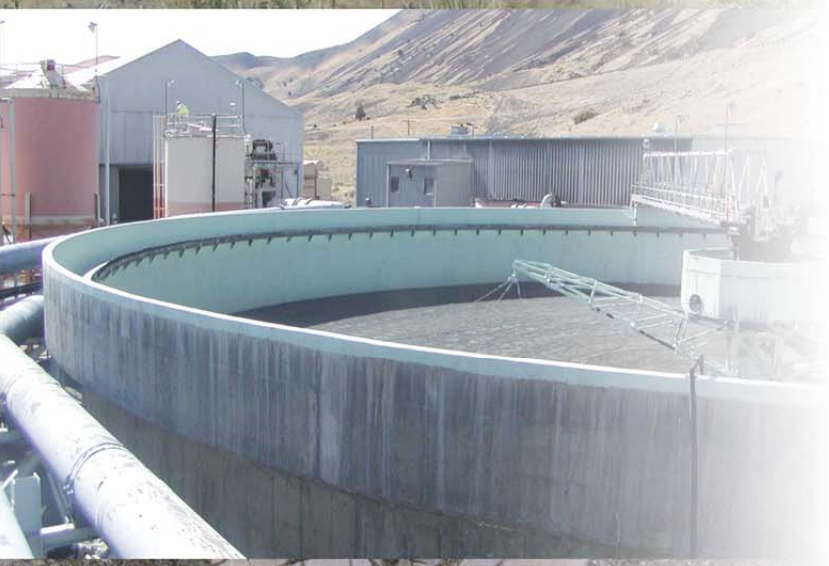


2017 ANNUAL GROUNDWATER MONITORING REPORT

WEST SURFACE IMPOUNDMENT

Columbia Gorge Aluminum Smelter Site

85 John Day Dam Road, Goldendale WA

Facility Site ID #95415874

September 8, 2017

On behalf of:

NSC Smelter LLC
3313 West Second Street
The Dalles OR 97058

In Cooperation With:

Blue Mountain Environmental Consulting Inc.
125 Main Street
Waitsburg WA 99361

Prepared by:

GeoPro LLC
P. O. Box 26
Battle Ground WA 98604

Table of Contents

TABLES

FIGURES

Table of Contents - continued

APPENDICES

1 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report presents the results of 2017 annual groundwater monitoring and evaluation following closure of the former Columbia Gorge Aluminum Smelter West Surface Impoundment (WSI). Statistical evaluation of the groundwater monitoring data was conducted to evaluate natural attenuation in the concentration of groundwater contaminates. This monitoring and statistical evaluation was conducted in accordance with the Groundwater Sampling Data Analysis and Evaluation Plan (GSDAEP) for the WSI facility (Parametrix 2004b). Groundwater sampling was performed in August 2017 by GeoPro LLC, Battle Ground, Washington.

1.2 SITE DESCRIPTION

The approximately 10-acre WSI was constructed as an earthen impoundment with Hypalon liner in 1981. It was used through 2001 to dispose of various types of waste generated from plant pollution controls. A map of the location is shown in Figure 1.

The WSI contains approximately 89,000 cubic yards of sludge comprised primarily of alumina, dust, and particulates from wastewater and residual waste generated by plant emission control systems. The WSI managed waste through evaporation of wastewater and disposal of emission control sludge (DOE 2014). The WSI discontinued accepting waste and was closed in September 2004 (Parametrix 2004a). Closure of the WSI included placement of an engineered RCRA cap consisting of soil and geosynthetic materials and development of a post-closure maintenance and groundwater monitoring plan (Parametrix 2004b).

1.3 HYDROGEOLOGIC SETTING

The geologic materials present beneath the WSI consist of unconsolidated alluvial deposits of Quaternary age, underlain by a series of basalt flows and sedimentary interbeds of the Columbia River Basalt Group (CH2M Hill 1995; Golder 1989). Aquifer A is the uppermost aquifer and occurs at a depth of 10 feet or more below the bottom of the WSI within the unconsolidated alluvium, colluviums, and top of the shallow brecciated basalt. Aquifer B occurs below Aquifer A below the WSI (Parametrix, 2005) within the fractured zone beneath the first basalt layer. Aquifer A is unconfined and the underlying Aquifer B is confined. A site-wide groundwater evaluation is currently being conducted as part of developing the Remedial Investigation work plan pursuant to the Agreed Order (DOE 2014).

The saturated thickness of Aquifer A decreases south of the WSI. Aquifer A is recharged by precipitation and Aquifer B is recharged by leakage from the overlying units. In addition, Aquifers A and B are both recharged by groundwater discharge through the basalt along the cliffs north of the WSI.

Groundwater in Aquifer A north of the WSI flows with a steep gradient toward the south-southeast (Parametrix, 2004b). The gradient flattens beneath the WSI; south of the

WSI, groundwater flows southwestward toward the Columbia River. The gradient and flow direction in the underlying Aquifer B are not defined.

1.4 PREVIOUS GROUNDWATER MONITORING

The current monitoring network at the site consists of sixteen monitoring wells, including some shallow and deep well clusters. The initial monitoring wells were installed in 1984, and another set of wells were installed in 1989. An additional monitoring well, MW-18, was installed near the downgradient property boundary, about 2,500-feet from the WSI, in October 2004.

Sampling and analysis of groundwater has been conducted since 1984, and followed a quarterly schedule between 1991 and 2004. One additional pre-closure sampling event was conducted in September 2004 for the five wells included in the post- closure monitoring plan to establish groundwater quality before the wells could be affected by subsurface disturbances from WSI closure construction. Post-closure sampling and analysis was conducted quarterly from 2005-2007, semiannually from 2008-2010, and annually beginning in 2011. Previous samples were analyzed for pH, conductivity, total organic carbon, sulfate, fluoride, chloride, sodium, iron, manganese, free cyanide, total cyanide, and total phenols. Sulfate and fluoride were determined to be representative indicator parameters for the WSI wastes, since sulfate concentrations show direct response to periods of waste discharge into the pond. Pre-closure maximum sulfate concentrations were observed in 2000 and 2001 (Parametrix 2004a).

2 GROUNDWATER INVESTIGATION

The post-closure monitoring investigation was described in the GSDAEP (Parametrix 2004b) and is summarized in this section.

2.1 MONITORING WELL LOCATIONS

The post-closure monitoring well locations include the following upgradient and downgradient wells:

- Upgradient well: MW-8A
- Downgradient wells near WSI: MW-10A, MW-12A, and MW-14A
- Downgradient wells farther from WSI: MW-3B and MW-18

The aquifer in which each well is screened will be determined as part of developing the Remedial Investigation work plan pursuant to the Agreed Order (DOE 2014). Monitoring well construction details are shown below in Table 1. Monitor well 12A has been dry except for the March 13, 2007 sampling event. Well locations are shown on Figure 2.

Table 1. Monitoring Well Construction Data

Well Number	Installed	Total Well Depth (ft bgs)	Well Screen Interval (ft bgs)	PVC Casing Diameter (inches)	Ground Surface Elevation (ft)	Top of PVC Elevation (ft)	Location
MW-8A	May 1989	41	22-32	4	490	492.97	Upgradient
MW-3B	April 1984	51	46-51	4	408	410.90	Downgradient
MW-10A	April 1989	26	13-25.5	4	425	427.95	Downgradient
MW-12A	May 1989	55	40-54	4	439	441.38	Downgradient
MW-14A	May 1989	30.5	8.5-29.5	4	429	431.65	Downgradient
MW-18	October 2004	51	35-50	4	346	348.40	Downgradient
Notes: bgs = below ground surface; elevations from Parametrix (2004b)							

2.2 SAMPLING PROCEDURES

Samples were collected on August 9, 2017 by GeoPro LLC using a submersible pump. Sampling collection procedures are summarized below.

- The static water level was measured prior to sampling.
- Each monitor well was purged of stagnant water in the casing and filter by slowly setting the pump within the approximate middle of the screened interval or slightly above the middle until the temperature, conductivity and pH stabilized.
- Samples were collected by setting the pump within the approximate middle of the screened interval with a low flow pumping rate.
- Water samples were placed in appropriate containers prepared by the laboratory. The containers were filled to prevent air-entrapment, sealed, labeled, and placed in an ice chest at approximately 4°C for transport to OnSite Laboratory. The samples were accompanied by a completed and signed chain-of-custody form. The samples were submitted by OnSite to AmTest laboratory for cyanide analysis.

2.3 SAMPLE ANALYSES

Laboratory reports from Onsite Environmental, Inc., Redmond, Washington for analysis of the groundwater samples were completed on August 29, 2017. The laboratory reports are included in Appendix A2.

2.4 MONITORING SCHEDULE

Groundwater sampling follows the schedule outlined in the post-closure plan (Parametric 2007c). Beginning in 2005, the plan specified quarterly sampling for the first two years, semiannually for years 3 through 7, and annual sampling thereafter until

concentrations drop below groundwater protection standards, or for a maximum of 30 years. One semiannual sampling event was not completed in 2011.

2.5 DATA EVALUATION

The statistical approach for evaluating the post-closure groundwater monitoring data collected at the WSI is described in the GSDAEP (Parametrix 2004b). The objectives of the post-closure data evaluation for the WSI are to demonstrate the effectiveness of the correction action, that is, evaluate whether groundwater quality is improving, deteriorating, or remaining unchanged relative to pre-closure conditions, and to determine compliance with the groundwater protection standards. The data evaluation schedule is summarized below in Table 2.

Table 2. Data Evaluation Schedule for WSI

Frequency of Evaluation	Statistical Procedure	Purpose
Quarterly or semiannually Years 1-7	Time-series plots	Visually identify increasing or decreasing trends in concentrations
Annually After Year 7	Trend analyses using Mann-Kendall test	Quantitatively identify increasing or decreasing trends in concentrations
	Upper Confidence Limit Evaluation	Compare concentrations to the groundwater protection standards
	Time-series plots	Visually identify increasing or decreasing trends in concentrations

Groundwater protection standards are MTCA[1] Method B cleanup standards and Maximum Contaminant Levels (MCLs). The groundwater protection standards for these parameters are presented in the following Table 3.

Table 3. Groundwater Protection Standards for WSI

Parameter	MTCA B Cleanup Level (mg/L)	MCL (mg/L)	
		Primary	Secondary
Fluoride	0.96	4	2
Chloride	-	-	250
Sulfate	-	-	250
Total Cyanide	0.32	0.2	-

The analysis for total cyanide is to be discontinued if not detected for four consecutive calendar quarters.

The GSDAEP (Parametrix 2004b) also recommended using Upper Prediction Limit (UPL) comparisons to evaluate post-closure data. However, EPA guidance (EPA 2004) does not recommend that UPL comparisons be used for sites such as WSI with pre-existing contamination.

[1] State of Washington Department of Ecology Model Toxics Control Act, Cleanup Regulations, Chapter 173-340 WAC, as revised.

Three years of quarterly data (2005-2007), three years of semiannual data (2008-2010), and seven years of annual data (2011-2017) from ground water sampling were used for analysis (see Appendix A1). The concentrations of fluoride, chloride, sulfate, and total cyanide in each well were evaluated and prepared to satisfy the quarterly and semiannual requirements. The time-series plots, Mann-Kendall test and UCL comparisons were conducted to satisfy the annual evaluation requirements. With approval from Paul Skyllingstad, DOE (personal communication, June 28, 2012) both the Washington Department of Ecology UCL calculator and the Environmental Protection Agency ProUCL calculator were used to calculate UCLs for the data.

Time-series plots were created using the Microsoft Excel graphing functions. The Mann-Kendall test was conducted using the EPA's ProUCL calculator. ProUCL did not directly create all the statistical outputs needed for the Mann-Kendall analysis. VAR(S) was computed using equation (1), Z was computed using equation (2), and probability was computed using Table A.21 (Hollander and Wolfe, 1973).

(1) $$\text{Standard Deviation of S} = \sqrt{\text{VAR(S)}}$$

(2) $$Z = \frac{|S|-1}{\sqrt{VAR(S)}}$$

The Washington DOE UCL (DOE, 2012) calculator was used to calculate the 95 percent UCL for normal and lognormal datasets as well as the mean, minimum value, and maximum value for each dataset. For datasets that were neither normal nor lognormal, the UCL was calculated using the EPA's ProUCL Calculator (ProUCL, 2012). The datasets evaluated using ProUCL were sulfate in MW-8A and MW-10A, chloride in MW-10A, and cyanide in MW-10A. Raw calculations for the DOE and EPA ProUCL calculators are presented in Appendix B.

3 RESULTS

3.1 SUMMARY

Post-closure data has been collected during 12 quarterly events between February 2005 and November 2007, 6 semiannual events between May 2008 and October 2010, and 7 annual events in July 2011, April 2012, June 2013, April 2014, July 2015, August 2016 and August 2017. The post-closure data are summarized in Appendix A1 and individual results that exceed the groundwater protection level are highlighted.

3.2 STATISTICAL EVALUATION

3.2.1 Time-Series Plots

During the post-closure period beginning in February 2005 groundwater samples were analyzed for sulfate, fluoride, chloride, and total cyanide. Time-series plots of data collected since 2005 are presented in Appendix B1. For the time-series non-detected data, points were plotted using one half of the laboratory practical quantitative limit.

Visual inspection of the time-series plots indicates the following trends since closing of the WSI in 2004.

Sulfate

The sulfate concentrations are increasing in downgradient well MW-10A; decreasing in downgradient wells MW-14A; slightly decreasing in MW-3B; and relatively steady in downgradient well MW-18. The sulfate concentration upgradient of the WSI in well MW-8A is relatively steady at just below 10 mg/L. Sulfate is still well below the pre-closure sulfate concentrations of over 23,000 mg/L in downgradient wells MW-10A and 20,000 mg/L in MW-14A (Parametrix, 2007). The highest downgradient sulfate concentrations during the post-closure period were 6,100 mg/L in 2014 in well MW-10A, 7,900 mg/L in 2007 in well MW-14A, and 1,700 mg/L in 2016 and other sampling events in well MW-18.

Fluoride

Fluoride concentrations are steady in the upgradient well MW-8A and downgradient wells MW-3B and MW-18; decreasing in the downgradient well MW-14A; and slightly increasing in downgradient well MW-10A.

Chloride

Chloride concentrations are steady in the upgradient well MW-8A. Chloride concentrations are increasing in the downgradient wells MW-10A and MW-14A. Chloride concentrations are slightly decreasing in downgradient well MW-3B. Pre-closure concentrations of chloride of over 1,200 mg/L for MW-10A and 900 mg/L in MW-14A (Parametrix, 2007) have decreased to less than the secondary MCL of 250 mg/L since the closure of the WSI.

Total Cyanide

Total cyanide concentrations are decreasing in wells MW-10A and MW-14A, and are below the groundwater protection standard. Total cyanide was not detected in the other wells.

3.2.2 Mann-Kendall Test

The Mann-Kendall test (Gilbert, 1987; Hollander and Wolfe, 1973) was used to evaluate temporal trends in the concentrations of analytes. The nonparametric Mann-Kendall test evaluates the direction and significance of trends in the data at the 95 percent UCL. The GWSDAEP specified that Sen's slope tests were to be used to evaluate trends in the data, but have not been used because they provide similar information to the Mann-Kendall test and are less conservative, since they evaluate the significance of the data at the 90 percent UCL.

The Mann-Kendall test was conducted using the post-closure data. Results of the Mann-Kendall tests are presented in Appendix B2 and summarized in Table 4.

Table 4. Post-Closure Significant Trends Using the Mann-Kendall Test

Well	Sulfate	Fluoride	Chloride	Total Cyanide
Upgradient				
MW-8A	-	↓	-	-
Downgradient				
MW-3B	↓	↓	↓	-
MW-10A	↑	+	↑	↓
MW-12A	n/a	n/a	n/a	n/a
MW-14A	↓	↓	-	↓
MW-18	+	↓	-	+

Notes:

↑ Significant Increasing Trend
↓ Significant Decreasing Trend
\- Negative Trend
\+ Positive Trend
n/a Trend could not be calculated: only one data point available because the well is dry

The Mann-Kendall Trend test results indicate the following:

- Sulfate levels are significantly increasing in downgradient well MW-10A, and are significantly decreasing in downgradient wells MW-3B and MW-14A.
- Fluoride levels are significantly decreasing in upgradient well MW-8A and downgradient wells MW-3B and MW-18.
- Chloride levels are significantly decreasing in downgradient well MW-3B and significantly increasing in downgradient well MW-10A.
- Total cyanide levels are significantly decreasing in the downgradient wells MW-10A and MW-14A.

3.2.3 Upper Confidence Limits

The primary tool cited in MTCA (WAC 173-340-720[9]) for assessing whether data exceeds established cleanup levels is by comparing data to UCLs calculated on the mean. The UCL for each parameter at each well was calculated using the post-closure data, and the calculated UCL was compared to the MTCA cleanup level and MCL for each analyte to assess whether groundwater protection standards are being met. The results of the UCL comparisons are presented in Appendix B and summarized in Table 5.

Table 5. Upper Confidence Limits of Post-Closure Groundwater Data

	Upper Confidence Limit (mg/L)			
	Sulfate	**Chloride**	**Fluoride**	**Total Cyanide**
Lowest Groundwater Protection Standard (mg/L)	250	250	0.96	0.2
Upgradient				
MW-8A	9.15	4.48	0.64	0.01
Downgradient				
MW-3B	**2272.33**	107.57	**2.31**	0.01
MW-10A	**1958.75**	66.96	**3.42**	0.03
MW-12A[1]	**1800**	150	**6**	0.01
MW-14A	**3954.35**	111.87	**20.22**	0.11
MW-18	**1496.25**	82.88	**2.84**	0.01

Notes:
[1] No UCL calculated. Well was dry during most sampling events.
Value represents single measurement collected on March 13, 2007.
[2] No UCL calculated, all data was non-detected.
Bold indicates UCL exceeds lowest groundwater protection standard.

All the sampled wells downgradient of the WSI have post-closure UCL concentrations above the groundwater protection standards for sulfate and fluoride and below the groundwater protection standard for chloride and total cyanide. Upgradient well MW-8A has a UCL below the groundwater protection standard for sulfate, chloride fluoride and total cyanide.

3.3 GROUNDWATER FLOW

Groundwater elevations were measured once during 2004, quarterly between 2005 and 2007, semiannually between 2008 and 2010, and annually during 2011 through 2017 in the five sampled wells. The groundwater elevation data and a hydrograph showing changes in groundwater elevation during post-closure are presented in Appendix C. A groundwater elevation contour map was prepared using groundwater levels measured in August 2017 and is provided in Figure 3. Groundwater flow is consistent with historical data and the overall flow direction downgradient from the WSI is toward the southwest.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

The following is concluded based on the August 2017 groundwater sampling results, trends, and statistical evaluation of historic data.

- Sulfate and fluoride concentrations in downgradient wells, based on the calculated UCLs, are above groundwater protection standards. Fluoride in the upgradient well is below groundwater protection standards.
- Sulfate concentrations are not significantly decreasing in concentration, based on calculated UCLs, since the last reporting period.
- Fluoride concentrations are not significantly decreasing in concentration, based on calculated UCLs, since the last reporting period.
- Chloride concentrations remain below groundwater protection standards, based on calculated UCLs, since the last reporting period. A significant increasing trend in chloride concentration continues in downgradient well MW-10A and a significantly decreasing trend continues for chloride in well MW-3B.
- Total cyanide concentrations are below groundwater protection standards, based on calculated UCLs, since the last reporting period. A significant decreasing trend continues since the last reporting period for total cyanide in wells MW-10A and MW-14A.

4.2 RECOMMENDATIONS

Post-closure fluoride and sulfate concentrations are much lower than pre-closure concentrations. However, the lack of significant reduction in their concentrations during the post-closure period may indicate that the WSI is continuing to contribute these contaminates to groundwater. Future sampling and data evaluation will be required to determine whether the concentrations of fluoride and sulfate decrease below the lowest groundwater protection standards.

As specified in the GSDAEP, the WSI groundwater monitoring frequency is on an annual basis. Also specified, future annual reports will continue to include time-series plots, Mann-Kendall tests for trend and a comparison of the UCLs of the most recent sampling data to groundwater protection standards.

5 REFERENCES

CH2M Hill, 1995, West Surface Impoundment Closure and Postclosure Plan. Prepared for Goldendale Aluminum, February 1995.

DOE, 2012, State of Washington Department of Ecology 6/11/2012 http://www.ecy.wa.gov/programs/tcp/tools/SITE97.XLT.

DOE, 2014, Agreed Order No. DE 10483 Columbia Gorge Aluminum Smelter, Effective May 1, 2014.

GeoPro LLC, 2012, Semi-Annual Groundwater Monitoring Report, West Surface Impoundment, Former Goldendale Aluminum Smelter.

GeoPro LLC, 2013, Annual Groundwater Monitoring Report, West Surface Impoundment, Former Goldendale Aluminum Smelter.

GeoPro LLC, 2014, Annual Groundwater Monitoring Report, West Surface Impoundment, Former Goldendale Aluminum Smelter.

GeoPro LLC, 2015, Annual Groundwater Monitoring Report, West Surface Impoundment, Former Goldendale Aluminum Smelter.

GeoPro LLC, 2016, Annual Groundwater Monitoring Report, West Surface Impoundment, Former Goldendale Aluminum Smelter.

Gibbons, R.D., 1994, Statistical Methods for Ground Water Monitoring. John Wiley and Sons.

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

Golder Associates, Inc., 1989, Groundwater Monitoring Well Installation, West Surface Impoundment, Golden Northwest Aluminum, Interim Report.

Hollander and Wolfe, 1973, Nonparametric Statistical Methods, John Wiley and Sons.

Parametrix, Inc., 2004a, Goldendale Aluminum West Surface Impoundment Closure.

Parametrix, Inc., 2004b, Groundwater Sampling Data Analysis and Evaluation Plan for Goldendale Aluminum West Surface Impoundment Facility.

Parametrix, Inc., 2004c, WSI Closure and Post Closure Plan.

Parametrix, Inc., 2005, Groundwater Sampling Data Analysis and Evaluation Plan for Goldendale Aluminum West Surface Impoundment Facility, February 2005 Revision to November 2004 Document.

Parametrix, Inc., 2007, Two-Year Post-Closure Groundwater Evaluation, Goldendale Aluminum West Surface Impoundment Facility, September 2007.

Paul Skyllingstad, WA DOE, Personal Communication, June 28, 2012.

