)	1842	99% Chebyshev (MVUE) UCL	2685
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.309	Data appear Normal at 5% Significance Level	
Theta Star	269.6		
MLE of Mean	1701		
MLE of Standard Deviation	677.1		
nu star	731.9		
Approximate Chi Square Value (.05)	670.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0459	95% CLT UCL	1839
Adjusted Chi Square Value	668.6	95% Jackknife UCL	1841
		95% Standard Bootstrap UCL	1836
Anderson-Darling Test Statistic	0.381	95% Bootstrap-t UCL	1852
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	1847
Kolmogorov-Smirnov Test Statistic	0.0772	95% Percentile Bootstrap UCL	1842
Kolmogorov-Smirnov 5% Critical Value	0.117	95% BCA Bootstrap UCL	1841
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2067
		97.5% Chebyshev(Mean, Sd) UCL	2226
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2538
95% Approximate Gamma UCL (Use when n >= 40)	1857		
95% Adjusted Gamma UCL (Use when n < 40)	1862		
Potential UCL to Use		Use 95% Student's-t UCL	1841

Infiltration Pond #1 TDS UCL (4600 outlier removed)

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

C1

General Statistics			
Number of Valid Observations	60	Number of Distinct Observations	41
Raw Statistics		Log-transformed Statistics	
Minimum	470	Minimum of Log Data	6.153
Maximum	1700	Maximum of Log Data	7.438
Mean	849.1	Mean of log Data	6.695
Geometric Mean	808.5	SD of log Data	0.313
Median	808		
SD	276.6		
Std. Error of Mean	35.71		
Coefficient of Variation	0.326		
Skewness	0.963		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.114	Lilliefors Test Statistic	0.0884
Lilliefors Critical Value	0.114	Lilliefors Critical Value	0.114
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	908.8	95% H-UCL	909.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1001
95% Adjusted-CLT UCL (Chen-1995)	912.6	97.5% Chebyshev (MVUE) UCL	1067
95% Modified-t UCL (Johnson-1978)	909.5	99% Chebyshev (MVUE) UCL	1197
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.861	Data appear Normal at 5% Significance Level	
Theta Star	86.11		
MLE of Mean	849.1		
MLE of Standard Deviation	270.4		
nu star	1183		
Approximate Chi Square Value (.05)	1104	Nonparametric Statistics	
Adjusted Level of Significance	0.046	95% CLT UCL	907.9
Adjusted Chi Square Value	1103	95% Jackknife UCL	908.8
		95% Standard Bootstrap UCL	907.7
Anderson-Darling Test Statistic	0.583	95% Bootstrap-t UCL	919.2
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	915.6
Kolmogorov-Smirnov Test Statistic	0.0773	95% Percentile Bootstrap UCL	908.5
Kolmogorov-Smirnov 5% Critical Value	0.115	95% BCA Bootstrap UCL	913.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1005
		97.5% Chebyshev(Mean, Sd) UCL	1072
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1204
95% Approximate Gamma UCL (Use when n >= 40)	909.8		
95% Adjusted Gamma UCL (Use when n < 40)	911.3		
Potential UCL to Use		Use 95% Student's-t UCL	908.8

LDA SHALLOW GROUNDWATER

TREND EVALUATIONS

MW-1A LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 16:21
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	25
Minimum	240
Maximum	680
Mean	367.8
Geometric Mean	350.2
Median	320
Standard Deviation	128.7
SEM	25.74

Mann-Kendall Test	
Test Value (S)	-89
Critical Value (0.05)	-1.645
Standard Deviation of S	42.55
Standardized Value of S	-2.068
Approximate p-value	0.0193

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-2A LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 16:49
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	36
Minimum	250
Maximum	606
Mean	438.2
Geometric Mean	429.7
Median	420
Standard Deviation	85.91
SEM	14.32

Mann-Kendall Test	
Test Value (S)	-239
Critical Value (0.05)	-1.645
Standard Deviation of S	73.31
Standardized Value of S	-3.247
Approximate p-value	5.84E-04

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-3A LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 17:18
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	29
Minimum	470
Maximum	1100
Mean	811.4
Geometric Mean	800.6
Median	820
Standard Deviation	129.8
SEM	24.1

Mann-Kendall Test	
Test Value (S)	-195
Critical Value (0.05)	-1.645
Standard Deviation of S	53.24
Standardized Value of S	-3.644
Approximate p-value	1.34E-04

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-4A LDA TDS UTL

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C0

General Statistics			
Total Number of Observations	45	Number of Distinct Observations	20
Tolerance Factor	1.662		

Raw Statistics		Log-Transformed Statistics	
Minimum	110	Minimum	4.7
Maximum	370	Maximum	5.914
Second Largest	320	Second Largest	5.768
First Quartile	200	First Quartile	5.298
Median	220	Median	5.394
Third Quartile	270	Third Quartile	5.598
Mean	228.9	Mean	5.404
Geometric Mean	222.3	SD	0.25
SD	53.86		
Coefficient of Variation	0.235		
Skewness	0.123		

Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.986	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	318.4	95% UTL with 90% Coverage	336.8
95% UPL (t)	320.4	95% UPL (t)	339.8
90% Percentile (z)	297.9	90% Percentile (z)	306.2
95% Percentile (z)	317.5	95% Percentile (z)	335.3
99% Percentile (z)	354.2	99% Percentile (z)	397.5

Gamma Distribution Test		Data Distribution Test	
k star	16.27	Data appear Normal at 5% Significance Level	
Theta Star	14.07		
MLE of Mean	228.9		
MLE of Standard Deviation	56.75		
nu star	1464		

A-D Test Statistic	0.325	Nonparametric Statistics	
5% A-D Critical Value	0.748	90% Percentile	290
K-S Test Statistic	0.089	95% Percentile	308
5% K-S Critical Value	0.132	99% Percentile	348
Data appear Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	304	95% UTL with 90% Coverage	310
95% Percentile	329.5	95% Percentile Bootstrap UTL with 90% Coverage	310
99% Percentile	381.1	95% BCA Bootstrap UTL with 90% Coverage	296
		95% UPL	317
		95% Chebyshev UPL	466.3
95% WH Approx. Gamma UPL	331	Upper Threshold Limit Based upon IQR	375
95% HW Approx. Gamma UPL	332.9		
95% WH Approx. Gamma UTL with 90% Coverage	328.5		
95% HW Approx. Gamma UTL with 90% Coverage	330.3		

MW-5A LDA TDS Trend (without 1100 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 18:07
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	34
Minimum	340
Maximum	800
Mean	514.4
Geometric Mean	504.9
Median	500
Standard Deviation	102.8
SEM	17.63

Mann-Kendall Test	
Test Value (S)	-101
Critical Value (0.05)	-1.645
Standard Deviation of S	67.37
Standardized Value of S	-1.484
Approximate p-value	0.0689

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-6A LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 17:43
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	36
Minimum	200
Maximum	810
Mean	516.4
Geometric Mean	497.9
Median	510
Standard Deviation	136.1
SEM	22.69

Mann-Kendall Test	
Test Value (S)	-71
Critical Value (0.05)	-1.645
Standard Deviation of S	73.31
Standardized Value of S	-0.955
Approximate p-value	0.17

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MW-1A LDA TDS UCL

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

C0

General Statistics			
Number of Valid Observations	25	Number of Distinct Observations	15
Raw Statistics		**Log-transformed Statistics**	
Minimum	240	Minimum of Log Data	5.481
Maximum	680	Maximum of Log Data	6.522
Mean	367.8	Mean of log Data	5.858
Geometric Mean	350.2	SD of log Data	0.306
Median	320		
SD	128.7		
Std. Error of Mean	25.74		
Coefficient of Variation	0.35		
Skewness	1.409		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.797	Shapiro Wilk Test Statistic	0.87
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	411.8	95% H-UCL	411
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	465.5
95% Adjusted-CLT UCL (Chen-1995)	417.8	97.5% Chebyshev (MVUE) UCL	508.4
95% Modified-t UCL (Johnson-1978)	413	99% Chebyshev (MVUE) UCL	592.8
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	9.147	Data do not follow a Discernable Distribution (0.05)	
Theta Star	40.21		
MLE of Mean	367.8		
MLE of Standard Deviation	121.6		
nu star	457.3		
Approximate Chi Square Value (.05)	408.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0395	95% CLT UCL	410.1
Adjusted Chi Square Value	405.6	95% Jackknife UCL	411.8
		95% Standard Bootstrap UCL	408.3
Anderson-Darling Test Statistic	1.495	95% Bootstrap-t UCL	425.5
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	414.3
Kolmogorov-Smirnov Test Statistic	0.278	95% Percentile Bootstrap UCL	411.8
Kolmogorov-Smirnov 5% Critical Value	0.174	95% BCA Bootstrap UCL	417
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	479.9
		97.5% Chebyshev(Mean, Sd) UCL	528.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	623.8
95% Approximate Gamma UCL (Use when n >= 40)	411.5		
95% Adjusted Gamma UCL (Use when n < 40)	414.6		

Potential UCL to Use		
	Use 95% Student's-t UCL	411.8
	or 95% Modified-t UCL	413

MW-2A LDA TDS UCL

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

C0

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	23
Raw Statistics		**Log-transformed Statistics**	
Minimum	250	Minimum of Log Data	5.521
Maximum	606	Maximum of Log Data	6.407
Mean	438.2	Mean of log Data	6.063
Geometric Mean	429.7	SD of log Data	0.204
Median	420		
SD	85.91		
Std. Error of Mean	14.32		
Coefficient of Variation	0.196		
Skewness	0.0175		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.976	Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
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	462.4	95% H-UCL	465.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	504
95% Adjusted-CLT UCL (Chen-1995)	461.8	97.5% Chebyshev (MVUE) UCL	532.4
95% Modified-t UCL (Johnson-1978)	462.4	99% Chebyshev (MVUE) UCL	588.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	23.55	Data appear Normal at 5% Significance Level	
Theta Star	18.61		
MLE of Mean	438.2		
MLE of Standard Deviation	90.3		
nu star	1696		
Approximate Chi Square Value (.05)	1601	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0428	95% CLT UCL	461.8
Adjusted Chi Square Value	1597	95% Jackknife UCL	462.4
		95% Standard Bootstrap UCL	461.7
Anderson-Darling Test Statistic	0.3	95% Bootstrap-t UCL	461.9
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	463.4
Kolmogorov-Smirnov Test Statistic	0.101	95% Percentile Bootstrap UCL	460.5
Kolmogorov-Smirnov 5% Critical Value	0.147	95% BCA Bootstrap UCL	460.5
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	500.6
		97.5% Chebyshev(Mean, Sd) UCL	527.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	580.7
95% Approximate Gamma UCL (Use when n >= 40)	464.1		
95% Adjusted Gamma UCL (Use when n < 40)	465.3		

Potential UCL to Use		Use 95% Student's-t UCL	462.4

MW-3A LDA TDS UCL

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

C0

General Statistics			
Number of Valid Observations	29	Number of Distinct Observations	23
Raw Statistics		**Log-transformed Statistics**	
Minimum	470	Minimum of Log Data	6.153
Maximum	1100	Maximum of Log Data	7.003
Mean	811.4	Mean of log Data	6.685
Geometric Mean	800.6	SD of log Data	0.172
Median	820		
SD	129.8		
Std. Error of Mean	24.1		
Coefficient of Variation	0.16		
Skewness	-0.388		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.981	Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.926	Shapiro Wilk Critical Value	0.926
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	852.4	95% H-UCL	859.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	925.6
95% Adjusted-CLT UCL (Chen-1995)	849.2	97.5% Chebyshev (MVUE) UCL	974.8
95% Modified-t UCL (Johnson-1978)	852.2	99% Chebyshev (MVUE) UCL	1071
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	33.38	Data appear Normal at 5% Significance Level	
Theta Star	24.31		
MLE of Mean	811.4		
MLE of Standard Deviation	140.5		
nu star	1936		
Approximate Chi Square Value (.05)	1835	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0407	95% CLT UCL	851.1
Adjusted Chi Square Value	1829	95% Jackknife UCL	852.4
		95% Standard Bootstrap UCL	850.3
Anderson-Darling Test Statistic	0.395	95% Bootstrap-t UCL	850.8
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	851
Kolmogorov-Smirnov Test Statistic	0.101	95% Percentile Bootstrap UCL	849.4
Kolmogorov-Smirnov 5% Critical Value	0.162	95% BCA Bootstrap UCL	848.4
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	916.5
		97.5% Chebyshev(Mean, Sd) UCL	961.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1051
95% Approximate Gamma UCL (Use when n >= 40)	856.2		
95% Adjusted Gamma UCL (Use when n < 40)	859		

Potential UCL to Use		Use 95% Student's-t UCL	852.4

MW-4A LDA TDS UTL

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C0

General Statistics			
Total Number of Observations	45	Number of Distinct Observations	20
Tolerance Factor	1.662		

Raw Statistics		Log-Transformed Statistics	
Minimum	110	Minimum	4.7
Maximum	370	Maximum	5.914
Second Largest	320	Second Largest	5.768
First Quartile	200	First Quartile	5.298
Median	220	Median	5.394
Third Quartile	270	Third Quartile	5.598
Mean	228.9	Mean	5.404
Geometric Mean	222.3	SD	0.25
SD	53.86		
Coefficient of Variation	0.235		
Skewness	0.123		

Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.986	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	318.4	95% UTL with 90% Coverage	336.8
95% UPL (t)	320.4	95% UPL (t)	339.8
90% Percentile (z)	297.9	90% Percentile (z)	306.2
95% Percentile (z)	317.5	95% Percentile (z)	335.3
99% Percentile (z)	354.2	99% Percentile (z)	397.5

Gamma Distribution Test		Data Distribution Test	
k star	16.27	Data appear Normal at 5% Significance Level	
Theta Star	14.07		
MLE of Mean	228.9		
MLE of Standard Deviation	56.75		
nu star	1464		

A-D Test Statistic	0.325	Nonparametric Statistics	
5% A-D Critical Value	0.748	90% Percentile	290
K-S Test Statistic	0.089	95% Percentile	308
5% K-S Critical Value	0.132	99% Percentile	348
Data appear Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	304	95% UTL with 90% Coverage	310
95% Percentile	329.5	95% Percentile Bootstrap UTL with 90% Coverage	310
99% Percentile	381.1	95% BCA Bootstrap UTL with 90% Coverage	296
		95% UPL	317
		95% Chebyshev UPL	466.3
95% WH Approx. Gamma UPL	331	Upper Threshold Limit Based upon IQR	375
95% HW Approx. Gamma UPL	332.9		
95% WH Approx. Gamma UTL with 90% Coverage	328.5		
95% HW Approx. Gamma UTL with 90% Coverage	330.3		

MW-5A LDA TDS UCL (without 1100 outlier)

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

C0

General Statistics			
Number of Valid Observations	34	Number of Distinct Observations	26
Raw Statistics		**Log-transformed Statistics**	
Minimum	340	Minimum of Log Data	5.829
Maximum	800	Maximum of Log Data	6.685
Mean	514.4	Mean of log Data	6.224
Geometric Mean	504.9	SD of log Data	0.195
Median	500		
SD	102.8		
Std. Error of Mean	17.63		
Coefficient of Variation	0.2		
Skewness	0.751		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.957	Shapiro Wilk Test Statistic	0.983
Shapiro Wilk Critical Value	0.933	Shapiro Wilk Critical Value	0.933
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	544.2	95% H-UCL	545.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	589.7
95% Adjusted-CLT UCL (Chen-1995)	545.8	97.5% Chebyshev (MVUE) UCL	622.3
95% Modified-t UCL (Johnson-1978)	544.6	99% Chebyshev (MVUE) UCL	686.4
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	24.66	Data appear Normal at 5% Significance Level	
Theta Star	20.86		
MLE of Mean	514.4		
MLE of Standard Deviation	103.6		
nu star	1677		
Approximate Chi Square Value (.05)	1583	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0422	95% CLT UCL	543.4
Adjusted Chi Square Value	1578	95% Jackknife UCL	544.2
		95% Standard Bootstrap UCL	542.9
Anderson-Darling Test Statistic	0.296	95% Bootstrap-t UCL	547.7
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	547.2
Kolmogorov-Smirnov Test Statistic	0.0918	95% Percentile Bootstrap UCL	543.2
Kolmogorov-Smirnov 5% Critical Value	0.151	95% BCA Bootstrap UCL	543.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	591.2
		97.5% Chebyshev(Mean, Sd) UCL	624.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	689.8
95% Approximate Gamma UCL (Use when n >= 40)	545		
95% Adjusted Gamma UCL (Use when n < 40)	546.6		

