2020 Annual Groundwater Monitoring Report

Dairyland Power Cooperative
Alma Off-Site Disposal Facility
Phase IV Landfill
Town of Belvidere, Wisconsin

January 2021

Prepared For:

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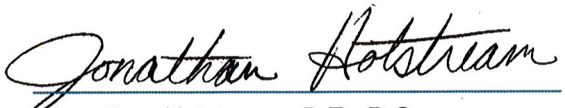

Jonathan Hotstream, P.E., P.G.
Senior Engineer

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Executive Summary

This Annual Report presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the March and September 2020 semiannual groundwater monitoring at the Dairyland Power Cooperative (DPC) Alma Off-site Disposal Facility Phase IV Landfill (Landfill). This groundwater monitoring represents ongoing detection monitoring events performed to comply with §257.94. The detection monitoring data were evaluated to identify statistically significant increases (SSIs) over background levels.

There were no potential SSIs over background limits for the Appendix III parameters during the 2020 monitoring events. Therefore, DPC will continue to conduct detection monitoring, and DPC is not required to take additional actions at this time. The next semiannual monitoring events at the Landfill are scheduled for March and September of 2021.

1.0 Introduction

1.1 Program Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) Subpart D - Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (the CCR Rule). The CCR Rule, which became effective on October 19, 2015, applies to the Dairyland Power Cooperative (DPC) Alma Off-site Disposal Facility Phase IV Landfill (Landfill). Pursuant to the CCR Rule, no later than January 31, 2018, and annually thereafter, the owner or operator of a CCR unit must prepare an annual groundwater monitoring and corrective action report for the CCR unit documenting the status of groundwater monitoring and corrective action for the preceding year in accordance with Title 40 Code of Federal Regulations (40 CFR) §257.90(e).

TRC Environmental Corporation (TRC), prepared this Annual Groundwater Monitoring Report (Annual Report) for the Landfill on behalf of DPC. This Annual Report was prepared in accordance with the requirements of 40 CFR §257.90(e) and presents the monitoring results and the statistical evaluation of the detection monitoring parameters (Appendix III to Part 257 of the CCR Rule) for the 2020 semiannual groundwater monitoring events for the Landfill. The monitoring was performed in accordance with the *Groundwater Monitoring Program for Compliance with the Federal Coal Combustion Rule* (GWMP) (TRC, 2017). As part of the statistical evaluation, the data collected during detection monitoring events are evaluated to identify statistically significant increases (SSIs) of detection monitoring parameters compared to background levels.

1.2 Site Overview

The Landfill is owned and operated by DPC. The Landfill is located in the NE 1/4 of the NE 1/4 of Section 19 and portions of Sections 18 and 20, T21N, R12W, Town of Belvidere, Buffalo County, Wisconsin (Figure 1). The Landfill accepts CCR produced from electricity generation. DPC operates the Landfill in compliance with the Plan of Operation (RMT, 2000) as permitted by the Wisconsin Department of Natural Resources (WDNR, License Number 4126).

1.3 Geology/Hydrogeology

The site is located within the Western Upland physiographic region of South-Central Wisconsin adjacent to the Mississippi River (Figure 1). This area of Wisconsin was not previously glaciated and is known as the “Driftless Area” and is characterized by a significant amount of topographic relief. The facility is situated within a central valley area surrounded by steep slopes.

The thickness of unconsolidated soils beneath the Landfill ranges from approximately 15 to 60 feet. The predominant soil type includes fine- to coarse-grained silty sand, poorly graded sand with gravel, and/or poorly graded gravel with sand. The sandy soils range in thickness from 20 to 60 feet beneath the Landfill, and are interpreted to be the result of fluvial deposition with limited sand deposited by weathering of underlying sandstone bedrock. In some areas beneath the Landfill, silts and clays ranging in thickness from a few feet to 40 feet overlie the sandy soils. The silt and clay soils were associated with loess deposits and, to a lesser degree, isolated lacustrine sediments.

Bedrock in the area is composed of the Prairie du Chien Group dolomite overlying Cambrian sandstone units. However, the Prairie du Chien group is absent beneath the Landfill due to erosion, so the sandy soil is directly underlain by Cambrian sandstone. The Cambrian sandstones were described as fine-grained, fissile, friable, and glauconitic with interbedded lenses of dark brown sandstone and calcareous shaley partings in boreholes performed during the Landfill siting.

The uppermost aquifer beneath the Landfill resides in the sandy soil and the underlying Cambrian sandstone. The saturated thickness of the aquifer ranges from 10 to 20 feet in the sandy soil. The Cambrian sandstone in the region is estimated to be approximately 400 feet in thickness (Young and Borman, 1973). Well drilling logs (WGNHS 2003 and WDNR 2015) in the vicinity of the Landfill present sandstone thicknesses of 338 feet to 435 feet. Precambrian igneous and metamorphic rock underlies the Cambrian sandstone.

Groundwater beneath the Landfill is first observed within the unconsolidated sandy deposits and the sandstone bedrock. A groundwater contour map (Figure 2) shows that groundwater flows toward the central part of the valley occupied by the facility and then south toward the Mississippi River.