ProUCL 7/12/11 U.S. Environmental Protection Agency 6/11/2012: http://www.epa.gov/osp/hstl/tsc/setup_v41.zip

6 LIMITATIONS

This report has been prepared for use by the landowner and is not intended for use by others except the landowner(s), landowner's agents and appropriate government agencies and all others should contact GeoPro LLC before applying or interpreting any information in this report. Each project and project site is unique and the information contained in this report is not applicable to other sites. This report has been prepared pursuant to a post-closure work plan prepared by others and the work plan approved by the State of Washington Department of Ecology.

GeoPro LLC does not accept liability or responsibility for use of this report by third parties, including but not limited to, detachment, partial use, separation, or reproduction without color, if used, which may depict significant information. Such use shall be at user's sole risk.

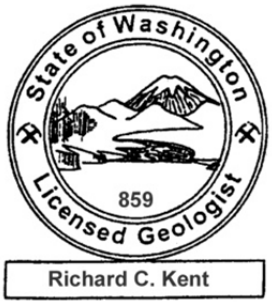
Records, documentation, and personal communication have been relied upon in good faith; however, GeoPro LLC accepts no responsibility for errors or omissions of work by others. Services are performed in accordance with generally accepted professional practices, in the same or similar localities, related to the nature of the work accomplished, at the time services are rendered. GeoPro LLC is not responsible for references to regulatory terms, practices, numeric data, or conditions that may lead to other conclusions if such references are not in final form.

Conclusions and findings apply only to present conditions, and opinions expressed are subject to revision when additional or new information is presented and reviewed. This warranty is in lieu of all other warranties, either expressed or implied. It is possible that explorations failed to reveal the presence of hazardous materials at areas where hazardous materials were assumed, suspected or expected to exist (hazardous as used herein shall also mean contaminated and polluted). Through use of this report it is understand that failure to sample soil or water, or install groundwater monitor wells at locations through appropriate and mutually agreed-upon techniques does not guarantee that hazardous materials have, or will be, detected at such locations. Similarly, areas which in fact are unaffected by hazardous materials at the time of this report, may later, due to natural causes or human intervention, become contaminated. GeoPro LLC is not responsible for failing to locate hazardous materials which have not been discovered at the time of this report or in the future. In the event of changes in future development plans as understood at the time of this report, the conclusions and recommendations made herein shall be invalid until GeoPro LLC is given the opportunity to review and modify this report in writing. Portions of an Agreement to perform professional services may or may not be disclosed in this report.

Respectfully submitted,

Richard C. Kent, L.G.

GeoPro LLC



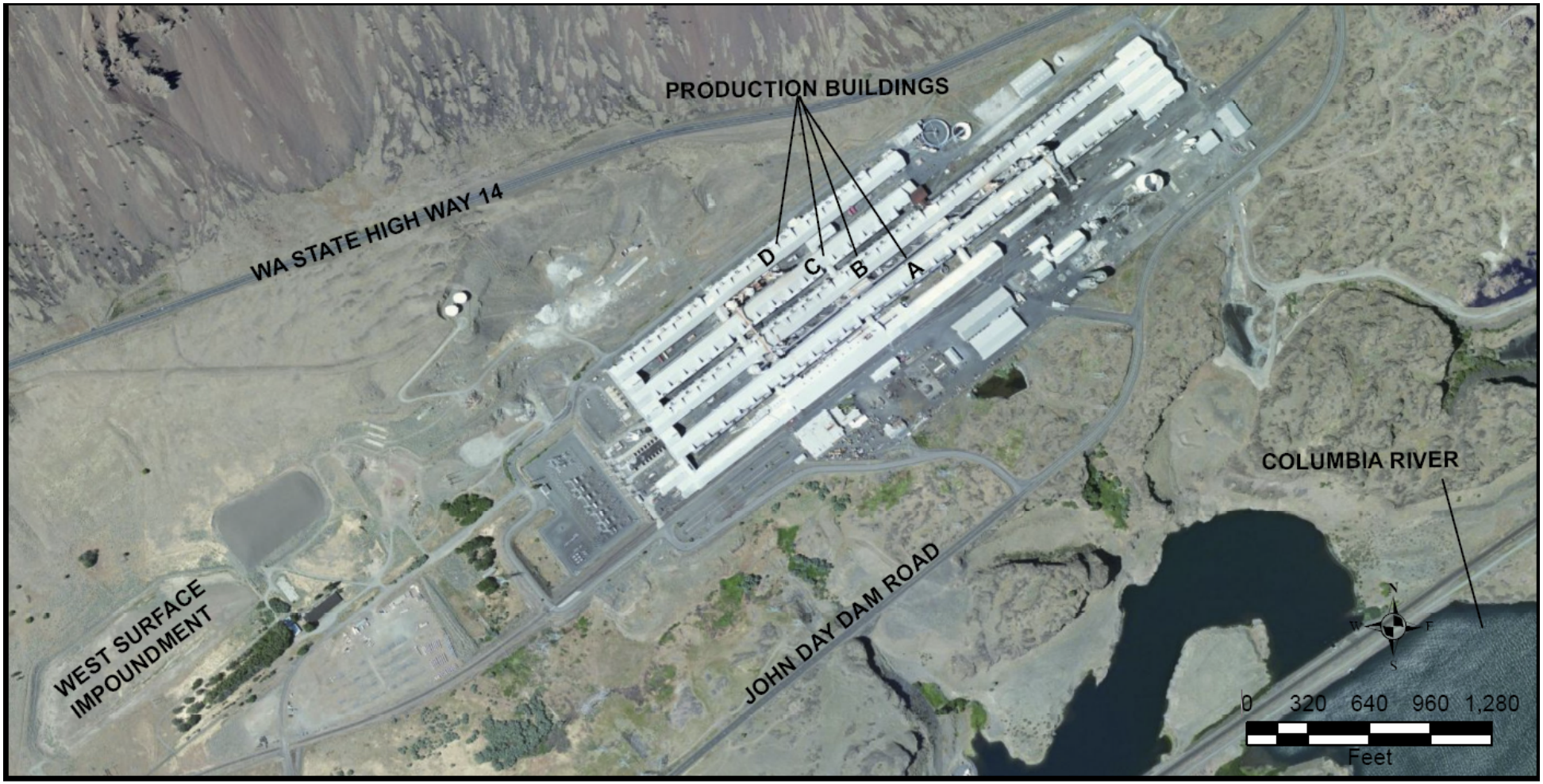


FIGURE 1

LOCATION MAP

Columbia Gorge Aluminum Corporation
Former Columbia Gorge Aluminum Smelter
Goldendale, Washington

GeoPro LLC
PO Box 26
Battle Ground, WA 98604

August 2017

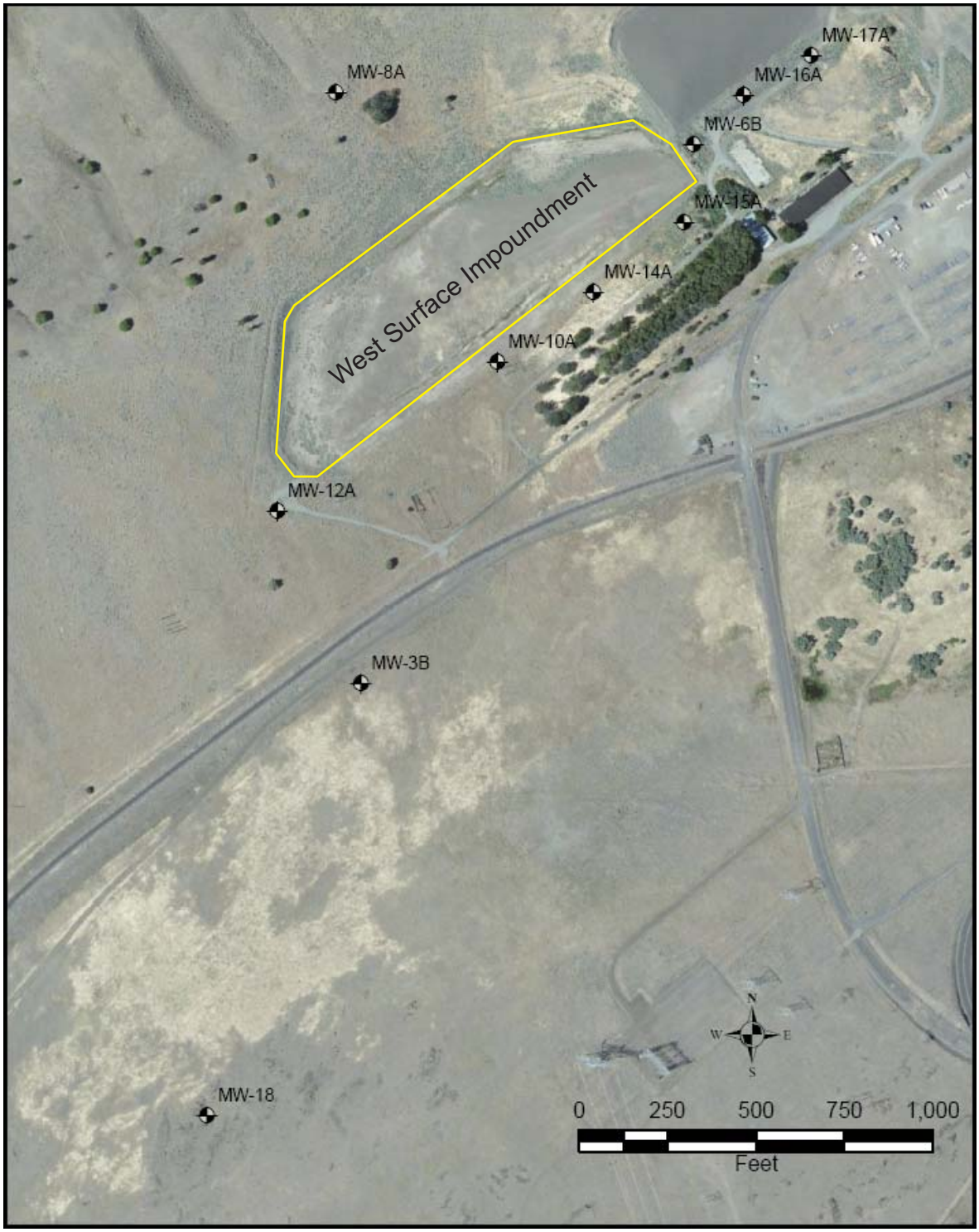


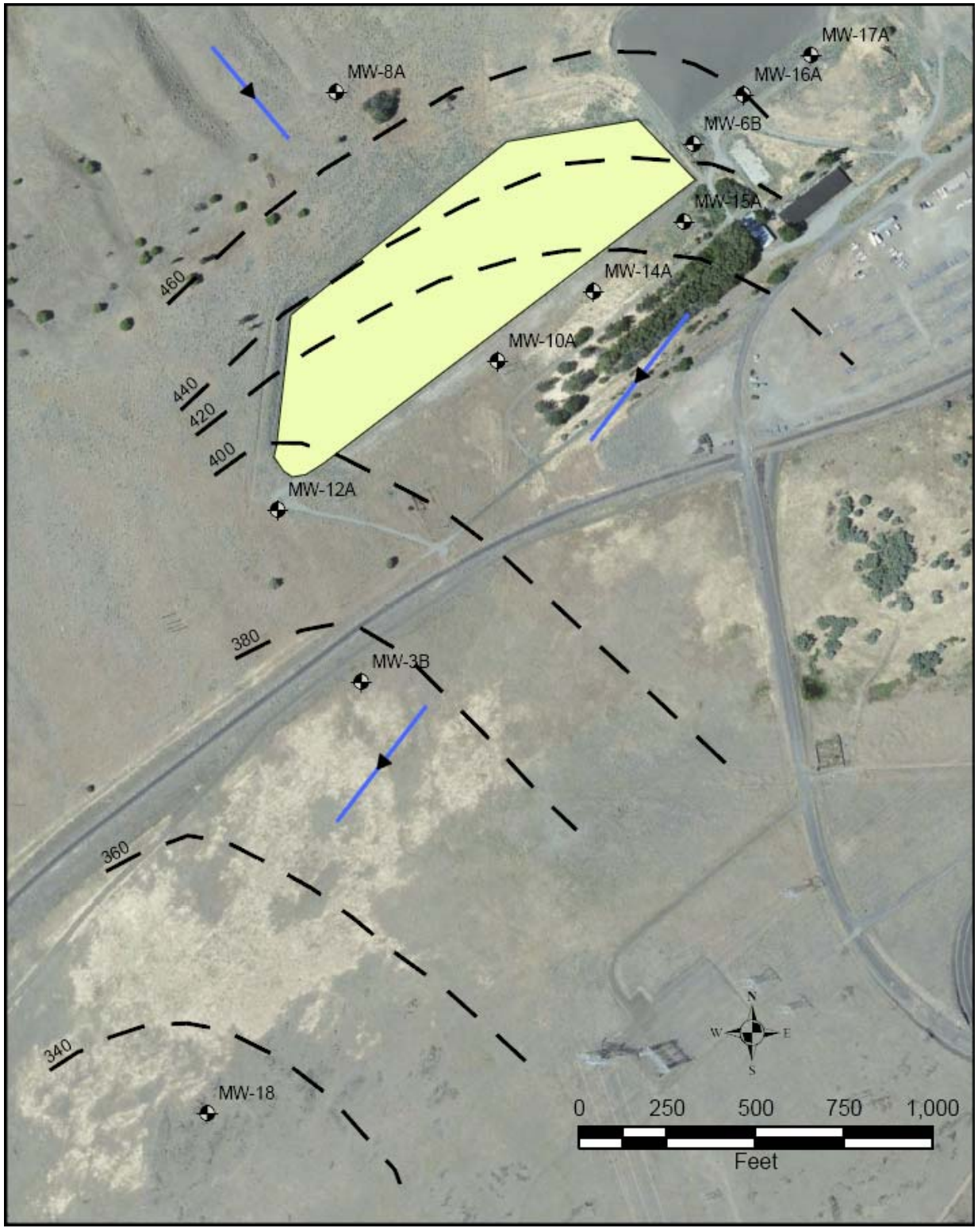
FIGURE 2

WEST SURFACE IMPOUNDMENT GROUNDWATER MONITOR WELLS LOCATION MAP

Columbia Gorge Aluminum Corporation
Former Columbia Gorge Aluminum Smelter
Goldendale, Washington

GeoPro LLC
PO Box 26
Battle Ground, WA 98604

August 2017



contour interval 20 feet
contours in feet MSL

flow direction

FIGURE 3

WEST SURFACE IMPOUNDMENT GROUNDWATER CONTOUR MAP

Columbia Gorge Aluminum Corporation
Former Columbia Gorge Aluminum Smelter
Goldendale, Washington

GeoPro LLC
PO Box 26
Battle Ground, WA 98604

August 2017

APPENDICES

Appendix A - Laboratory Reports

Appendix A1
Summary Post-Closure Groundwater Sample Analyses

Summary Post-Closure Groundwater Sample Analyses (mg/L): page 1 of 2

	Upgradient Well MW-8A				Downgradient Well MW-3B				Downgradient Well MW-10A			
	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)
Lowest Groundwater Protection Standard	250	0.96	250	0.2	250	0.96	250	0.2	250	0.96	250	0.2
Sample Date												
2/16/2005	10	0.9	5.6	<0.01	2300	0.6	130	<0.01	940	1.8	29	0.04
5/11/2005	9.8	0.3	4.6	<0.01	2500	0.4	140	<0.01	910	1.5	31	0.05
8/29/2005	8.9	0.4	4.2	<0.01	2700	0.6	120	<0.01	670	1.2	28	0.04
11/1/2005	9.6	0.9	4.7	<0.01	2600	0.9	130	<0.01	670	2.7	28	0.03
2/27/2006	9.27	2.8	4.2	<0.01	2610	0.7	118	<0.01	1570	2.3	43	0.03
6/5/2006	9.8	0.2	4.9	<0.05	2220	0.2	113	<0.01	1650	3.2	48	0.03
7/31/2006	9.8	0.1	4.6	<0.01	2000	3.7	110	<0.01	860	2.3	35	0.08
10/9/2006	9.7	<0.2	4.5	<0.01	2500	3.8	110	<0.01	850	1.9	30	0.03
3/13/2007	10	<0.1	6.6	<0.01	2500	3.8	110	<0.01	1100	3.4	45	0.04
6/22/2007	1	<10	4.89	<0.01	2500	<10	97	<0.01	1100	<10	36	<0.01
9/24/2007	10	<1	4.2	<0.01	2200	<1	124.79	<0.01	760	1.2	30	0.04
11/14/2007	-	-	-	<0.01	-	-	-	<0.01	-	-	-	0.043
5/8/2008	10	<1	4	<0.01	2200	<50	100	<0.01	2700	<50	100	0.05
10/14/2008	10	0.1	4.5	<0.01	2600	<10	100	<0.01	860	<10	30	0.04
5/29/2009	9	<1	3	<0.02	2200	<1	96	<0.02	2000	2	68	0.03
10/27/2009	10	<1	5.5	<0.02	2606	<1	110	<0.02	760	<1	79	<0.02
5/26/2010	9.3	<1	4.4	<0.02	2300	2.3	120	<0.02	2200	4.4	83	0.032
10/6/2010	8.9	<1	3.6	<0.02	2400	<1	110	<0.02	710	1	23	0.022
7/26/2011	7.8	<1	3.6	<0.02	2000	<1	98	<0.02	1800	3.3	62	0.028
4/19/2012	10	0.18	3.8	<0.005	2200	0.16	90	<0.005	5800	1.9	180	0.007
6/20/2013	9.4	0.16	4.8	<0.005	1900	0.16	91	0.006	4700	3.1	99	0.008
4/25/2014	9.5	0.19	4.9	<0.005	2000	0.18	91	<0.006	6100	2	190	ND<0.005
7/20/2015	9.5	0.16	4.2	<0.005	1900	0.14	80	<0.005	1900	2	58	<0.005
8/2/2016	9.3	0.13	4.1	<0.005	1900	0.12	98	<0.005	3500	2.1	82	<0.005
8/9/2017	9.6	0.15	4.1	<0.005	1700	0.15	95	0.01	2900	3.2	170	<0.005

Summary Post-Closure Groundwater Sample Analyses (mg/L): page 2 of 2

	Downgradient Well MW-12A				Downgradient Well MW-14A				Downgradient Well MW-18			
	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)	Sulfate	Fluoride	Chloride	CN (total)
Lowest Groundwater Protection Standard	250	0.96	250	0.2	250	0.96	250	0.2	250	0.96	250	0.2
Sample Date												
2/16/2005	Dry	Dry	Dry	Dry	4000	9.6	110	0.35	1500	0.6	86	<0.01
5/11/2005	Dry	Dry	Dry	Dry	3500	8.6	90	0.24	1300	0.4	91	<0.01
8/29/2005	Dry	Dry	Dry	Dry	3600	30	71	0.27	1500	0.4	75	<0.01
11/1/2005	Dry	Dry	Dry	Dry	2800	25	75	0.19	1300	1.8	84	<0.01
2/27/2006	Dry	Dry	Dry	Dry	2170	31	53	0.19	1520	0.9	83	<0.01
6/5/2006	Dry	Dry	Dry	Dry	2380	27	63	0.2	1490	0.2	91	<0.01
7/31/2006	Dry	Dry	Dry	Dry	3300	30	98	0.17	1500	2.6	89	<0.01
10/9/2006	Dry	Dry	Dry	Dry	3900	24	130	0.01	1600	2.4	80	<0.01
3/13/2007	1800	6.3	150	<0.01	4400	16	140	0.12	1600	2.6	93	<0.01
6/22/2007	Dry	Dry	Dry	Dry	7900	19	170	<0.01	1700	<1	77	<0.01
9/24/2007	Dry	Dry	Dry	Dry	6400	<50	200	0.03	1400	<50	100	<0.01
11/14/2007	Dry	Dry	Dry	Dry	-	-	-	<0.01	-	-	-	<0.01
5/8/2008	Dry	Dry	Dry	Dry	5500	<50	100	0.19	1300	<50	70	<0.01
10/14/2008	Dry	Dry	Dry	Dry	6500	20	180	0.12	1600	<1	80	<0.01
5/29/2009	Dry	Dry	Dry	Dry	7000	30	210	0.14	1500	1	81	<0.01
10/27/2009	Dry	Dry	Dry	Dry	5900	24	160	0.044	1200	<1	70	<0.01
5/26/2010	Dry	Dry	Dry	Dry	5200	32	170	0.14	1500	2	100	<0.02
10/6/2010	Dry	Dry	Dry	Dry	4000	18	120	0.086	1600	<1	84	<0.02
7/26/2011	Dry	Dry	Dry	Dry	3900	23	130	0.066	1600	<1	89	<0.02
4/19/2012	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1700	0.2	79	<0.005
6/20/2013	Dry	Dry	Dry	Dry	2300	17	66	0.028	1500	0.13	84	<0.005
4/25/2014	Dry	Dry	Dry	Dry	2100	18	61	0.037	1700	0.12	79	<0.005
7/20/2015	Dry	Dry	Dry	Dry	1100	6.8	47	0.008	1300	0.11	86	<0.005
8/2/2016	Dry	Dry	Dry	Dry	1400	3.5	61	0.019	1700	0.12	79	<0.005
8/9/2017	Dry	Dry	Dry	Dry	1700	2.5	68	0.017	1300	0.11	59	0.086

Appendix A2
Laboratory Reports

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

August 29, 2017

Rick Kent
GeoPro, LLC
PO Box 26
Battle Ground, WA 98604

Re: Analytical Data for Project 160802
Laboratory Reference No. 1708-205

Dear Rick:

Enclosed are the analytical results and associated quality control data for samples submitted on August 15, 2017.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: August 29, 2017
Samples Submitted: August 15, 2017
Laboratory Reference: 1708-205
Project: 160802

Case Narrative

Samples were collected on August 9, 2017 and received by the laboratory on August 15, 2017. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: August 29, 2017
Samples Submitted: August 15, 2017
Laboratory Reference: 1708-205
Project: 160802