Potential UCL to Use		Use 95% Student's-t UCL	544.2

MW-6A LDA TDS UCL

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

C0

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	26
Raw Statistics		**Log-transformed Statistics**	
Minimum	200	Minimum of Log Data	5.298
Maximum	810	Maximum of Log Data	6.697
Mean	516.4	Mean of log Data	6.21
Geometric Mean	497.9	SD of log Data	0.284
Median	510		
SD	136.1		
Std. Error of Mean	22.69		
Coefficient of Variation	0.264		
Skewness	0.227		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.976	Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
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	554.8	95% H-UCL	564.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	626.1
95% Adjusted-CLT UCL (Chen-1995)	554.7	97.5% Chebyshev (MVUE) UCL	673
95% Modified-t UCL (Johnson-1978)	554.9	99% Chebyshev (MVUE) UCL	765.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	12.69	Data appear Normal at 5% Significance Level	
Theta Star	40.7		
MLE of Mean	516.4		
MLE of Standard Deviation	145		
nu star	913.5		
Approximate Chi Square Value (.05)	844.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0428	95% CLT UCL	553.8
Adjusted Chi Square Value	841.3	95% Jackknife UCL	554.8
		95% Standard Bootstrap UCL	552.2
Anderson-Darling Test Statistic	0.282	95% Bootstrap-t UCL	555.1
Anderson-Darling 5% Critical Value	0.748	95% Hall's Bootstrap UCL	558
Kolmogorov-Smirnov Test Statistic	0.0923	95% Percentile Bootstrap UCL	554.6
Kolmogorov-Smirnov 5% Critical Value	0.147	95% BCA Bootstrap UCL	553.2
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	615.3
		97.5% Chebyshev(Mean, Sd) UCL	658.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	742.2
95% Approximate Gamma UCL (Use when n >= 40)	558.7		
95% Adjusted Gamma UCL (Use when n < 40)	560.7		

Potential UCL to Use		Use 95% Student's-t UCL	554.8

LDA BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 12:20
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	40
Maximum	310
Mean	224.2
Geometric Mean	214.1
Median	230
Standard Deviation	48.63
SEM	9.926

Mann-Kendall Test	
Test Value (S)	-18
Critical Value (0.05)	-1.645
Standard Deviation of S	38.99
Standardized Value of S	-0.436
Approximate p-value	0.331

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-2LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 13:19
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	74
Maximum	250
Mean	195.5
Geometric Mean	189
Median	210
Standard Deviation	42.83
SEM	8.743

Mann-Kendall Test	
Test Value (S)	-26
Critical Value (0.05)	-1.645
Standard Deviation of S	39.43
Standardized Value of S	-0.634
Approximate p-value	0.263

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-3LDA TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 11:37
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	36
Minimum	140
Maximum	770
Mean	233.6
Geometric Mean	218.9
Median	205
Standard Deviation	111.7
SEM	18.62

Mann-Kendall Test	
Test Value (S)	-372
Critical Value (0.05)	-1.645
Standard Deviation of S	73.16
Standardized Value of S	-5.071
Approximate p-value	1.98E-07

Statistically significant evidence of a decreasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

BMW-3LDA TDS UTL (without 770 & 500 Outliers)

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C1

General Statistics			
Total Number of Observations	34	Number of Distinct Observations	16
Tolerance Factor	1.732		
Raw Statistics		Log-Transformed Statistics	
Minimum	140	Minimum	4.942
Maximum	310	Maximum	5.737
Second Largest	280	Second Largest	5.635
First Quartile	180	First Quartile	5.193
Median	200	Median	5.298
Third Quartile	240	Third Quartile	5.481
Mean	210	Mean	5.327
Geometric Mean	205.9	SD	0.202
SD	42.28		
Coefficient of Variation	0.201		
Skewness	0.35		
Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk Test Statistic	0.974
Shapiro Wilk Critical Value	0.933	Shapiro Wilk Critical Value	0.933
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	283.2	95% UTL with 90% Coverage	292
95% UPL (t)	282.6	95% UPL (t)	291.1
90% Percentile (z)	264.2	90% Percentile (z)	266.6
95% Percentile (z)	279.5	95% Percentile (z)	286.9
99% Percentile (z)	308.4	99% Percentile (z)	329.2
Gamma Distribution Test		Data Distribution Test	
k star	23.36	Data appear Normal at 5% Significance Level	
Theta Star	8.988		
MLE of Mean	210		
MLE of Standard Deviation	43.45		
nu star	1589		
A-D Test Statistic	0.286	Nonparametric Statistics	
5% A-D Critical Value	0.746	90% Percentile	267
K-S Test Statistic	0.1	95% Percentile	273.5
5% K-S Critical Value	0.151	99% Percentile	300.1
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	280
90% Percentile	267.2	95% Percentile Bootstrap UTL with 90% Coverage	280
95% Percentile	286.2	95% BCA Bootstrap UTL with 90% Coverage	280
99% Percentile	324.1	95% UPL	287.5
		95% Chebyshev UPL	397
95% WH Approx. Gamma UPL	287.6	Upper Threshold Limit Based upon IQR	330
95% HW Approx. Gamma UPL	288.4		
95% WH Approx. Gamma UTL with 90% Coverage	288.3		
95% HW Approx. Gamma UTL with 90% Coverage	289.2		

MWB-1 LDA TDS UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	10
Raw Statistics		Log-transformed Statistics	
Minimum	40	Minimum of Log Data	3.689
Maximum	310	Maximum of Log Data	5.737
Mean	224.2	Mean of log Data	5.366
Geometric Mean	214.1	SD of log Data	0.38
Median	230		
SD	48.63		
Std. Error of Mean	9.926		
Coefficient of Variation	0.217		
Skewness	-2.391		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.719	Shapiro Wilk Test Statistic	0.487
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	241.2	95% H-UCL	267.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	308.8
95% Adjusted-CLT UCL (Chen-1995)	235.3	97.5% Chebyshev (MVUE) UCL	343.2
95% Modified-t UCL (Johnson-1978)	240.4	99% Chebyshev (MVUE) UCL	410.7
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.703	Data do not follow a Discernable Distribution (0.05)	
Theta Star	23.1		
MLE of Mean	224.2		
MLE of Standard Deviation	71.96		
nu star	465.8		
Approximate Chi Square Value (.05)	416.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	240.5
Adjusted Chi Square Value	413.5	95% Jackknife UCL	241.2
		95% Standard Bootstrap UCL	240.2
Anderson-Darling Test Statistic	3.791	95% Bootstrap-t UCL	237.4
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	237.1
Kolmogorov-Smirnov Test Statistic	0.349	95% Percentile Bootstrap UCL	238.3
Kolmogorov-Smirnov 5% Critical Value	0.178	95% BCA Bootstrap UCL	235.8
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	267.4
		97.5% Chebyshev(Mean, Sd) UCL	286.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	322.9
95% Approximate Gamma UCL (Use when n >= 40)	250.5		
95% Adjusted Gamma UCL (Use when n < 40)	252.5		

Potential UCL to Use	Use 95% Student's-t UCL	241.2
	or 95% Modified-t UCL	240.4

MWB-2 LDA TDS UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	10
Raw Statistics		**Log-transformed Statistics**	
Minimum	74	Minimum of Log Data	4.304
Maximum	250	Maximum of Log Data	5.521
Mean	195.5	Mean of log Data	5.242
Geometric Mean	189	SD of log Data	0.293
Median	210		
SD	42.83		
Std. Error of Mean	8.743		
Coefficient of Variation	0.219		
Skewness	-1.851		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.74	Shapiro Wilk Test Statistic	0.65
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	210.5	95% H-UCL	220.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	249
95% Adjusted-CLT UCL (Chen-1995)	206.4	97.5% Chebyshev (MVUE) UCL	271.5
95% Modified-t UCL (Johnson-1978)	209.9	99% Chebyshev (MVUE) UCL	315.8
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	13.16	Data do not follow a Discernable Distribution (0.05)	
Theta Star	14.85		
MLE of Mean	195.5		
MLE of Standard Deviation	53.89		
nu star	631.8		
Approximate Chi Square Value (.05)	574.5	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0392	95% CLT UCL	209.9
Adjusted Chi Square Value	570.7	95% Jackknife UCL	210.5
		95% Standard Bootstrap UCL	209.7
Anderson-Darling Test Statistic	3.363	95% Bootstrap-t UCL	207.6
Anderson-Darling 5% Critical Value	0.743	95% Hall's Bootstrap UCL	206.7
Kolmogorov-Smirnov Test Statistic	0.361	95% Percentile Bootstrap UCL	209.1
Kolmogorov-Smirnov 5% Critical Value	0.178	95% BCA Bootstrap UCL	207.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	233.6
		97.5% Chebyshev(Mean, Sd) UCL	250.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	282.5
95% Approximate Gamma UCL (Use when n >= 40)	215		
95% Adjusted Gamma UCL (Use when n < 40)	216.4		

Potential UCL to Use		
	Use 95% Student's-t UCL	210.5
	or 95% Modified-t UCL	209.9

DSP BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1S DSP TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 15:47
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	37
Minimum	530
Maximum	1400
Mean	1080
Geometric Mean	1069
Median	1100
Standard Deviation	141.4
SEM	23.24

Mann-Kendall Test	
Test Value (S)	352
Critical Value (0.05)	1.645
Standard Deviation of S	74.59
Standardized Value of S	4.706
Approximate p-value	1.27E-06

Statistically significant evidence of an increasing trend at the specified level of significance.

MWB-1D DSP TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 15:19
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	37
Minimum	370
Maximum	600
Mean	489.8
Geometric Mean	486.8
Median	480
Standard Deviation	55.09
SEM	9.056

Mann-Kendall Test	
Test Value (S)	323
Critical Value (0.05)	1.645
Standard Deviation of S	76.26
Standardized Value of S	4.222
Approximate p-value	1.21E-05

Statistically significant evidence of an increasing trend at the specified level of significance.

MWB-2 DSP TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 15:03
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	21
Minimum	338
Maximum	560
Mean	451
Geometric Mean	446.4
Median	459
Standard Deviation	64.93
SEM	14.17

Mann-Kendall Test	
Test Value (S)	-74
Tabulated p-value	0.013
Standard Deviation of S	33.12
Standardized Value of S	-2.204
Approximate p-value	0.0137

Statistically significant evidence of a decreasing trend at the specified level of significance.

MWB-5D DSP TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 14:57
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	25
Minimum	450
Maximum	820
Mean	575.6
Geometric Mean	572.7
Median	560
Standard Deviation	62.72
SEM	12.54

Mann-Kendall Test	
Test Value (S)	12
Critical Value (0.05)	1.645
Standard Deviation of S	42.33
Standardized Value of S	0.26
Approximate p-value	0.397

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-6 DSP TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 14:45
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	23
Minimum	270
Maximum	480
Mean	353.9
Geometric Mean	349.7
Median	340
Standard Deviation	57.35
SEM	11.96

Mann-Kendall Test	
Test Value (S)	-73
Critical Value (0.05)	-1.645
Standard Deviation of S	37.63
Standardized Value of S	-1.914
Approximate p-value	0.0278

Statistically significant evidence of a decreasing trend at the specified level of significance.

Portal DSP TDS Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 15:59
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	42
Minimum	330
Maximum	656
Mean	519.9
Geometric Mean	512.2
Median	525
Standard Deviation	87.67
SEM	13.53

Mann-Kendall Test	
Test Value (S)	-462
Critical Value (0.05)	-1.645
Standard Deviation of S	92.14
Standardized Value of S	-5.003
Approximate p-value	2.82E-07

Statistically significant evidence of a decreasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1D DSP TDS UCL

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

C1

General Statistics			
Number of Valid Observations	37	Number of Distinct Observations	22
Raw Statistics		**Log-transformed Statistics**	
Minimum	370	Minimum of Log Data	5.914
Maximum	600	Maximum of Log Data	6.397
Mean	489.8	Mean of log Data	6.188
Geometric Mean	486.8	SD of log Data	0.114
Median	480		
SD	55.09		
Std. Error of Mean	9.056		
Coefficient of Variation	0.112		
Skewness	0.0323		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.969	Shapiro Wilk Test Statistic	0.969
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
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	505.1	95% H-UCL	505.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	529.8
95% Adjusted-CLT UCL (Chen-1995)	504.8	97.5% Chebyshev (MVUE) UCL	547.1
95% Modified-t UCL (Johnson-1978)	505.1	99% Chebyshev (MVUE) UCL	581
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	73.97	Data appear Normal at 5% Significance Level	
Theta Star	6.622		
MLE of Mean	489.8		
MLE of Standard Deviation	56.95		
nu star	5474		
Approximate Chi Square Value (.05)	5303	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0431	95% CLT UCL	504.7
Adjusted Chi Square Value	5296	95% Jackknife UCL	505.1
		95% Standard Bootstrap UCL	504.5
Anderson-Darling Test Statistic	0.483	95% Bootstrap-t UCL	505.1
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	505.2
Kolmogorov-Smirnov Test Statistic	0.112	95% Percentile Bootstrap UCL	505.1
Kolmogorov-Smirnov 5% Critical Value	0.144	95% BCA Bootstrap UCL	504.4
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	529.3
		97.5% Chebyshev(Mean, Sd) UCL	546.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	579.9
95% Approximate Gamma UCL (Use when n >= 40)	505.6		
95% Adjusted Gamma UCL (Use when n < 40)	506.3		

Potential UCL to Use	Use 95% Student's-t UCL	505.1

MWB-1S DSP TDS UCL (without 550 outlier)

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

C1

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	14
Raw Statistics		Log-transformed Statistics	
Minimum	860	Minimum of Log Data	6.757
Maximum	1400	Maximum of Log Data	7.244
Mean	1096	Mean of log Data	6.994
Geometric Mean	1090	SD of log Data	0.0981
Median	1100		
SD	108		
Std. Error of Mean	18		
Coefficient of Variation	0.0986		
Skewness	0.387		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.948	Shapiro Wilk Test Statistic	0.956
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
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	1126	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1174
95% Adjusted-CLT UCL (Chen-1995)	1126	97.5% Chebyshev (MVUE) UCL	1208
95% Modified-t UCL (Johnson-1978)	1126	99% Chebyshev (MVUE) UCL	1274
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	98.01	Data appear Normal at 5% Significance Level	
Theta Star	11.18		
MLE of Mean	1096		
MLE of Standard Deviation	110.7		
nu star	7057		
Approximate Chi Square Value (.05)	6863	Nonparametric Statistics	
Adjusted Level of Significance	0.0428	95% CLT UCL	1125
Adjusted Chi Square Value	6854	95% Jackknife UCL	1126
		95% Standard Bootstrap UCL	1124
Anderson-Darling Test Statistic	0.904	95% Bootstrap-t UCL	1127
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	1128
Kolmogorov-Smirnov Test Statistic	0.193	95% Percentile Bootstrap UCL	1124
Kolmogorov-Smirnov 5% Critical Value	0.146	95% BCA Bootstrap UCL	1126
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1174
		97.5% Chebyshev(Mean, Sd) UCL	1208
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1275
95% Approximate Gamma UCL (Use when n >= 40)	1127		
95% Adjusted Gamma UCL (Use when n < 40)	1128		

Potential UCL to Use		Use 95% Student's-t UCL	1126

MWB-2 DSP TDS UCL

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

C0

General Statistics			
Number of Valid Observations	21	Number of Distinct Observations	21
Raw Statistics		**Log-transformed Statistics**	
Minimum	338	Minimum of Log Data	5.823
Maximum	560	Maximum of Log Data	6.328
Mean	451	Mean of log Data	6.101
Geometric Mean	446.4	SD of log Data	0.148
Median	459		
SD	64.93		
Std. Error of Mean	14.17		
Coefficient of Variation	0.144		
Skewness	-0.128		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.973	Shapiro Wilk Test Statistic	0.964
Shapiro Wilk Critical Value	0.908	Shapiro Wilk Critical Value	0.908
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	475.4	95% H-UCL	478
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	514.6
95% Adjusted-CLT UCL (Chen-1995)	473.8	97.5% Chebyshev (MVUE) UCL	542.1
95% Modified-t UCL (Johnson-1978)	475.3	99% Chebyshev (MVUE) UCL	596.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	42.22	Data appear Normal at 5% Significance Level	
Theta Star	10.68		
MLE of Mean	451		
MLE of Standard Deviation	69.4		
nu star	1773		
Approximate Chi Square Value (.05)	1676	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0383	95% CLT UCL	474.3
Adjusted Chi Square Value	1669	95% Jackknife UCL	475.4
		95% Standard Bootstrap UCL	474.1
Anderson-Darling Test Statistic	0.236	95% Bootstrap-t UCL	474.9
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	474.2
Kolmogorov-Smirnov Test Statistic	0.0921	95% Percentile Bootstrap UCL	474.1
Kolmogorov-Smirnov 5% Critical Value	0.189	95% BCA Bootstrap UCL	474
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	512.7
		97.5% Chebyshev(Mean, Sd) UCL	539.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	591.9
95% Approximate Gamma UCL (Use when n >= 40)	477		
95% Adjusted Gamma UCL (Use when n < 40)	479.1		