Historical and recent groundwater elevation data are comparable and indicate that groundwater flow at the site is consistent with little temporal variation. The approximate horizontal gradient determined for the Feasibility Report was 0.06 ft/ft (RMT, 1997) and is currently estimated at 0.05 ft/ft over the past several years (2013 through 2020). In-situ hydraulic conductivity data presented in the Feasibility Report (RMT, 1997) indicates a geometric mean hydraulic conductivity of 1.4×10^{-3} cm/s for the fluvial sand and gravel unit and 1.1×10^{-3} cm/s for the Cambrian sandstone.

Vertical gradients were also evaluated in the Feasibility Report (RMT, 1997) and indicated that the vertical gradients within the sand and bedrock-to-sand were generally upward (0.02 ft/ft to 0.05 ft/ft) and the vertical gradients within the bedrock were generally downward (0.2 ft/ft to 0.49 ft/ft). By applying the same methods used in the Feasibility Report to recent water level data (2015 through 2020), the vertical gradients within the fluvial sand and gravel unit, from sand to bedrock, and within the bedrock are generally downward, with the exception of a slight upward gradient observed from bedrock to sand at W42/P42A and flat vertical gradient observed at W101/W101A during the 2020 monitoring period. In the Feasibility Report (RMT, 1997), water levels for well pair W102/W102A indicated an upward vertical gradient. Recent monitoring suggests that this gradient has reversed to primarily downward within this area of the fluvial sand and gravel unit. Current observations suggest hydrogeologic conditions have not changed since the preparation of the Feasibility Report except at well pair W102R/W102AR.

2.0 Groundwater Monitoring

2.1 Monitoring Well Network

A groundwater monitoring system has been established for the Landfill, as detailed in the GWMP (TRC, 2017). The detection monitoring well network for the Landfill consists of six water table monitoring wells and one piezometer (denoted with an "A" suffix). Three of the water table wells are upgradient (i.e. "background") wells: one represents groundwater within the fluvial sand and gravel unit (W-102R) and the other two represent groundwater within the sandstone bedrock (W-101 and W-107). The four downgradient monitoring wells are W-100R, W-100AR, W-105, and W-106. The four monitoring well locations are shown on Figure 2. There were no changes to the monitoring well network during 2020.

2.2 Background Sampling

Quarterly background groundwater monitoring was conducted at the Landfill from September 2015 through September 2017 in accordance with the GWMP. Groundwater data included eight background sampling events with field and laboratory analysis of the parameters required in the CCR Rule's Appendix III and Appendix IV to Part 257 from both the upgradient and downgradient wells. Background data was included in the first Annual GW monitoring and corrective active report (TRC, 2018). The background dataset has been expanded to include the semiannual monitoring events from September 2017 to September 2019. Refer to Appendix B for additional detail.

2.3 Semiannual Groundwater Monitoring

The semiannual monitoring parameters for the detection groundwater monitoring program were selected per the CCR Rule's Appendix III to Part 257 – Constituents for Detection Monitoring. The Appendix III indicator parameters consist of boron, calcium, chloride, fluoride, pH (field), sulfate, and total dissolved solids (TDS). These parameters were analyzed in accordance with the groundwater monitoring program described in the GWMP.

2.3.1 Data Summary

The semiannual detection monitoring groundwater sampling events were performed by DPC personnel on March 17-24, 2020 and September 23-24, 2020. Samples were analyzed by DPC's Chemical Services Laboratory and Pace Analytical Services, LLC, in accordance with the GWMP. These laboratories are accredited with the WDNR. Static water elevation data were collected at all seven monitoring well locations during each sampling event. Groundwater samples were collected from each of the detection monitoring wells and analyzed for the Appendix III indicator parameters and field parameters. A summary of the groundwater data collected during the March and September 2020 events are provided in Appendix A, including static groundwater elevation data, analytical results, and field data.

2.3.2 Data Quality Review

Data from each round were evaluated for completeness and potential sample contamination. The data were found to be complete and usable for the purposes of the CCR monitoring program.

2.3.3 Groundwater Flow Rate and Direction

Groundwater elevation data collected during the March and September 2020 sampling events show that groundwater within the uppermost aquifer generally flows to the south at the site. Groundwater potentiometric surface elevations measured across the Landfill during the September 2020 sampling event are provided on Table 2 and were used to construct a groundwater potentiometric surface map (Figure 2).

The map indicates that current groundwater flow is consistent with previous monitoring events. The average hydraulic gradient throughout the Landfill during this event is estimated at 0.05 ft/ft, resulting in an estimated average seepage velocity of approximately 0.9 ft/day or 347 ft/year for this event, using the average hydraulic conductivity of 4 ft/day (TRC, 2017) and an assumed effective porosity of 20 percent.

The general flow rate and direction in the uppermost aquifer is similar to that identified in previous monitoring and continues to demonstrate that the compliance wells are appropriately positioned to detect the presence of Appendix III parameters that could potentially migrate from the Landfill.

3.0 Statistical Evaluation

3.1 Establishing Background Limits

Background limits were established for the Appendix III indicator parameters following the collection of eight background monitoring events and established and described in the Annual Groundwater Monitoring Report (TRC, 2018). The background datasets and tolerance limits were updated for several parameters in 2020. These updates were performed in accordance with the Groundwater Monitoring Program (TRC, 2017) and additional detail on the updates is provided in Appendix B.