FLUORIDE
SM 4500-F C

Matrix: Water
Units: mg F- /L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-8A-2017**					
Laboratory ID:	08-205-01					
Fluoride	**0.15**	0.020	SM 4500-F C	8-17-17	8-17-17	
Client ID:	**MW-14A-2017**					
Laboratory ID:	08-205-02					
Fluoride	**2.5**	0.10	SM 4500-F C	8-17-17	8-17-17	
Client ID:	**MW-10A-2017**					
Laboratory ID:	08-205-03					
Fluoride	**3.2**	0.10	SM 4500-F C	8-17-17	8-17-17	
Client ID:	**MW-10A-D-2017**					
Laboratory ID:	08-205-04					
Fluoride	**3.3**	0.10	SM 4500-F C	8-17-17	8-17-17	
Client ID:	**MW-3B-2017**					
Laboratory ID:	08-205-05					
Fluoride	**0.15**	0.020	SM 4500-F C	8-17-17	8-17-17	
Client ID:	**MW-18-2017**					
Laboratory ID:	08-205-06					
Fluoride	**0.11**	0.020	SM 4500-F C	8-17-17	8-17-17	

Date of Report: August 29, 2017
Samples Submitted: August 15, 2017
Laboratory Reference: 1708-205
Project: 160802

FLUORIDE
SM 4500-F C
QUALITY CONTROL

Matrix: Water
Units: mg F- /L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0817W2					
Fluoride	**ND**	0.020	SM 4500-F C	8-17-17	8-17-17	

Analyte	Result		Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE									
Laboratory ID:	08-205-01								
	ORIG	DUP							
Fluoride	**0.150**	**0.138**	NA	NA	NA	NA	8	14	
MATRIX SPIKE									
Laboratory ID:	08-205-01								
	MS		MS		MS				
Fluoride	**0.601**		0.500	0.150	90	63-136	NA	NA	
SPIKE BLANK									
Laboratory ID:	SB0817W2								
	SB		SB		SB				
Fluoride	**0.414**		0.500	NA	83	74-113	NA	NA	

Date of Report: August 29, 2017
Samples Submitted: August 15, 2017
Laboratory Reference: 1708-205
Project: 160802

SULFATE
ASTM D516-07

Matrix: Water
Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-8A-2017**					
Laboratory ID:	08-205-01					
Sulfate	**9.6**	5.0	ASTM D516-07	8-22-17	8-22-17	
Client ID:	**MW-14A-2017**					
Laboratory ID:	08-205-02					
Sulfate	**1700**	500	ASTM D516-07	8-22-17	8-22-17	
Client ID:	**MW-10A-2017**					
Laboratory ID:	08-205-03					
Sulfate	**2900**	1000	ASTM D516-07	8-22-17	8-22-17	
Client ID:	**MW-10A-D-2017**					
Laboratory ID:	08-205-04					
Sulfate	**3000**	1000	ASTM D516-07	8-22-17	8-22-17	
Client ID:	**MW-3B-2017**					
Laboratory ID:	08-205-05					
Sulfate	**1700**	500	ASTM D516-07	8-22-17	8-22-17	
Client ID:	**MW-18-2017**					
Laboratory ID:	08-205-06					
Sulfate	**1300**	500	ASTM D516-07	8-22-17	8-22-17	

Date of Report: August 29, 2017
Samples Submitted: August 15, 2017
Laboratory Reference: 1708-205
Project: 160802

SULFATE
ASTM D516-07
QUALITY CONTROL

Matrix: Water
Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0822W1					
Sulfate	**ND**	5.0	ASTM D516-07	8-22-17	8-22-17	

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	08-229-17							
	ORIG DUP							
Sulfate	**16.4** **16.0**	NA	NA	NA	NA	2	10	
MATRIX SPIKE								
Laboratory ID:	08-229-17							
	MS	MS		MS				
Sulfate	**36.9**	20.0	16.4	103	77-129	NA	NA	
SPIKE BLANK								
Laboratory ID:	SB0822W1							
	SB	SB		SB				
Sulfate	**10.4**	10.0	NA	104	91-113	NA	NA	

Date of Report: August 29, 2017
Samples Submitted: August 15, 2017
Laboratory Reference: 1708-205
Project: 160802

CHLORIDE
SM 4500-Cl E

Matrix: Water
Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-8A-2017**					
Laboratory ID:	08-205-01					
Chloride	**4.1**	2.0	SM 4500-Cl E	8-21-17	8-21-17	
Client ID:	**MW-14A-2017**					
Laboratory ID:	08-205-02					
Chloride	**68**	2.0	SM 4500-Cl E	8-21-17	8-21-17	
Client ID:	**MW-10A-2017**					
Laboratory ID:	08-205-03					
Chloride	**170**	4.0	SM 4500-Cl E	8-21-17	8-21-17	
Client ID:	**MW-10A-D-2017**					
Laboratory ID:	08-205-04					
Chloride	**180**	4.0	SM 4500-Cl E	8-21-17	8-21-17	
Client ID:	**MW-3B-2017**					
Laboratory ID:	08-205-05					
Chloride	**95**	2.0	SM 4500-Cl E	8-21-17	8-21-17	
Client ID:	**MW-18-2017**					
Laboratory ID:	08-205-06					
Chloride	**59**	4.0	SM 4500-Cl E	8-22-17	8-22-17	

Date of Report: August 29, 2017
Samples Submitted: August 15, 2017
Laboratory Reference: 1708-205
Project: 160802

CHLORIDE
SM 4500-Cl E
QUALITY CONTROL

Matrix: Water
Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0821W1					
Chloride	**ND**	2.0	SM 4500-Cl E	8-21-17	8-21-17	

Analyte	Result		Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE									
Laboratory ID:	08-205-01								
	ORIG	DUP							
Chloride	**4.09**	**4.47**	NA	NA	NA	NA	9	17	
MATRIX SPIKE									
Laboratory ID:	08-205-01								
	MS		MS		MS				
Chloride	**54.6**		50.0	4.09	101	82-126	NA	NA	
SPIKE BLANK									
Laboratory ID:	SB0821W1								
	SB		SB		SB				
Chloride	**50.2**		50.0	NA	100	92-118	NA	NA	

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a Sulfuric acid/Silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260C, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664

Professional Analytical Services

Aug 29 2017
On-Site Environmental
14648 NE 95th ST
Redmond, WA 98052
Attention: David Baumeister

Dear David Baumeister:

Enclosed please find the analytical data for your 160802 project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
MW-8A-2017	Water	17-A013909	CONV
MW-14A-2017	Water	17-A013910	CONV
MW-10A-2017	Water	17-A013911	CONV
MW-10A-D-2017	Water	17-A013912	CONV
MW-3B-2017	Water	17-A013913	CONV
MW-18-2017	Water	17-A013914	CONV

Your samples were received on Wednesday, August 16, 2017. At the time of receipt, the samples were logged in and properly maintained prior to the subsequent analysis.

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to conact me.

Sincerely,

Aaron W. Young
Laboratory Manager

PO Number: 08-205

BACT = Bacteriological
CONV = Conventionals
MET = Metals
ORG = Organics
NUT=Nutrients
DEM=Demand
MIN=Minerals

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

ANALYSIS REPORT

On-Site Environmental
14648 NE 95th ST
Redmond, WA 98052
Attention: David Baumeister
Project Name: 160802
PO Number: 08-205
All results reported on an as received basis.

Date Received: 08/16/17
Date Reported: 8/29/17

AMTEST Identification Number **17-A013909**
Client Identification **MW-8A-2017**
Sampling Date **08/09/17, 09:30**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Cyanide	< 0.005	mg/l		0.005	EPA 335.4	JC	08/23/17

AMTEST Identification Number **17-A013910**
Client Identification **MW-14A-2017**
Sampling Date **08/09/17, 10:30**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Cyanide	0.017	mg/l		0.005	EPA 335.4	JC	08/23/17

AMTEST Identification Number **17-A013911**
Client Identification **MW-10A-2017**
Sampling Date **08/09/17, 11:45**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Cyanide	< 0.005	mg/l		0.005	EPA 335.4	JC	08/23/17

AMTEST Identification Number **17-A013912**
Client Identification **MW-10A-D-2017**
Sampling Date **08/09/17, 11:45**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Cyanide	0.006	mg/l		0.005	EPA 335.4	JC	08/23/17

AMTEST Identification Number **17-A013913**
Client Identification **MW-3B-2017**
Sampling Date **08/09/17, 13:50**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Cyanide	0.010	mg/l		0.005	EPA 335.4	JC	08/23/17

AMTEST Identification Number **17-A013914**
Client Identification **MW-18-2017**
Sampling Date **08/09/17, 14:35**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Cyanide	0.086	mg/l		0.005	EPA 335.4	JC	08/23/17

Aaron W. Young
Laboratory Manager

Am Test Inc.
13600 NE 126th PL
Suite C
Kirkland, WA, 98034
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

QC Summary for sample numbers: 17-A013909 to 17-A013914

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Total Cyanide	mg/l	0.20	0.19	95.0 %
Total Cyanide	mg/l	0.20	0.19	95.0 %
Total Cyanide	mg/l	0.20	0.19	95.0 %

BLANKS

ANALYTE	UNITS	RESULT
Total Cyanide	mg/l	< 0.005
Total Cyanide	mg/l	< 0.005
Total Cyanide	mg/l	< 0.005

OnSite Environmental Inc.

14648 NE 95th Street, Redmond, WA 98052 · (425) 883-3881

Laboratory Reference #: 08-205

Laboratory: AmTest Laboratories

Turnaround Request

Project Manager: David Baumeister

Attention: Aaron Young

1 Day 2 Day 3 Day

email: dbaumeister@onsite-env.com

13600 NE 126th Pl Kirkland, WA 98034

(Standard)

Project Number:

Phone Number: (425) 885-1664

Other:

Project Name: 160802

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	Requested Analyses
13909	MW-8A-2017	8/9/17	0930	W	1	Total Cyanide
10	MW-14A-2017	↓	1030	↓	↓	↓
11	MW-10A-2017		1145			
12	MW-10A-D-2017		1145			
13	MW-3B-2017		1350			
14	MW-18-2017	↓	1435	↓	↓	

Signature	Company	Date	Time	Comments/Special Instructions
Relinquished by:	OSE	8/16/17	2:10	
Received by:	T-10.7	8/16/17	2:10	
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Chain of Custody

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: GeoPro LLC
Project Number: 160802
Project Name: CGA-WS1
Project Manager: R. Kent
Sampled by: Angela Piller

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days) (TPH analysis 5 Days)
☐ _____ (other)

Laboratory Number: 08-205

APPENDIX A2

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	Cyanide (total)	Fluoride	Sulfate	Chloride	% Moisture
1	MW-8A-2017	8/9/17	0930	W	3																		X	X	X	X	
2	MW-14A-2017		1030																								
3	MW-10A-2017		1145																								
4	MW-10A-D-2017		1145																								
5	MW-3B-2017		1350																								
6	MW-18-2017		1435																								

	Signature	Company	Date	Time
Relinquished	Angela Piller	GeoPro LLC	8/14/17	~~5:58~~ 1245
Received		GEC	8/15/17	1445
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

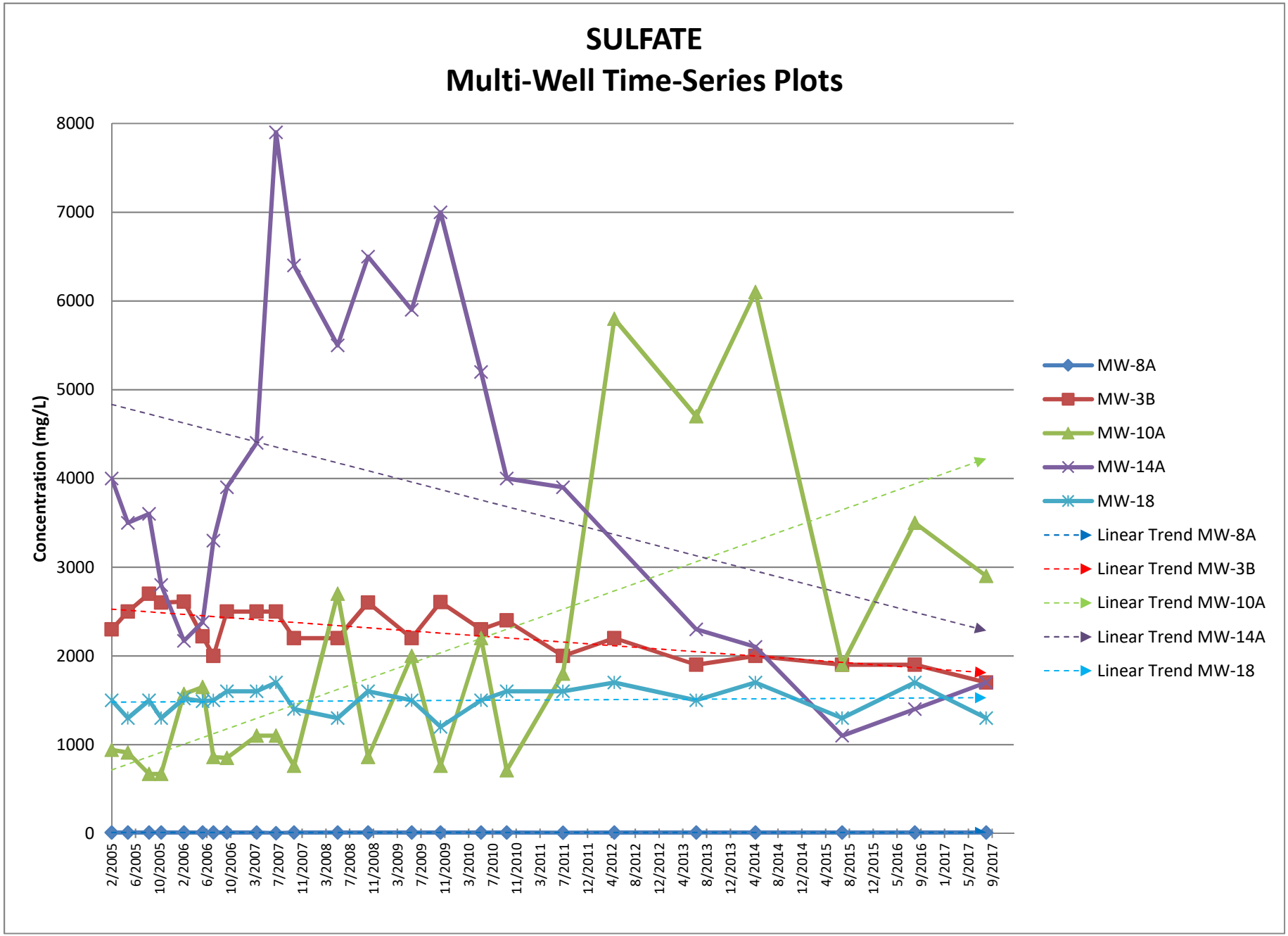
Comments/Special Instructions
Invoice BMEC

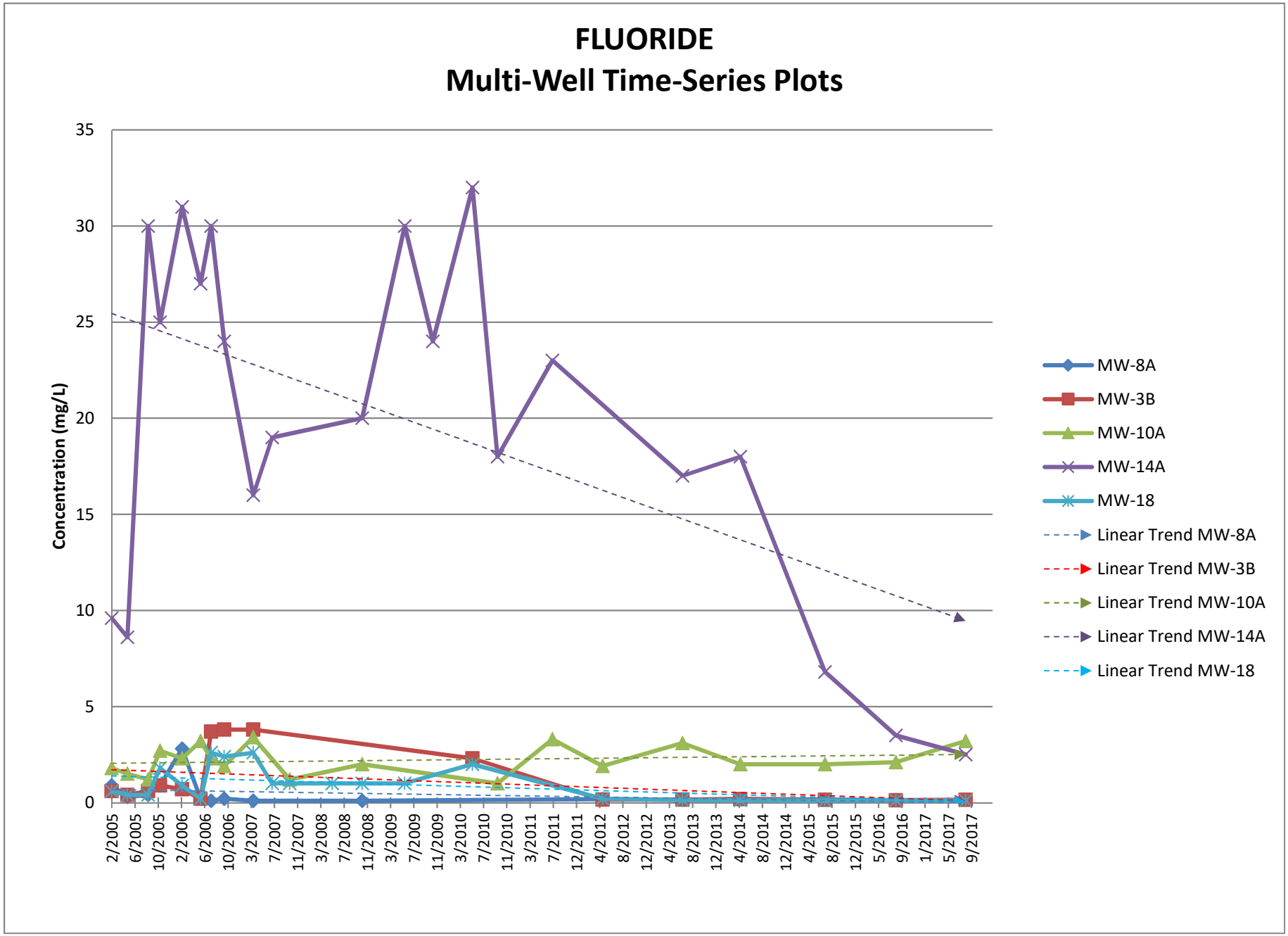
Data Package: Standard ☐ Level III ☐ Level IV ☐

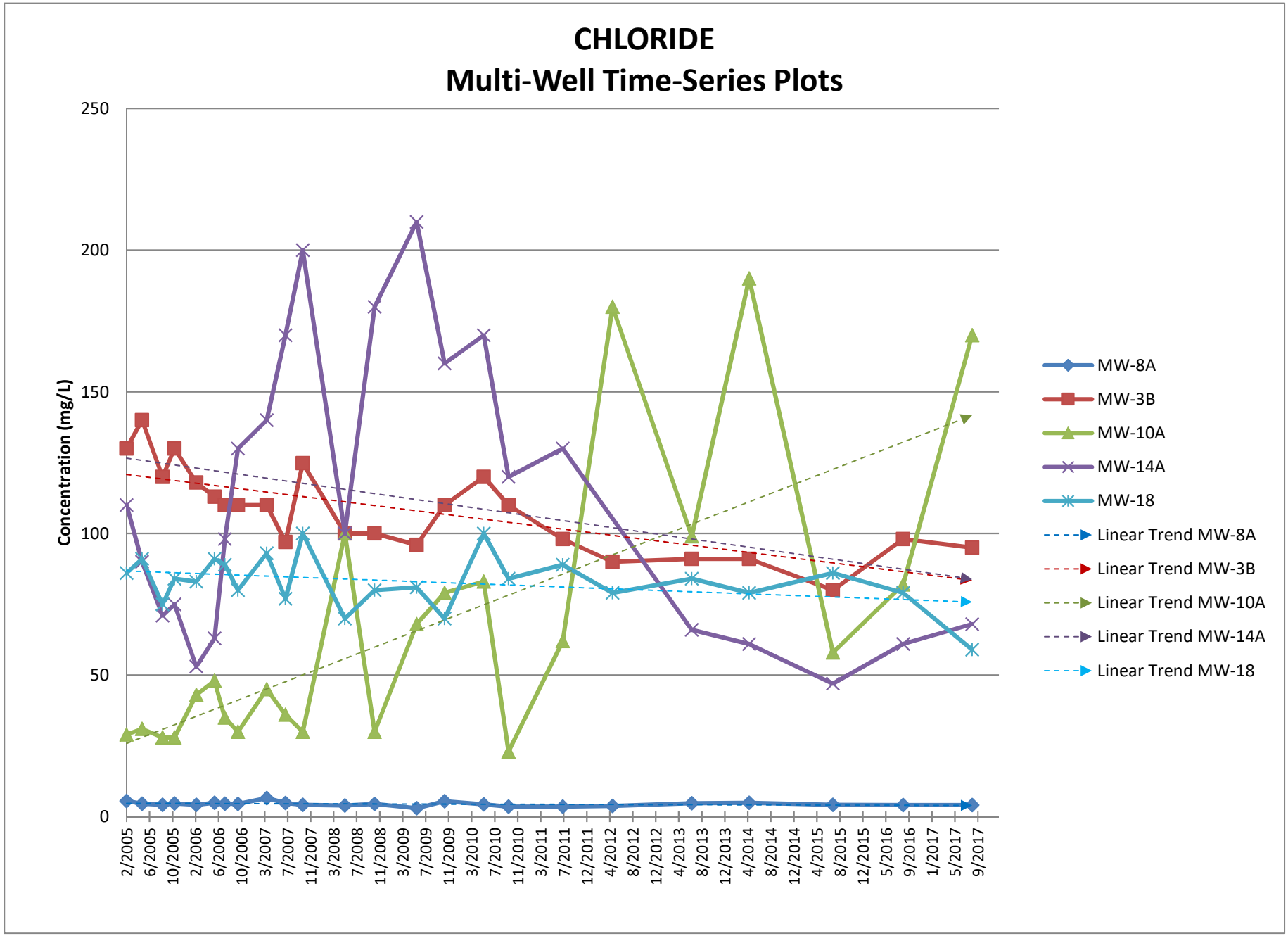
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