Potential UCL to Use		Use 95% Student's-t UCL	475.4

MWB-5D DSP TDS UCL

630
540
530
550
560
540
600
550
590
590
620
560
820
550
550
550
580
580
610
540
610
560
580
450

General UCL Statistics for Full Data Sets

WorkSheet.wst
OFF
95%
2000

	25	Number of Distinct Observations	12
		Log-transformed Statistics	
	450	Minimum of Log Data	6.109
	820	Maximum of Log Data	6.709
	575.6	Mean of log Data	6.35
	572.7	SD of log Data	0.101
	560		
	62.72		
	12.54		
	0.109		
	2.317		

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.749	Shapiro Wilk Test Statistic	0.81
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	597.1	95% H-UCL	596.1
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	626
95% Adjusted-CLT UCL (Chen-1995)	602.4	97.5% Chebyshev (MVUE) UCL	647.8
95% Modified-t UCL (Johnson-1978)	598	99% Chebyshev (MVUE) UCL	690.8
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	86.62	Data do not follow a Discernable Distribution (0.05)	
Theta Star	6.645		
MLE of Mean	575.6		
MLE of Standard Deviation	61.85		
nu star	4331		
Approximate Chi Square Value (.05)	4179	Nonparametric Statistics	
Adjusted Level of Significance	0.0395	95% CLT UCL	596.2
Adjusted Chi Square Value	4169	95% Jackknife UCL	597.1
		95% Standard Bootstrap UCL	595.8
Anderson-Darling Test Statistic	1.628	95% Bootstrap-t UCL	605.7
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	709.4
Kolmogorov-Smirnov Test Statistic	0.197	95% Percentile Bootstrap UCL	597.2
Kolmogorov-Smirnov 5% Critical Value	0.174	95% BCA Bootstrap UCL	603.6
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	630.3
		97.5% Chebyshev(Mean, Sd) UCL	653.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	700.4
95% Approximate Gamma UCL (Use when n >= 40)	596.5		
95% Adjusted Gamma UCL (Use when n < 40)	598		
Potential UCL to Use		Use 95% Student's-t UCL	597.1
		or 95% Modified-t UCL	598

MWB-6 DSP TDS UCL

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

C0

General Statistics			
Number of Valid Observations	23	Number of Distinct Observations	14
Raw Statistics		Log-transformed Statistics	
Minimum	270	Minimum of Log Data	5.598
Maximum	480	Maximum of Log Data	6.174
Mean	353.9	Mean of log Data	5.857
Geometric Mean	349.7	SD of log Data	0.158
Median	340		
SD	57.35		
Std. Error of Mean	11.96		
Coefficient of Variation	0.162		
Skewness	0.674		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.939	Shapiro Wilk Test Statistic	0.961
Shapiro Wilk Critical Value	0.914	Shapiro Wilk Critical Value	0.914
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	374.4	95% H-UCL	375.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	404.8
95% Adjusted-CLT UCL (Chen-1995)	375.4	97.5% Chebyshev (MVUE) UCL	426.9
95% Modified-t UCL (Johnson-1978)	374.7	99% Chebyshev (MVUE) UCL	470.3
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	36.09	Data appear Normal at 5% Significance Level	
Theta Star	9.807		
MLE of Mean	353.9		
MLE of Standard Deviation	58.91		
nu star	1660		
Approximate Chi Square Value (.05)	1566	Nonparametric Statistics	
Adjusted Level of Significance	0.0389	95% CLT UCL	373.6
Adjusted Chi Square Value	1560	95% Jackknife UCL	374.4
		95% Standard Bootstrap UCL	373.1
Anderson-Darling Test Statistic	0.368	95% Bootstrap-t UCL	375.9
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	376.9
Kolmogorov-Smirnov Test Statistic	0.112	95% Percentile Bootstrap UCL	373.9
Kolmogorov-Smirnov 5% Critical Value	0.181	95% BCA Bootstrap UCL	374.3
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	406
		97.5% Chebyshev(Mean, Sd) UCL	428.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	472.9
95% Approximate Gamma UCL (Use when n >= 40)	375.1		
95% Adjusted Gamma UCL (Use when n < 40)	376.6		
Potential UCL to Use		Use 95% Student's-t UCL	374.4

Fe

LDA SURFACE WATER

TREND EVALUATIONS

South Pond LDA Iron Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 8:29
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	59
Minimum	0.075
Maximum	8.36
Mean	1.897
Geometric Mean	0.99
Median	1.13
Standard Deviation	2.022
SEM	0.263

Mann-Kendall Test	
Test Value (S)	267
Critical Value (0.05)	1.645
Standard Deviation of S	152.8
Standardized Value of S	1.741
Approximate p-value	0.0408

Statistically significant evidence of an increasing trend at the specified level of significance.

Weir Iron Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 10:02
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	55
Minimum	0.075
Maximum	2.3
Mean	0.744
Geometric Mean	0.58
Median	0.526
Standard Deviation	0.535
SEM	0.0722

Mann-Kendall Test	
Test Value (S)	128
Critical Value (0.05)	1.645
Standard Deviation of S	137.7
Standardized Value of S	0.922
Approximate p-value	0.178

Insufficient evidence to identify a significant trend at the specified level of significance.

InfiltrationPond #1 LDA Iron Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 9:14
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	59
Minimum	0.075
Maximum	1.1
Mean	0.406
Geometric Mean	0.322
Median	0.344
Standard Deviation	0.261
SEM	0.034

Mann-Kendall Test	
Test Value (S)	136
Critical Value (0.05)	1.645
Standard Deviation of S	152.8
Standardized Value of S	0.883
Approximate p-value	0.188

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

South Pond LDA Iron UCL

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	52
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.075	Minimum of Log Data	-2.59
Maximum	8.36	Maximum of Log Data	2.123
Mean	1.897	Mean of log Data	-0.00971
Geometric Mean	0.99	SD of log Data	1.305
Median	1.13		
SD	2.022		
Std. Error of Mean	0.263		
Coefficient of Variation	1.066		
Skewness	1.52		
Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.214	Lilliefors Test Statistic	0.0946
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	2.337	95% H-UCL	3.824
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.411
95% Adjusted-CLT UCL (Chen-1995)	2.386	97.5% Chebyshev (MVUE) UCL	5.34
95% Modified-t UCL (Johnson-1978)	2.346	99% Chebyshev (MVUE) UCL	7.165
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.865	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.193		
MLE of Mean	1.897		
MLE of Standard Deviation	2.04		
nu star	102.1		
Approximate Chi Square Value (.05)	79.76	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0459	95% CLT UCL	2.33
Adjusted Chi Square Value	79.27	95% Jackknife UCL	2.337
		95% Standard Bootstrap UCL	2.335
Anderson-Darling Test Statistic	0.461	95% Bootstrap-t UCL	2.424
Anderson-Darling 5% Critical Value	0.784	95% Hall's Bootstrap UCL	2.377
Kolmogorov-Smirnov Test Statistic	0.0767	95% Percentile Bootstrap UCL	2.341
Kolmogorov-Smirnov 5% Critical Value	0.12	95% BCA Bootstrap UCL	2.358
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.045
		97.5% Chebyshev(Mean, Sd) UCL	3.541
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4.516
95% Approximate Gamma UCL (Use when n >= 40)	2.428		
95% Adjusted Gamma UCL (Use when n < 40)	2.443		
Potential UCL to Use		Use 95% Approximate Gamma UCL	2.428

Weir Iron UCL

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

C1

General Statistics			
Number of Valid Observations	55	Number of Distinct Observations	52
Raw Statistics		Log-transformed Statistics	
Minimum	0.075	Minimum of Log Data	-2.59
Maximum	2.3	Maximum of Log Data	0.833
Mean	0.744	Mean of log Data	-0.545
Geometric Mean	0.58	SD of log Data	0.73
Median	0.526		
SD	0.535		
Std. Error of Mean	0.0722		
Coefficient of Variation	0.72		
Skewness	1.193		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.186	Lilliefors Test Statistic	0.097
Lilliefors Critical Value	0.119	Lilliefors Critical Value	0.119
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	0.864	95% H-UCL	0.929
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.109
95% Adjusted-CLT UCL (Chen-1995)	0.875	97.5% Chebyshev (MVUE) UCL	1.263
95% Modified-t UCL (Johnson-1978)	0.866	99% Chebyshev (MVUE) UCL	1.566
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.055	Data appear Lognormal at 5% Significance Level	
Theta Star	0.362		
MLE of Mean	0.744		
MLE of Standard Deviation	0.519		
nu star	226.1		
Approximate Chi Square Value (.05)	192.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0456	95% CLT UCL	0.862
Adjusted Chi Square Value	191.4	95% Jackknife UCL	0.864
		95% Standard Bootstrap UCL	0.86
Anderson-Darling Test Statistic	0.951	95% Bootstrap-t UCL	0.874
Anderson-Darling 5% Critical Value	0.762	95% Hall's Bootstrap UCL	0.885
Kolmogorov-Smirnov Test Statistic	0.134	95% Percentile Bootstrap UCL	0.858
Kolmogorov-Smirnov 5% Critical Value	0.121	95% BCA Bootstrap UCL	0.87
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.058
		97.5% Chebyshev(Mean, Sd) UCL	1.194
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.462
95% Approximate Gamma UCL (Use when n >= 40)	0.874		
95% Adjusted Gamma UCL (Use when n < 40)	0.878		
Potential UCL to Use		Use 95% H-UCL	0.929

Infiltration Pond #1 LDA Iron UCL

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	50
Raw Statistics		Log-transformed Statistics	
Minimum	0.075	Minimum of Log Data	-2.59
Maximum	1.1	Maximum of Log Data	0.0953
Mean	0.406	Mean of log Data	-1.134
Geometric Mean	0.322	SD of log Data	0.734
Median	0.344		
SD	0.261		
Std. Error of Mean	0.034		
Coefficient of Variation	0.643		
Skewness	0.775		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.118	Lilliefors Test Statistic	0.0884
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	0.463	95% H-UCL	0.514
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.611
95% Adjusted-CLT UCL (Chen-1995)	0.466	97.5% Chebyshev (MVUE) UCL	0.695
95% Modified-t UCL (Johnson-1978)	0.464	99% Chebyshev (MVUE) UCL	0.859
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.192	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.185		
MLE of Mean	0.406		
MLE of Standard Deviation	0.274		
nu star	258.6		
Approximate Chi Square Value (.05)	222.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	0.462
Adjusted Chi Square Value	221.5	95% Jackknife UCL	0.463
		95% Standard Bootstrap UCL	0.462
Anderson-Darling Test Statistic	0.512	95% Bootstrap-t UCL	0.468
Anderson-Darling 5% Critical Value	0.761	95% Hall's Bootstrap UCL	0.469
Kolmogorov-Smirnov Test Statistic	0.0837	95% Percentile Bootstrap UCL	0.464
Kolmogorov-Smirnov 5% Critical Value	0.117	95% BCA Bootstrap UCL	0.462
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.555
		97.5% Chebyshev(Mean, Sd) UCL	0.619
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.745
95% Approximate Gamma UCL (Use when n >= 40)	0.472		
95% Adjusted Gamma UCL (Use when n < 40)	0.474		

Potential UCL to Use	Use 95% Approximate Gamma UCL	0.472

LDA SHALLOW GROUNDWATER

TREND EVALUATIONS

MW-3A LDA Iron Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 17:15
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	29
Minimum	0.05
Maximum	10.1
Mean	5.028
Geometric Mean	3.562
Median	5.1
Standard Deviation	2.609
SEM	0.484

Mann-Kendall Test	
Test Value (S)	-8
Critical Value (0.05)	-1.645
Standard Deviation of S	53.31
Standardized Value of S	-0.131
Approximate p-value	0.448

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MW-3A LDA Iron UCL

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

C0

General Statistics			
Number of Valid Observations	29	Number of Distinct Observations	29
Raw Statistics		Log-transformed Statistics	
Minimum	0.05	Minimum of Log Data	-2.996
Maximum	10.1	Maximum of Log Data	2.313
Mean	5.028	Mean of log Data	1.27
Geometric Mean	3.562	SD of log Data	1.238
Median	5.1		
SD	2.609		
Std. Error of Mean	0.484		
Coefficient of Variation	0.519		
Skewness	-0.104		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.98	Shapiro Wilk Test Statistic	0.652
Shapiro Wilk Critical Value	0.926	Shapiro Wilk Critical Value	0.926
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	5.852	95% H-UCL	14.68
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	16.17
95% Adjusted-CLT UCL (Chen-1995)	5.815	97.5% Chebyshev (MVUE) UCL	20
95% Modified-t UCL (Johnson-1978)	5.851	99% Chebyshev (MVUE) UCL	27.51
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.455	Data appear Normal at 5% Significance Level	
Theta Star	3.456		
MLE of Mean	5.028		
MLE of Standard Deviation	4.168		
nu star	84.39		
Approximate Chi Square Value (.05)	64.21	Nonparametric Statistics	
Adjusted Level of Significance	0.0407	95% CLT UCL	5.825
Adjusted Chi Square Value	63.16	95% Jackknife UCL	5.852
		95% Standard Bootstrap UCL	5.823
Anderson-Darling Test Statistic	1.935	95% Bootstrap-t UCL	5.862
Anderson-Darling 5% Critical Value	0.762	95% Hall's Bootstrap UCL	5.813
Kolmogorov-Smirnov Test Statistic	0.22	95% Percentile Bootstrap UCL	5.797
Kolmogorov-Smirnov 5% Critical Value	0.165	95% BCA Bootstrap UCL	5.78
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7.14
		97.5% Chebyshev(Mean, Sd) UCL	8.054
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	9.848
95% Approximate Gamma UCL (Use when n >= 40)	6.607		
95% Adjusted Gamma UCL (Use when n < 40)	6.717		

Potential UCL to Use		Use 95% Student's-t UCL	5.852

LDA BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1LDA Iron Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	0.052
Maximum	0.208
Mean	0.119
Geometric Mean	0.111
Median	0.11
Standard Deviation	0.0443
SEM	0.00905

Mann-Kendall Test	
Test Value (S)	-32
Critical Value (0.05)	-1.645
Standard Deviation of S	40.04
Standardized Value of S	-0.774
Approximate p-value	0.219

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-2LDA Iron Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 13:24
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	0.075
Maximum	0.35
Mean	0.257
Geometric Mean	0.243
Median	0.27
Standard Deviation	0.0663
SEM	0.0135

Mann-Kendall Test	
Test Value (S)	88
Critical Value (0.05)	1.645
Standard Deviation of S	40.21
Standardized Value of S	2.164
Approximate p-value	0.0152

Statistically significant evidence of an increasing trend at the specified level of significance.