3.2 Data Comparison to Background Limits

Concentrations of the indicator parameters in each of the detection monitoring wells (W-100R, W-100AR, W-105, and W-106) were compared to their respective statistical background limits. The comparisons are presented on Table 1 (March 17-24, 2020) and Table 2 (September 23-24, 2020).

The evaluation of the March and September 2020 Appendix III indicator parameters shows that there were no SSIs compared to background for boron, calcium, chloride, fluoride, pH, sulfate, or TDS. Since there were no SSIs in the tested parameters in 2020, the monitoring program has remained in detection monitoring.

4.0 Conclusions and Recommendations

DPC has established a monitoring program at the Landfill in accordance with the CCR Rule and has conducted compliance monitoring for 2020 in accordance with 40 CFR §257.94 of the CCR Rule. There were no potential SSIs over background limits for the Appendix III parameters during the March and September 2020 monitoring events. Therefore, DPC will continue to conduct detection monitoring, and is not required to take additional action(s) at this time.

The next semiannual monitoring events at the Landfill are scheduled for March and September of 2021. Sampling and analytical results will be reported in January 2022.

5.0 References

RMT, Inc. October 2000. Dairyland Power Cooperative Plan of Operation Phase IV Disposal Area Alma Off-site Ash Disposal Facility, Town of Belvidere, Wisconsin. Prepared for Dairyland Power Cooperative.

TRC Environmental Corporation. October 2017. Groundwater Monitoring Program (GWMP) for Compliance with the Federal Coal Combustion Residual Rule – Dairyland Power Cooperative Off-site Disposal Facility Phase IV Landfill, Town of Belvidere, Wisconsin. Prepared for Dairyland Power Cooperative.

TRC Environmental Corporation. January 2018. Annual Groundwater Monitoring Report – Dairyland Power Cooperative Off-site Disposal Facility Phase IV Landfill, Town of Belvidere, Wisconsin. Prepared for Dairyland Power Cooperative.

Wisconsin Department of Natural Resources. 2015. Water Well Data Disc. Database. January 2015.

Wisconsin Geologic and Natural History Survey (WGNHS). 2003. wiscLITH: A Digital Lithologic and Stratigraphic Database of Wisconsin Geology. Database.

Young, H.L. and R.G. Borman. 1973. Water Resources of Wisconsin Trempealeau – Black River Basin. Hydrologic Investigations Atlas HA-474. U.S. Geological Survey. Washington, D.C. Maps. 4p.

Table 1: Comparison of Appendix III Parameter Results to Background Limits - March 17-24, 2020
Dairyland Power Cooperative - Off-site Disposal Facility, Phase IV Landfill
Buffalo County, Wisconsin

	W-100R		W-100AR		W-105		W-106	
Parameter	**Data**	**TL[(1)]**	**Data**	**TL[(1)]**	**Data**	**TL[(1)]**	**Data**	**TL[(1)]**
Boron, total (µg/L)	14.5	52.6	18.4	38.4	<12.0	20	<12.0	20
Calcium, total (µg/L)	77,700	92,200	76,300	89,100	67,700	80,700	69,300	80,700
Chloride, total (mg/L)	4.3	13.2	4.5	13.2	3.7	13.2	7.3	13.2
Fluoride, total (mg/L)	<0.095	0.21	<0.095	0.21	<0.095	0.21	<0.095	0.21
pH, field (SU)	7.26	6.61, 7.48	7.32	6.66, 7.60	7.46	6.80, 7.76	7.56	6.81, 7.91
Sulfate (mg/L)	16.8	32.7	16.7	29.0	14.3	29.0	20.0	29.0
Total Dissolved Solids (TDS) (mg/L)	379	488	398	551	339	448	355	448
Water elevation (Feet MSL)	727.72	--	718.31	--	733.96	--	774.01	--

Footnotes:

(1) TL = tolerance limit for each parameter. Exceeding a tolerance limit would indicate a possible SSI.

Created By: J. Hotstream, 5/11/2020; Updated By: A. Rowley, 12/31/2020

Checked By: S. Edwards, 5/11/2020; P. Popp, 1/11/2021

Table 2: Comparison of Appendix III Parameter Results to Background Limits - September 23-24, 2020
Dairyland Power Cooperative - Off-site Disposal Facility, Phase IV Landfill
Buffalo County, Wisconsin