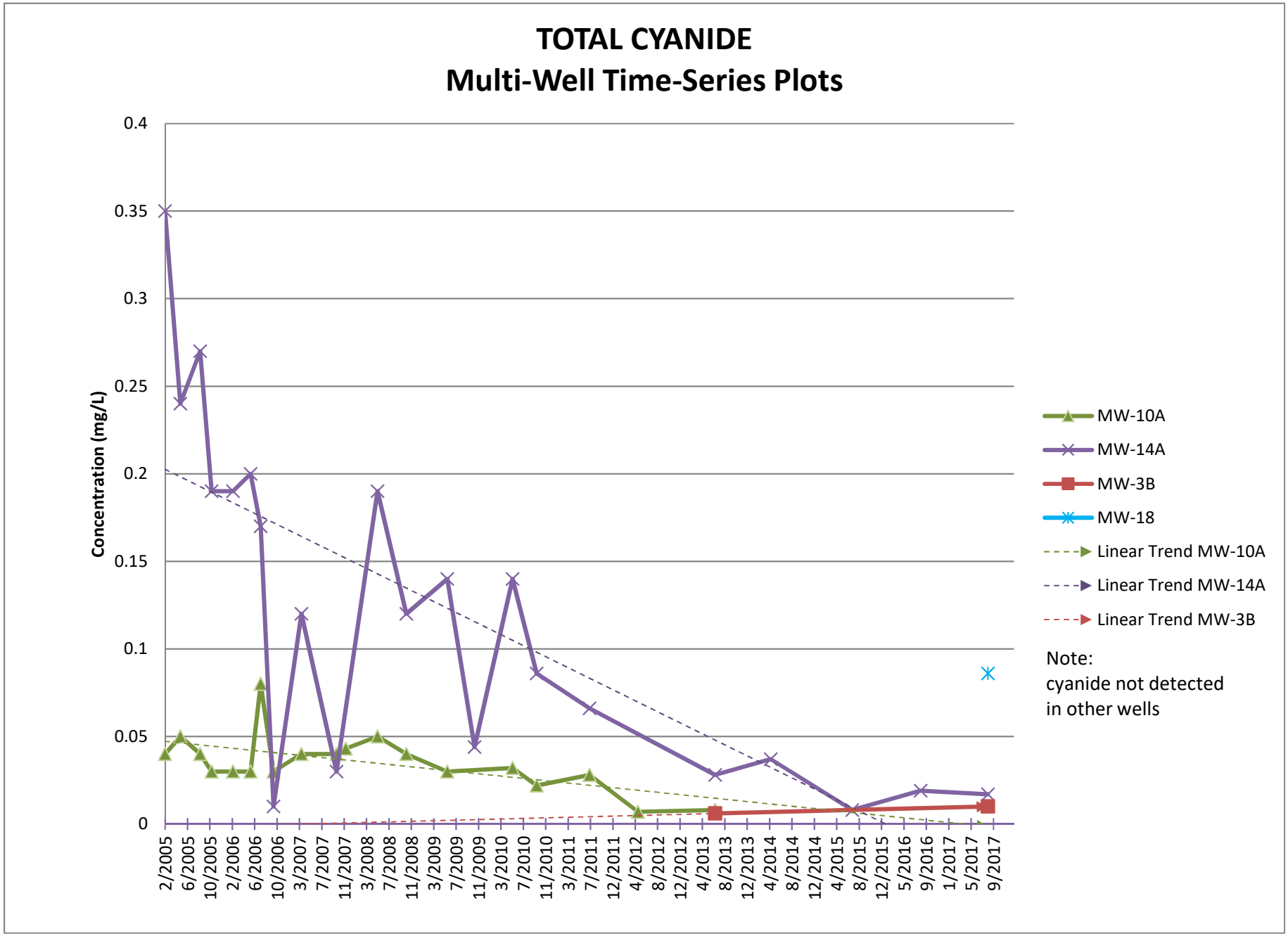
Appendix B - UCL and Trend Calculations

Appendix B1
Multi-Well Time-Series Graphs: Sulfate, Fluoride, Chloride, Cyanide


SULFATE
Multi-Well Time-Series Plots
Concentration (mg/L)
8000
7000
6000
5000
4000
3000
2000
1000
0
2/2005
6/2005
10/2005
2/2006
6/2006
10/2006
3/2007
7/2007
11/2007
3/2008
7/2008
11/2008
3/2009
7/2009
11/2009
3/2010
7/2010
11/2010
3/2011
7/2011
12/2011
4/2012
8/2012
12/2012
4/2013
8/2013
12/2013
4/2014
8/2014
12/2014
4/2015
8/2015
12/2015
5/2016
9/2016
1/2017
5/2017
9/2017
MW-8A
MW-3B
MW-10A
MW-14A
MW-18
Linear Trend MW-8A
Linear Trend MW-3B
Linear Trend MW-10A
Linear Trend MW-14A
Linear Trend MW-18


FLUORIDE
Multi-Well Time-Series Plots
Concentration (mg/L)
35
30
25
20
15
10
5
0
2/2005
6/2005
10/2005
2/2006
6/2006
10/2006
3/2007
7/2007
11/2007
3/2008
7/2008
11/2008
3/2009
7/2009
11/2009
3/2010
7/2010
11/2010
3/2011
7/2011
12/2011
4/2012
8/2012
12/2012
4/2013
8/2013
12/2013
4/2014
8/2014
12/2014
4/2015
8/2015
12/2015
5/2016
9/2016
1/2017
5/2017
9/2017
MW-8A
MW-3B
MW-10A
MW-14A
MW-18
Linear Trend MW-8A
Linear Trend MW-3B
Linear Trend MW-10A
Linear Trend MW-14A
Linear Trend MW-18


CHLORIDE
Multi-Well Time-Series Plots
Concentration (mg/L)
250
200
150
100
50
0
2/2005
6/2005
10/2005
2/2006
6/2006
10/2006
3/2007
7/2007
11/2007
3/2008
7/2008
11/2008
3/2009
7/2009
11/2009
3/2010
7/2010
11/2010
3/2011
7/2011
12/2011
4/2012
8/2012
12/2012
4/2013
8/2013
12/2013
4/2014
8/2014
12/2014
4/2015
8/2015
12/2015
5/2016
9/2016
1/2017
5/2017
9/2017
MW-8A
MW-3B
MW-10A
MW-14A
MW-18
Linear Trend MW-8A
Linear Trend MW-3B
Linear Trend MW-10A
Linear Trend MW-14A
Linear Trend MW-18


TOTAL CYANIDE
Multi-Well Time-Series Plots
Concentration (mg/L)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2/2005
6/2005
10/2005
2/2006
6/2006
10/2006
3/2007
7/2007
11/2007
3/2008
7/2008
11/2008
3/2009
7/2009
11/2009
3/2010
7/2010
11/2010
3/2011
7/2011
12/2011
4/2012
8/2012
12/2012
4/2013
8/2013
12/2013
4/2014
8/2014
12/2014
4/2015
8/2015
12/2015
5/2016
9/2016
1/2017
5/2017
9/2017
MW-10A
MW-14A
MW-3B
MW-18
Linear Trend MW-10A
Linear Trend MW-14A
Linear Trend MW-3B
Note:
cyanide not detected
in other wells

Appendix B2
Summary of Results - Mann-Kendall Test for Trend

SUMMARY MANN-KENDALL TEST FOR TREND RESULTS

Well ID	Analyte	n	S	Variance	Z	Probability	Trend
MW-3B	**Sulfate**	**24**	**-62**	**264**	**3.754**	**0.000**	**Significantly Negative**
	Fluoride	**24**	**-52**	**267**	**3.123**	**0.002**	**Significantly Negative**
	Chloride	**24**	**-46**	**267**	**2.756**	**0.006**	**Significantly Negative**
	Cyanide	25	-1	112	0.000	1.000	Negative
MW-8A	Sulfate	24	-18	261	1.052	0.293	Negative
	Fluoride	**24**	**-40**	**258**	**2.428**	**0.015**	**Significantly Negative**
	Chloride	24	-20	267	1.164	0.245	Negative
	Cyanide	25	-9	217	0.543	0.587	Negative
MW-10A	**Sulfate**	**24**	**50**	**269**	**2.989**	**0.003**	**Significantly Positive**
	Fluoride	24	3	268	0.122	0.903	Positive
	Chloride	**24**	**44**	**269**	**2.623**	**0.009**	**Significantly Positive**
	Cyanide	**25**	**-52**	**264**	**3.139**	**0.002**	**Significantly Negative**
MW-12A	Sulfate	1	-	-	-	-	-
	Fluoride	1	-	-	-	-	-
	Chloride	1	-	-	-	-	-
	Cyanide	1	-	-	-	-	-
MW-14A	**Sulfate**	**23**	**-36**	**2**	**212.667**	**0.016**	**Significantly Negative**
	Fluoride	23	**-36**	**213**	**2.400**	**0.016**	**Significantly Negative**
	Chloride	23	-29	212	1.925	0.054	Negative
	Cyanide	**24**	**-44**	**213**	**2.949**	**0.003**	**Significantly Negative**
MW-18	Sulfate	24	7	263	0.370	0.711	Positive
	Fluoride	**24**	**-55**	**266**	**3.313**	**0.001**	**Significantly Negative**
	Chloride	24	-20	264	1.169	0.242	Negative
	Cyanide	25	3	220	0.135	0.893	Positive

Notes:

n = Sample size

S = Mann-Kendall test statistic; calculated based on S and the estimated variance when the sample size is greater than 10.

Variance = Standard Deviation of S Squared

Z = Approximate normal test statistic; calculated based on S and the estimated variance when the sample size is greater than 10.

Probability from Table A.21 [Hollander and Wolfe (1973)]

Trends significant at alpha = 0.05 or less are shown in bold type

Appendix B3
Output of Mann-Kendall Test

1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	9/6/2017 12:17:57 PM					
4			From File	MannKendall Input Sheet 2017.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**S3B**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		24				
13			Number of Missing Events		0				
14			Number or Reported Events Used		24				
15			Number Values Reported (n)		24				
16			Minimum		1700				
17			Maximum		2700				
18			Mean		2272				
19			Geometric Mean		2255				
20			Median		2260				
21			Standard Deviation		282.7				
22									
23			**Mann-Kendall Test**						
24			Test Value (S)		-144				
25			Critical Value (0.05)		-1.645				
26			Standard Deviation of S		39.98				
27			Standardized Value of S		-3.576				
28			Approximate p-value		1.7412E-4				
29									
30	**Statistically significant evidence of a decreasing**								
31	**trend at the specified level of significance.**								
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									

	A	B	C	D	E	F	G	H	I
46				**Mann-Kendall Trend Test Analysis**					
47			User Selected Options						
48			Date/Time of Computation	9/6/2017 12:22:54 PM					
49			From File	MannKendall Input Sheet 2017.xls					
50			Full Precision	OFF					
51			Confidence Coefficient	0.95					
52			Level of Significance	0.05					
53									
54			**S8A**						
55									
56			**General Statistics**						
57			Number of Events Reported (m)		24				
58			Number of Missing Events		0				
59			Number or Reported Events Used		24				
60			Number Values Reported (n)		24				
61			Minimum		0.5				
62			Maximum		10				
63			Mean		9.153				
64			Geometric Mean		8.415				
65			Median		9.6				
66			Standard Deviation		1.913				
67									
68			**Mann-Kendall Test**						
69			Test Value (S)		-26				
70			Critical Value (0.05)		-1.645				
71			Standard Deviation of S		39.67				
72			Standardized Value of S		-0.63				
73			Approximate p-value		0.264				
74									
75	**Insufficient evidence to identify a significant**								
76	**trend at the specified level of significance.**								
77									
78									
79									
80									
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									

	A	B	C	D	E	F	G	H	I
91				**Mann-Kendall Trend Test Analysis**					
92			User Selected Options						
93			Date/Time of Computation	9/6/2017 12:23:36 PM					
94			From File	MannKendall Input Sheet 2017.xls					
95			Full Precision	OFF					
96			Confidence Coefficient	0.95					
97			Level of Significance	0.05					
98									
99			**S10A**						
100									
101			**General Statistics**						
102			Number of Events Reported (m)		24				
103			Number of Missing Events		0				
104			Number or Reported Events Used		24				
105			Number Values Reported (n)		24				
106			Minimum		670				
107			Maximum		6100				
108			Mean		1959				
109			Geometric Mean		1515				
110			Median		1335				
111			Standard Deviation		1596				
112									
113			**Mann-Kendall Test**						
114			Test Value (S)		118				
115			Critical Value (0.05)		1.645				
116			Standard Deviation of S		40.27				
117			Standardized Value of S		2.906				
118			Approximate p-value		0.00183				
119									
120	**Statistically significant evidence of an increasing**								
121	**trend at the specified level of significance.**								
122									
123									
124									
125									
126									
127									
128									
129									
130									
131									
132									
133									
134									
135									

	A	B	C	D	E	F	G	H	I
136				**Mann-Kendall Trend Test Analysis**					
137			User Selected Options						
138			Date/Time of Computation	9/6/2017 12:44:27 PM					
139			From File	MannKendall Input Sheet 2017_b.xls					
140			Full Precision	OFF					
141			Confidence Coefficient	0.95					
142			Level of Significance	0.05					
143									
144			**S14A**						
145									
146			**General Statistics**						
147			Number of Events Reported (m)		23				
148			Number of Missing Events		0				
149			Number or Reported Events Used		23				
150			Number Values Reported (n)		23				
151			Minimum		1100				
152			Maximum		7900				
153			Mean		3954				
154			Geometric Mean		3495				
155			Median		3900				
156			Standard Deviation		1894				
157									
158			**Mann-Kendall Test**						
159			Test Value (S)		-41				
160			Critical Value (0.05)		-1.645				
161			Standard Deviation of S		37.84				
162			Standardized Value of S		-1.057				
163			Approximate p-value		0.145				
164									
165	**Insufficient evidence to identify a significant**								
166	**trend at the specified level of significance.**								
167									
168									
169									
170									
171									
172									
173									
174									
175									
176									
177									
178									
179									
180									

	A	B	C	D	E	F	G	H	I
181				**Mann-Kendall Trend Test Analysis**					
182			User Selected Options						
183			Date/Time of Computation	9/6/2017 12:24:33 PM					
184			From File	MannKendall Input Sheet 2017.xls					
185			Full Precision	OFF					
186			Confidence Coefficient	0.95					
187			Level of Significance	0.05					
188									
189			**S18**						
190									
191			**General Statistics**						
192			Number of Events Reported (m)		24				
193			Number of Missing Events		0				
194			Number or Reported Events Used		24				
195			Number Values Reported (n)		24				
196			Minimum		1200				
197			Maximum		1700				
198			Mean		1496				
199			Geometric Mean		1489				
200			Median		1500				
201			Standard Deviation		148.9				
202									
203			**Mann-Kendall Test**						
204			Test Value (S)		47				
205			Critical Value (0.05)		1.645				
206			Standard Deviation of S		39.43				
207			Standardized Value of S		1.167				
208			Approximate p-value		0.122				
209									
210	**Insufficient evidence to identify a significant**								
211	**trend at the specified level of significance.**								
212									
213									
214									
215									
216									
217									
218									
219									
220									
221									
222									
223									
224									
225									

	A	B	C	D	E	F	G	H	I
226				**Mann-Kendall Trend Test Analysis**					
227			User Selected Options						
228			Date/Time of Computation	9/6/2017 12:25:24 PM					
229			From File	MannKendall Input Sheet 2017.xls					
230			Full Precision	OFF					
231			Confidence Coefficient	0.95					
232			Level of Significance	0.05					
233									
234			**F3B**						
235									
236			**General Statistics**						
237			Number of Events Reported (m)		24				
238			Number of Missing Events		0				
239			Number or Reported Events Used		24				
240			Number Values Reported (n)		24				
241			Minimum		0.12				
242			Maximum		25				
243			Mean		2.309				
244			Geometric Mean		0.729				
245			Median		0.5				
246			Standard Deviation		5.101				
247									
248			**Mann-Kendall Test**						
249			Test Value (S)		-102				
250			Critical Value (0.05)		-1.645				
251			Standard Deviation of S		40.06				
252			Standardized Value of S		-2.521				
253			Approximate p-value		0.00585				
254									
255	**Statistically significant evidence of a decreasing**								
256	**trend at the specified level of significance.**								
257									
258									
259									
260									
261									
262									
263									
264									
265									
266									
267									
268									
269									
270									

	A	B	C	D	E	F	G	H	I
271				**Mann-Kendall Trend Test Analysis**					
272			User Selected Options						
273			Date/Time of Computation	9/6/2017 12:26:45 PM					
274			From File	MannKendall Input Sheet 2017.xls					
275			Full Precision	OFF					
276			Confidence Coefficient	0.95					
277			Level of Significance	0.05					
278									
279			**S8A**						
280									
281			**General Statistics**						
282			Number of Events Reported (m)		24				
283			Number of Missing Events		0				
284			Number or Reported Events Used		24				
285			Number Values Reported (n)		24				
286			Minimum		0.5				
287			Maximum		10				
288			Mean		9.153				
289			Geometric Mean		8.415				
290			Median		9.6				
291			Standard Deviation		1.913				
292									
293			**Mann-Kendall Test**						
294			Test Value (S)		-26				
295			Critical Value (0.05)		-1.645				
296			Standard Deviation of S		39.67				
297			Standardized Value of S		-0.63				
298			Approximate p-value		0.264				
299									
300	**Insufficient evidence to identify a significant**								
301	**trend at the specified level of significance.**								
302									
303									
304									
305									
306									
307									
308									
309									
310									
311									
312									
313									
314									
315									

	A	B	C	D	E	F	G	H	I
316				**Mann-Kendall Trend Test Analysis**					
317			User Selected Options						
318			Date/Time of Computation	9/6/2017 12:27:37 PM					
319			From File	MannKendall Input Sheet 2017.xls					
320			Full Precision	OFF					
321			Confidence Coefficient	0.95					
322			Level of Significance	0.05					
323									
324			**S10A**						
325									
326			**General Statistics**						
327			Number of Events Reported (m)		24				
328			Number of Missing Events		0				
329			Number or Reported Events Used		24				
330			Number Values Reported (n)		24				
331			Minimum		670				
332			Maximum		6100				
333			Mean		1959				
334			Geometric Mean		1515				
335			Median		1335				
336			Standard Deviation		1596				
337									
338			**Mann-Kendall Test**						
339			Test Value (S)		118				
340			Critical Value (0.05)		1.645				
341			Standard Deviation of S		40.27				
342			Standardized Value of S		2.906				
343			Approximate p-value		0.00183				
344									
345	**Statistically significant evidence of an increasing**								
346	**trend at the specified level of significance.**								
347									
348									
349									
350									
351									
352									
353									
354									
355									
356									
357									
358									
359									
360									

	A	B	C	D	E	F	G	H	I
361				**Mann-Kendall Trend Test Analysis**					
362			User Selected Options						
363			Date/Time of Computation	9/6/2017 12:47:53 PM					
364			From File	MannKendall Input Sheet 2017_b.xls					
365			Full Precision	OFF					
366			Confidence Coefficient	0.95					
367			Level of Significance	0.05					
368									
369			**F14A**						
370									
371			**General Statistics**						
372			Number of Events Reported (m)		23				
373			Number of Missing Events		0				
374			Number or Reported Events Used		23				
375			Number Values Reported (n)		23				
376			Minimum		2.5				
377			Maximum		32				
378			Mean		20.22				
379			Geometric Mean		17.16				
380			Median		23				
381			Standard Deviation		8.928				
382									
383			**Mann-Kendall Test**						
384			Test Value (S)		-81				
385			Critical Value (0.05)		-1.645				
386			Standard Deviation of S		37.74				
387			Standardized Value of S		-2.12				
388			Approximate p-value		0.017				
389									
390	**Statistically significant evidence of a decreasing**								
391	**trend at the specified level of significance.**								
392									
393									
394									
395									
396									
397									
398									
399									
400									
401									
402									
403									
404									
405									

	A	B	C	D	E	F	G	H	I
406				**Mann-Kendall Trend Test Analysis**					
407			User Selected Options						
408			Date/Time of Computation	9/6/2017 12:28:33 PM					
409			From File	MannKendall Input Sheet 2017.xls					
410			Full Precision	OFF					
411			Confidence Coefficient	0.95					
412			Level of Significance	0.05					
413									
414			**F18**						
415									
416			**General Statistics**						
417			Number of Events Reported (m)		24				
418			Number of Missing Events		0				
419			Number or Reported Events Used		24				
420			Number Values Reported (n)		24				
421			Minimum		0.11				
422			Maximum		25				
423			Mean		2.841				
424			Geometric Mean		0.678				
425			Median		0.5				
426			Standard Deviation		6.874				
427									
428			**Mann-Kendall Test**						
429			Test Value (S)		-104				
430			Critical Value (0.05)		-1.645				
431			Standard Deviation of S		40.03				
432			Standardized Value of S		-2.573				
433			Approximate p-value		0.00504				
434									
435	**Statistically significant evidence of a decreasing**								
436	**trend at the specified level of significance.**								
437									
438									
439									
440									
441									
442									
443									
444									
445									
446									
447									
448									
449									
450									

	A	B	C	D	E	F	G	H	I
451				**Mann-Kendall Trend Test Analysis**					
452			User Selected Options						
453			Date/Time of Computation	9/6/2017 12:29:53 PM					
454			From File	MannKendall Input Sheet 2017.xls					
455			Full Precision	OFF					
456			Confidence Coefficient	0.95					
457			Level of Significance	0.05					
458									
459			**CH3B**						
460									
461			**General Statistics**						
462			Number of Events Reported (m)		24				
463			Number of Missing Events		0				
464			Number or Reported Events Used		24				
465			Number Values Reported (n)		24				
466			Minimum		80				
467			Maximum		140				
468			Mean		107.6				
469			Geometric Mean		106.6				
470			Median		110				
471			Standard Deviation		14.96				
472									
473			**Mann-Kendall Test**						
474			Test Value (S)		-175				
475			Critical Value (0.05)		-1.645				
476			Standard Deviation of S		40.05				
477			Standardized Value of S		-4.345				
478			Approximate p-value		6.9630E-6				
479									
480	**Statistically significant evidence of a decreasing**								
481	**trend at the specified level of significance.**								
482									
483									
484									
485									
486									
487									
488									
489									
490									
491									
492									
493									
494									
495									