MWB-3LDA Iron Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 11:43
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	36
Minimum	0.15
Maximum	0.949
Mean	0.424
Geometric Mean	0.394
Median	0.442
Standard Deviation	0.161
SEM	0.0269

Mann-Kendall Test	
Test Value (S)	109
Critical Value (0.05)	1.645
Standard Deviation of S	73.38
Standardized Value of S	1.472
Approximate p-value	0.0705

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1 LDA Iron UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	15
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.052	Minimum of Log Data	-2.957
Maximum	0.208	Maximum of Log Data	-1.57
Mean	0.119	Mean of log Data	-2.194
Geometric Mean	0.111	SD of log Data	0.384
Median	0.11		
SD	0.0443		
Std. Error of Mean	0.00905		
Coefficient of Variation	0.371		
Skewness	0.402		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.929	Shapiro Wilk Test Statistic	0.949
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	0.135	95% H-UCL	0.139
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.161
95% Adjusted-CLT UCL (Chen-1995)	0.135	97.5% Chebyshev (MVUE) UCL	0.179
95% Modified-t UCL (Johnson-1978)	0.135	99% Chebyshev (MVUE) UCL	0.215
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.558	Data appear Normal at 5% Significance Level	
Theta Star	0.0182		
MLE of Mean	0.119		
MLE of Standard Deviation	0.0466		
nu star	314.8		
Approximate Chi Square Value (.05)	274.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0392	95% CLT UCL	0.134
Adjusted Chi Square Value	272.1	95% Jackknife UCL	0.135
		95% Standard Bootstrap UCL	0.134
Anderson-Darling Test Statistic	0.573	95% Bootstrap-t UCL	0.136
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	0.135
Kolmogorov-Smirnov Test Statistic	0.163	95% Percentile Bootstrap UCL	0.134
Kolmogorov-Smirnov 5% Critical Value	0.178	95% BCA Bootstrap UCL	0.135
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.159
		97.5% Chebyshev(Mean, Sd) UCL	0.176
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.209
95% Approximate Gamma UCL (Use when n >= 40)	0.137		
95% Adjusted Gamma UCL (Use when n < 40)	0.138		

Potential UCL to Use	Use 95% Student's-t UCL	0.135

MWB-2 LDA Iron UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	17
Raw Statistics		Log-transformed Statistics	
Minimum	0.075	Minimum of Log Data	-2.59
Maximum	0.35	Maximum of Log Data	-1.05
Mean	0.257	Mean of log Data	-1.413
Geometric Mean	0.243	SD of log Data	0.387
Median	0.27		
SD	0.0663		
Std. Error of Mean	0.0135		
Coefficient of Variation	0.258		
Skewness	-1.768		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.807	Shapiro Wilk Test Statistic	0.633
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	0.28	95% H-UCL	0.306
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.354
95% Adjusted-CLT UCL (Chen-1995)	0.274	97.5% Chebyshev (MVUE) UCL	0.394
95% Modified-t UCL (Johnson-1978)	0.279	99% Chebyshev (MVUE) UCL	0.472
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	8.276	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.031		
MLE of Mean	0.257		
MLE of Standard Deviation	0.0893		
nu star	397.2		
Approximate Chi Square Value (.05)	352	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	0.279
Adjusted Chi Square Value	349.1	95% Jackknife UCL	0.28
		95% Standard Bootstrap UCL	0.279
Anderson-Darling Test Statistic	2.744	95% Bootstrap-t UCL	0.275
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	0.275
Kolmogorov-Smirnov Test Statistic	0.302	95% Percentile Bootstrap UCL	0.277
Kolmogorov-Smirnov 5% Critical Value	0.178	95% BCA Bootstrap UCL	0.274
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.316
		97.5% Chebyshev(Mean, Sd) UCL	0.341
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.391
95% Approximate Gamma UCL (Use when n >= 40)	0.29		
95% Adjusted Gamma UCL (Use when n < 40)	0.292		
Potential UCL to Use		Use 95% Student's-t UCL	0.28
		or 95% Modified-t UCL	0.279

MWB-3 LDA Iron UCL

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

C0

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	31
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.15	Minimum of Log Data	-1.897
Maximum	0.949	Maximum of Log Data	-0.0523
Mean	0.424	Mean of log Data	-0.932
Geometric Mean	0.394	SD of log Data	0.404
Median	0.442		
SD	0.161		
Std. Error of Mean	0.0269		
Coefficient of Variation	0.38		
Skewness	0.825		

Relevant UCL Statistics			
Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.941	Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
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	0.469	95% H-UCL	0.485
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.555
95% Adjusted-CLT UCL (Chen-1995)	0.472	97.5% Chebyshev (MVUE) UCL	0.611
95% Modified-t UCL (Johnson-1978)	0.47	99% Chebyshev (MVUE) UCL	0.721
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.362	Data appear Normal at 5% Significance Level	
Theta Star	0.0667		
MLE of Mean	0.424		
MLE of Standard Deviation	0.168		
nu star	458.1		
Approximate Chi Square Value (.05)	409.5	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0428	95% CLT UCL	0.468
Adjusted Chi Square Value	407.4	95% Jackknife UCL	0.469
		95% Standard Bootstrap UCL	0.468
Anderson-Darling Test Statistic	0.518	95% Bootstrap-t UCL	0.473
Anderson-Darling 5% Critical Value	0.749	95% Hall's Bootstrap UCL	0.473
Kolmogorov-Smirnov Test Statistic	0.117	95% Percentile Bootstrap UCL	0.469
Kolmogorov-Smirnov 5% Critical Value	0.147	95% BCA Bootstrap UCL	0.468
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.541
		97.5% Chebyshev(Mean, Sd) UCL	0.592
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.692
95% Approximate Gamma UCL (Use when n >= 40)	0.474		
95% Adjusted Gamma UCL (Use when n < 40)	0.477		

Potential UCL to Use	Use 95% Student's-t UCL	0.469

K

LDA SURFACE WATER

TREND EVALUATIONS

South Pond LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/20/2013 14:48
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	15
Minimum	240
Maximum	1300
Mean	567.7
Geometric Mean	522.7
Median	520
Standard Deviation	253.3
SEM	65.39

Mann-Kendall Test	
Test Value (S)	-36
Tabulated p-value	0.037
Standard Deviation of S	20.18
Standardized Value of S	-1.734
Approximate p-value	0.0414

Statistically significant evidence of a decreasing trend at the specified level of significance.

Still Well LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/19/2013 16:15	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	17
Minimum	551
Maximum	1000
Mean	792.2
Geometric Mean	782.3
Median	780
Standard Deviation	125.9
SEM	30.53

Mann-Kendall Test	
Test Value (S)	6
Tabulated p-value	0.42
Standard Deviation of S	24.28
Standardized Value of S	0.206
Approximate p-value	0.418

Insufficient evidence to identify a significant trend at the specified level of significance.

Weir LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/20/2013 14:56
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	17
Minimum	290
Maximum	880
Mean	506.9
Geometric Mean	487.5
Median	490
Standard Deviation	149.4
SEM	36.23

Mann-Kendall Test	
Test Value (S)	-29
Tabulated p-value	0.135
Standard Deviation of S	24.26
Standardized Value of S	-1.154
Approximate p-value	0.124

Insufficient evidence to identify a significant trend at the specified level of significance.

Infiltration Pond #1 LDA Potassium Trend (without 670 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/20/2013 15:27	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient		0.95
Level of Significance		0.05

C1

General Statistics	
Number of Values	16
Minimum	144
Maximum	440
Mean	269.1
Geometric Mean	256.8
Median	270.5
Standard Deviation	83
SEM	20.75

Mann-Kendall Test	
Test Value (S)	23
Tabulated p-value	0.175
Standard Deviation of S	22.14
Standardized Value of S	0.994
Approximate p-value	0.16

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

South Pond LDA Potassium UCL

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

C1

General Statistics			
Number of Valid Observations	15	Number of Distinct Observations	14
Raw Statistics		Log-transformed Statistics	
Minimum	240	Minimum of Log Data	5.481
Maximum	1300	Maximum of Log Data	7.17
Mean	567.7	Mean of log Data	6.259
Geometric Mean	522.7	SD of log Data	0.419
Median	520		
SD	253.3		
Std. Error of Mean	65.39		
Coefficient of Variation	0.446		
Skewness	1.679		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.855	Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
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	682.9	95% H-UCL	713
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	840.6
95% Adjusted-CLT UCL (Chen-1995)	705.6	97.5% Chebyshev (MVUE) UCL	958.9
95% Modified-t UCL (Johnson-1978)	687.6	99% Chebyshev (MVUE) UCL	1191
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.016	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	113.2		
MLE of Mean	567.7		
MLE of Standard Deviation	253.5		
nu star	150.5		
Approximate Chi Square Value (.05)	123.1	Nonparametric Statistics	
Adjusted Level of Significance	0.0324	95% CLT UCL	675.3
Adjusted Chi Square Value	120.1	95% Jackknife UCL	682.9
		95% Standard Bootstrap UCL	676
Anderson-Darling Test Statistic	0.398	95% Bootstrap-t UCL	730.2
Anderson-Darling 5% Critical Value	0.738	95% Hall's Bootstrap UCL	1251
Kolmogorov-Smirnov Test Statistic	0.146	95% Percentile Bootstrap UCL	677.6
Kolmogorov-Smirnov 5% Critical Value	0.222	95% BCA Bootstrap UCL	713.2
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	852.8
		97.5% Chebyshev(Mean, Sd) UCL	976.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1218
95% Approximate Gamma UCL (Use when n >= 40)	693.9		
95% Adjusted Gamma UCL (Use when n < 40)	711.4		
Potential UCL to Use		Use 95% Approximate Gamma UCL	693.9

Still Well LDA Potassium UCL

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

C1

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	17
Raw Statistics		**Log-transformed Statistics**	
Minimum	551	Minimum of Log Data	6.312
Maximum	1000	Maximum of Log Data	6.908
Mean	792.2	Mean of log Data	6.662
Geometric Mean	782.3	SD of log Data	0.166
Median	780		
SD	125.9		
Std. Error of Mean	30.53		
Coefficient of Variation	0.159		
Skewness	-0.283		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.965	Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
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	845.5	95% H-UCL	853.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	932.5
95% Adjusted-CLT UCL (Chen-1995)	840.2	97.5% Chebyshev (MVUE) UCL	993.1
95% Modified-t UCL (Johnson-1978)	845.1	99% Chebyshev (MVUE) UCL	1112
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	32.85	Data appear Normal at 5% Significance Level	
Theta Star	24.12		
MLE of Mean	792.2		
MLE of Standard Deviation	138.2		
nu star	1117		
Approximate Chi Square Value (.05)	1040	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0346	95% CLT UCL	842.4
Adjusted Chi Square Value	1032	95% Jackknife UCL	845.5
		95% Standard Bootstrap UCL	839.9
Anderson-Darling Test Statistic	0.315	95% Bootstrap-t UCL	841.9
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	840.9
Kolmogorov-Smirnov Test Statistic	0.121	95% Percentile Bootstrap UCL	838.9
Kolmogorov-Smirnov 5% Critical Value	0.209	95% BCA Bootstrap UCL	838.6
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	925.2
		97.5% Chebyshev(Mean, Sd) UCL	982.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1096
95% Approximate Gamma UCL (Use when n >= 40)	850.5		
95% Adjusted Gamma UCL (Use when n < 40)	856.9		

Potential UCL to Use		Use 95% Student's-t UCL	845.5

Weir LDA Potassium UCL

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

C1

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Raw Statistics		Log-transformed Statistics	
Minimum	290	Minimum of Log Data	5.67
Maximum	880	Maximum of Log Data	6.78
Mean	506.9	Mean of log Data	6.189
Geometric Mean	487.5	SD of log Data	0.286
Median	490		
SD	149.4		
Std. Error of Mean	36.23		
Coefficient of Variation	0.295		
Skewness	0.93		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.941	Shapiro Wilk Test Statistic	0.98
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
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	570.1	95% H-UCL	579.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	661.8
95% Adjusted-CLT UCL (Chen-1995)	575.2	97.5% Chebyshev (MVUE) UCL	729
95% Modified-t UCL (Johnson-1978)	571.5	99% Chebyshev (MVUE) UCL	860.9
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	10.75	Data appear Normal at 5% Significance Level	
Theta Star	47.15		
MLE of Mean	506.9		
MLE of Standard Deviation	154.6		
nu star	365.5		
Approximate Chi Square Value (.05)	322.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	566.5
Adjusted Chi Square Value	318	95% Jackknife UCL	570.1
		95% Standard Bootstrap UCL	565.2
Anderson-Darling Test Statistic	0.226	95% Bootstrap-t UCL	587
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	599.7
Kolmogorov-Smirnov Test Statistic	0.13	95% Percentile Bootstrap UCL	564.8
Kolmogorov-Smirnov 5% Critical Value	0.209	95% BCA Bootstrap UCL	579.4
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	664.8
		97.5% Chebyshev(Mean, Sd) UCL	733.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	867.4
95% Approximate Gamma UCL (Use when n >= 40)	575		
95% Adjusted Gamma UCL (Use when n < 40)	582.7		
Potential UCL to Use		Use 95% Student's-t UCL	570.1

Infiltration Pond #1 LDA Potassium UCL (without 670 outlier)

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

C1

General Statistics			
Number of Valid Observations	16	Number of Distinct Observations	13
Raw Statistics		Log-transformed Statistics	
Minimum	144	Minimum of Log Data	4.97
Maximum	440	Maximum of Log Data	6.087
Mean	269.1	Mean of log Data	5.548
Geometric Mean	256.8	SD of log Data	0.322
Median	270.5		
SD	83		
Std. Error of Mean	20.75		
Coefficient of Variation	0.308		
Skewness	0.246		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.965	Shapiro Wilk Test Statistic	0.96
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
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	305.5	95% H-UCL	316.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	365.5
95% Adjusted-CLT UCL (Chen-1995)	304.6	97.5% Chebyshev (MVUE) UCL	407
95% Modified-t UCL (Johnson-1978)	305.7	99% Chebyshev (MVUE) UCL	488.6
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	8.819	Data appear Normal at 5% Significance Level	
Theta Star	30.52		
MLE of Mean	269.1		
MLE of Standard Deviation	90.63		
nu star	282.2		
Approximate Chi Square Value (.05)	244.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0335	95% CLT UCL	303.3
Adjusted Chi Square Value	240.3	95% Jackknife UCL	305.5
		95% Standard Bootstrap UCL	302.5
Anderson-Darling Test Statistic	0.28	95% Bootstrap-t UCL	307
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	304.5
Kolmogorov-Smirnov Test Statistic	0.122	95% Percentile Bootstrap UCL	302.9
Kolmogorov-Smirnov 5% Critical Value	0.215	95% BCA Bootstrap UCL	304.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	359.6
		97.5% Chebyshev(Mean, Sd) UCL	398.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	475.6
95% Approximate Gamma UCL (Use when n >= 40)	310.9		
95% Adjusted Gamma UCL (Use when n < 40)	316.1		
Potential UCL to Use		Use 95% Student's-t UCL	305.5

LDA SHALLOW GROUNDWATER

TREND EVALUATIONS

MW-1A LDA Potassium Trend (without 106 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 16:41	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	12
Minimum	14
Maximum	43.9
Mean	24.53
Geometric Mean	23.43
Median	22.95
Standard Deviation	8.208
SEM	2.369

Mann-Kendall Test	
Test Value (S)	-30
Tabulated p-value	0.022
Standard Deviation of S	14.58
Standardized Value of S	-1.989
Approximate p-value	0.0234

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-2A LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 17:01
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	23
Maximum	76.3
Mean	45.56
Geometric Mean	43.5
Median	43.55
Standard Deviation	13.86
SEM	2.829

Mann-Kendall Test	
Test Value (S)	-172
Critical Value (0.05)	-1.645
Standard Deviation of S	40.26
Standardized Value of S	-4.248
Approximate p-value	1.08E-05

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-3A LDA Potassium Trend (without 160 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 17:07
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	16
Minimum	30.3
Maximum	100
Mean	60.12
Geometric Mean	56.93
Median	57.5
Standard Deviation	19.97
SEM	4.993

Mann-Kendall Test	
Test Value (S)	43
Tabulated p-value	0.032
Standard Deviation of S	22.19
Standardized Value of S	1.893
Approximate p-value	0.0292

Statistically significant evidence of an increasing trend at the specified level of significance.

MW-4A LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 18:15
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	17
Minimum	0.7
Maximum	5
Mean	1.585
Geometric Mean	1.388
Median	1.3
Standard Deviation	1.029
SEM	0.25

Mann-Kendall Test	
Test Value (S)	7
Tabulated p-value	0.42
Standard Deviation of S	23.98
Standardized Value of S	0.25
Approximate p-value	0.401

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-5A LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/21/2013 11:54	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	23
Minimum	71
Maximum	180
Mean	118.7
Geometric Mean	115.7
Median	110
Standard Deviation	28.06
SEM	5.852

Mann-Kendall Test	
Test Value (S)	64
Critical Value (0.05)	1.645
Standard Deviation of S	37.76
Standardized Value of S	1.668
Approximate p-value	0.0476

Statistically significant evidence of an increasing trend at the specified level of significance.