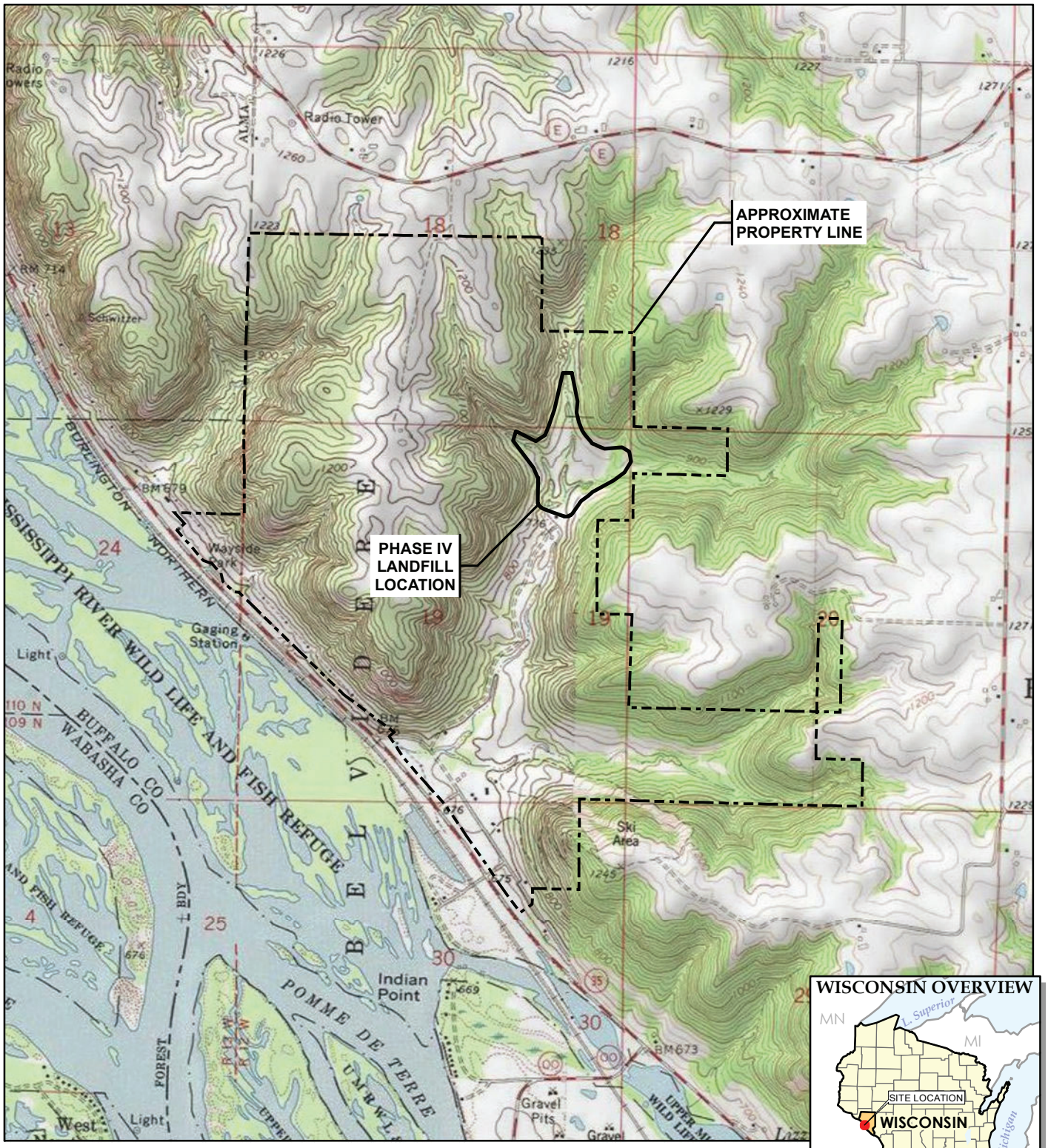
	W-100R		W-100AR		W-105		W-106	
Parameter	**Data**	**TL[(1)]**	**Data**	**TL[(1)]**	**Data**	**TL[(1)]**	**Data**	**TL[(1)]**
Boron, total (µg/L)	15.7	52.6	22.9	38.4	<15	20	<15	20
Calcium, total (µg/L)	72,000	92,200	76,600	89,100	65,900	80,700	71,100	80,700
Chloride, total (mg/L)	4.2	13.2	4.6	13.2	3.8	13.2	8.0	13.2
Fluoride, total (mg/L)	0.10	0.21	<0.095	0.21	<0.095	0.21	0.097	0.21
pH, field (SU)	7.24	6.61, 7.48	7.25	6.66, 7.60	7.39	6.80, 7.76	7.45	6.81, 7.91
Sulfate (mg/L)	16.7	32.7	15.3	29.0	12.7	29.0	19.1	29.0
Total Dissolved Solids (TDS) (mg/L)	365	488	373	551	336	448	367	448
Water elevation (Feet MSL)	727.95	--	718.59	--	734.24	--	774.19	--

Footnotes:

(1) TL = tolerance limit for each parameter. Exceeding a tolerance limit would indicate a possible SSI.