	A	B	C	D	E	F	G	H	I
496				**Mann-Kendall Trend Test Analysis**					
497			User Selected Options						
498			Date/Time of Computation	9/6/2017 1:23:15 PM					
499			From File	MannKendall Input Sheet 2017.xls					
500			Full Precision	OFF					
501			Confidence Coefficient	0.95					
502			Level of Significance	0.05					
503									
504			**CH8A**						
505									
506			**General Statistics**						
507			Number of Events Reported (m)		24				
508			Number of Missing Events		0				
509			Number or Reported Events Used		24				
510			Number Values Reported (n)		24				
511			Minimum		3				
512			Maximum		6.6				
513			Mean		4.479				
514			Geometric Mean		4.423				
515			Median		4.45				
516			Standard Deviation		0.738				
517									
518			**Mann-Kendall Test**						
519			Test Value (S)		-75				
520			Critical Value (0.05)		-1.645				
521			Standard Deviation of S		40.15				
522			Standardized Value of S		-1.843				
523			Approximate p-value		0.0326				
524									
525	**Statistically significant evidence of a decreasing**								
526	**trend at the specified level of significance.**								
527									
528									
529									
530									
531									
532									
533									
534									
535									
536									
537									
538									
539									
540									

	A	B	C	D	E	F	G	H	I
541				**Mann-Kendall Trend Test Analysis**					
542			User Selected Options						
543			Date/Time of Computation	9/6/2017 12:34:49 PM					
544			From File	MannKendall Input Sheet 2017.xls					
545			Full Precision	OFF					
546			Confidence Coefficient	0.95					
547			Level of Significance	0.05					
548									
549			**CH10A**						
550									
551			**General Statistics**						
552			Number of Events Reported (m)		24				
553			Number of Missing Events		0				
554			Number or Reported Events Used		24				
555			Number Values Reported (n)		24				
556			Minimum		23				
557			Maximum		190				
558			Mean		66.96				
559			Geometric Mean		54.06				
560			Median		46.5				
561			Standard Deviation		49.6				
562									
563			**Mann-Kendall Test**						
564			Test Value (S)		138				
565			Critical Value (0.05)		1.645				
566			Standard Deviation of S		40.26				
567			Standardized Value of S		3.403				
568			Approximate p-value		3.3314E-4				
569									
570	**Statistically significant evidence of an increasing**								
571	**trend at the specified level of significance.**								
572									
573									
574									
575									
576									
577									
578									
579									
580									
581									
582									
583									
584									
585									

	A	B	C	D	E	F	G	H	I
586				**Mann-Kendall Trend Test Analysis**					
587			User Selected Options						
588			Date/Time of Computation	9/6/2017 12:48:26 PM					
589			From File	MannKendall Input Sheet 2017_b.xls					
590			Full Precision	OFF					
591			Confidence Coefficient	0.95					
592			Level of Significance	0.05					
593									
594			**CH14A**						
595									
596			**General Statistics**						
597			Number of Events Reported (m)		23				
598			Number of Missing Events		0				
599			Number or Reported Events Used		23				
600			Number Values Reported (n)		23				
601			Minimum		47				
602			Maximum		210				
603			Mean		111.9				
604			Geometric Mean		101.3				
605			Median		100				
606			Standard Deviation		50.33				
607									
608			**Mann-Kendall Test**						
609			Test Value (S)		-10				
610			Critical Value (0.05)		-1.645				
611			Standard Deviation of S		37.82				
612			Standardized Value of S		-0.238				
613			Approximate p-value		0.406				
614									
615	**Insufficient evidence to identify a significant**								
616	**trend at the specified level of significance.**								
617									
618									
619									
620									
621									
622									
623									
624									
625									
626									
627									
628									
629									
630									

	A	B	C	D	E	F	G	H	I
631				**Mann-Kendall Trend Test Analysis**					
632			User Selected Options						
633			Date/Time of Computation	9/6/2017 12:37:53 PM					
634			From File	MannKendall Input Sheet 2017.xls					
635			Full Precision	OFF					
636			Confidence Coefficient	0.95					
637			Level of Significance	0.05					
638									
639			**CH18**						
640									
641			**General Statistics**						
642			Number of Events Reported (m)		24				
643			Number of Missing Events		0				
644			Number or Reported Events Used		24				
645			Number Values Reported (n)		24				
646			Minimum		59				
647			Maximum		100				
648			Mean		82.88				
649			Geometric Mean		82.35				
650			Median		83.5				
651			Standard Deviation		9.284				
652									
653			**Mann-Kendall Test**						
654			Test Value (S)		-52				
655			Critical Value (0.05)		-1.645				
656			Standard Deviation of S		40.15				
657			Standardized Value of S		-1.27				
658			Approximate p-value		0.102				
659									
660	**Insufficient evidence to identify a significant**								
661	**trend at the specified level of significance.**								
662									
663									
664									
665									
666									
667									
668									
669									
670									
671									
672									
673									
674									
675									

	A	B	C	D	E	F	G	H	I
676				**Mann-Kendall Trend Test Analysis**					
677			User Selected Options						
678			Date/Time of Computation	9/6/2017 12:39:48 PM					
679			From File	MannKendall Input Sheet 2017_a.xls					
680			Full Precision	OFF					
681			Confidence Coefficient	0.95					
682			Level of Significance	0.05					
683									
684			**CY3B**						
685									
686			**General Statistics**						
687			Number of Events Reported (m)		25				
688			Number of Missing Events		0				
689			Number or Reported Events Used		25				
690			Number Values Reported (n)		25				
691			Minimum		0.0025				
692			Maximum		0.01				
693			Mean		0.00604				
694			Geometric Mean		0.00563				
695			Median		0.005				
696			Standard Deviation		0.00238				
697									
698			**Mann-Kendall Test**						
699			Test Value (S)		52				
700			Critical Value (0.05)		1.645				
701			Standard Deviation of S		36.2				
702			Standardized Value of S		1.409				
703			Approximate p-value		0.0795				
704									
705	**Insufficient evidence to identify a significant**								
706	**trend at the specified level of significance.**								
707									
708									
709									
710									
711									
712									
713									
714									
715									
716									
717									
718									
719									
720									

	A	B	C	D	E	F	G	H	I
721				**Mann-Kendall Trend Test Analysis**					
722			User Selected Options						
723			Date/Time of Computation	9/6/2017 12:40:53 PM					
724			From File	MannKendall Input Sheet 2017_a.xls					
725			Full Precision	OFF					
726			Confidence Coefficient	0.95					
727			Level of Significance	0.05					
728									
729			**CY8A**						
730									
731			**General Statistics**						
732			Number of Events Reported (m)		25				
733			Number of Missing Events		0				
734			Number or Reported Events Used		25				
735			Number Values Reported (n)		25				
736			Minimum		0.0025				
737			Maximum		0.025				
738			Mean		0.0065				
739			Geometric Mean		0.00564				
740			Median		0.005				
741			Standard Deviation		0.00451				
742									
743			**Mann-Kendall Test**						
744			Test Value (S)		-9				
745			Critical Value (0.05)		-1.645				
746			Standard Deviation of S		36.33				
747			Standardized Value of S		-0.22				
748			Approximate p-value		0.413				
749									
750	**Insufficient evidence to identify a significant**								
751	**trend at the specified level of significance.**								
752									
753									
754									
755									
756									
757									
758									
759									
760									
761									
762									
763									
764									
765									

	A	B	C	D	E	F	G	H	I
766				**Mann-Kendall Trend Test Analysis**					
767			User Selected Options						
768			Date/Time of Computation	9/6/2017 12:48:54 PM					
769			From File	MannKendall Input Sheet 2017_c.xls					
770			Full Precision	OFF					
771			Confidence Coefficient	0.95					
772			Level of Significance	0.05					
773									
774			**CY14A**						
775									
776			**General Statistics**						
777			Number of Events Reported (m)		24				
778			Number of Missing Events		0				
779			Number or Reported Events Used		24				
780			Number Values Reported (n)		24				
781			Minimum		0.005				
782			Maximum		0.35				
783			Mean		0.111				
784			Geometric Mean		0.0612				
785			Median		0.103				
786			Standard Deviation		0.0973				
787									
788			**Mann-Kendall Test**						
789			Test Value (S)		-148				
790			Critical Value (0.05)		-1.645				
791			Standard Deviation of S		40.23				
792			Standardized Value of S		-3.654				
793			Approximate p-value		1.2922E-4				
794									
795	**Statistically significant evidence of a decreasing**								
796	**trend at the specified level of significance.**								
797									
798									
799									
800									
801									
802									
803									
804									
805									
806									
807									
808									
809									
810									

	A	B	C	D	E	F	G	H	I
811				**Mann-Kendall Trend Test Analysis**					
812			User Selected Options						
813			Date/Time of Computation	9/6/2017 12:43:09 PM					
814			From File	MannKendall Input Sheet 2017_a.xls					
815			Full Precision	OFF					
816			Confidence Coefficient	0.95					
817			Level of Significance	0.05					
818									
819			**CY18**						
820									
821			**General Statistics**						
822			Number of Events Reported (m)		25				
823			Number of Missing Events		0				
824			Number or Reported Events Used		25				
825			Number Values Reported (n)		25				
826			Minimum		0.0025				
827			Maximum		0.086				
828			Mean		0.00854				
829			Geometric Mean		0.0056				
830			Median		0.005				
831			Standard Deviation		0.0163				
832									
833			**Mann-Kendall Test**						
834			Test Value (S)		15				
835			Critical Value (0.05)		1.645				
836			Standard Deviation of S		33.6				
837			Standardized Value of S		0.417				
838			Approximate p-value		0.338				
839									
840	**Insufficient evidence to identify a significant**								
841	**trend at the specified level of significance.**								

Appendix B4
Summary of UCL Calculations

SUMMARY OF UCL CALCULATIONS

	Sulfate						Fluoride					
	MW-3B	MW-8A	MW-10A	MW-12A	MW-14A	MW-18	MW-3B	MW-8A	MW-10A	MW-12A	MW-14A	MW-18
Num data pts	24	24	24	1	23	24	24	24	24	1	23	24
Num Non Detect	0	1	0	0	0	0	8	8	4	0	2	8
Percent Non-Detect	0	4.17	0	0	0	0	33.33	33.33	16.67	0	8.70	33.33
Min.	1700	0.5	670	1800	1100	1200	0.12	0.05	0.5	6	2.5	0.11
Max.	2700	10	6100	1800	7900	1700	25	5	25	6	32	25
Mean	2272.33	9.15	1958.75	1800	3954.35	1496.25	2.31	0.64	3.42	6	20.22	2.84
Max Conc. (>50 ND)				1800						6		
Lands Method	2380.56		2655.86		5048.23	1552.29	5.17	1.04				5.99
t-statistic											23.41	
95% KM (t)									2.59			
95% KM (BCA)												
95% Chebyshev (Mean, Sd)		10.86										
Distribution	Lognormal	Neither	Lognormal	-	Lognormal	Lognormal	Lognormal	Lognormal	Neither	-	Normal	Lognormal
	Chloride						**Cyanide**					
	MW-3B	MW-8A	MW-10A	MW-12A	MW-14A	MW-18	MW-3B	MW-8A	MW-10A	MW-12A	MW-14A	MW-18
Num data pts	24	24	24	1	23	24	25	25	25	1	24	25
Num Non Detect	0	0	0	0	0	0	23	25	5	1	1	24
Percent Non-Detect	0	0	0	0	0	0	92.00	100	20.00	100	4.17	96
Min.	80	3	23	150	47	59	0.0025	0.0025	0.0025	0.005	0.005	0.0025
Max.	140	6.6	190	150	210	100	0.01	0.025	0.08	0.005	0.35	0.086
Mean	107.57	4.48	66.96	150	111.87	82.88	0.01	0.01	0.03	0.01	0.11	0.01
Max Conc. (>50 ND)				150			0.01	0.025		0.005		0.086
Lands Method	5.99	4.75	87.87		136.22	86.45					0.33	
t-statistic							0.004		0.03			
95% Approximate Gamma												
Distribution	Lognormal	Lognormal	Lognormal	-	Lognormal	Lognormal	Neither	-	Normal	-	Lognormal	-

Appendix B5
DOE Groundwater UCL Reports

Compliance Calculation

2300	MW-3B
2500	MW-3B
2700	MW-3B
2600	MW-3B
2610	MW-3B
2220	MW-3B
2000	MW-3B
2500	MW-3B
2500	MW-3B
2500	MW-3B
2200	MW-3B
2200	MW-3B
2600	MW-3B
2200	MW-3B
2606	MW-3B
2300	MW-3B
2400	MW-3B
2000	MW-3B
2200	MW-3B
1900	MW-3B
2000	MW-3B
1900	MW-3B
1900	MW-3B
1700	MW-3B

Sulfate MW-3B

Number of samples		Uncensored values	
Uncensored	24	Mean	2272.333
Censored		Lognormal mean	2273.449
Detection limit or PQL		Std. devn.	282.6709
Method detection limit		Median	2260
TOTAL	24	Min.	1700
		Max.	2700
Lognormal distribution?		Normal distribution?	
r-squared is:	0.940299403	r-squared is:	0.949313
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 2380.56062192901			

Compliance Calculation

10	MW-8A
9.8	MW-8A
8.9	MW-8A
9.6	MW-8A
9.27	MW-8A
9.8	MW-8A
9.8	MW-8A
9.7	MW-8A
10	MW-8A
0.5	MW-8A
10	MW-8A
10	MW-8A
10	MW-8A
9	MW-8A
10	MW-8A
9.3	MW-8A
8.9	MW-8A
7.8	MW-8A
10	MW-8A
9.4	MW-8A
9.5	MW-8A
9.5	MW-8A
9.3	MW-8A
9.6	MW-8A

Sulfate MW-8A

Number of samples		Uncensored values	
Uncensored	24	Mean	9.152917
Censored		Lognormal mean	10.09928
Detection limit or PQL		Std. devn.	1.913246
Method detection limit		Median	9.6
TOTAL	24	Min.	0.5
		Max.	10
Lognormal distribution?		Normal distribution?	
r-squared is:	0.249268275	r-squared is:	0.390767
Recommendations:			
Reject BOTH lognormal and normal distributions. See Statistics Guidance.			

Compliance Calculation

940	MW-10A
910	MW-10A
670	MW-10A
670	MW-10A
1570	MW-10A
1650	MW-10A
860	MW-10A
850	MW-10A
1100	MW-10A
1100	MW-10A
760	MW-10A
2700	MW-10A
860	MW-10A
2000	MW-10A
760	MW-10A
2200	MW-10A
710	MW-10A
1800	MW-10A
5800	MW-10A
4700	MW-10A
6100	MW-10A
1900	MW-10A
3500	MW-10A
2900	MW-10A

Sulfate MW-10A

Number of samples		Uncensored values	
Uncensored	24	Mean	1958.75
Censored		Lognormal mean	1936.997
Detection limit or PQL		Std. devn.	1595.879
Method detection limit		Median	1335
TOTAL	24	Min.	670
		Max.	6100
Lognormal distribution?		Normal distribution?	
r-squared is:	0.919796652	r-squared is:	0.777357
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 2655.85818632041			

Compliance Calculation

1500	MW-18
1300	MW-18
1500	MW-18
1300	MW-18
1520	MW-18
1490	MW-18
1500	MW-18
1600	MW-18
1600	MW-18
1700	MW-18
1400	MW-18
1300	MW-18
1600	MW-18
1500	MW-18
1200	MW-18
1500	MW-18
1600	MW-18
1600	MW-18
1700	MW-18
1500	MW-18
1700	MW-18
1300	MW-18
1700	MW-18
1300	MW-18

Sulfate MW-18

Number of samples		Uncensored values	
Uncensored	24	Mean	1496.25
Censored		Lognormal mean	1496.699
Detection limit or PQL		Std. devn.	148.9328
Method detection limit		Median	1500
TOTAL	24	Min.	1200
		Max.	1700
Lognormal distribution?		Normal distribution?	
r-squared is:	0.910042954	r-squared is:	0.920457
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 1552.28610859472			

Compliance Calculation

0.6	MW-3B
0.4	MW-3B
0.6	MW-3B
0.9	MW-3B
0.7	MW-3B
0.2	MW-3B
3.7	MW-3B
3.8	MW-3B
3.8	MW-3B
5	MW-3B
0.5	MW-3B
25	MW-3B
5	MW-3B
0.5	MW-3B
0.5	MW-3B
2.3	MW-3B
0.5	MW-3B
0.5	MW-3B
0.16	MW-3B
0.16	MW-3B
0.18	MW-3B
0.14	MW-3B
0.12	MW-3B
0.15	MW-3B

Fluoride MW-3B

Number of samples		Uncensored values	
Uncensored	24	Mean	2.30875
Censored		Lognormal mean	2.034637
Detection limit or PQL		Std. devn.	5.101331
Method detection limit		Median	0.5
TOTAL	24	Min.	0.12
		Max.	25
Lognormal distribution?		Normal distribution?	
r-squared is:	0.909943648	r-squared is:	0.411873
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 5.17132238745994			

Compliance Calculation

0.9	MW-8A
0.3	MW-8A
0.4	MW-8A
0.9	MW-8A
2.8	MW-8A
0.2	MW-8A
0.1	MW-8A
0.1	MW-8A
0.05	MW-8A
5	MW-8A
0.5	MW-8A
0.5	MW-8A
0.1	MW-8A
0.5	MW-8A
0.5	MW-8A
0.5	MW-8A
0.5	MW-8A
0.5	MW-8A
0.18	MW-8A
0.16	MW-8A
0.19	MW-8A
0.16	MW-8A
0.13	MW-8A
0.15	MW-8A

Fluoride MW-8A

Number of samples		Uncensored values	
Uncensored	24	Mean	0.638333
Censored		Lognormal mean	0.57697
Detection limit or PQL		Std. devn.	1.081712
Method detection limit		Median	0.35
TOTAL	24	Min.	0.05
		Max.	5
Lognormal distribution?		Normal distribution?	
r-squared is:	0.929295357	r-squared is:	0.481121
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 1.03526302440004			

Compliance Calculation

1.8	MW-10A
1.5	MW-10A
1.2	MW-10A
2.7	MW-10A
2.3	MW-10A
3.2	MW-10A
2.3	MW-10A
1.9	MW-10A
3.4	MW-10A
5	MW-10A
1.2	MW-10A
25	MW-10A
5	MW-10A
2	MW-10A
0.5	MW-10A
4.4	MW-10A
1	MW-10A
3.3	MW-10A
1.9	MW-10A
3.1	MW-10A
2	MW-10A
2	MW-10A
2.1	MW-10A
3.2	MW-10A

Fluoride MW-10A

Number of samples		Uncensored values	
Uncensored	24	Mean	3.416667
Censored		Lognormal mean	3.151521
Detection limit or PQL		Std. devn.	4.745036
Method detection limit		Median	2.2
TOTAL	24	Min.	0.5
		Max.	25
Lognormal distribution?		Normal distribution?	
r-squared is:	0.876802563	r-squared is:	0.39671
Recommendations:			
Reject BOTH lognormal and normal distributions. See Statistics Guidance.			

Compliance Calculation

0.6	MW-18
0.4	MW-18
0.4	MW-18
1.8	MW-18
0.9	MW-18
0.2	MW-18
2.6	MW-18
2.4	MW-18
2.6	MW-18
0.5	MW-18
25	MW-18
25	MW-18
0.5	MW-18
1	MW-18
0.5	MW-18
2	MW-18
0.5	MW-18
0.5	MW-18
0.2	MW-18
0.13	MW-18
0.12	MW-18
0.11	MW-18
0.12	MW-18
0.11	MW-18

Fluoride MW-18

Number of samples		Uncensored values	
Uncensored	24	Mean	2.84125
Censored		Lognormal mean	2.143881
Detection limit or PQL		Std. devn.	6.873595
Method detection limit		Median	0.5
TOTAL	24	Min.	0.11
		Max.	25
Lognormal distribution?		Normal distribution?	
r-squared is:	0.900011689	r-squared is:	0.394953
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 5.9915968337536			

Compliance Calculation

130	MW-3B
140	MW-3B
120	MW-3B
130	MW-3B
118	MW-3B
113	MW-3B
110	MW-3B
110	MW-3B
110	MW-3B
97	MW-3B
124.79	MW-3B
100	MW-3B
100	MW-3B
96	MW-3B
110	MW-3B
120	MW-3B
110	MW-3B
98	MW-3B
90	MW-3B
91	MW-3B
91	MW-3B
80	MW-3B
98	MW-3B
95	MW-3B

Chloride MW-3B

Number of samples		Uncensored values	
Uncensored	24	Mean	2.84125
Censored		Lognormal mean	2.143881
Detection limit or PQL		Std. devn.	6.873595
Method detection limit		Median	0.5
TOTAL	24	Min.	0.11
		Max.	25
Lognormal distribution?		Normal distribution?	
r-squared is:	0.900011689	r-squared is:	0.394953
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 5.9915968337536			

Compliance Calculation

5.6	MW-8A
4.6	MW-8A
4.2	MW-8A
4.7	MW-8A
4.2	MW-8A
4.9	MW-8A
4.6	MW-8A
4.5	MW-8A
6.6	MW-8A
4.89	MW-8A
4.2	MW-8A
4	MW-8A
4.5	MW-8A
3	MW-8A
5.5	MW-8A
4.4	MW-8A
3.6	MW-8A
3.6	MW-8A
3.8	MW-8A
4.8	MW-8A
4.9	MW-8A
4.2	MW-8A
4.1	MW-8A
4.1	MW-8A

Chloride MW-8A

Number of samples		Uncensored values	
Uncensored	24	Mean	4.47875
Censored		Lognormal mean	4.480771
Detection limit or PQL		Std. devn.	0.738131
Method detection limit		Median	4.45
TOTAL	24	Min.	3
		Max.	6.6
Lognormal distribution?		Normal distribution?	
r-squared is:	0.954190022	r-squared is:	0.928151
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 4.7513185196829			

Compliance Calculation

29	MW-10A
31	MW-10A
28	MW-10A
28	MW-10A
43	MW-10A
48	MW-10A
35	MW-10A
30	MW-10A
45	MW-10A
36	MW-10A
30	MW-10A
100	MW-10A
30	MW-10A
68	MW-10A
79	MW-10A
83	MW-10A
23	MW-10A
62	MW-10A
180	MW-10A
99	MW-10A
190	MW-10A
58	MW-10A
82	MW-10A
170	MW-10A

Chloride MW-10A

Number of samples		Uncensored values	
Uncensored	24	Mean	66.95833
Censored		Lognormal mean	66.38417
Detection limit or PQL		Std. devn.	49.59968
Method detection limit		Median	46.5
TOTAL	24	Min.	23
		Max.	190
Lognormal distribution?		Normal distribution?	
r-squared is:	0.921868705	r-squared is:	0.783535
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 87.8663458070589			

Compliance Calculation

86	MW-18
91	MW-18
75	MW-18
84	MW-18
83	MW-18
91	MW-18
89	MW-18
80	MW-18
93	MW-18
77	MW-18
100	MW-18
70	MW-18
80	MW-18
81	MW-18
70	MW-18
100	MW-18
84	MW-18
89	MW-18
79	MW-18
84	MW-18
79	MW-18
86	MW-18
79	MW-18
59	MW-18

Chloride MW-18

Number of samples		Uncensored values	
Uncensored	24	Mean	82.875
Censored		Lognormal mean	82.91352
Detection limit or PQL		Std. devn.	9.284454
Method detection limit		Median	83.5
TOTAL	24	Min.	59
		Max.	100
Lognormal distribution?		Normal distribution?	
r-squared is:	0.935263058	r-squared is:	0.960767
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 86.4500957579022			

Compliance Calculation

0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.005	MW-3B
0.01	MW-3B
0.01	MW-3B
0.01	MW-3B
0.01	MW-3B
0.01	MW-3B
0.0025	MW-3B
0.006	MW-3B
0.0025	MW-3B
0.005	MW-3B
0.005	MW-3B
0.01	MW-3B

Cyanide MW-3B

Number of samples		Uncensored values	
Uncensored	25	Mean	0.00604
Censored		Lognormal mean	0.006056
Detection limit or PQL		Std. devn.	0.002384
Method detection limit		Median	0.005
TOTAL	25	Min.	0.0025
		Max.	0.01
Lognormal distribution?		Normal distribution?	
r-squared is:	0.748100977	r-squared is:	0.709744
Recommendations:			
Reject BOTH lognormal and normal distributions. See Statistics Guidance.			