MW-6A LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 17:30
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	72.9
Maximum	150
Mean	106.2
Geometric Mean	104.2
Median	107.5
Standard Deviation	20.53
SEM	4.19

Mann-Kendall Test	
Test Value (S)	1
Critical Value (0.05)	1.645
Standard Deviation of S	40.17
Standardized Value of S	0
Approximate p-value	0.5

Insufficient evidence to identify a significant trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MW-1A LDA Potassium UCL (without 106 outlier)

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

C0

General Statistics			
Number of Valid Observations	12	Number of Distinct Observations	12
Raw Statistics		**Log-transformed Statistics**	
Minimum	14	Minimum of Log Data	2.639
Maximum	43.9	Maximum of Log Data	3.782
Mean	24.53	Mean of log Data	3.154
Geometric Mean	23.43	SD of log Data	0.309
Median	22.95		
SD	8.208		
Std. Error of Mean	2.369		
Coefficient of Variation	0.335		
Skewness	1.344		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.888	Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.859	Shapiro Wilk Critical Value	0.859
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	28.78	95% H-UCL	29.42
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	34.07
95% Adjusted-CLT UCL (Chen-1995)	29.4	97.5% Chebyshev (MVUE) UCL	38.22
95% Modified-t UCL (Johnson-1978)	28.93	99% Chebyshev (MVUE) UCL	46.37
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	8.404	Data appear Normal at 5% Significance Level	
Theta Star	2.918		
MLE of Mean	24.53		
MLE of Standard Deviation	8.46		
nu star	201.7		
Approximate Chi Square Value (.05)	169.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.029	95% CLT UCL	28.42
Adjusted Chi Square Value	165.4	95% Jackknife UCL	28.78
		95% Standard Bootstrap UCL	28.2
Anderson-Darling Test Statistic	0.351	95% Bootstrap-t UCL	31.25
Anderson-Darling 5% Critical Value	0.73	95% Hall's Bootstrap UCL	54.04
Kolmogorov-Smirnov Test Statistic	0.169	95% Percentile Bootstrap UCL	28.47
Kolmogorov-Smirnov 5% Critical Value	0.245	95% BCA Bootstrap UCL	29.56
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	34.85
		97.5% Chebyshev(Mean, Sd) UCL	39.32
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	48.1
95% Approximate Gamma UCL (Use when n >= 40)	29.13		
95% Adjusted Gamma UCL (Use when n < 40)	29.91		

Potential UCL to Use		Use 95% Student's-t UCL	28.78

MW-2A LDA Potassium UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	21

Raw Statistics		Log-transformed Statistics	
Minimum	23	Minimum of Log Data	3.135
Maximum	76.3	Maximum of Log Data	4.335
Mean	45.56	Mean of log Data	3.773
Geometric Mean	43.5	SD of log Data	0.316
Median	43.55		
SD	13.86		
Std. Error of Mean	2.829		
Coefficient of Variation	0.304		
Skewness	0.347		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.976	Shapiro Wilk Test Statistic	0.976
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	50.41	95% H-UCL	51.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	58.65
95% Adjusted-CLT UCL (Chen-1995)	50.43	97.5% Chebyshev (MVUE) UCL	64.28
95% Modified-t UCL (Johnson-1978)	50.44	99% Chebyshev (MVUE) UCL	75.35

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.647	Data appear Normal at 5% Significance Level	
Theta Star	4.723		
MLE of Mean	45.56		
MLE of Standard Deviation	14.67		
nu star	463		
Approximate Chi Square Value (.05)	414.1	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	50.21
Adjusted Chi Square Value	410.9	95% Jackknife UCL	50.41
		95% Standard Bootstrap UCL	50.18
Anderson-Darling Test Statistic	0.177	95% Bootstrap-t UCL	50.41
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	50.52
Kolmogorov-Smirnov Test Statistic	0.0945	95% Percentile Bootstrap UCL	49.98
Kolmogorov-Smirnov 5% Critical Value	0.178	95% BCA Bootstrap UCL	50.37
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	57.89
		97.5% Chebyshev(Mean, Sd) UCL	63.22
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	73.71
95% Approximate Gamma UCL (Use when n >= 40)	50.94		
95% Adjusted Gamma UCL (Use when n < 40)	51.34		

Potential UCL to Use	Use 95% Student's-t UCL	50.41

MW-3A LDA Potassium UCL (without 160 outlier)

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

C0

General Statistics			
Number of Valid Observations	16	Number of Distinct Observations	15
Raw Statistics		**Log-transformed Statistics**	
Minimum	30.3	Minimum of Log Data	3.411
Maximum	100	Maximum of Log Data	4.605
Mean	60.12	Mean of log Data	4.042
Geometric Mean	56.93	SD of log Data	0.348
Median	57.5		
SD	19.97		
Std. Error of Mean	4.993		
Coefficient of Variation	0.332		
Skewness	0.296		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.962	Shapiro Wilk Test Statistic	0.961
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
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	68.87	95% H-UCL	71.77
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	83.4
95% Adjusted-CLT UCL (Chen-1995)	68.73	97.5% Chebyshev (MVUE) UCL	93.43
95% Modified-t UCL (Johnson-1978)	68.93	99% Chebyshev (MVUE) UCL	113.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	7.622	Data appear Normal at 5% Significance Level	
Theta Star	7.888		
MLE of Mean	60.12		
MLE of Standard Deviation	21.78		
nu star	243.9		
Approximate Chi Square Value (.05)	208.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0335	95% CLT UCL	68.33
Adjusted Chi Square Value	205	95% Jackknife UCL	68.87
		95% Standard Bootstrap UCL	67.83
Anderson-Darling Test Statistic	0.264	95% Bootstrap-t UCL	69.23
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	69.26
Kolmogorov-Smirnov Test Statistic	0.139	95% Percentile Bootstrap UCL	67.63
Kolmogorov-Smirnov 5% Critical Value	0.215	95% BCA Bootstrap UCL	68.22
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	81.88
		97.5% Chebyshev(Mean, Sd) UCL	91.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	109.8
95% Approximate Gamma UCL (Use when n >= 40)	70.24		
95% Adjusted Gamma UCL (Use when n < 40)	71.51		

Potential UCL to Use	Use 95% Student's-t UCL	68.87

MW-4A LDA Potassium UCL (without 5 outlier)

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

C0

General Statistics			
Number of Valid Observations	16	Number of Distinct Observations	9
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.7	Minimum of Log Data	-0.357
Maximum	2.9	Maximum of Log Data	1.065
Mean	1.372	Mean of log Data	0.247
Geometric Mean	1.281	SD of log Data	0.38
Median	1.3		
SD	0.551		
Std. Error of Mean	0.138		
Coefficient of Variation	0.402		
Skewness	1.395		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.873	Shapiro Wilk Test Statistic	0.944
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1.614	95% H-UCL	1.665
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.948
95% Adjusted-CLT UCL (Chen-1995)	1.65	97.5% Chebyshev (MVUE) UCL	2.198
95% Modified-t UCL (Johnson-1978)	1.622	99% Chebyshev (MVUE) UCL	2.689
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	6.084	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.225		
MLE of Mean	1.372		
MLE of Standard Deviation	0.556		
nu star	194.7		
Approximate Chi Square Value (.05)	163.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0335	95% CLT UCL	1.599
Adjusted Chi Square Value	160.2	95% Jackknife UCL	1.614
		95% Standard Bootstrap UCL	1.59
Anderson-Darling Test Statistic	0.45	95% Bootstrap-t UCL	1.69
Anderson-Darling 5% Critical Value	0.74	95% Hall's Bootstrap UCL	1.95
Kolmogorov-Smirnov Test Statistic	0.169	95% Percentile Bootstrap UCL	1.594
Kolmogorov-Smirnov 5% Critical Value	0.215	95% BCA Bootstrap UCL	1.647
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.973
		97.5% Chebyshev(Mean, Sd) UCL	2.233
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2.743
95% Approximate Gamma UCL (Use when n >= 40)	1.634		
95% Adjusted Gamma UCL (Use when n < 40)	1.668		

Potential UCL to Use	Use 95% Approximate Gamma UCL	1.634

MW-5A LDA Potassium UCL

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

C1

General Statistics			
Number of Valid Observations	23	Number of Distinct Observations	17
Raw Statistics		**Log-transformed Statistics**	
Minimum	71	Minimum of Log Data	4.263
Maximum	180	Maximum of Log Data	5.193
Mean	118.7	Mean of log Data	4.751
Geometric Mean	115.7	SD of log Data	0.232
Median	110		
SD	28.06		
Std. Error of Mean	5.852		
Coefficient of Variation	0.236		
Skewness	0.677		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.943	Shapiro Wilk Test Statistic	0.973
Shapiro Wilk Critical Value	0.914	Shapiro Wilk Critical Value	0.914
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	128.8	95% H-UCL	129.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	144
95% Adjusted-CLT UCL (Chen-1995)	129.3	97.5% Chebyshev (MVUE) UCL	154.9
95% Modified-t UCL (Johnson-1978)	128.9	99% Chebyshev (MVUE) UCL	176.4
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	16.95	Data appear Normal at 5% Significance Level	
Theta Star	7.005		
MLE of Mean	118.7		
MLE of Standard Deviation	28.84		
nu star	779.8		
Approximate Chi Square Value (.05)	716	Nonparametric Statistics	
Adjusted Level of Significance	0.0389	95% CLT UCL	128.4
Adjusted Chi Square Value	711.6	95% Jackknife UCL	128.8
		95% Standard Bootstrap UCL	128
Anderson-Darling Test Statistic	0.325	95% Bootstrap-t UCL	129.8
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	129.9
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL	127.6
Kolmogorov-Smirnov 5% Critical Value	0.181	95% BCA Bootstrap UCL	129
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	144.3
		97.5% Chebyshev(Mean, Sd) UCL	155.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	177
95% Approximate Gamma UCL (Use when n >= 40)	129.3		
95% Adjusted Gamma UCL (Use when n < 40)	130.1		
Potential UCL to Use		Use 95% Student's-t UCL	128.8

MW-6A LDA Potassium UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	18
Raw Statistics		**Log-transformed Statistics**	
Minimum	72.9	Minimum of Log Data	4.289
Maximum	150	Maximum of Log Data	5.011
Mean	106.2	Mean of log Data	4.647
Geometric Mean	104.2	SD of log Data	0.198
Median	107.5		
SD	20.53		
Std. Error of Mean	4.19		
Coefficient of Variation	0.193		
Skewness	0.121		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Test Statistic	0.947
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	113.3	95% H-UCL	114.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	125.1
95% Adjusted-CLT UCL (Chen-1995)	113.2	97.5% Chebyshev (MVUE) UCL	133.2
95% Modified-t UCL (Johnson-1978)	113.4	99% Chebyshev (MVUE) UCL	149.3
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	23.86	Data appear Normal at 5% Significance Level	
Theta Star	4.45		
MLE of Mean	106.2		
MLE of Standard Deviation	21.73		
nu star	1145		
Approximate Chi Square Value (.05)	1068	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0392	95% CLT UCL	113.1
Adjusted Chi Square Value	1062	95% Jackknife UCL	113.3
		95% Standard Bootstrap UCL	112.9
Anderson-Darling Test Statistic	0.478	95% Bootstrap-t UCL	113.9
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	113.4
Kolmogorov-Smirnov Test Statistic	0.153	95% Percentile Bootstrap UCL	112.7
Kolmogorov-Smirnov 5% Critical Value	0.177	95% BCA Bootstrap UCL	113
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	124.4
		97.5% Chebyshev(Mean, Sd) UCL	132.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	147.9
95% Approximate Gamma UCL (Use when n >= 40)	113.9		
95% Adjusted Gamma UCL (Use when n < 40)	114.4		

Potential UCL to Use		Use 95% Student's-t UCL	113.3

LDA BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 12:54
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	18
Minimum	0.9
Maximum	1.7
Mean	1.239
Geometric Mean	1.218
Median	1.15
Standard Deviation	0.235
SEM	0.0555

Mann-Kendall Test	
Test Value (S)	-63
Tabulated p-value	0.009
Standard Deviation of S	25.67
Standardized Value of S	-2.415
Approximate p-value	0.00786

Statistically significant evidence of a decreasing trend at the specified level of significance.

MWB-2 LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 16:13
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	18
Minimum	0.9
Maximum	1.65
Mean	1.258
Geometric Mean	1.238
Median	1.2
Standard Deviation	0.233
SEM	0.0549

Mann-Kendall Test	
Test Value (S)	-54
Tabulated p-value	0.02
Standard Deviation of S	25.55
Standardized Value of S	-2.075
Approximate p-value	0.019

Statistically significant evidence of a decreasing trend at the specified level of significance.

MWB-3LDA Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 11:58
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	18
Minimum	1
Maximum	12
Mean	1.939
Geometric Mean	1.505
Median	1.3
Standard Deviation	2.519
SEM	0.594

Mann-Kendall Test	
Test Value (S)	-59
Tabulated p-value	0.013
Standard Deviation of S	25.67
Standardized Value of S	-2.259
Approximate p-value	0.0119

Statistically significant evidence of a decreasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1 LDA Potassium UCL

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

C0

General Statistics			
Number of Valid Observations	18	Number of Distinct Observations	7
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.9	Minimum of Log Data	-0.105
Maximum	1.7	Maximum of Log Data	0.531
Mean	1.239	Mean of log Data	0.198
Geometric Mean	1.218	SD of log Data	0.187
Median	1.15		
SD	0.235		
Std. Error of Mean	0.0555		
Coefficient of Variation	0.19		
Skewness	0.476		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.892	Shapiro Wilk Test Statistic	0.91
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
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	1.335	95% H-UCL	1.344
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.478
95% Adjusted-CLT UCL (Chen-1995)	1.337	97.5% Chebyshev (MVUE) UCL	1.581
95% Modified-t UCL (Johnson-1978)	1.336	99% Chebyshev (MVUE) UCL	1.784
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	25.2	Data appear Lognormal at 5% Significance Level	
Theta Star	0.0492		
MLE of Mean	1.239		
MLE of Standard Deviation	0.247		
nu star	907.2		
Approximate Chi Square Value (.05)	838.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0357	95% CLT UCL	1.33
Adjusted Chi Square Value	831.9	95% Jackknife UCL	1.335
		95% Standard Bootstrap UCL	1.327
Anderson-Darling Test Statistic	0.883	95% Bootstrap-t UCL	1.348
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	1.333
Kolmogorov-Smirnov Test Statistic	0.219	95% Percentile Bootstrap UCL	1.328
Kolmogorov-Smirnov 5% Critical Value	0.203	95% BCA Bootstrap UCL	1.328
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.481
		97.5% Chebyshev(Mean, Sd) UCL	1.586
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.791
95% Approximate Gamma UCL (Use when n >= 40)	1.341		
95% Adjusted Gamma UCL (Use when n < 40)	1.351		

Potential UCL to Use		
	Use 95% Student's-t UCL	1.335
	or 95% Modified-t UCL	1.336
	or 95% H-UCL	1.344

MWB-2 LDA Potassium UCL

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

C0

General Statistics			
Number of Valid Observations	18	Number of Distinct Observations	6
Raw Statistics		Log-transformed Statistics	
Minimum	0.9	Minimum of Log Data	-0.105
Maximum	1.65	Maximum of Log Data	0.501
Mean	1.258	Mean of log Data	0.214
Geometric Mean	1.238	SD of log Data	0.186
Median	1.2		
SD	0.233		
Std. Error of Mean	0.0549		
Coefficient of Variation	0.185		
Skewness	0.18		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.885	Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
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	1.354	95% H-UCL	1.365
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.5
95% Adjusted-CLT UCL (Chen-1995)	1.351	97.5% Chebyshev (MVUE) UCL	1.605
95% Modified-t UCL (Johnson-1978)	1.354	99% Chebyshev (MVUE) UCL	1.81
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	25.79	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0488		
MLE of Mean	1.258		
MLE of Standard Deviation	0.248		
nu star	928.6		
Approximate Chi Square Value (.05)	858.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0357	95% CLT UCL	1.349
Adjusted Chi Square Value	852.4	95% Jackknife UCL	1.354
		95% Standard Bootstrap UCL	1.346
Anderson-Darling Test Statistic	0.965	95% Bootstrap-t UCL	1.359
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	1.344
Kolmogorov-Smirnov Test Statistic	0.246	95% Percentile Bootstrap UCL	1.35
Kolmogorov-Smirnov 5% Critical Value	0.203	95% BCA Bootstrap UCL	1.344
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.498
		97.5% Chebyshev(Mean, Sd) UCL	1.601
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.804
95% Approximate Gamma UCL (Use when n >= 40)	1.36		
95% Adjusted Gamma UCL (Use when n < 40)	1.371		

Potential UCL to Use		
	Use 95% Student's-t UCL	1.354
	or 95% Modified-t UCL	1.354

MWB-3 LDA Potassium UCL (without 12 outlier)

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

C1

General Statistics			
Number of Valid Observations	18	Number of Distinct Observations	7
Raw Statistics		Log-transformed Statistics	
Minimum	1	Minimum of Log Data	0
Maximum	12	Maximum of Log Data	2.485
Mean	1.939	Mean of log Data	0.409
Geometric Mean	1.505	SD of log Data	0.54
Median	1.3		
SD	2.519		
Std. Error of Mean	0.594		
Coefficient of Variation	1.299		
Skewness	4.196		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.323	Shapiro Wilk Test Statistic	0.517
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
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	2.972	95% H-UCL	2.281
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.721
95% Adjusted-CLT UCL (Chen-1995)	3.543	97.5% Chebyshev (MVUE) UCL	3.151
95% Modified-t UCL (Johnson-1978)	3.07	99% Chebyshev (MVUE) UCL	3.997
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.807	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.073		
MLE of Mean	1.939		
MLE of Standard Deviation	1.443		
nu star	65.03		
Approximate Chi Square Value (.05)	47.48	Nonparametric Statistics	
Adjusted Level of Significance	0.0357	95% CLT UCL	2.916
Adjusted Chi Square Value	46.04	95% Jackknife UCL	2.972
		95% Standard Bootstrap UCL	2.905
Anderson-Darling Test Statistic	4.113	95% Bootstrap-t UCL	10.77
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	8.139
Kolmogorov-Smirnov Test Statistic	0.426	95% Percentile Bootstrap UCL	3.117
Kolmogorov-Smirnov 5% Critical Value	0.206	95% BCA Bootstrap UCL	3.722
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4.527
		97.5% Chebyshev(Mean, Sd) UCL	5.647
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	7.847
95% Approximate Gamma UCL (Use when n >= 40)	2.656		
95% Adjusted Gamma UCL (Use when n < 40)	2.739		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	4.527

DSP BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1S DSP Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 15:51	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	16
Minimum	5.2
Maximum	6.1
Mean	5.675
Geometric Mean	5.671
Median	5.65
Standard Deviation	0.211
SEM	0.0528

Mann-Kendall Test	
Test Value (S)	29
Tabulated p-value	0.114
Standard Deviation of S	21.61
Standardized Value of S	1.296
Approximate p-value	0.0975

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-1D DSP Potassium Trend (without Non Detects)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 15:23	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	13
Minimum	3
Maximum	4.1
Mean	3.292
Geometric Mean	3.281
Median	3.2
Standard Deviation	0.299
SEM	0.0828

Mann-Kendall Test	
Test Value (S)	12
Tabulated p-value	0.255
Standard Deviation of S	16.1
Standardized Value of S	0.683
Approximate p-value	0.247

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-6 DSP Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 14:50	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	16
Minimum	1.1
Maximum	1.6
Mean	1.338
Geometric Mean	1.328
Median	1.3
Standard Deviation	0.167
SEM	0.0417

Mann-Kendall Test	
Test Value (S)	-32
Tabulated p-value	0.083
Standard Deviation of S	21.53
Standardized Value of S	-1.44
Approximate p-value	0.0749

Insufficient evidence to identify a significant trend at the specified level of significance.