Created By: J. Hotstream, 10/22/2020; Updated By: A. Rowley, 12/31/2020

Checked By: S. Edwards, 11/3/2020; P. Popp, 1/11/2021



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

TRC
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Madison, WI 53717
Phone: 608.826.3600
TRC - GIS

PROJECT:
DAIRYLAND POWER COOPERATIVE
2020 ANNUAL GROUNDWATER MONITORING REPORT
ALMA OFF-SITE PHASE IV LANDFILL
BUFFALO COUNTY, WISCONSIN

TITLE:
SITE LOCATION MAP

DRAWN BY:	R. SUEMNICHT
CHECKED BY:	A. ROWLEY
APPROVED BY:	J. HOTSTREAM
DATE:	JANUARY 2021
PROJ. NO.:	421717
FILE:	421717-001slm.mxd

FIGURE 1

S:\1-PROJECTS\Dairyland_Power_Coop\AlmaWI\2020_421717\421717-001slm.mxd -- Saved By: RSUEMNICHT on 1/20/2021, 09:19:52 AM

EXISTING PHASE II LANDFILL (CLOSED)

EXISTING PHASE IV, CELL 3A AND 3B (ACTIVE)

EXISTING PHASE IV, CELL 2A

EXISTING PHASE IV, CELL 2B

EXISTING PHASE IV, CELL 1

CELL 4A (FUTURE)

CELL 4B (FUTURE)

AREA OF PHASE IV LANDFILL THAT HAS RECEIVED FINAL COVER

W106 (774.19)

P42B P42A W42 (790.72)

W100R (727.95)

W100AR

W105 (734.24)

W104 (775.24)

W104A

W101A

W101 (820.95)

W102AR

W102R (821.62)

W107 (832.91)

SG-2

SG-3

770 760 750 740 730 780 790 800 810 820 830

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- GRID LOCATION
- 890 — EXISTING 10' CONTOUR
- x 895.7 — EXISTING SPOT ELEVATION
- LIMITS OF PERMITTED LANDFILL
- LIMITS OF CCR DISPOSAL (ACTIVE LANDFILL)
- PHASE LINE
- W42 — MONITORING WELL (NOT INCLUDED IN FEDERAL GWMP)
- W42B — PIEZOMETER (NOT INCLUDED IN FEDERAL GWMP)
- W101 — MONITORING WELL LOCATION
- W101A — PIEZOMETER LOCATION
- (787.22) — GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION
- 800 — GROUNDWATER EQUIPOTENTIAL LINE

NOTES

1. THE BASE MAP WAS COMPILED FROM THE CELL 3B LINER CONSTRUCTION DOCUMENTATION REPORT (OCTOBER, 2016) AND THE NOVEMBER 12, 2020 ANNUAL AIR SPACE SURVEY BY EXETER DESIGN, INC.
2. THE HORIZONTAL DATUM IS REFERENCED TO THE WISCONSIN STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM 1983, US SURVEY FEET.
3. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 1988. CONTOUR INTERVAL IS 10 FEET.
4. GROUNDWATER ELEVATIONS BASED ON MEASUREMENTS TAKEN SEPTEMBER 23-24, 2020. GROUNDWATER ELEVATIONS ARE BASED ON MEAN SEA LEVEL DATUM.

0 200 400

SCALE IN FEET

PROJECT: DAIRYLAND POWER COOPERATIVE
2020 ANNUAL GROUNDWATER MONITORING REPORT
ALMA OFF-SITE PHASE IV LANDFILL
BUFFALO COUNTY, WISCONSIN

TITLE: GROUNDWATER ELEVATION MAP

DRAWN BY:	G. ASHWORTH	PROJ NO.:	421717
CHECKED BY:	A. ROWLEY		FIGURE 2
APPROVED BY:	J. HOTSTREAM		
DATE:	JANUARY 2021		

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FILE NO.: 421717.01.dwg

11x17 --- ATTACHED XREFS: WELLS 200, GRID 200, PROPOSED_EQ 2020-11-12 --- ATTACHED IMAGES:
DRAWING NAME: I:\dairyland power\Alma\421717 - 2020 annual groundwater\0000\ 421717.01.dwg --- PLOT DATE: January 20, 2021 - 10:04AM --- LAYOUT: FIGURE 2 GROUNDWATER ELEVATION MAP
Version: 2017-03-03

Appendix A: 2020 Detection Monitoring Data

Dairyland Power Cooperative - Alma Off-Site Groundwater Data
March 2020

		W-100R 3/24/2020 2003-X02	W-100AR 3/24/2020 2003-X01	W-105 3/23/2020 2003-X05	W-106 3/23/2020 2003-X06	W-101 3/23/2020 2003-X04	W-102R 3/24/2020 2003-X03	W-107 3/17/2020 2003-X07
Water elevation	Feet	727.72	718.31	733.96	774.01	820.2	820.88	832.66
Appendix III								
Boron, total	µg/L	14.5	18.4	< 12	< 12	< 12	< 12	< 12
Calcium, total	µg/L	77700	76300	67700	69300	60300	67700	76500
Chloride, total	mg/L	4.3	4.5	3.7	7.3	4.5	3.2	13
Fluoride, total	mg/L	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095
pH, field	SU	7.26	7.32	7.46	7.56	7.65	7.56	7.57
Sulfate	mg/L	16.8	16.7	14.3	20	24.95	14.3	21.6
Total Dissolved Solids (TDS)	mg/L	379	398	339	355	316	324	403