Compliance Calculation

0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.025	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A
0.01	MW-8A
0.01	MW-8A
0.01	MW-8A
0.01	MW-8A
0.01	MW-8A
0.0025	MW-8A
0.0025	MW-8A
0.0025	MW-8A
0.005	MW-8A
0.005	MW-8A
0.005	MW-8A

Cyanide MW-8A

Number of samples		Uncensored values	
Uncensored	25	Mean	0.0065
Censored		Lognormal mean	0.006397
Detection limit or PQL		Std. devn.	0.004507
Method detection limit		Median	0.005
TOTAL	25	Min.	0.0025
		Max.	0.025
Lognormal distribution?		Normal distribution?	
r-squared is:	0.770255289	r-squared is:	0.563756
Recommendations:			
Reject BOTH lognormal and normal distributions. See Statistics Guidance.			

Compliance Calculation

0.04	MW-10A
0.05	MW-10A
0.04	MW-10A
0.03	MW-10A
0.03	MW-10A
0.03	MW-10A
0.08	MW-10A
0.03	MW-10A
0.04	MW-10A
0.005	MW-10A
0.04	MW-10A
0.043	MW-10A
0.05	MW-10A
0.04	MW-10A
0.03	MW-10A
0.01	MW-10A
0.032	MW-10A
0.022	MW-10A
0.028	MW-10A
0.007	MW-10A
0.008	MW-10A
0.0025	MW-10A
0.005	MW-10A
0.005	MW-10A
0.005	MW-10A

Cyanide MW-10A

Number of samples		Uncensored values	
Uncensored	25	Mean	0.0281
Censored		Lognormal mean	0.031874
Detection limit or PQL		Std. devn.	0.018952
Method detection limit		Median	0.03
TOTAL	25	Min.	0.0025
		Max.	0.08
Lognormal distribution?		Normal distribution?	
r-squared is:	0.859777553	r-squared is:	0.9039
Recommendations:			
Use normal distribution.			
UCL (based on t-statistic) is 0.0345852693364784			

Compliance Calculation

0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.005	MW-18
0.01	MW-18
0.01	MW-18
0.01	MW-18
0.0025	MW-18
0.0025	MW-18
0.0025	MW-18
0.005	MW-18
0.005	MW-18
0.086	MW-18

Cyanide MW-18

Number of samples		Uncensored values	
Uncensored	25	Mean	0.00854
Censored		Lognormal mean	0.006995
Detection limit or PQL		Std. devn.	0.016255
Method detection limit		Median	0.005
TOTAL	25	Min.	0.0025
		Max.	0.086
Lognormal distribution?		Normal distribution?	
r-squared is:	0.554825343	r-squared is:	0.253145
Recommendations:			
Reject BOTH lognormal and normal distributions. See Statistics Guidance.			

Compliance Calculation

4000	MW-14A
3500	MW-14A
3600	MW-14A
2800	MW-14A
2170	MW-14A
2380	MW-14A
3300	MW-14A
3900	MW-14A
4400	MW-14A
7900	MW-14A
6400	MW-14A
5500	MW-14A
6500	MW-14A
7000	MW-14A
5900	MW-14A
5200	MW-14A
4000	MW-14A
3900	MW-14A
2300	MW-14A
2100	MW-14A
1100	MW-14A
1400	MW-14A
1700	MW-14A

Sulfate MW-14A

Number of samples		Uncensored values	
Uncensored	23	Mean	3954.348
Censored		Lognormal mean	4024.508
Detection limit or PQL		Std. devn.	1894.074
Method detection limit		Median	3900
TOTAL	23	Min.	1100
		Max.	7900
Lognormal distribution?		Normal distribution?	
r-squared is:	0.971169948	r-squared is:	0.967373
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 5048.23107134869			

Compliance Calculation

9.6	MW-14A
8.6	MW-14A
30	MW-14A
25	MW-14A
31	MW-14A
27	MW-14A
30	MW-14A
24	MW-14A
16	MW-14A
19	MW-14A
25	MW-14A
25	MW-14A
20	MW-14A
30	MW-14A
24	MW-14A
32	MW-14A
18	MW-14A
23	MW-14A
17	MW-14A
18	MW-14A
6.8	MW-14A
3.5	MW-14A
2.5	MW-14A

Fluoride MW-14A

Number of samples		Uncensored values	
Uncensored	23	Mean	20.21739
Censored		Lognormal mean	21.81327
Detection limit or PQL		Std. devn.	8.928435
Method detection limit		Median	23
TOTAL	23	Min.	2.5
		Max.	32
Lognormal distribution?		Normal distribution?	
r-squared is:	0.78627108	r-squared is:	0.935369
Recommendations:			
Use normal distribution.			
UCL (based on t-statistic) is 23.4139429969175			

Compliance Calculation

110	MW-14A
90	MW-14A
71	MW-14A
75	MW-14A
53	MW-14A
63	MW-14A
98	MW-14A
130	MW-14A
140	MW-14A
170	MW-14A
200	MW-14A
100	MW-14A
180	MW-14A
210	MW-14A
160	MW-14A
170	MW-14A
120	MW-14A
130	MW-14A
66	MW-14A
61	MW-14A
47	MW-14A
61	MW-14A
68	MW-14A

Chloride MW-14A

Number of samples		Uncensored values	
Uncensored	23	Mean	111.8696
Censored		Lognormal mean	112.6048
Detection limit or PQL		Std. devn.	50.33461
Method detection limit		Median	100
TOTAL	23	Min.	47
		Max.	210
Lognormal distribution?		Normal distribution?	
r-squared is:	0.960045658	r-squared is:	0.934798
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 136.220386453624			

Compliance Calculation

0.35	MW-14A
0.24	MW-14A
0.27	MW-14A
0.19	MW-14A
0.19	MW-14A
0.2	MW-14A
0.17	MW-14A
0.01	MW-14A
0.12	MW-14A
0.005	MW-14A
0.03	MW-14A
0.005	MW-14A
0.19	MW-14A
0.12	MW-14A
0.14	MW-14A
0.044	MW-14A
0.14	MW-14A
0.086	MW-14A
0.066	MW-14A
0.028	MW-14A
0.037	MW-14A
0.008	MW-14A
0.019	MW-14A
0.017	MW-14A

Cyanide MW-14A

Number of samples		Uncensored values	
Uncensored	24	Mean	0.111458
Censored		Lognormal mean	0.146749
Detection limit or PQL		Std. devn.	0.097279
Method detection limit		Median	0.103
TOTAL	24	Min.	0.005
		Max.	0.35
Lognormal distribution?		Normal distribution?	
r-squared is:	0.920560337	r-squared is:	0.912075
Recommendations:			
Use lognormal distribution.			
UCL (Land's method) is 0.332046915524663			

Appendix B6
EPA Groundwater UCL Reports

UCL Statistics for Data Sets with Non-Detects					
User Selected Options					
Date/Time of Computation	9/6/2017 16:28				
From File	WSI.xls				
Full Precision	OFF				
Confidence Coefficient	95%				
Number of Bootstrap Operations	2000				
S3B					
General Statistics					
Total Number of Observations		24	Number of Distinct Observations		12
			Number of Missing Observations		0
Minimum		1700	Mean		2272
Maximum		2700	Median		2260
SD		282.7	Std. Error of Mean		57.7
Coefficient of Variation		0.124	Skewness		-0.275
Normal GOF Test					
Shapiro Wilk Test Statistic		0.939	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value		0.916	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic		0.165	Lilliefors GOF Test		
5% Lilliefors Critical Value		0.181	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level					
Assuming Normal Distribution					
95% Normal UCL			95% UCLs (Adjusted for Skewness)		
95% Student's-t UCL		2371	95% Adjusted-CLT UCL (Chen-1995)		2364
			95% Modified-t UCL (Johnson-1978)		2371
Gamma GOF Test					
A-D Test Statistic		0.626	Anderson-Darling Gamma GOF Test		
5% A-D Critical Value		0.742	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic		0.17	Kolmogrov-Smirnoff Gamma GOF Test		
5% K-S Critical Value		0.177	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level					
Gamma Statistics					
k hat (MLE)		65.2	k star (bias corrected MLE)		57.08
Theta hat (MLE)		34.85	Theta star (bias corrected MLE)		39.81
nu hat (MLE)		3130	nu star (bias corrected)		2740
MLE Mean (bias corrected)		2272	MLE Sd (bias corrected)		300.8
			Approximate Chi Square Value (0.05)		2619
Adjusted Level of Significance		0.0392	Adjusted Chi Square Value		2611
Assuming Gamma Distribution					
95% Approximate Gamma UCL (use when n>=50))		2377	95% Adjusted Gamma UCL (use when n<50)		2384
Lognormal GOF Test					
Shapiro Wilk Test Statistic		0.932	Shapiro Wilk Lognormal GOF Test		
5% Shapiro Wilk Critical Value		0.916	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic		0.165	Lilliefors Lognormal GOF Test		
5% Lilliefors Critical Value		0.181	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level					
Lognormal Statistics					
Minimum of Logged Data		7.438	Mean of logged Data		7.721
Maximum of Logged Data		7.901	SD of logged Data		0.128
Assuming Lognormal Distribution					

95% H-UCL	2381	90% Chebyshev (MVUE) UCL	2451
95% Chebyshev (MVUE) UCL	2532	97.5% Chebyshev (MVUE) UCL	2644
99% Chebyshev (MVUE) UCL	2865		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2367	95% Jackknife UCL	2371
95% Standard Bootstrap UCL	2364	95% Bootstrap-t UCL	2370
95% Hall's Bootstrap UCL	2366	95% Percentile Bootstrap UCL	2364
95% BCA Bootstrap UCL	2357		
90% Chebyshev(Mean, Sd) UCL	2445	95% Chebyshev(Mean, Sd) UCL	2524
97.5% Chebyshev(Mean, Sd) UCL	2633	99% Chebyshev(Mean, Sd) UCL	2846
Suggested UCL to Use			
95% Student's-t UCL	2371		
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). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
Note: For highly negatively-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.			
S8A			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	12
Number of Detects	23	Number of Non-Detects	1
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	7.8	Minimum Non-Detect	0.5
Maximum Detect	10	Maximum Non-Detect	0.5
Variance Detects	0.276	Percent Non-Detects	4.17%
Mean Detects	9.529	SD Detects	0.525
Median Detects	9.6	CV Detects	0.0551
Skewness Detects	-1.742	Kurtosis Detects	4.174
Mean of Logged Detects	2.253	SD of Logged Detects	0.0579
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.821	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.185	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.185	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	9.153	Standard Error of Mean	0.391
SD	1.873	95% KM (BCA) UCL	9.631
95% KM (t) UCL	9.823	95% KM (Percentile Bootstrap) UCL	9.645
95% KM (z) UCL	9.796	95% KM Bootstrap t UCL	9.602
90% KM Chebyshev UCL	10.33	95% KM Chebyshev UCL	10.86
97.5% KM Chebyshev UCL	11.59	99% KM Chebyshev UCL	13.04
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.149	Anderson-Darling GOF Test	
5% A-D Critical Value	0.74	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.186	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.181	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only			
k hat (MLE)	322.5	k star (bias corrected MLE)	280.5
Theta hat (MLE)	0.0295	Theta star (bias corrected MLE)	0.034
nu hat (MLE)	14834	nu star (bias corrected)	12901
MLE Mean (bias corrected)	9.529	MLE Sd (bias corrected)	0.569
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	23.88	nu hat (KM)	1146
Approximate Chi Square Value (N/A, α)	1069	Adjusted Chi Square Value (N/A, β)	1063
95% Gamma Approximate KM-UCL (use when n>=50)	9.818	95% Gamma Adjusted KM-UCL (use when n<5	9.866
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	7.8	Mean	9.483
Maximum	10	Median	9.6
SD	0.561	CV	0.0592
k hat (MLE)	280.6	k star (bias corrected MLE)	245.5
Theta hat (MLE)	0.0338	Theta star (bias corrected MLE)	0.0386
nu hat (MLE)	13467	nu star (bias corrected)	11785
MLE Mean (bias corrected)	9.483	MLE Sd (bias corrected)	0.605
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (N/A, α)	11533	Adjusted Chi Square Value (N/A, β)	11516
95% Gamma Approximate UCL (use when n>=50)	9.689	95% Gamma Adjusted UCL (use when n<50)	9.704
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.796	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.195	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.185	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	9.482	Mean in Log Scale	2.248
SD in Original Scale	0.564	SD in Log Scale	0.0622
95% t UCL (assumes normality of ROS data)	9.679	95% Percentile Bootstrap UCL	9.653
95% BCA Bootstrap UCL	9.64	95% Bootstrap t UCL	9.65
95% H-UCL (Log ROS)	N/A		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	9.143	Mean in Log Scale	2.101
SD in Original Scale	1.962	SD in Log Scale	0.745
95% t UCL (Assumes normality)	9.829	95% H-Stat UCL	15.25
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	10.86		
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
S10A			

General Statistics			
Total Number of Observations	24	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	670	Mean	1959
Maximum	6100	Median	1335
SD	1596	Std. Error of Mean	325.8
Coefficient of Variation	0.815	Skewness	1.587
Normal GOF Test			
Shapiro Wilk Test Statistic	0.773	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.21	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.181	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	2517	95% Adjusted-CLT UCL (Chen-1995)	2607
		95% Modified-t UCL (Johnson-1978)	2535
Gamma GOF Test			
A-D Test Statistic	1.07	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.199	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.18	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.096	k star (bias corrected MLE)	1.862
Theta hat (MLE)	934.4	Theta star (bias corrected MLE)	1052
nu hat (MLE)	100.6	nu star (bias corrected)	89.38
MLE Mean (bias corrected)	1959	MLE Sd (bias corrected)	1435
		Approximate Chi Square Value (0.05)	68.58
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	67.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	2553	95% Adjusted Gamma UCL (use when n<50)	2601
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.904	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.176	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	6.507	Mean of logged Data	7.323
Maximum of Logged Data	8.716	SD of logged Data	0.701
Assuming Lognormal Distribution			
95% H-UCL	2664	90% Chebyshev (MVUE) UCL	2796
95% Chebyshev (MVUE) UCL	3196	97.5% Chebyshev (MVUE) UCL	3751
99% Chebyshev (MVUE) UCL	4841		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2495	95% Jackknife UCL	2517
95% Standard Bootstrap UCL	2485	95% Bootstrap-t UCL	2804
95% Hall's Bootstrap UCL	2688	95% Percentile Bootstrap UCL	2532

95% BCA Bootstrap UCL	2588		
90% Chebyshev(Mean, Sd) UCL	2936	95% Chebyshev(Mean, Sd) UCL	3379
97.5% Chebyshev(Mean, Sd) UCL	3993	99% Chebyshev(Mean, Sd) UCL	5200
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	3379		
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). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
S14A			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	1100	Mean	3954
Maximum	7900	Median	3900
SD	1894	Std. Error of Mean	394.9
Coefficient of Variation	0.479	Skewness	0.44
Normal GOF Test			
Shapiro Wilk Test Statistic	0.958	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.143	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.185	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	4633	95% Adjusted-CLT UCL (Chen-1995)	4643
		95% Modified-t UCL (Johnson-1978)	4639
Gamma GOF Test			
A-D Test Statistic	0.222	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.09	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.21	k star (bias corrected MLE)	3.69
Theta hat (MLE)	939.3	Theta star (bias corrected MLE)	1072
nu hat (MLE)	193.7	nu star (bias corrected)	169.7
MLE Mean (bias corrected)	3954	MLE Sd (bias corrected)	2059
		Approximate Chi Square Value (0.05)	140.6
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	138.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	4773	95% Adjusted Gamma UCL (use when n<50)	4840
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.964	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.11	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.003	Mean of logged Data	8.159

Maximum of Logged Data	8.975	SD of logged Data	0.531
Assuming Lognormal Distribution			
95% H-UCL	5048	90% Chebyshev (MVUE) UCL	5383
95% Chebyshev (MVUE) UCL	6011	97.5% Chebyshev (MVUE) UCL	6883
99% Chebyshev (MVUE) UCL	8595		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	4604	95% Jackknife UCL	4633
95% Standard Bootstrap UCL	4589	95% Bootstrap-t UCL	4685
95% Hall's Bootstrap UCL	4676	95% Percentile Bootstrap UCL	4597
95% BCA Bootstrap UCL	4625		
90% Chebyshev(Mean, Sd) UCL	5139	95% Chebyshev(Mean, Sd) UCL	5676
97.5% Chebyshev(Mean, Sd) UCL	6421	99% Chebyshev(Mean, Sd) UCL	7884
Suggested UCL to Use			
95% Student's-t UCL	4633		
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). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
S18			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1200	Mean	1496
Maximum	1700	Median	1500
SD	148.9	Std. Error of Mean	30.4
Coefficient of Variation	0.0995	Skewness	-0.363
Normal GOF Test			
Shapiro Wilk Test Statistic	0.908	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.192	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.181	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1548	95% Adjusted-CLT UCL (Chen-1995)	1544
		95% Modified-t UCL (Johnson-1978)	1548
Gamma GOF Test			
A-D Test Statistic	0.978	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.742	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.205	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.177	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	102.2	k star (bias corrected MLE)	89.41
Theta hat (MLE)	14.65	Theta star (bias corrected MLE)	16.73
nu hat (MLE)	4903	nu star (bias corrected)	4292
MLE Mean (bias corrected)	1496	MLE Sd (bias corrected)	158.2
		Approximate Chi Square Value (0.05)	4140

Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	4130
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1551	95% Adjusted Gamma UCL (use when n<50)	1555
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.899	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.211	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.181	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.09	Mean of logged Data	7.306
Maximum of Logged Data	7.438	SD of logged Data	0.102
Assuming Lognormal Distribution			
95% H-UCL	1552	90% Chebyshev (MVUE) UCL	1590
95% Chebyshev (MVUE) UCL	1632	97.5% Chebyshev (MVUE) UCL	1691
99% Chebyshev (MVUE) UCL	1807		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1546	95% Jackknife UCL	1548
95% Standard Bootstrap UCL	1544	95% Bootstrap-t UCL	1544
95% Hall's Bootstrap UCL	1543	95% Percentile Bootstrap UCL	1546
95% BCA Bootstrap UCL	1542		
90% Chebyshev(Mean, Sd) UCL	1587	95% Chebyshev(Mean, Sd) UCL	1629
97.5% Chebyshev(Mean, Sd) UCL	1686	99% Chebyshev(Mean, Sd) UCL	1799
Suggested UCL to Use			
95% Student's-t UCL	1548	or 95% Modified-t UCL	1548
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). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
Note: For highly negatively-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.			
F3B			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	16
Number of Detects	16	Number of Non-Detects	8
Number of Distinct Detects	13	Number of Distinct Non-Detects	3
Minimum Detect	0.12	Minimum Non-Detect	0.5
Maximum Detect	3.8	Maximum Non-Detect	25
Variance Detects	2.011	Percent Non-Detects	33.33%
Mean Detects	1.119	SD Detects	1.418
Median Detects	0.5	CV Detects	1.267
Skewness Detects	1.346	Kurtosis Detects	0.133
Mean of Logged Detects	-0.66	SD of Logged Detects	1.283
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.69	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.311	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.222	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.898	Standard Error of Mean	0.285
SD	1.263	95% KM (BCA) UCL	1.406
95% KM (t) UCL	1.386	95% KM (Percentile Bootstrap) UCL	1.372
95% KM (z) UCL	1.366	95% KM Bootstrap t UCL	1.635
90% KM Chebyshev UCL	1.753	95% KM Chebyshev UCL	2.14
97.5% KM Chebyshev UCL	2.677	99% KM Chebyshev UCL	3.733
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.168	Anderson-Darling GOF Test	
5% A-D Critical Value	0.774	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.216	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.223	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.772	k star (bias corrected MLE)	0.669
Theta hat (MLE)	1.451	Theta star (bias corrected MLE)	1.674
nu hat (MLE)	24.69	nu star (bias corrected)	21.39
MLE Mean (bias corrected)	1.119	MLE Sd (bias corrected)	1.369
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.505	nu hat (KM)	24.25
Approximate Chi Square Value (24.25, α)	14.04	Adjusted Chi Square Value (24.25, β)	13.49
95% Gamma Approximate KM-UCL (use when n>=50)	1.551	95% Gamma Adjusted KM-UCL (use when n<50)	1.614
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.846
Maximum	3.8	Median	0.323
SD	1.227	CV	1.451
k hat (MLE)	0.609	k star (bias corrected MLE)	0.561
Theta hat (MLE)	1.389	Theta star (bias corrected MLE)	1.509
nu hat (MLE)	29.24	nu star (bias corrected)	26.92
MLE Mean (bias corrected)	0.846	MLE Sd (bias corrected)	1.13
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (26.92, α)	16.09	Adjusted Chi Square Value (26.92, β)	15.5
95% Gamma Approximate UCL (use when n>=50)	1.415	95% Gamma Adjusted UCL (use when n<50)	1.469
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.863	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.208	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.85	Mean in Log Scale	-0.896
SD in Original Scale	1.215	SD in Log Scale	1.157
95% t UCL (assumes normality of ROS data)	1.275	95% Percentile Bootstrap UCL	1.284
95% BCA Bootstrap UCL	1.368	95% Bootstrap t UCL	1.48
95% H-UCL (Log ROS)	1.552		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	-0.916	95% H-UCL (KM -Log)	1.626
KM SD (logged)	1.189	95% Critical H Value (KM-Log)	2.805
KM Standard Error of Mean (logged)	0.272		

DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.528	Mean in Log Scale	-0.547
SD in Original Scale	2.664	SD in Log Scale	1.354
95% t UCL (Assumes normality)	2.46	95% H-Stat UCL	3.421
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (BCA) UCL	1.406	95% GROS Adjusted Gamma UCL	1.469
95% Adjusted Gamma KM-UCL	1.614		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
F8A			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	14
Number of Detects	16	Number of Non-Detects	8
Number of Distinct Detects	12	Number of Distinct Non-Detects	2
Minimum Detect	0.05	Minimum Non-Detect	0.5
Maximum Detect	2.8	Maximum Non-Detect	5
Variance Detects	0.469	Percent Non-Detects	33.33%
Mean Detects	0.426	SD Detects	0.685
Median Detects	0.17	CV Detects	1.607
Skewness Detects	3.156	Kurtosis Detects	10.76
Mean of Logged Detects	-1.487	SD of Logged Detects	1.021
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.538	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.328	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.222	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.348	Standard Error of Mean	0.123
SD	0.568	95% KM (BCA) UCL	0.574
95% KM (t) UCL	0.559	95% KM (Percentile Bootstrap) UCL	0.574
95% KM (z) UCL	0.551	95% KM Bootstrap t UCL	0.903
90% KM Chebyshev UCL	0.717	95% KM Chebyshev UCL	0.884
97.5% KM Chebyshev UCL	1.116	99% KM Chebyshev UCL	1.571
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.462	Anderson-Darling GOF Test	
5% A-D Critical Value	0.767	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.297	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.222	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.919	k star (bias corrected MLE)	0.789
Theta hat (MLE)	0.464	Theta star (bias corrected MLE)	0.541
nu hat (MLE)	29.42	nu star (bias corrected)	25.23
MLE Mean (bias corrected)	0.426	MLE Sd (bias corrected)	0.48

Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.377	nu hat (KM)	18.1
Approximate Chi Square Value (18.10, α)	9.463	Adjusted Chi Square Value (18.10, β)	9.025
95% Gamma Approximate KM-UCL (use when n>=50)	0.667	95% Gamma Adjusted KM-UCL (use when n<5	0.699
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.352
Maximum	2.8	Median	0.17
SD	0.576	CV	1.636
k hat (MLE)	0.777	k star (bias corrected MLE)	0.708
Theta hat (MLE)	0.453	Theta star (bias corrected MLE)	0.498
nu hat (MLE)	37.3	nu star (bias corrected)	33.97
MLE Mean (bias corrected)	0.352	MLE Sd (bias corrected)	0.419
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (33.97, α)	21.64	Adjusted Chi Square Value (33.97, β)	20.95
95% Gamma Approximate UCL (use when n>=50)	0.553	95% Gamma Adjusted UCL (use when n<50)	0.571
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.896	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.235	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.222	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.35	Mean in Log Scale	-1.585
SD in Original Scale	0.567	SD in Log Scale	0.907
95% t UCL (assumes normality of ROS data)	0.549	95% Percentile Bootstrap UCL	0.553
95% BCA Bootstrap UCL	0.711	95% Bootstrap t UCL	0.879
95% H-UCL (Log ROS)	0.488		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	-1.611	95% H-UCL (KM -Log)	0.464
KM SD (logged)	0.891	95% Critical H Value (KM-Log)	2.401
KM Standard Error of Mean (logged)	0.206		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.461	Mean in Log Scale	-1.358
SD in Original Scale	0.708	SD in Log Scale	0.957
95% t UCL (Assumes normality)	0.709	95% H-Stat UCL	0.668
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	1.116		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
F10A			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	17

Number of Detects	20	Number of Non-Detects	4
Number of Distinct Detects	14	Number of Distinct Non-Detects	3
Minimum Detect	1	Minimum Non-Detect	0.5
Maximum Detect	4.4	Maximum Non-Detect	25
Variance Detects	0.771	Percent Non-Detects	16.67%
Mean Detects	2.325	SD Detects	0.878
Median Detects	2.05	CV Detects	0.378
Skewness Detects	0.588	Kurtosis Detects	0.0121
Mean of Logged Detects	0.774	SD of Logged Detects	0.39
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.945	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.161	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.198	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	2.238	Standard Error of Mean	0.206
SD	0.921	95% KM (BCA) UCL	2.565
95% KM (t) UCL	2.592	95% KM (Percentile Bootstrap) UCL	2.557
95% KM (z) UCL	2.577	95% KM Bootstrap t UCL	2.621
90% KM Chebyshev UCL	2.857	95% KM Chebyshev UCL	3.137
97.5% KM Chebyshev UCL	3.526	99% KM Chebyshev UCL	4.291
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.359	Anderson-Darling GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.126	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.194	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	7.329	k star (bias corrected MLE)	6.263
Theta hat (MLE)	0.317	Theta star (bias corrected MLE)	0.371
nu hat (MLE)	293.2	nu star (bias corrected)	250.5
MLE Mean (bias corrected)	2.325	MLE Sd (bias corrected)	0.929
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	5.9	nu hat (KM)	283.2
Approximate Chi Square Value (283.19, α)	245.2	Adjusted Chi Square Value (283.19, β)	242.7
95% Gamma Approximate KM-UCL (use when n>=50)	2.585	95% Gamma Adjusted KM-UCL (use when n<5	2.611
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.638	Mean	2.235
Maximum	4.4	Median	2.05
SD	0.879	CV	0.393
k hat (MLE)	6.188	k star (bias corrected MLE)	5.442
Theta hat (MLE)	0.361	Theta star (bias corrected MLE)	0.411
nu hat (MLE)	297	nu star (bias corrected)	261.2
MLE Mean (bias corrected)	2.235	MLE Sd (bias corrected)	0.958
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (261.23, α)	224.8	Adjusted Chi Square Value (261.23, β)	222.4
95% Gamma Approximate UCL (use when n>=50)	2.597	95% Gamma Adjusted UCL (use when n<50)	2.625
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.962	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	

Lilliefors Test Statistic	0.12	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.198	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.236	Mean in Log Scale	0.729
SD in Original Scale	0.864	SD in Log Scale	0.409
95% t UCL (assumes normality of ROS data)	2.538	95% Percentile Bootstrap UCL	2.521
95% BCA Bootstrap UCL	2.567	95% Bootstrap t UCL	2.567
95% H-UCL (Log ROS)	2.651		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	0.704	95% H-UCL (KM -Log)	2.775
KM SD (logged)	0.485	95% Critical H Value (KM-Log)	1.967
KM Standard Error of Mean (logged)	0.109		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2.677	Mean in Log Scale	0.769
SD in Original Scale	2.28	SD in Log Scale	0.681
95% t UCL (Assumes normality)	3.475	95% H-Stat UCL	3.695
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	2.592	95% KM (Percentile Bootstrap) UCL	2.557
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
F14A			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	17
Number of Detects	21	Number of Non-Detects	2
Number of Distinct Detects	17	Number of Distinct Non-Detects	1
Minimum Detect	2.5	Minimum Non-Detect	25
Maximum Detect	32	Maximum Non-Detect	25
Variance Detects	85.18	Percent Non-Detects	8.70%
Mean Detects	19.76	SD Detects	9.229
Median Detects	20	CV Detects	0.467
Skewness Detects	-0.49	Kurtosis Detects	-0.819
Mean of Logged Detects	2.806	SD of Logged Detects	0.716
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.931	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.908	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.113	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.193	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	19.35	Standard Error of Mean	1.975
SD	8.962	95% KM (BCA) UCL	22.51
95% KM (t) UCL	22.74	95% KM (Percentile Bootstrap) UCL	22.35
95% KM (z) UCL	22.6	95% KM Bootstrap t UCL	22.47
90% KM Chebyshev UCL	25.27	95% KM Chebyshev UCL	27.95
97.5% KM Chebyshev UCL	31.68	99% KM Chebyshev UCL	38.99

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.067	Anderson-Darling GOF Test	
5% A-D Critical Value	0.75	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.191	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.977	k star (bias corrected MLE)	2.583
Theta hat (MLE)	6.639	Theta star (bias corrected MLE)	7.651
nu hat (MLE)	125	nu star (bias corrected)	108.5
MLE Mean (bias corrected)	19.76	MLE Sd (bias corrected)	12.3
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	4.661	nu hat (KM)	214.4
Approximate Chi Square Value (214.39, α)	181.5	Adjusted Chi Square Value (214.39, β)	179.3
95% Gamma Approximate KM-UCL (use when n>=50)	22.85	95% Gamma Adjusted KM-UCL (use when n<5	23.13
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	2.5	Mean	19.33
Maximum	32	Median	19
SD	8.945	CV	0.463
k hat (MLE)	3.167	k star (bias corrected MLE)	2.783
Theta hat (MLE)	6.102	Theta star (bias corrected MLE)	6.944
nu hat (MLE)	145.7	nu star (bias corrected)	128
MLE Mean (bias corrected)	19.33	MLE Sd (bias corrected)	11.58
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (128.01, α)	102.9	Adjusted Chi Square Value (128.01, β)	101.2
95% Gamma Approximate UCL (use when n>=50)	24.05	95% Gamma Adjusted UCL (use when n<50)	24.43
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.81	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.243	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.193	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	19.11	Mean in Log Scale	2.779
SD in Original Scale	9.093	SD in Log Scale	0.692
95% t UCL (assumes normality of ROS data)	22.37	95% Percentile Bootstrap UCL	22.03
95% BCA Bootstrap UCL	22.01	95% Bootstrap t UCL	22.3
95% H-UCL (Log ROS)	28.13		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	19.13	Mean in Log Scale	2.782
SD in Original Scale	9.045	SD in Log Scale	0.688
95% t UCL (Assumes normality)	22.37	95% H-Stat UCL	28.06
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	22.74	95% KM (Percentile Bootstrap) UCL	22.35

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
F18			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	14
Number of Detects	16	Number of Non-Detects	8
Number of Distinct Detects	12	Number of Distinct Non-Detects	3
Minimum Detect	0.11	Minimum Non-Detect	0.2
Maximum Detect	2.6	Maximum Non-Detect	25
Variance Detects	0.942	Percent Non-Detects	33.33%
Mean Detects	0.968	SD Detects	0.97
Median Detects	0.5	CV Detects	1.002
Skewness Detects	0.78	Kurtosis Detects	-1.103
Mean of Logged Detects	-0.668	SD of Logged Detects	1.258
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.221	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.222	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.753	Standard Error of Mean	0.194
SD	0.877	95% KM (BCA) UCL	1.065
95% KM (t) UCL	1.085	95% KM (Percentile Bootstrap) UCL	1.091
95% KM (z) UCL	1.071	95% KM Bootstrap t UCL	1.17
90% KM Chebyshev UCL	1.334	95% KM Chebyshev UCL	1.597
97.5% KM Chebyshev UCL	1.962	99% KM Chebyshev UCL	2.68
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.776	Anderson-Darling GOF Test	
5% A-D Critical Value	0.767	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.17	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.222	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.918	k star (bias corrected MLE)	0.787
Theta hat (MLE)	1.055	Theta star (bias corrected MLE)	1.23
nu hat (MLE)	29.37	nu star (bias corrected)	25.19
MLE Mean (bias corrected)	0.968	MLE Sd (bias corrected)	1.091
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.736	nu hat (KM)	35.35
Approximate Chi Square Value (35.35, α)	22.75	Adjusted Chi Square Value (35.35, β)	22.03
95% Gamma Approximate KM-UCL (use when n>=50)	1.17	95% Gamma Adjusted KM-UCL (use when n<5	1.207
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.738
Maximum	2.6	Median	0.371
SD	0.868	CV	1.175
k hat (MLE)	0.728	k star (bias corrected MLE)	0.665
Theta hat (MLE)	1.015	Theta star (bias corrected MLE)	1.111

nu hat (MLE)	34.93	nu star (bias corrected)	31.9
MLE Mean (bias corrected)	0.738	MLE Sd (bias corrected)	0.906
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (31.90, α)	19.99	Adjusted Chi Square Value (31.90, β)	19.33
95% Gamma Approximate UCL (use when n>=50)	1.178	95% Gamma Adjusted UCL (use when n<50)	1.219
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.868	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.175	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.734	Mean in Log Scale	-0.959
SD in Original Scale	0.86	SD in Log Scale	1.165
95% t UCL (assumes normality of ROS data)	1.035	95% Percentile Bootstrap UCL	1.024
95% BCA Bootstrap UCL	1.063	95% Bootstrap t UCL	1.126
95% H-UCL (Log ROS)	1.481		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	-0.994	95% H-UCL (KM -Log)	1.519
KM SD (logged)	1.194	95% Critical H Value (KM-Log)	2.811
KM Standard Error of Mean (logged)	0.271		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.743	Mean in Log Scale	-0.62
SD in Original Scale	3.42	SD in Log Scale	1.464
95% t UCL (Assumes normality)	2.94	95% H-Stat UCL	4.201
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.085	95% KM (Percentile Bootstrap) UCL	1.091
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CH3B			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	80	Mean	107.6
Maximum	140	Median	110
SD	14.96	Std. Error of Mean	3.055
Coefficient of Variation	0.139	Skewness	0.341
Normal GOF Test			
Shapiro Wilk Test Statistic	0.968	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.152	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	112.8	95% Adjusted-CLT UCL (Chen-1995)	112.8
		95% Modified-t UCL (Johnson-1978)	112.8
Gamma GOF Test			
A-D Test Statistic	0.352	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.145	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.177	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	54.5	k star (bias corrected MLE)	47.72
Theta hat (MLE)	1.974	Theta star (bias corrected MLE)	2.255
nu hat (MLE)	2616	nu star (bias corrected)	2290
MLE Mean (bias corrected)	107.6	MLE Sd (bias corrected)	15.57
		Approximate Chi Square Value (0.05)	2180
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	2173
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	113	95% Adjusted Gamma UCL (use when n<50)	113.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.975	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.136	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.382	Mean of logged Data	4.669
Maximum of Logged Data	4.942	SD of logged Data	0.138
Assuming Lognormal Distribution			
95% H-UCL	113.1	90% Chebyshev (MVUE) UCL	116.7
95% Chebyshev (MVUE) UCL	120.9	97.5% Chebyshev (MVUE) UCL	126.6
99% Chebyshev (MVUE) UCL	137.9		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	112.6	95% Jackknife UCL	112.8
95% Standard Bootstrap UCL	112.7	95% Bootstrap-t UCL	113.2
95% Hall's Bootstrap UCL	113.2	95% Percentile Bootstrap UCL	112.4
95% BCA Bootstrap UCL	112.6		
90% Chebyshev(Mean, Sd) UCL	116.7	95% Chebyshev(Mean, Sd) UCL	120.9
97.5% Chebyshev(Mean, Sd) UCL	126.7	99% Chebyshev(Mean, Sd) UCL	138
Suggested UCL to Use			
95% Student's-t UCL	112.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
CH8A			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	16

		Number of Missing Observations	0
Minimum	3	Mean	4.479
Maximum	6.6	Median	4.45
SD	0.738	Std. Error of Mean	0.151
Coefficient of Variation	0.165	Skewness	0.835
Normal GOF Test			
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.159	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	4.737	95% Adjusted-CLT UCL (Chen-1995)	4.754
		95% Modified-t UCL (Johnson-1978)	4.741
Gamma GOF Test			
A-D Test Statistic	0.38	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.14	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.177	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	39.92	k star (bias corrected MLE)	34.96
Theta hat (MLE)	0.112	Theta star (bias corrected MLE)	0.128
nu hat (MLE)	1916	nu star (bias corrected)	1678
MLE Mean (bias corrected)	4.479	MLE Sd (bias corrected)	0.758
		Approximate Chi Square Value (0.05)	1584
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	1577
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	4.745	95% Adjusted Gamma UCL (use when n<50)	4.764
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.97	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.138	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.099	Mean of logged Data	1.487
Maximum of Logged Data	1.887	SD of logged Data	0.161
Assuming Lognormal Distribution			
95% H-UCL	4.752	90% Chebyshev (MVUE) UCL	4.923
95% Chebyshev (MVUE) UCL	5.124	97.5% Chebyshev (MVUE) UCL	5.404
99% Chebyshev (MVUE) UCL	5.953		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	4.727	95% Jackknife UCL	4.737
95% Standard Bootstrap UCL	4.725	95% Bootstrap-t UCL	4.771
95% Hall's Bootstrap UCL	4.799	95% Percentile Bootstrap UCL	4.729
95% BCA Bootstrap UCL	4.741		
90% Chebyshev(Mean, Sd) UCL	4.931	95% Chebyshev(Mean, Sd) UCL	5.136
97.5% Chebyshev(Mean, Sd) UCL	5.42	99% Chebyshev(Mean, Sd) UCL	5.978

Suggested UCL to Use			
95% Student's-t UCL	4.737		
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). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
CH10A			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	23	Mean	66.96
Maximum	190	Median	46.5
SD	49.6	Std. Error of Mean	10.12
Coefficient of Variation	0.741	Skewness	1.527
Normal GOF Test			
Shapiro Wilk Test Statistic	0.778	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.191	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.181	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	84.31	95% Adjusted-CLT UCL (Chen-1995)	86.98
		95% Modified-t UCL (Johnson-1978)	84.84
Gamma GOF Test			
A-D Test Statistic	1.044	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.164	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.18	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.49	k star (bias corrected MLE)	2.207
Theta hat (MLE)	26.89	Theta star (bias corrected MLE)	30.34
nu hat (MLE)	119.5	nu star (bias corrected)	105.9
MLE Mean (bias corrected)	66.96	MLE Sd (bias corrected)	45.08
		Approximate Chi Square Value (0.05)	83.17
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	81.75
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	85.27	95% Adjusted Gamma UCL (use when n<50)	86.75
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.908	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.154	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.135	Mean of logged Data	3.99
Maximum of Logged Data	5.247	SD of logged Data	0.641
Assuming Lognormal Distribution			

95% H-UCL	88.07	90% Chebyshev (MVUE) UCL	93.15
95% Chebyshev (MVUE) UCL	105.6	97.5% Chebyshev (MVUE) UCL	122.8
99% Chebyshev (MVUE) UCL	156.7		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	83.61	95% Jackknife UCL	84.31
95% Standard Bootstrap UCL	83.13	95% Bootstrap-t UCL	89.47
95% Hall's Bootstrap UCL	85.61	95% Percentile Bootstrap UCL	84.96
95% BCA Bootstrap UCL	85.79		
90% Chebyshev(Mean, Sd) UCL	97.33	95% Chebyshev(Mean, Sd) UCL	111.1
97.5% Chebyshev(Mean, Sd) UCL	130.2	99% Chebyshev(Mean, Sd) UCL	167.7
Suggested UCL to Use			
95% Adjusted Gamma UCL	86.75		
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). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
CH14A			
General Statistics			
Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	47	Mean	111.9
Maximum	210	Median	100
SD	50.33	Std. Error of Mean	10.5
Coefficient of Variation	0.45	Skewness	0.513
Normal GOF Test			
Shapiro Wilk Test Statistic	0.921	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.159	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.185	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	129.9	95% Adjusted-CLT UCL (Chen-1995)	130.3
		95% Modified-t UCL (Johnson-1978)	130.1
Gamma GOF Test			
A-D Test Statistic	0.503	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.15	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.195	k star (bias corrected MLE)	4.547
Theta hat (MLE)	21.53	Theta star (bias corrected MLE)	24.6
nu hat (MLE)	239	nu star (bias corrected)	209.2
MLE Mean (bias corrected)	111.9	MLE Sd (bias corrected)	52.46
		Approximate Chi Square Value (0.05)	176.7
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	174.5
Assuming Gamma Distribution			

95% Approximate Gamma UCL (use when n>=50))	132.4	95% Adjusted Gamma UCL (use when n<50)	134.1
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.945	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.134	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.85	Mean of logged Data	4.618
Maximum of Logged Data	5.347	SD of logged Data	0.46
Assuming Lognormal Distribution			
95% H-UCL	136.2	90% Chebyshev (MVUE) UCL	145.4
95% Chebyshev (MVUE) UCL	160.5	97.5% Chebyshev (MVUE) UCL	181.4
99% Chebyshev (MVUE) UCL	222.6		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	129.1	95% Jackknife UCL	129.9
95% Standard Bootstrap UCL	128.7	95% Bootstrap-t UCL	131.1
95% Hall's Bootstrap UCL	130.4	95% Percentile Bootstrap UCL	129.1
95% BCA Bootstrap UCL	130.2		
90% Chebyshev(Mean, Sd) UCL	143.4	95% Chebyshev(Mean, Sd) UCL	157.6
97.5% Chebyshev(Mean, Sd) UCL	177.4	99% Chebyshev(Mean, Sd) UCL	216.3
Suggested UCL to Use			
95% Student's-t UCL	129.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
CH18			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	59	Mean	82.88
Maximum	100	Median	83.5
SD	9.284	Std. Error of Mean	1.895
Coefficient of Variation	0.112	Skewness	-0.363
Normal GOF Test			
Shapiro Wilk Test Statistic	0.967	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.13	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	86.12	95% Adjusted-CLT UCL (Chen-1995)	85.84
		95% Modified-t UCL (Johnson-1978)	86.1
Gamma GOF Test			
A-D Test Statistic	0.354	Anderson-Darling Gamma GOF Test	