Portal DSP Potassium Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 16:03
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	16
Minimum	20
Maximum	42
Mean	32.86
Geometric Mean	32.23
Median	32.2
Standard Deviation	6.417
SEM	1.604

Mann-Kendall Test	
Test Value (S)	-50
Tabulated p-value	0.013
Standard Deviation of S	22.17
Standardized Value of S	-2.211
Approximate p-value	0.0135

Statistically significant evidence of a decreasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1S DSP Potassium UCL

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

C0

General Statistics			
Number of Valid Observations	16	Number of Distinct Observations	8
Raw Statistics		Log-transformed Statistics	
Minimum	5.2	Minimum of Log Data	1.649
Maximum	6.1	Maximum of Log Data	1.808
Mean	5.675	Mean of log Data	1.735
Geometric Mean	5.671	SD of log Data	0.0373
Median	5.65		
SD	0.211		
Std. Error of Mean	0.0528		
Coefficient of Variation	0.0372		
Skewness	0.0363		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.935	Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
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	5.768	95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.906
95% Adjusted-CLT UCL (Chen-1995)	5.762	97.5% Chebyshev (MVUE) UCL	6.005
95% Modified-t UCL (Johnson-1978)	5.768	99% Chebyshev (MVUE) UCL	6.202
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	624.1	Data appear Normal at 5% Significance Level	
Theta Star	0.00909		
MLE of Mean	5.675		
MLE of Standard Deviation	0.227		
nu star	19971		
Approximate Chi Square Value (.05)	19644	Nonparametric Statistics	
Adjusted Level of Significance	0.0335	95% CLT UCL	5.762
Adjusted Chi Square Value	19607	95% Jackknife UCL	5.768
		95% Standard Bootstrap UCL	5.758
Anderson-Darling Test Statistic	0.57	95% Bootstrap-t UCL	5.773
Anderson-Darling 5% Critical Value	0.736	95% Hall's Bootstrap UCL	5.78
Kolmogorov-Smirnov Test Statistic	0.197	95% Percentile Bootstrap UCL	5.763
Kolmogorov-Smirnov 5% Critical Value	0.214	95% BCA Bootstrap UCL	5.769
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5.905
		97.5% Chebyshev(Mean, Sd) UCL	6.005
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	6.201
95% Approximate Gamma UCL (Use when n >= 40)	5.77		
95% Adjusted Gamma UCL (Use when n < 40)	5.781		

Potential UCL to Use	Use 95% Student's-t UCL	5.768

MWB-1D DSP Potassium UCL

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

C0

General Statistics			
Number of Valid Observations	16	Number of Distinct Observations	8
Raw Statistics		Log-transformed Statistics	
Minimum	1.5	Minimum of Log Data	0.405
Maximum	4.1	Maximum of Log Data	1.411
Mean	2.956	Mean of log Data	1.041
Geometric Mean	2.833	SD of log Data	0.325
Median	3.2		
SD	0.77		
Std. Error of Mean	0.193		
Coefficient of Variation	0.261		
Skewness	-1.206		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.779	Shapiro Wilk Test Statistic	0.698
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
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	3.294	95% H-UCL	3.499
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.044
95% Adjusted-CLT UCL (Chen-1995)	3.211	97.5% Chebyshev (MVUE) UCL	4.506
95% Modified-t UCL (Johnson-1978)	3.284	99% Chebyshev (MVUE) UCL	5.413
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.713	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.304		
MLE of Mean	2.956		
MLE of Standard Deviation	0.949		
nu star	310.8		
Approximate Chi Square Value (.05)	271	Nonparametric Statistics	
Adjusted Level of Significance	0.0335	95% CLT UCL	3.273
Adjusted Chi Square Value	266.7	95% Jackknife UCL	3.294
		95% Standard Bootstrap UCL	3.265
Anderson-Darling Test Statistic	2.168	95% Bootstrap-t UCL	3.243
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	3.21
Kolmogorov-Smirnov Test Statistic	0.371	95% Percentile Bootstrap UCL	3.231
Kolmogorov-Smirnov 5% Critical Value	0.215	95% BCA Bootstrap UCL	3.213
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.796
		97.5% Chebyshev(Mean, Sd) UCL	4.159
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4.872
95% Approximate Gamma UCL (Use when n >= 40)	3.391		
95% Adjusted Gamma UCL (Use when n < 40)	3.445		

Potential UCL to Use		
	Use 95% Student's-t UCL	3.294
	or 95% Modified-t UCL	3.284

MWB-6 DSP Potassium UCL

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

C1

General Statistics			
Number of Valid Observations	16	Number of Distinct Observations	6
Raw Statistics		Log-transformed Statistics	
Minimum	1.1	Minimum of Log Data	0.0953
Maximum	1.6	Maximum of Log Data	0.47
Mean	1.338	Mean of log Data	0.283
Geometric Mean	1.328	SD of log Data	0.127
Median	1.3		
SD	0.167		
Std. Error of Mean	0.0417		
Coefficient of Variation	0.125		
Skewness	-0.0954		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.9	Shapiro Wilk Test Statistic	0.895
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
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	1.411	95% H-UCL	1.417
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.523
95% Adjusted-CLT UCL (Chen-1995)	1.405	97.5% Chebyshev (MVUE) UCL	1.603
95% Modified-t UCL (Johnson-1978)	1.41	99% Chebyshev (MVUE) UCL	1.76
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	54.8	Data appear Normal at 5% Significance Level	
Theta Star	0.0244		
MLE of Mean	1.338		
MLE of Standard Deviation	0.181		
nu star	1754		
Approximate Chi Square Value (.05)	1657	Nonparametric Statistics	
Adjusted Level of Significance	0.0335	95% CLT UCL	1.406
Adjusted Chi Square Value	1647	95% Jackknife UCL	1.411
		95% Standard Bootstrap UCL	1.404
Anderson-Darling Test Statistic	0.708	95% Bootstrap-t UCL	1.408
Anderson-Darling 5% Critical Value	0.736	95% Hall's Bootstrap UCL	1.403
Kolmogorov-Smirnov Test Statistic	0.216	95% Percentile Bootstrap UCL	1.406
Kolmogorov-Smirnov 5% Critical Value	0.214	95% BCA Bootstrap UCL	1.394
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1.519
		97.5% Chebyshev(Mean, Sd) UCL	1.598
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1.752
95% Approximate Gamma UCL (Use when n >= 40)	1.415		
95% Adjusted Gamma UCL (Use when n < 40)	1.424		
Potential UCL to Use		Use 95% Student's-t UCL	1.411

Portal DSP Potassium UCL

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

C1

General Statistics			
Number of Valid Observations	16	Number of Distinct Observations	14
Raw Statistics		**Log-transformed Statistics**	
Minimum	20	Minimum of Log Data	2.996
Maximum	42	Maximum of Log Data	3.738
Mean	32.86	Mean of log Data	3.473
Geometric Mean	32.23	SD of log Data	0.207
Median	32.2		
SD	6.417		
Std. Error of Mean	1.604		
Coefficient of Variation	0.195		
Skewness	-0.244		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.963	Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
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	35.67	95% H-UCL	36.26
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	40.34
95% Adjusted-CLT UCL (Chen-1995)	35.39	97.5% Chebyshev (MVUE) UCL	43.57
95% Modified-t UCL (Johnson-1978)	35.65	99% Chebyshev (MVUE) UCL	49.9
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	21.3	Data appear Normal at 5% Significance Level	
Theta Star	1.543		
MLE of Mean	32.86		
MLE of Standard Deviation	7.119		
nu star	681.6		
Approximate Chi Square Value (.05)	622	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0335	95% CLT UCL	35.5
Adjusted Chi Square Value	615.6	95% Jackknife UCL	35.67
		95% Standard Bootstrap UCL	35.34
Anderson-Darling Test Statistic	0.258	95% Bootstrap-t UCL	35.4
Anderson-Darling 5% Critical Value	0.736	95% Hall's Bootstrap UCL	35.33
Kolmogorov-Smirnov Test Statistic	0.146	95% Percentile Bootstrap UCL	35.49
Kolmogorov-Smirnov 5% Critical Value	0.215	95% BCA Bootstrap UCL	35.53
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	39.85
		97.5% Chebyshev(Mean, Sd) UCL	42.87
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	48.82
95% Approximate Gamma UCL (Use when n >= 40)	36		
95% Adjusted Gamma UCL (Use when n < 40)	36.38		

Potential UCL to Use		Use 95% Student's-t UCL	35.67

Mn

LDA SURFACE WATER

TREND EVALUATIONS

South Pond LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 8:05
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	58
Minimum	0.005
Maximum	0.24
Mean	0.0758
Geometric Mean	0.0546
Median	0.0691
Standard Deviation	0.0517
SEM	0.00678

Mann-Kendall Test	
Test Value (S)	182
Critical Value (0.05)	1.645
Standard Deviation of S	149
Standardized Value of S	1.215
Approximate p-value	0.112

Insufficient evidence to identify a significant trend at the specified level of significance.

Weir Manganese Trend (without .64 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 10:20
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	56
Minimum	0.0309
Maximum	0.463
Mean	0.128
Geometric Mean	0.103
Median	0.0962
Standard Deviation	0.101
SEM	0.0134

Mann-Kendall Test	
Test Value (S)	44
Critical Value (0.05)	1.645
Standard Deviation of S	141.5
Standardized Value of S	0.304
Approximate p-value	0.381

Insufficient evidence to identify a significant trend at the specified level of significance.

Infiltration Pond #1 LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 8:56
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	59
Minimum	0.005
Maximum	0.134
Mean	0.0423
Geometric Mean	0.0363
Median	0.037
Standard Deviation	0.0235
SEM	0.00306

Mann-Kendall Test	
Test Value (S)	290
Critical Value (0.05)	1.645
Standard Deviation of S	152.9
Standardized Value of S	1.89
Approximate p-value	0.0294

Statistically significant evidence of an increasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

South Pond LDA Manganese UCL

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

C1

General Statistics			
Number of Valid Observations	58	Number of Distinct Observations	51
Raw Statistics		Log-transformed Statistics	
Minimum	0.005	Minimum of Log Data	-5.298
Maximum	0.24	Maximum of Log Data	-1.427
Mean	0.0758	Mean of log Data	-2.908
Geometric Mean	0.0546	SD of log Data	0.969
Median	0.0691		
SD	0.0517		
Std. Error of Mean	0.00678		
Coefficient of Variation	0.681		
Skewness	0.927		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.117	Lilliefors Test Statistic	0.18
Lilliefors Critical Value	0.116	Lilliefors Critical Value	0.116
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	0.0872	95% H-UCL	0.117
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.142
95% Adjusted-CLT UCL (Chen-1995)	0.0879	97.5% Chebyshev (MVUE) UCL	0.167
95% Modified-t UCL (Johnson-1978)	0.0873	99% Chebyshev (MVUE) UCL	0.214
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.593	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0476		
MLE of Mean	0.0758		
MLE of Standard Deviation	0.0601		
nu star	184.8		
Approximate Chi Square Value (.05)	154.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	0.087
Adjusted Chi Square Value	153.7	95% Jackknife UCL	0.0872
		95% Standard Bootstrap UCL	0.087
Anderson-Darling Test Statistic	0.94	95% Bootstrap-t UCL	0.0886
Anderson-Darling 5% Critical Value	0.767	95% Hall's Bootstrap UCL	0.0883
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL	0.0876
Kolmogorov-Smirnov 5% Critical Value	0.119	95% BCA Bootstrap UCL	0.0879
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.105
		97.5% Chebyshev(Mean, Sd) UCL	0.118
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.143
95% Approximate Gamma UCL (Use when n >= 40)	0.0908		
95% Adjusted Gamma UCL (Use when n < 40)	0.0912		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	0.105

Weir Manganese UCL (without .64 outlier)

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

C1

General Statistics			
Number of Valid Observations	56	Number of Distinct Observations	51
Raw Statistics		Log-transformed Statistics	
Minimum	0.0309	Minimum of Log Data	-3.477
Maximum	0.463	Maximum of Log Data	-0.77
Mean	0.128	Mean of log Data	-2.268
Geometric Mean	0.103	SD of log Data	0.615
Median	0.0962		
SD	0.101		
Std. Error of Mean	0.0134		
Coefficient of Variation	0.788		
Skewness	2.303		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.226	Lilliefors Test Statistic	0.105
Lilliefors Critical Value	0.118	Lilliefors Critical Value	0.118
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	0.15	95% H-UCL	0.147
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.173
95% Adjusted-CLT UCL (Chen-1995)	0.154	97.5% Chebyshev (MVUE) UCL	0.193
95% Modified-t UCL (Johnson-1978)	0.151	99% Chebyshev (MVUE) UCL	0.234
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.42	Data appear Lognormal at 5% Significance Level	
Theta Star	0.0527		
MLE of Mean	0.128		
MLE of Standard Deviation	0.082		
nu star	271.1		
Approximate Chi Square Value (.05)	233.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0457	95% CLT UCL	0.15
Adjusted Chi Square Value	233	95% Jackknife UCL	0.15
		95% Standard Bootstrap UCL	0.15
Anderson-Darling Test Statistic	1.85	95% Bootstrap-t UCL	0.157
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL	0.155
Kolmogorov-Smirnov Test Statistic	0.151	95% Percentile Bootstrap UCL	0.15
Kolmogorov-Smirnov 5% Critical Value	0.12	95% BCA Bootstrap UCL	0.154
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.186
		97.5% Chebyshev(Mean, Sd) UCL	0.211
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.261
95% Approximate Gamma UCL (Use when n >= 40)	0.148		
95% Adjusted Gamma UCL (Use when n < 40)	0.148		

Potential UCL to Use	Use 95% H-UCL	0.147

Infiltration Pond #1 LDA Manganese UCL (without .17 outlier)

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	53
Raw Statistics		Log-transformed Statistics	
Minimum	0.005	Minimum of Log Data	-5.298
Maximum	0.134	Maximum of Log Data	-2.01
Mean	0.0423	Mean of log Data	-3.317
Geometric Mean	0.0363	SD of log Data	0.597
Median	0.037		
SD	0.0235		
Std. Error of Mean	0.00306		
Coefficient of Variation	0.555		
Skewness	1.571		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.0981	Lilliefors Test Statistic	0.0922
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	0.0474	95% H-UCL	0.0505
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0589
95% Adjusted-CLT UCL (Chen-1995)	0.048	97.5% Chebyshev (MVUE) UCL	0.0657
95% Modified-t UCL (Johnson-1978)	0.0475	99% Chebyshev (MVUE) UCL	0.079
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.24	Data appear Normal at 5% Significance Level	
Theta Star	0.0131		
MLE of Mean	0.0423		
MLE of Standard Deviation	0.0235		
nu star	382.3		
Approximate Chi Square Value (.05)	338	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	0.0474
Adjusted Chi Square Value	336.9	95% Jackknife UCL	0.0474
		95% Standard Bootstrap UCL	0.0475
Anderson-Darling Test Statistic	0.393	95% Bootstrap-t UCL	0.0485
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	0.0486
Kolmogorov-Smirnov Test Statistic	0.0674	95% Percentile Bootstrap UCL	0.0473
Kolmogorov-Smirnov 5% Critical Value	0.116	95% BCA Bootstrap UCL	0.0481
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0557
		97.5% Chebyshev(Mean, Sd) UCL	0.0614
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0728
95% Approximate Gamma UCL (Use when n >= 40)	0.0479		
95% Adjusted Gamma UCL (Use when n < 40)	0.048		
Potential UCL to Use		Use 95% Student's-t UCL	0.0474