September 2020

		W-100R 9/24/2020 2009-X02	W-100AR 9/24/2020 2009-X01	W-105 9/24/2020 2009-X05	W-106 9/24/2020 2009-X06	W-101 9/23/2020 2009-X04	W-102R 9/23/2020 2009-X03	W-107 9/23/2020 2009-X07
Water elevation	Feet	727.95	718.59	734.24	774.19	820.95	821.62	832.91
Appendix III								
Boron, total	µg/L	15.7	22.9	< 15	< 15	< 15	< 15	< 15
Calcium, total	µg/L	72000	76600	65900	71100	55300	62800	78200
Chloride, total	mg/L	4.2	4.6	3.8	8	3.8	3.3	13.6
Fluoride, total	mg/L	0.1	< 0.095	< 0.095	0.097	< 0.095	0.099	0.11
pH, field	SU	7.24	7.25	7.39	7.45	7.63	7.41	7.41
Sulfate	mg/L	16.7	15.3	12.7	19.1	30.1	14.6	20
Total Dissolved Solids (TDS)	mg/L	365	373	336	367	303	323	409

Appendix B: Federal CCR Rule Groundwater Monitoring Compliance Point Statistics Update

TRC
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Main 608.826.3600

Memorandum

To:	Leif Tolokken – Dairyland Power Cooperative
From:	Jonathan Hotstream, PE, PG – Senior Geological Engineer
Subject:	Dairyland Power Cooperative: Alma Offsite Disposal Facility Phase IV Landfill – Federal CCR Rule Groundwater Monitoring Compliance Point Statistics Update
Date:	January 21, 2021
CC:	Brian Kalvelage, PG – Dairyland Power Cooperative Todd Martin – TRC
Project No.:	421717.0000

Detection groundwater monitoring was initiated at the Alma Offsite Disposal Facility Phase IV Landfill following the Groundwater Monitoring Program (GWMP; TRC, 2017) in September 2017. Seven rounds of groundwater data has been collected during the semi-annual groundwater monitoring events from September of 2017 to September 2019. The GWMP indicates that the background dataset and tolerance limits will be updated as appropriate every 2 to 4 years. Hence, the background dataset was evaluated, and the background datasets and tolerance limits were updated for several parameters for the 2020 statistical evaluation of the groundwater monitoring results.

The tolerance limits for the interwell parameters calcium and sulfate for monitoring wells W-105 and W-106 and the intrawell parameters for pH for monitoring wells W-100R, W-105, and W-106) were updated.

- The results for samples collected from the upgradient monitoring wells for calcium and sulfate suggested change or variability in the upgradient groundwater quality as compared to the original background dataset.
- The results for pH for the wells in the monitoring network generally displayed more variability than was captured in the original background dataset. Less variability was observed for the parameter pH reported for W-100AR, so statistical analysis of the pH tolerance limits for W-100AR was not performed.

The monitoring results for the parameters boron, chloride, and fluoride did not indicate changing conditions, so the statistics for those parameters were not reevaluated.

Table 1 provides the updated tolerance limits for detection monitoring. The statistical analysis for these parameters was performed following the methods in the GWMP and are attached to this memorandum.

List of Attachments

- Table 1
- Attachment A: Updated Statistical Analysis
- Attachment B: Statistical Analysis for Parameters that were not Modified

References

TRC Environmental Corporation. October 2017. Groundwater Monitoring Program (GWMP) for Compliance with the Federal Coal Combustion Residual Rule – Dairyland Power Cooperative Off-site Disposal Facility Phase IV Landfill, Town of Belvidere, Wisconsin. Prepared for Dairyland Power Cooperative.

Table 1: Groundwater Monitoring Program - Federal CCR Rule Sampling
Detection Monitoring - Compliance Well Tolerance Limit Summary
Dairyland Power Cooperative - Off-site Disposal Facility, Phase IV Landfill

Parameter / Well	W-100R	W-100AR	W-105	W-106
Well Type	Water Table	Piezometer	Water Table	Water Table
Units	mg/L	mg/L	mg/L	mg/L
Boron, total	0.0526 (1)	0.0384 (1)	0.02 (2)	0.02 (2)
Calcium, total	92.2 (1)	89.1 (1)	80.7 (2)	80.7 (2)
Chloride, total	13.2 (2)	13.2 (2)	13.2 (2)	13.2 (2)
Fluoride, total	0.21 (2)	0.21 (2)	0.21 (2)	0.21 (2)
pH, field (SU)	6.61,7.48 (1)	6.66, 7.60 (1)	6.80,7.76 (1)	6.81, 7.91 (1)
Sulfate	32.7 (1)	29.0 (2)	29.0 (2)	29.0 (2)
Total Dissolved Solids (TDS)	488 (1)	551 (1)	448 (2)	448 (2)

Footnotes:

(1) Intrawell tolerance limit

(2) Interwell tolerance limit

Created by: A. Sampson 10/26/2017; J. Hotstream 3/16/2020

Checked by: P. Popp 10/26/2017, 3/16/2020

Attachment A

Updated Statistical Analysis

Calcium

Inter-well Background Statistics for 9/2015 – 9/2019
Pooled Results from W-102R, W-101, W-107, W-105, W-106, W-100AR, and W-100R

Concentrations (UG/L)

Parameter: CALCIUM

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 91
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 39
There are 3 background locations