5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.141	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.177	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	79.42	k star (bias corrected MLE)	69.52
Theta hat (MLE)	1.044	Theta star (bias corrected MLE)	1.192
nu hat (MLE)	3812	nu star (bias corrected)	3337
MLE Mean (bias corrected)	82.88	MLE Sd (bias corrected)	9.94
		Approximate Chi Square Value (0.05)	3204
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	3194
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	86.32	95% Adjusted Gamma UCL (use when n<50)	86.57
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.945	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.152	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.181	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.078	Mean of logged Data	4.411
Maximum of Logged Data	4.605	SD of logged Data	0.116
Assuming Lognormal Distribution			
95% H-UCL	86.46	90% Chebyshev (MVUE) UCL	88.81
95% Chebyshev (MVUE) UCL	91.49	97.5% Chebyshev (MVUE) UCL	95.22
99% Chebyshev (MVUE) UCL	102.5		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	85.99	95% Jackknife UCL	86.12
95% Standard Bootstrap UCL	85.92	95% Bootstrap-t UCL	86.04
95% Hall's Bootstrap UCL	85.9	95% Percentile Bootstrap UCL	85.79
95% BCA Bootstrap UCL	85.63		
90% Chebyshev(Mean, Sd) UCL	88.56	95% Chebyshev(Mean, Sd) UCL	91.14
97.5% Chebyshev(Mean, Sd) UCL	94.71	99% Chebyshev(Mean, Sd) UCL	101.7
Suggested UCL to Use			
95% Student's-t UCL	86.12		
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). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
Note: For highly negatively-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.			
CY3B			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	4
Number of Detects	2	Number of Non-Detects	23
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	0.006	Minimum Non-Detect	0.0025
Maximum Detect	0.01	Maximum Non-Detect	0.01

Variance Detects	8.00E-06	Percent Non-Detects	92%
Mean Detects	0.008	SD Detects	0.00283
Median Detects	0.008	CV Detects	0.354
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-4.861	SD of Logged Detects	0.361
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.00298	Standard Error of Mean	4.73E-04
SD	0.00163	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.00379	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.00375	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0044	95% KM Chebyshev UCL	0.00504
97.5% KM Chebyshev UCL	0.00593	99% KM Chebyshev UCL	0.00768
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	15.66	k star (bias corrected MLE)	N/A
Theta hat (MLE)	5.11E-04	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	62.64	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	3.355	nu hat (KM)	167.7
		Adjusted Level of Significance (β)	0.0395
Approximate Chi Square Value (167.73, α)	138.8	Adjusted Chi Square Value (167.73, β)	137
95% Gamma Approximate KM-UCL (use when n>=50)	0.0036	95% Gamma Adjusted KM-UCL (use when n<5	0.00364
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00207	Mean in Log Scale	-6.523
SD in Original Scale	0.0021	SD in Log Scale	0.82
95% t UCL (assumes normality of ROS data)	0.00279	95% Percentile Bootstrap UCL	0.00281
95% BCA Bootstrap UCL	0.00309	95% Bootstrap t UCL	0.00335
95% H-UCL (Log ROS)	0.00301		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00334	Mean in Log Scale	-5.818
SD in Original Scale	0.00188	SD in Log Scale	0.47
95% t UCL (Assumes normality)	0.00398	95% H-Stat UCL	0.004
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.00379	95% KM (% Bootstrap) UCL	N/A
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/6/2017 16:40
From File	WSI.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CY8A

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/6/2017 16:41
From File	WSI.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CY10A

General Statistics			
Total Number of Observations	25	Number of Distinct Observations	13
Number of Detects	20	Number of Non-Detects	5
Number of Distinct Detects	11	Number of Distinct Non-Detects	3
Minimum Detect	0.005	Minimum Non-Detect	0.0025
Maximum Detect	0.08	Maximum Non-Detect	0.01
Variance Detects	2.84E-04	Percent Non-Detects	20%
Mean Detects	0.0338	SD Detects	0.0169
Median Detects	0.031	CV Detects	0.499
Skewness Detects	0.58	Kurtosis Detects	2.177
Mean of Logged Detects	-3.561	SD of Logged Detects	0.694

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.908	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.166	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.198	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.0276	Standard Error of Mean	0.00394
SD	0.0192	95% KM (BCA) UCL	0.0346
95% KM (t) UCL	0.0343	95% KM (Percentile Bootstrap) UCL	0.0341
95% KM (z) UCL	0.0341	95% KM Bootstrap t UCL	0.0345
90% KM Chebyshev UCL	0.0394	95% KM Chebyshev UCL	0.0448
97.5% KM Chebyshev UCL	0.0522	99% KM Chebyshev UCL	0.0668

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.284	Anderson-Darling GOF Test	
5% A-D Critical Value	0.747	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.251	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.195	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics on Detected Data Only

k hat (MLE)	3.065	k star (bias corrected MLE)	2.639
Theta hat (MLE)	0.011	Theta star (bias corrected MLE)	0.0128
nu hat (MLE)	122.6	nu star (bias corrected)	105.5
MLE Mean (bias corrected)	0.0338	MLE Sd (bias corrected)	0.0208
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	2.061	nu hat (KM)	103
Approximate Chi Square Value (103.03, α)	80.61	Adjusted Chi Square Value (103.03, β)	79.26
95% Gamma Approximate KM-UCL (use when n>=50)	0.0352	95% Gamma Adjusted KM-UCL (use when n<5	0.0358
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.005	Mean	0.029
Maximum	0.08	Median	0.03
SD	0.0178	CV	0.614
k hat (MLE)	2.351	k star (bias corrected MLE)	2.096
Theta hat (MLE)	0.0123	Theta star (bias corrected MLE)	0.0139
nu hat (MLE)	117.6	nu star (bias corrected)	104.8
MLE Mean (bias corrected)	0.029	MLE Sd (bias corrected)	0.0201
		Adjusted Level of Significance (β)	0.0395
Approximate Chi Square Value (104.78, α)	82.16	Adjusted Chi Square Value (104.78, β)	80.79
95% Gamma Approximate UCL (use when n>=50)	0.037	95% Gamma Adjusted UCL (use when n<50)	0.0376
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.291	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.198	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0285	Mean in Log Scale	-3.828
SD in Original Scale	0.0184	SD in Log Scale	0.829
95% t UCL (assumes normality of ROS data)	0.0348	95% Percentile Bootstrap UCL	0.0348
95% BCA Bootstrap UCL	0.0346	95% Bootstrap t UCL	0.0353
95% H-UCL (Log ROS)	0.0452		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0276	Mean in Log Scale	-4.047
SD in Original Scale	0.0196	SD in Log Scale	1.186
95% t UCL (Assumes normality)	0.0343	95% H-Stat UCL	0.0685
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0343	95% KM (Percentile Bootstrap) UCL	0.0341
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
UCL Statistics for Data Sets with Non-Detects			
User Selected Options			

Date/Time of Computation	9/6/2017 16:42				
From File	WSI.xls				
Full Precision	OFF				
Confidence Coefficient	95%				
Number of Bootstrap Operations	2000				
CY18					
General Statistics					
Total Number of Observations		25	Number of Distinct Observations		4
Number of Detects		1	Number of Non-Detects		24
Number of Distinct Detects		1	Number of Distinct Non-Detects		3
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!					
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).					
The data set for variable CY18 was not processed!					

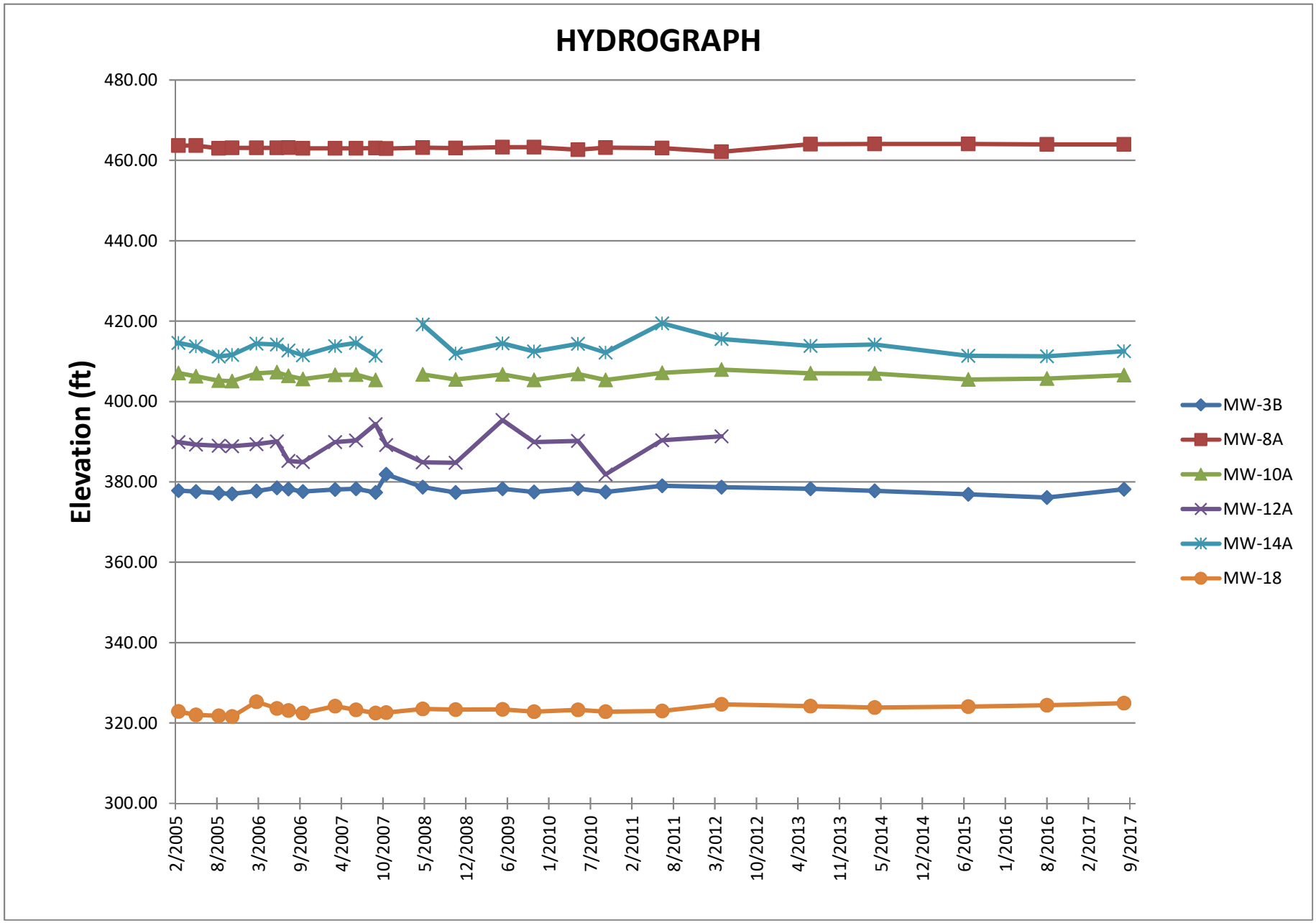
Appendix B7
Calculator Input Table

CALCULATOR INPUT TABLE

Date	Sulfate MW-3B	d_SulfateMW-3B	Sulfate MW-8A	d_Sulfate MW-8A	Sulfate MW-10A	d_Sulfate MW-10A	Sulfate MW-12A	d_Sulfate MW-12A	Sulfate MW-14A	d_Sulfate MW-14A	Sulfate MW-18	d_Sulfate MW-18	Fluoride MW-3B	d_Fluoride MW-3B	Fluoride MW-8A	d_Fluoride MW-8A	Fluoride MW-10A	d_Fluoride MW-10A	Fluoride MW-12A	d_Fluoride MW-12A	Fluoride MW-14A	d_Fluoride MW-14A	Fluoride MW-18	d_Fluoride MW-18	Chloride MW-3B	d_Chloride MW-3B	Chloride MW-8A	d_Chloride MW-8A	Chloride MW-10A	d_Chloride MW-10A	Chloride MW-12A	d_Chloride MW-12A	Chloride MW-14A	d_Chloride MW-14A	Chloride MW-18	d_Chloride MW-18	Cyanide MW-3B	d_Cyanide MW-3B	Cyanide MW-8A	d_Cyanide MW-8A	Cyanide MW-10A	d_Cyanide MW-10A	Cyanide MW-12A	d_Cyanide MW-12A	Cyanide MW-14A	d_Cyanide MW-14A	Cyanide MW-18	d_Cyanide MW-18
2/16/2005	2300	1	10	1	940	1	-	-	4000	1	1500	1	0.6	1	0.9	1	1.8	1	-	-	9.6	1	0.6	1	130	1	5.6	1	29	1	-	-	110	1	86	1	0.005	0	0.005	0	0.04	1	-	-	0.35	1	0.005	0
5/11/2005	2500	1	9.8	1	910	1	-	-	3500	1	1300	1	0.4	1	0.3	1	1.5	1	-	-	8.6	1	0.4	1	140	1	4.6	1	31	1	-	-	90	1	91	1	0.005	0	0.005	0	0.05	1	-	-	0.24	1	0.005	0
8/29/2005	2700	1	8.9	1	670	1	-	-	3600	1	1500	1	0.6	1	0.4	1	1.2	1	-	-	30	1	0.4	1	120	1	4.2	1	28	1	-	-	71	1	75	1	0.005	0	0.005	0	0.04	1	-	-	0.27	1	0.005	0
11/1/2005	2600	1	9.6	1	670	1	-	-	2800	1	1300	1	0.9	1	0.9	1	2.7	1	-	-	25	1	1.8	1	130	1	4.7	1	28	1	-	-	75	1	84	1	0.005	0	0.005	0	0.03	1	-	-	0.19	1	0.005	0
2/27/2006	2610	1	9.27	1	1570	1	-	-	2170	1	1520	1	0.7	1	2.8	1	2.3	1	-	-	31	1	0.9	1	118	1	4.2	1	43	1	-	-	53	1	83	1	0.005	0	0.005	0	0.03	1	-	-	0.19	1	0.005	0
6/5/2006	2220	1	9.8	1	1650	1	-	-	2380	1	1490	1	0.2	1	0.2	1	3.2	1	-	-	27	1	0.2	0	113	1	4.9	1	48	1	-	-	63	1	91	1	0.005	0	0.025	0	0.03	1	-	-	0.2	1	0.005	0
7/31/2006	2000	1	9.8	1	860	1	-	-	3300	1	1500	1	3.7	1	0.1	1	2.3	1	-	-	30	1	2.6	1	110	1	4.6	1	35	1	-	-	98	1	89	1	0.005	0	0.005	0	0.08	1	-	-	0.17	1	0.005	0
10/9/2006	2500	1	9.7	1	850	1	-	-	3900	1	1600	1	3.8	1	0.1	1	1.9	1	-	-	24	1	2.4	1	110	1	4.5	1	30	1	-	-	130	1	80	1	0.005	0	0.005	0	0.03	1	-	-	0.01	1	0.005	0
3/13/2007	2500	1	10	1	1100	1	1800	1	4400	1	1600	1	3.8	1	0.05	1	3.4	1	6.3	1	16	1	2.6	1	110	1	6.6	1	45	1	150	1	140	1	93	1	0.005	0	0.005	0	0.04	1	0.005	0	0.12	1	0.005	0
6/22/2007	2500	1	0.5	0	1100	1	-	-	7900	1	1700	1	5	0	5	0	5	0	-	-	19	1	0.5	0	97	1	4.89	1	36	1	-	-	170	1	77	1	0.005	0	0.005	0	0.005	1	-	-	0.005	0	0.005	0
9/24/2007	2200	1	10	1	760	1	-	-	6400	1	1400	1	0.5	0	0.5	0	1.2	1	-	-	25	0	25	0	125	1	4.2	1	30	1	-	-	200	1	100	1	0.005	0	0.005	0	0.04	1	-	-	0.03	1	0.005	0
11/14/2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.005	0	0.005	0	0.043	1	-	-	0.005	1	0.005	0
5/8/2008	2200	1	10	1	2700	1	-	-	5500	1	1300	1	25	0	0.5	0	25	0	-	-	25	0	25	0	100	1	4	1	100	1	-	-	100	1	70	1	0.005	0	0.005	0	0.05	1	-	-	0.19	1	0.005	0
10/14/2008	2600	1	10	1	860	1	-	-	6500	1	1600	1	5	0	0.1	1	5	0	-	-	20	1	0.5	0	100	1	4.5	1	30	1	-	-	180	1	80	1	0.005	0	0.005	0	0.04	1	-	-	0.12	1	0.005	0
5/29/2009	2200	1	9	1	2000	1	-	-	7000	1	1500	1	0.5	0	0.5	0	2	1	-	-	30	1	1	1	96	1	3	1	68	1	-	-	210	1	81	1	0.01	0	0.01	0	0.03	1	-	-	0.14	1	0.005	0
10/27/2009	2606	1	10	1	760	1	-	-	5900	1	1200	1	0.5	0	0.5	0	0.5	0	-	-	24	1	0.5	0	110	1	5.5	1	79	1	-	-	160	1	70	1	0.01	0	0.01	0	0.01	0	-	-	0.044	1	0.005	0
5/26/2010	2300	1	9.3	1	2200	1	-	-	5200	1	1500	1	2.3	1	0.5	0	4.4	1	-	-	32	1	2	1	120	1	4.4	1	83	1	-	-	170	1	100	1	0.01	0	0.01	0	0.032	1	-	-	0.14	1	0.01	0
10/6/2010	2400	1	8.9	1	710	1	-	-	4000	1	1600	1	0.5	0	0.5	0	1	1	-	-	18	1	0.5	0	110	1	3.6	1	23	1	-	-	120	1	84	1	0.01	0	0.01	0	0.022	1	-	-	0.086	1	0.01	0
7/26/2011	2000	1	7.8	1	1800	1	-	-	3900	1	1600	1	0.5	0	0.5	0	3.3	1	-	-	23	1	0.5	0	98	1	3.6	1	62	1	-	-	130	1	89	1	0.01	0	0.01	0	0.028	1	-	-	0.066	1	0.01	0
4/19/2012	2200	1	10	1	5800	1	-	-	-	-	1700	1	0.16	1	0.18	1	1.9	1	-	-	-	-	0.2	1	90	1	3.8	1	180	1	-	-	-	-	79	1	0.0025	0	0.0025	0	0.007	1	-	-	-	-	0.003	0
6/20/2013	1900	1	9.4	1	4700	1	-	-	2300	1	1500	1	0.16	1	0.16	1	3.1	1	-	-	17	1	0.13	1	91	1	4.8	1	99	1	-	-	66	1	84	1	0.0025	0	0.0025	0	0.008	1	-	-	0.028	1	0.003	0
4/25/2014	2000	1	9.5	1	6100	1	-	-	2100	1	1700	1	0.18	1	0.19	1	2	1	-	-	18	1	0.12	1	91	1	4.9	1	190	1	-	-	61	1	79	1	0.0025	0	0.0025	0	0.0025	0	-	-	0.037	1	0.003	0
7/20/2015	1900	1	9.5	1	1900	1	-	-	1100	1	1300	1	0.14	1	0.16	1	2	1	-	-	6.8	1	0.11	1	80	1	4.2	1	58	1	-	-	47	1	86	1	0.005	0	0.005	0	0.005	0	-	-	0.008	1	0.005	0
8/2/2016	1900	1	9.3	1	3500	1	-	-	1400	1	1700	1	0.12	1	0.13	1	2.1	1	-	-	3.5	1	0.12	1	98	1	4.1	1	82	1	-	-	61	1	79	1	0.005	0	0.005	0	0.005	0	-	-	0.019	1	0.005	0
8/9/2017	1700	1	9.6	1	2900	1	-	-	1700	1	1300	1	0.15	1	0.15	1	3.2	1	-	-	2.5	1	0.11	1	95	1	4.1	1	170	1	-	-	68	1	59	1	0.01	1	0.005	0	0.005	0	-	-	0.017	1	0.086	1

Appendix C

Appendix C1
Hydrograph for WSI Monitoring Wells


HYDROGRAPH
Elevation (ft)
480.00
460.00
440.00
420.00
400.00
380.00
360.00
340.00
320.00
300.00
2/2005
8/2005
3/2006
9/2006
4/2007
10/2007
5/2008
12/2008
6/2009
1/2010
7/2010
2/2011
8/2011
3/2012
10/2012
4/2013
11/2013
5/2014
12/2014
6/2015
1/2016
8/2016
2/2017
9/2017
MW-3B
MW-8A
MW-10A
MW-12A
MW-14A
MW-18

Appendix C2
Summary Groundwater Elevations

GROUNDWATER STATIC WATER LEVEL ELEVATIONS

		Well ID					
		MW-3B	MW-8A	MW-10A	MW-12A	MW-14A	MW-18
Elevation (ft.)	Ground	408	490	425	439	429	346
	PVC	410.97	492.97	427.95	441.38	431.65	348.40
Water Level Elevation from PVC (ft.)	09/08/04	378.1	463.7	406.6	390.2	413.2	NA [a]
	02/16/05	377.8	463.7	407.1	389.9	414.6	322.9
	05/11/05	377.6	463.7	406.3	389.3	413.7	322.0
	08/29/05	377.2	463.0	405.2	389.0	411.2	321.8
	11/01/05	377.0	463.1	405.1	388.9	411.6	321.6
	02/27/06	377.7	463.1	407.0	389.4	414.4	325.3
	06/05/06	378.5	463.1	407.3	390.1	414.2	323.6
	07/31/06	378.2	463.2	406.4	385.2	412.7	323.1
	10/09/06	377.6	463.0	405.6	384.9	411.5	322.5
	03/13/07	378.1	463.0	406.6	389.9	413.8	324.2
	06/22/07	378.3	463.0	406.7	390.3	414.6	323.3
	09/24/07	377.4	463.1	405.4	394.4	411.4	322.5
	11/14/07	381.9	463.0	NA [b]	389.2	NA [b]	322.6
	05/08/08	378.7	463.2	406.8	384.9	419.2	323.5
	10/14/08	377.4	463.1	405.5	384.8	412.0	323.3
	05/28/09	378.3	463.3	406.8	395.4	414.5	323.4
	10/27/09	377.5	463.3	405.4	389.9	412.5	322.8
	05/26/10	378.3	462.7	406.9	390.2	414.4	323.3
	10/06/10	377.5	463.2	405.4	381.9	412.2	322.8
	07/06/11	379.0	463.1	407.2	390.4	419.5	323.0
	04/17/12	378.7	462.1	407.9	391.3	415.5	324.6
	6/20/2013	378.27	464.02	407	dry	413.85	324.18
	4/25/2014	377.8	464.1	407.0	dry	414.2	323.9
	7/20/2015	376.9	464.1	405.5	dry	411.4	324.1
	8/2/2016	376.12	464.00	405.68	390.04	411.25	324.40
	8/9/2017	378.17	463.97	406.55	391.05	412.50	324.96

Notes: [a] Well was not in operation at this time. [b] Field sheets for MW-10A and MW-14A are missing for 5/8/2008.