LDA SHALLOW GROUNDWATER

TREND EVALUATIONS

MW-1A LDA Manganese Trend (without two outliers)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 16:35	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	23
Minimum	0.0042
Maximum	0.0286
Mean	0.0113
Geometric Mean	0.00923
Median	0.01
Standard Deviation	0.00741
SEM	0.00154

Mann-Kendall Test	
Test Value (S)	-69
Critical Value (0.05)	-1.645
Standard Deviation of S	36.63
Standardized Value of S	-1.856
Approximate p-value	0.0317

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-2A LDA Manganese Trend (.44 outlier removed)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 16:57	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	35
Minimum	0.0018
Maximum	0.23
Mean	0.0533
Geometric Mean	0.0217
Median	0.0135
Standard Deviation	0.0665
SEM	0.0112

Mann-Kendall Test	
Test Value (S)	-387
Critical Value (0.05)	-1.645
Standard Deviation of S	69.94
Standardized Value of S	-5.519
Approximate p-value	1.70E-08

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-3A LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 17:11
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	29
Minimum	0.628
Maximum	3.6
Mean	2.163
Geometric Mean	2.063
Median	2.2
Standard Deviation	0.62
SEM	0.115

Mann-Kendall Test	
Test Value (S)	-200
Critical Value (0.05)	-1.645
Standard Deviation of S	53.23
Standardized Value of S	-3.739
Approximate p-value	9.25E-05

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-4A LDA Manganese Trend (without .42 Outlier)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/7/2013 18:22
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	45
Minimum	0.009
Maximum	0.229
Mean	0.0708
Geometric Mean	0.0478
Median	0.0442
Standard Deviation	0.0631
SEM	0.0094

Mann-Kendall Test	
Test Value (S)	-250
Critical Value (0.05)	-1.645
Standard Deviation of S	102.2
Standardized Value of S	-2.436
Approximate p-value	0.00742

Statistically significant evidence of a decreasing trend at the specified level of significance.

MW-5A LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 17:58	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	35
Minimum	0.0019
Maximum	1.13
Mean	0.108
Geometric Mean	0.0251
Median	0.0207
Standard Deviation	0.238
SEM	0.0402

Mann-Kendall Test	
Test Value (S)	15
Critical Value (0.05)	1.645
Standard Deviation of S	70.21
Standardized Value of S	0.199
Approximate p-value	0.421

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-5A LDA Manganese Trend (without 1.13 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/18/2013 17:06	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	34
Minimum	0.0019
Maximum	0.63
Mean	0.0782
Geometric Mean	0.0225
Median	0.0195
Standard Deviation	0.16
SEM	0.0275

Mann-Kendall Test	
Test Value (S)	49
Critical Value (0.05)	1.645
Standard Deviation of S	67.24
Standardized Value of S	0.714
Approximate p-value	0.238

Insufficient evidence to identify a significant trend at the specified level of significance.

MW-6A LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/7/2013 17:37	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	36
Minimum	0.0025
Maximum	0.682
Mean	0.106
Geometric Mean	0.0288
Median	0.0185
Standard Deviation	0.176
SEM	0.0293

Mann-Kendall Test	
Test Value (S)	-342
Critical Value (0.05)	-1.645
Standard Deviation of S	73.09
Standardized Value of S	-4.666
Approximate p-value	1.54E-06

Statistically significant evidence of a decreasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MW-1A LDA Manganese UCL (without .6 & .3 outliers)

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

C0

General Statistics			
Number of Valid Observations	23	Number of Distinct Observations	15

Raw Statistics		Log-transformed Statistics	
Minimum	0.0042	Minimum of Log Data	-5.473
Maximum	0.0286	Maximum of Log Data	-3.554
Mean	0.0113	Mean of log Data	-4.686
Geometric Mean	0.00923	SD of log Data	0.641
Median	0.01		
SD	0.00741		
Std. Error of Mean	0.00154		
Coefficient of Variation	0.658		
Skewness	0.972		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.838	Shapiro Wilk Test Statistic	0.859
Shapiro Wilk Critical Value	0.914	Shapiro Wilk Critical Value	0.914
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	0.0139	95% H-UCL	0.0151
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0182
95% Adjusted-CLT UCL (Chen-1995)	0.0141	97.5% Chebyshev (MVUE) UCL	0.0212
95% Modified-t UCL (Johnson-1978)	0.014	99% Chebyshev (MVUE) UCL	0.0271

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.346	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0048		
MLE of Mean	0.0113		
MLE of Standard Deviation	0.00735		
nu star	107.9		
Approximate Chi Square Value (.05)	84.94	Nonparametric Statistics	
Adjusted Level of Significance	0.0389	95% CLT UCL	0.0138
Adjusted Chi Square Value	83.46	95% Jackknife UCL	0.0139
		95% Standard Bootstrap UCL	0.0138
Anderson-Darling Test Statistic	1.358	95% Bootstrap-t UCL	0.0143
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	0.014
Kolmogorov-Smirnov Test Statistic	0.264	95% Percentile Bootstrap UCL	0.0137
Kolmogorov-Smirnov 5% Critical Value	0.183	95% BCA Bootstrap UCL	0.0141
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.018
		97.5% Chebyshev(Mean, Sd) UCL	0.0209
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0266
95% Approximate Gamma UCL (Use when n >= 40)	0.0143		
95% Adjusted Gamma UCL (Use when n < 40)	0.0146		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	0.018

MW-2A Manganese UCL (.44 outlier removed)

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

C0

General Statistics			
Number of Valid Observations	35	Number of Distinct Observations	26
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0018	Minimum of Log Data	-6.32
Maximum	0.23	Maximum of Log Data	-1.47
Mean	0.0533	Mean of log Data	-3.831
Geometric Mean	0.0217	SD of log Data	1.439
Median	0.0135		
SD	0.0665		
Std. Error of Mean	0.0112		
Coefficient of Variation	1.25		
Skewness	1.355		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.754	Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.934	Shapiro Wilk Critical Value	0.934
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	0.0723	95% H-UCL	0.13
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.136
95% Adjusted-CLT UCL (Chen-1995)	0.0745	97.5% Chebyshev (MVUE) UCL	0.169
95% Modified-t UCL (Johnson-1978)	0.0727	99% Chebyshev (MVUE) UCL	0.235
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.637	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0836		
MLE of Mean	0.0533		
MLE of Standard Deviation	0.0667		
nu star	44.6		
Approximate Chi Square Value (.05)	30.28	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0425	95% CLT UCL	0.0718
Adjusted Chi Square Value	29.72	95% Jackknife UCL	0.0723
		95% Standard Bootstrap UCL	0.0711
Anderson-Darling Test Statistic	1.586	95% Bootstrap-t UCL	0.0759
Anderson-Darling 5% Critical Value	0.795	95% Hall's Bootstrap UCL	0.0741
Kolmogorov-Smirnov Test Statistic	0.228	95% Percentile Bootstrap UCL	0.0721
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	0.0731
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.102
		97.5% Chebyshev(Mean, Sd) UCL	0.124
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.165
95% Approximate Gamma UCL (Use when n >= 40)	0.0784		
95% Adjusted Gamma UCL (Use when n < 40)	0.0799		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	0.102

MW-3A LDA Manganese UCL

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

C1

General Statistics			
Number of Valid Observations	29	Number of Distinct Observations	22
Raw Statistics		Log-transformed Statistics	
Minimum	0.628	Minimum of Log Data	-0.465
Maximum	3.6	Maximum of Log Data	1.281
Mean	2.163	Mean of log Data	0.724
Geometric Mean	2.063	SD of log Data	0.336
Median	2.2		
SD	0.62		
Std. Error of Mean	0.115		
Coefficient of Variation	0.287		
Skewness	0.0446		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.981	Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical Value	0.926	Shapiro Wilk Critical Value	0.926
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	2.359	95% H-UCL	2.451
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.782
95% Adjusted-CLT UCL (Chen-1995)	2.354	97.5% Chebyshev (MVUE) UCL	3.044
95% Modified-t UCL (Johnson-1978)	2.359	99% Chebyshev (MVUE) UCL	3.557
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	9.613	Data appear Normal at 5% Significance Level	
Theta Star	0.225		
MLE of Mean	2.163		
MLE of Standard Deviation	0.698		
nu star	557.6		
Approximate Chi Square Value (.05)	503.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0407	95% CLT UCL	2.353
Adjusted Chi Square Value	500.8	95% Jackknife UCL	2.359
		95% Standard Bootstrap UCL	2.348
Anderson-Darling Test Statistic	0.469	95% Bootstrap-t UCL	2.357
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	2.361
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL	2.343
Kolmogorov-Smirnov 5% Critical Value	0.162	95% BCA Bootstrap UCL	2.352
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2.665
		97.5% Chebyshev(Mean, Sd) UCL	2.883
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3.309
95% Approximate Gamma UCL (Use when n >= 40)	2.394		
95% Adjusted Gamma UCL (Use when n < 40)	2.408		
Potential UCL to Use		Use 95% Student's-t UCL	2.359

MW-4A LDA Manganese UTL (without .42 outlier)

General Background Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

C1

General Statistics			
Total Number of Observations	45	Number of Distinct Observations	43
Tolerance Factor	1.662		
Raw Statistics		Log-Transformed Statistics	
Minimum	0.009	Minimum	-4.711
Maximum	0.229	Maximum	-1.474
Second Largest	0.222	Second Largest	-1.505
First Quartile	0.0246	First Quartile	-3.705
Median	0.0442	Median	-3.119
Third Quartile	0.0991	Third Quartile	-2.312
Mean	0.0708	Mean	-3.041
Geometric Mean	0.0478	SD	0.923
SD	0.0631		
Coefficient of Variation	0.891		
Skewness	1.23		
Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.824	Shapiro Wilk Test Statistic	0.956
Shapiro Wilk Critical Value	0.945	Shapiro Wilk Critical Value	0.945
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	0.176	95% UTL with 90% Coverage	0.222
95% UPL (t)	0.178	95% UPL (t)	0.229
90% Percentile (z)	0.152	90% Percentile (z)	0.156
95% Percentile (z)	0.175	95% Percentile (z)	0.218
99% Percentile (z)	0.218	99% Percentile (z)	0.409
Gamma Distribution Test		Data Distribution Test	
k star	1.339	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.0529		
MLE of Mean	0.0708		
MLE of Standard Deviation	0.0612		
nu star	120.5		
A-D Test Statistic	0.671	Nonparametric Statistics	
5% A-D Critical Value	0.769	90% Percentile	0.176
K-S Test Statistic	0.119	95% Percentile	0.211
5% K-S Critical Value	0.134	99% Percentile	0.226
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	0.216
90% Percentile	0.152	95% Percentile Bootstrap UTL with 90% Coverage	0.216
95% Percentile	0.192	95% BCA Bootstrap UTL with 90% Coverage	0.216
99% Percentile	0.282	95% UPL	0.22
		95% Chebyshev UPL	0.349
95% WH Approx. Gamma UPL	0.193	Upper Threshold Limit Based upon IQR	0.211
95% HW Approx. Gamma UPL	0.199		
95% WH Approx. Gamma UTL with 90% Coverage	0.189		
95% HW Approx. Gamma UTL with 90% Coverage	0.194		

MW-5A LDA Manganese UCL (without 1.13 outlier)

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

C1

General Statistics			
Number of Valid Observations	34	Number of Distinct Observations	28
Raw Statistics		Log-transformed Statistics	
Minimum	0.0019	Minimum of Log Data	-6.266
Maximum	0.63	Maximum of Log Data	-0.462
Mean	0.0782	Mean of log Data	-3.796
Geometric Mean	0.0225	SD of log Data	1.467
Median	0.0195		
SD	0.16		
Std. Error of Mean	0.0275		
Coefficient of Variation	2.051		
Skewness	2.737		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.498	Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical Value	0.933	Shapiro Wilk Critical Value	0.933
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	0.125	95% H-UCL	0.144
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.149
95% Adjusted-CLT UCL (Chen-1995)	0.137	97.5% Chebyshev (MVUE) UCL	0.186
95% Modified-t UCL (Johnson-1978)	0.127	99% Chebyshev (MVUE) UCL	0.26
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.483	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.162		
MLE of Mean	0.0782		
MLE of Standard Deviation	0.113		
nu star	32.83		
Approximate Chi Square Value (.05)	20.73	Nonparametric Statistics	
Adjusted Level of Significance	0.0422	95% CLT UCL	0.123
Adjusted Chi Square Value	20.25	95% Jackknife UCL	0.125
		95% Standard Bootstrap UCL	0.123
Anderson-Darling Test Statistic	2.98	95% Bootstrap-t UCL	0.154
Anderson-Darling 5% Critical Value	0.811	95% Hall's Bootstrap UCL	0.129
Kolmogorov-Smirnov Test Statistic	0.304	95% Percentile Bootstrap UCL	0.127
Kolmogorov-Smirnov 5% Critical Value	0.159	95% BCA Bootstrap UCL	0.139
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.198
		97.5% Chebyshev(Mean, Sd) UCL	0.25
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.352
95% Approximate Gamma UCL (Use when n >= 40)	0.124		
95% Adjusted Gamma UCL (Use when n < 40)	0.127		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	0.198

MW-6A LDA Manganese UCL

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

C0

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	28
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0025	Minimum of Log Data	-5.991
Maximum	0.682	Maximum of Log Data	-0.383
Mean	0.106	Mean of log Data	-3.548
Geometric Mean	0.0288	SD of log Data	1.653
Median	0.0185		
SD	0.176		
Std. Error of Mean	0.0293		
Coefficient of Variation	1.663		
Skewness	2.129		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.638	Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
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	0.155	95% H-UCL	0.278
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.269
95% Adjusted-CLT UCL (Chen-1995)	0.165	97.5% Chebyshev (MVUE) UCL	0.341
95% Modified-t UCL (Johnson-1978)	0.157	99% Chebyshev (MVUE) UCL	0.481
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.468	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.225		
MLE of Mean	0.106		
MLE of Standard Deviation	0.154		
nu star	33.7		
Approximate Chi Square Value (.05)	21.43	Nonparametric Statistics	
Adjusted Level of Significance	0.0428	95% CLT UCL	0.154
Adjusted Chi Square Value	20.98	95% Jackknife UCL	0.155
		95% Standard Bootstrap UCL	0.153
Anderson-Darling Test Statistic	2.211	95% Bootstrap-t UCL	0.176
Anderson-Darling 5% Critical Value	0.815	95% Hall's Bootstrap UCL	0.167
Kolmogorov-Smirnov Test Statistic	0.221	95% Percentile Bootstrap UCL	0.156
Kolmogorov-Smirnov 5% Critical Value	0.155	95% BCA Bootstrap UCL	0.171
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.233
		97.5% Chebyshev(Mean, Sd) UCL	0.288
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.397
95% Approximate Gamma UCL (Use when n >= 40)	0.166		
95% Adjusted Gamma UCL (Use when n < 40)	0.17		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	0.233

LDA BEDROCK GROUNDWATER

TREND EVALUATIONS

MWB-1LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 12:43
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	0.0377
Maximum	0.07
Mean	0.0534
Geometric Mean	0.0529
Median	0.052
Standard Deviation	0.00752
SEM	0.00154

Mann-Kendall Test	
Test Value (S)	67
Critical Value (0.05)	1.645
Standard Deviation of S	40.25
Standardized Value of S	1.64
Approximate p-value	0.0505

Insufficient evidence to identify a significant trend at the specified level of significance.

MWB-2LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 13:27
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	24
Minimum	0.017
Maximum	0.032
Mean	0.0249
Geometric Mean	0.0245
Median	0.024
Standard Deviation	0.00447
SEM	9.13E-04

Mann-Kendall Test	
Test Value (S)	-130
Critical Value (0.05)	-1.645
Standard Deviation of S	40.21
Standardized Value of S	-3.208
Approximate p-value	6.68E-04

Statistically significant evidence of a decreasing trend at the specified level of significance.