Loc.	Meas.	ND	Date	Conc.	Original
W-102/R	13	0 (0%)	9/23/2015	57400	57400
			12/10/2015	59900	59900
			3/18/2016	61170	61170
			6/16/2016	61710	61710
			9/14/2016	58100	58100
			12/14/2016	62400	62400
			3/23/2017	65200	65200
			6/28/2017	62200	62200
			9/20/2017	63840	63840
			3/21/2018	65200	65200
			9/19/2018	63700	63700
			3/19/2019	62800	62800
			9/18/2019	62550	62550
W-101	13	0 (0%)	9/23/2015	62400	62400
			12/10/2015	69900	69900
			3/17/2016	69940	69940
			6/16/2016	67760	67760
			9/15/2016	64200	64200
			12/14/2016	67800	67800
			3/22/2017	72450	72450
			6/28/2017	67200	67200
			9/20/2017	69110	69110
			3/21/2018	69900	69900
			9/19/2018	69000	69000
			3/19/2019	66200	66200
			9/19/2019	53500	53500
W-107	13	0 (0%)	9/23/2015	61700	61700
			12/11/2015	75300	75300
			3/17/2016	72640	72640
			6/15/2016	72780	72780
			9/14/2016	69400	69400
			12/14/2016	72900	72900
			3/22/2017	76300	76300
			6/27/2017	73800	73800
			9/20/2017	78180	78180
			3/21/2018	76300	76300
			9/19/2018	76700	76700
			3/21/2019	75300	75300
			9/17/2019	76900	76900

There are 4 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

W-105	13	0 (0%)	9/23/2015	60600	60600
			12/9/2015	65200	65200
			3/16/2016	64780	64780
			6/16/2016	64990	64990
			9/14/2016	61400	61400
			12/15/2016	66000	66000
			3/23/2017	70100	70100
			6/28/2017	65900	65900
			9/21/2017	69520	69520
			3/22/2018	68500	68500
			9/20/2018	67600	67600
			3/20/2019	68000	68000
			9/19/2019	69000	69000
W-106	13	0 (0%)	12/28/2015	67700	67700
			3/18/2016	68850	68850
			6/16/2016	66790	66790
			9/14/2016	63800	63800
			12/14/2016	67800	67800
			1/27/2017	70900	70900
			3/23/2017	71800	71800
			6/28/2017	67300	67300
			9/21/2017	70330	70330
			3/22/2018	69900	69900
			9/20/2018	69600	69600
			3/20/2019	68900	68900
			9/19/2019	69900	69900
W-100A/R	13	0 (0%)	9/25/2015	71700	71700
			12/11/2015	73100	73100
			3/17/2016	78770	78770
			6/15/2016	76000	76000
			9/15/2016	72700	72700
			12/15/2016	79600	79600
			3/23/2017	82600	82600
			6/28/2017	78900	78900
			9/21/2017	80950	80950
			3/21/2018	83300	83300
			9/20/2018	79500	79500
			3/19/2019	77900	77900
			9/18/2019	76900	76900
W-100/R	13	0 (0%)	9/25/2015	77100	77100
			12/11/2015	66400	66400
			3/17/2016	73820	73820
			6/15/2016	74830	74830
			9/15/2016	71700	71700
			12/15/2016	77100	77100
			3/23/2017	84000	84000
			6/28/2017	79200	79200
			9/21/2017	78660	78660
			3/21/2018	78100	78100
			9/20/2018	78500	78500
			3/19/2019	73800	73800
			9/18/2019	74000	74000

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original

Shapiro-Wilks Test of Normality

Parameter: CALCIUM

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 19 for 39 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	53500	78180	24680	0.3989	9844.85
2	57400	76900	19500	0.2755	5372.25
3	58100	76700	18600	0.238	4426.8
4	59900	76300	16400	0.2104	3450.56
5	61170	76300	15130	0.188	2844.44
6	61700	75300	13600	0.1689	2297.04
7	61710	75300	13590	0.152	2065.68
8	62200	73800	11600	0.1366	1584.56
9	62400	72900	10500	0.1225	1286.25
10	62400	72780	10380	0.1092	1133.5
11	62550	72640	10090	0.0967	975.703
12	62800	72450	9650	0.0848	818.32
13	63700	69940	6240	0.0733	457.392
14	63840	69900	6060	0.0622	376.932
15	64200	69900	5700	0.0515	293.55
16	65200	69400	4200	0.0409	171.78
17	65200	69110	3910	0.0305	119.255
18	66200	69000	2800	0.0203	56.84
19	67200	67800	600	0.0101	6.06
20	67760	67760	0		
21	67800	67200	-600		
22	69000	66200	-2800		
23	69110	65200	-3910		
24	69400	65200	-4200		
25	69900	64200	-5700		
26	69900	63840	-6060		
27	69940	63700	-6240		
28	72450	62800	-9650		
29	72640	62550	-10090		
30	72780	62400	-10380		
31	72900	62400	-10500		
32	73800	62200	-11600		
33	75300	61710	-13590		
34	75300	61700	-13600		
35	76300	61170	-15130		
36	76300	59900	-16400		
37	76700	58100	-18600		
38	76900	57400	-19500		
39	78180	53500	-24680		

Sum of b values = 37581.8
Sample Standard Deviation = 6212.19
W Statistic = 0.963122

5% Critical value of 0.939 is less than 0.963122
Data is normally distributed at 95% level of significance