MWB-3LDA Manganese Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/6/2013 11:51
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	36
Minimum	0.044
Maximum	0.197
Mean	0.0827
Geometric Mean	0.079
Median	0.0823
Standard Deviation	0.0273
SEM	0.00455

Mann-Kendall Test	
Test Value (S)	-167
Critical Value (0.05)	-1.645
Standard Deviation of S	73.41
Standardized Value of S	-2.261
Approximate p-value	0.0119

Statistically significant evidence of a decreasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

MWB-1 LDA Manganese UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	20
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0377	Minimum of Log Data	-3.278
Maximum	0.07	Maximum of Log Data	-2.659
Mean	0.0534	Mean of log Data	-2.939
Geometric Mean	0.0529	SD of log Data	0.14
Median	0.052		
SD	0.00752		
Std. Error of Mean	0.00154		
Coefficient of Variation	0.141		
Skewness	0.494		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.946	Shapiro Wilk Test Statistic	0.959
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	0.0561	95% H-UCL	0.0562
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0601
95% Adjusted-CLT UCL (Chen-1995)	0.0561	97.5% Chebyshev (MVUE) UCL	0.063
95% Modified-t UCL (Johnson-1978)	0.0561	99% Chebyshev (MVUE) UCL	0.0687

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	46.86	Data appear Normal at 5% Significance Level	
Theta Star	0.00114		
MLE of Mean	0.0534		
MLE of Standard Deviation	0.00781		
nu star	2249		
Approximate Chi Square Value (.05)	2140	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0392	95% CLT UCL	0.056
Adjusted Chi Square Value	2133	95% Jackknife UCL	0.0561
		95% Standard Bootstrap UCL	0.056
Anderson-Darling Test Statistic	0.511	95% Bootstrap-t UCL	0.0562
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	0.0563
Kolmogorov-Smirnov Test Statistic	0.14	95% Percentile Bootstrap UCL	0.056
Kolmogorov-Smirnov 5% Critical Value	0.177	95% BCA Bootstrap UCL	0.0561
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0601
		97.5% Chebyshev(Mean, Sd) UCL	0.063
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0687
95% Approximate Gamma UCL (Use when n >= 40)	0.0562		
95% Adjusted Gamma UCL (Use when n < 40)	0.0564		

Potential UCL to Use	Use 95% Student's-t UCL	0.0561

MWB-2 LDA Manganese UCL

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

C0

General Statistics			
Number of Valid Observations	24	Number of Distinct Observations	17
Raw Statistics		Log-transformed Statistics	
Minimum	0.017	Minimum of Log Data	-4.075
Maximum	0.032	Maximum of Log Data	-3.442
Mean	0.0249	Mean of log Data	-3.71
Geometric Mean	0.0245	SD of log Data	0.186
Median	0.024		
SD	0.00447		
Std. Error of Mean	9.13E-04		
Coefficient of Variation	0.18		
Skewness	-0.0912		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.949	Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
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	0.0264	95% H-UCL	0.0267
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.029
95% Adjusted-CLT UCL (Chen-1995)	0.0264	97.5% Chebyshev (MVUE) UCL	0.0308
95% Modified-t UCL (Johnson-1978)	0.0264	99% Chebyshev (MVUE) UCL	0.0343
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	27.31	Data appear Normal at 5% Significance Level	
Theta Star	9.11E-04		
MLE of Mean	0.0249		
MLE of Standard Deviation	0.00476		
nu star	1311		
Approximate Chi Square Value (.05)	1228	Nonparametric Statistics	
Adjusted Level of Significance	0.0392	95% CLT UCL	0.0264
Adjusted Chi Square Value	1222	95% Jackknife UCL	0.0264
		95% Standard Bootstrap UCL	0.0263
Anderson-Darling Test Statistic	0.461	95% Bootstrap-t UCL	0.0265
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	0.0264
Kolmogorov-Smirnov Test Statistic	0.143	95% Percentile Bootstrap UCL	0.0264
Kolmogorov-Smirnov 5% Critical Value	0.177	95% BCA Bootstrap UCL	0.0264
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0289
		97.5% Chebyshev(Mean, Sd) UCL	0.0306
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.034
95% Approximate Gamma UCL (Use when n >= 40)	0.0266		
95% Adjusted Gamma UCL (Use when n < 40)	0.0267		

Potential UCL to Use	Use 95% Student's-t UCL	0.0264

MWB-3 LDA Manganese UCL

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

C0

General Statistics			
Number of Valid Observations	36	Number of Distinct Observations	35
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.044	Minimum of Log Data	-3.124
Maximum	0.197	Maximum of Log Data	-1.625
Mean	0.0827	Mean of log Data	-2.539
Geometric Mean	0.079	SD of log Data	0.3
Median	0.0823		
SD	0.0273		
Std. Error of Mean	0.00455		
Coefficient of Variation	0.33		
Skewness	2.013		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.844	Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.935	Shapiro Wilk Critical Value	0.935
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	0.0903	95% H-UCL	0.0905
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.101
95% Adjusted-CLT UCL (Chen-1995)	0.0918	97.5% Chebyshev (MVUE) UCL	0.109
95% Modified-t UCL (Johnson-1978)	0.0906	99% Chebyshev (MVUE) UCL	0.124
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	10.27	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.00805		
MLE of Mean	0.0827		
MLE of Standard Deviation	0.0258		
nu star	739.5		
Approximate Chi Square Value (.05)	677.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0428	95% CLT UCL	0.0901
Adjusted Chi Square Value	674.7	95% Jackknife UCL	0.0903
		95% Standard Bootstrap UCL	0.0903
Anderson-Darling Test Statistic	0.614	95% Bootstrap-t UCL	0.0924
Anderson-Darling 5% Critical Value	0.748	95% Hall's Bootstrap UCL	0.0983
Kolmogorov-Smirnov Test Statistic	0.105	95% Percentile Bootstrap UCL	0.0903
Kolmogorov-Smirnov 5% Critical Value	0.147	95% BCA Bootstrap UCL	0.0918
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.102
		97.5% Chebyshev(Mean, Sd) UCL	0.111
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.128
95% Approximate Gamma UCL (Use when n >= 40)	0.0902		
95% Adjusted Gamma UCL (Use when n < 40)	0.0906		

Potential UCL to Use	Use 95% Approximate Gamma UCL	0.0902

Pb

LDA SURFACE WATER

TREND EVALUATIONS

South Pond LDA Lead Trend

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 8:38
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	59
Minimum	0.00128
Maximum	0.099
Mean	0.033
Geometric Mean	0.025
Median	0.027
Standard Deviation	0.0232
SEM	0.00302

Mann-Kendall Test	
Test Value (S)	-68
Critical Value (0.05)	-1.645
Standard Deviation of S	152.9
Standardized Value of S	-0.438
Approximate p-value	0.331

Insufficient evidence to identify a significant trend at the specified level of significance.

Still Well LDA Lead Trend

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/19/2013 16:24	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	61
Minimum	5.00E-04
Maximum	0.039
Mean	0.011
Geometric Mean	0.00762
Median	0.0109
Standard Deviation	0.00831
SEM	0.00106

Mann-Kendall Test	
Test Value (S)	378
Critical Value (0.05)	1.645
Standard Deviation of S	160.7
Standardized Value of S	2.346
Approximate p-value	0.00948

Statistically significant evidence of an increasing trend at the specified level of significance.

Weir Lead Trend (without .073 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options		
Date/Time of Computation	2/8/2013 10:11	
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	0.95	
Level of Significance	0.05	

C1

General Statistics	
Number of Values	57
Minimum	0.0022
Maximum	0.0578
Mean	0.0141
Geometric Mean	0.0109
Median	0.0099
Standard Deviation	0.012
SEM	0.00158

Mann-Kendall Test	
Test Value (S)	194
Critical Value (0.05)	1.645
Standard Deviation of S	145.3
Standardized Value of S	1.329
Approximate p-value	0.092

Insufficient evidence to identify a significant trend at the specified level of significance.

Infiltration Pond #1 LDA Lead Trend (without .021 outlier)

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	2/8/2013 9:27
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

C1

General Statistics	
Number of Values	60
Minimum	5.00E-04
Maximum	0.014
Mean	0.00453
Geometric Mean	0.00373
Median	0.00369
Standard Deviation	0.00294
SEM	3.79E-04

Mann-Kendall Test	
Test Value (S)	262
Critical Value (0.05)	1.645
Standard Deviation of S	156.8
Standardized Value of S	1.665
Approximate p-value	0.048

Statistically significant evidence of an increasing trend at the specified level of significance.

UCL/UTL DETERMINATIONS

South Pond Lead UCL

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

C1

General Statistics			
Number of Valid Observations	59	Number of Distinct Observations	56
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.00128	Minimum of Log Data	-6.661
Maximum	0.099	Maximum of Log Data	-2.313
Mean	0.033	Mean of log Data	-3.689
Geometric Mean	0.025	SD of log Data	0.843
Median	0.027		
SD	0.0232		
Std. Error of Mean	0.00302		
Coefficient of Variation	0.702		
Skewness	1.164		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.139	Lilliefors Test Statistic	0.114
Lilliefors Critical Value	0.115	Lilliefors Critical Value	0.115
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	0.0381	95% H-UCL	0.0454
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0546
95% Adjusted-CLT UCL (Chen-1995)	0.0385	97.5% Chebyshev (MVUE) UCL	0.0629
95% Modified-t UCL (Johnson-1978)	0.0382	99% Chebyshev (MVUE) UCL	0.0793

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.858	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.0178		
MLE of Mean	0.033		
MLE of Standard Deviation	0.0242		
nu star	219.3		
Approximate Chi Square Value (.05)	186	Nonparametric Statistics	
Adjusted Level of Significance	0.0459	95% CLT UCL	0.038
Adjusted Chi Square Value	185.2	95% Jackknife UCL	0.0381
		95% Standard Bootstrap UCL	0.0381
Anderson-Darling Test Statistic	0.242	95% Bootstrap-t UCL	0.0384
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL	0.0386
Kolmogorov-Smirnov Test Statistic	0.0631	95% Percentile Bootstrap UCL	0.0381
Kolmogorov-Smirnov 5% Critical Value	0.117	95% BCA Bootstrap UCL	0.0385
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0462
		97.5% Chebyshev(Mean, Sd) UCL	0.0519
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0631
95% Approximate Gamma UCL (Use when n >= 40)	0.0389		
95% Adjusted Gamma UCL (Use when n < 40)	0.0391		

Potential UCL to Use	Use 95% Approximate Gamma UCL	0.0389

Still Well LDA Lead UCL

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

C1

General Statistics			
Number of Valid Observations	61	Number of Distinct Observations	57
Raw Statistics		**Log-transformed Statistics**	
Minimum	5.00E-04	Minimum of Log Data	-7.601
Maximum	0.039	Maximum of Log Data	-3.244
Mean	0.011	Mean of log Data	-4.877
Geometric Mean	0.00762	SD of log Data	0.996
Median	0.0109		
SD	0.00831		
Std. Error of Mean	0.00106		
Coefficient of Variation	0.757		
Skewness	1.408		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.136	Lilliefors Test Statistic	0.21
Lilliefors Critical Value	0.113	Lilliefors Critical Value	0.113
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	0.0127	95% H-UCL	0.0167
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0205
95% Adjusted-CLT UCL (Chen-1995)	0.0129	97.5% Chebyshev (MVUE) UCL	0.024
95% Modified-t UCL (Johnson-1978)	0.0128	99% Chebyshev (MVUE) UCL	0.0309
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.455	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.00754		
MLE of Mean	0.011		
MLE of Standard Deviation	0.0091		
nu star	177.5		
Approximate Chi Square Value (.05)	147.6	Nonparametric Statistics	
Adjusted Level of Significance	0.0461	95% CLT UCL	0.0127
Adjusted Chi Square Value	147	95% Jackknife UCL	0.0127
		95% Standard Bootstrap UCL	0.0127
Anderson-Darling Test Statistic	1.256	95% Bootstrap-t UCL	0.013
Anderson-Darling 5% Critical Value	0.769	95% Hall's Bootstrap UCL	0.0131
Kolmogorov-Smirnov Test Statistic	0.161	95% Percentile Bootstrap UCL	0.0127
Kolmogorov-Smirnov 5% Critical Value	0.116	95% BCA Bootstrap UCL	0.013
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.0156
		97.5% Chebyshev(Mean, Sd) UCL	0.0176
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0216
95% Approximate Gamma UCL (Use when n >= 40)	0.0132		
95% Adjusted Gamma UCL (Use when n < 40)	0.0132		

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL	0.0156

Weir Lead UCL (without .073 outlier)

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

C1

General Statistics			
Number of Valid Observations	57	Number of Distinct Observations	57
Raw Statistics		Log-transformed Statistics	
Minimum	0.0022	Minimum of Log Data	-6.119
Maximum	0.0578	Maximum of Log Data	-2.851
Mean	0.0141	Mean of log Data	-4.523
Geometric Mean	0.0109	SD of log Data	0.708
Median	0.0099		
SD	0.012		
Std. Error of Mean	0.00158		
Coefficient of Variation	0.846		
Skewness	2.04		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.216	Lilliefors Test Statistic	0.0846
Lilliefors Critical Value	0.117	Lilliefors Critical Value	0.117
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	0.0168	95% H-UCL	0.0169
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0201
95% Adjusted-CLT UCL (Chen-1995)	0.0172	97.5% Chebyshev (MVUE) UCL	0.0228
95% Modified-t UCL (Johnson-1978)	0.0169	99% Chebyshev (MVUE) UCL	0.0281
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.947	Data appear Lognormal at 5% Significance Level	
Theta Star	0.00726		
MLE of Mean	0.0141		
MLE of Standard Deviation	0.0101		
nu star	222		
Approximate Chi Square Value (.05)	188.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0458	95% CLT UCL	0.0167
Adjusted Chi Square Value	187.7	95% Jackknife UCL	0.0168
		95% Standard Bootstrap UCL	0.0168
Anderson-Darling Test Statistic	1.345	95% Bootstrap-t UCL	0.0175
Anderson-Darling 5% Critical Value	0.763	95% Hall's Bootstrap UCL	0.0172
Kolmogorov-Smirnov Test Statistic	0.13	95% Percentile Bootstrap UCL	0.0169
Kolmogorov-Smirnov 5% Critical Value	0.119	95% BCA Bootstrap UCL	0.0173
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.021
		97.5% Chebyshev(Mean, Sd) UCL	0.024
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0299
95% Approximate Gamma UCL (Use when n >= 40)	0.0167		
95% Adjusted Gamma UCL (Use when n < 40)	0.0167		
Potential UCL to Use		Use 95% H-UCL	0.0169

Infiltration Pond #1 LDA Lead UCL (without .021 outlier)

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

C1

General Statistics			
Number of Valid Observations	60	Number of Distinct Observations	56
Raw Statistics		Log-transformed Statistics	
Minimum	5.00E-04	Minimum of Log Data	-7.601
Maximum	0.014	Maximum of Log Data	-4.269
Mean	0.00453	Mean of log Data	-5.592
Geometric Mean	0.00373	SD of log Data	0.656
Median	0.00369		
SD	0.00294		
Std. Error of Mean	3.79E-04		
Coefficient of Variation	0.649		
Skewness	1.505		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.16	Lilliefors Test Statistic	0.0741
Lilliefors Critical Value	0.114	Lilliefors Critical Value	0.114
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	0.00516	95% H-UCL	0.00549
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00645
95% Adjusted-CLT UCL (Chen-1995)	0.00523	97.5% Chebyshev (MVUE) UCL	0.00725
95% Modified-t UCL (Johnson-1978)	0.00517	99% Chebyshev (MVUE) UCL	0.00882
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.602	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.00174		
MLE of Mean	0.00453		
MLE of Standard Deviation	0.00281		
nu star	312.2		
Approximate Chi Square Value (.05)	272.3	Nonparametric Statistics	
Adjusted Level of Significance	0.046	95% CLT UCL	0.00515
Adjusted Chi Square Value	271.4	95% Jackknife UCL	0.00516
		95% Standard Bootstrap UCL	0.00513
Anderson-Darling Test Statistic	0.627	95% Bootstrap-t UCL	0.00529
Anderson-Darling 5% Critical Value	0.759	95% Hall's Bootstrap UCL	0.00524
Kolmogorov-Smirnov Test Statistic	0.0831	95% Percentile Bootstrap UCL	0.0052
Kolmogorov-Smirnov 5% Critical Value	0.116	95% BCA Bootstrap UCL	0.00524
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.00618
		97.5% Chebyshev(Mean, Sd) UCL	0.0069
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.0083
95% Approximate Gamma UCL (Use when n >= 40)	0.00519		
95% Adjusted Gamma UCL (Use when n < 40)	0.00521		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.00519