1% Critical value of 0.917 is less than 0.963122
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: CALCIUM

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 39
Background mean = 67531.5
Background standard deviation = 6212.19
One-sided normal tolerance factor (K) at 95% confidence = 2.125
Upper tolerance limit = 80732.4

Location	Date	Value	Significant

Parametric Tolerance Interval Analysis

Parameter: CALCIUM

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 39
Background mean = 67531.5
Background standard deviation = 6212.19
One-sided normal tolerance factor (K) at 95% confidence = 2.125
Upper tolerance limit = 80732.4

Location	Date	Value	Significant
W-105	9/23/2015	60600	FALSE
	12/9/2015	65200	FALSE
	3/16/2016	64780	FALSE
	6/16/2016	64990	FALSE
	9/14/2016	61400	FALSE
	12/15/2016	66000	FALSE
	3/23/2017	70100	FALSE
	6/28/2017	65900	FALSE
	9/21/2017	69520	FALSE
	3/22/2018	68500	FALSE
	9/20/2018	67600	FALSE
	3/20/2019	68000	FALSE
	9/19/2019	69000	FALSE
W-106	12/28/2015	67700	FALSE
	3/18/2016	68850	FALSE
	6/16/2016	66790	FALSE
	9/14/2016	63800	FALSE
	12/14/2016	67800	FALSE
	1/27/2017	70900	FALSE
	3/23/2017	71800	FALSE
	6/28/2017	67300	FALSE
	9/21/2017	70330	FALSE
	3/22/2018	69900	FALSE
	9/20/2018	69600	FALSE
	3/20/2019	68900	FALSE
	9/19/2019	69900	FALSE
W-100A/R	9/25/2015	71700	FALSE
	12/11/2015	73100	FALSE
	3/17/2016	78770	FALSE
	6/15/2016	76000	FALSE
	9/15/2016	72700	FALSE
	12/15/2016	79600	FALSE
	3/23/2017	**82600**	**TRUE**
	6/28/2017	78900	FALSE
	9/21/2017	**80950**	**TRUE**
	3/21/2018	**83300**	**TRUE**
	9/20/2018	79500	FALSE
	3/19/2019	77900	FALSE
	9/18/2019	76900	FALSE
W-100/R	9/25/2015	77100	FALSE

12/11/2015	66400	FALSE
3/17/2016	73820	FALSE
6/15/2016	74830	FALSE
9/15/2016	71700	FALSE
12/15/2016	77100	FALSE
3/23/2017	**84000**	**TRUE**
6/28/2017	79200	FALSE
9/21/2017	78660	FALSE
3/21/2018	78100	FALSE
9/20/2018	78500	FALSE
3/19/2019	73800	FALSE
9/18/2019	74000	FALSE

pH

Inter-well Background Statistics for 9/2015 – 9/2019
Pooled Results from W-105, W-100R, and W-106

Concentrations (SU)

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 52
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 52
There are 4 background locations

Loc.	Meas.	ND	Date	Conc.	Original
W-105	13	0 (0%)	9/23/2015	7.4	7.4
			12/9/2015	7.23	7.23
			3/16/2016	7.28	7.28
			6/16/2016	7.37	7.37
			9/14/2016	7.23	7.23
			12/15/2016	7.08	7.08
			3/23/2017	7.29	7.29
			6/28/2017	7.17	7.17
			9/21/2017	7.33	7.33
			3/22/2018	7.55	7.55
			9/20/2018	7.18	7.18
			3/20/2019	6.97	6.97
			9/19/2019	7.52	7.52
W-100/R	13	0 (0%)	9/25/2015	7.09	7.09
			12/11/2015	6.94	6.94
			3/17/2016	7.01	7.01
			6/15/2016	7.13	7.13
			9/15/2016	7.1	7.1
			12/15/2016	6.95	6.95
			3/23/2017	6.89	6.89
			6/28/2017	6.95	6.95
			9/21/2017	7.04	7.04
			3/21/2018	7.31	7.31
			9/20/2018	6.79	6.79
			3/19/2019	7.12	7.12
			9/18/2019	7.28	7.28
W-100A/R	13	0 (0%)	9/25/2015	7.25	7.25
			12/11/2015	7.11	7.11
			3/17/2016	7.22	7.22
			6/15/2016	7.29	7.29
			9/15/2016	7.04	7.04
			12/15/2016	7.11	7.11
			3/23/2017	7.11	7.11
			6/28/2017	6.9	6.9
			9/21/2017	7.01	7.01
			3/21/2018	6.96	6.96
			9/20/2018	7.36	7.36
			3/19/2019	6.85	6.85
			9/18/2019	6.97	6.97
W-106	13	0 (0%)	12/28/2015	7.21	7.21
			3/18/2016	7.43	7.43
			6/16/2016	7.51	7.51

9/14/2016	7.33	7.33
12/14/2016	7.43	7.43
1/27/2017	7.43	7.43
3/23/2017	7.4	7.4
6/28/2017	7.21	7.21
9/21/2017	6.99	6.99
3/22/2018	7.63	7.63
9/20/2018	7.31	7.31
3/20/2019	7.13	7.13
9/19/2019	7.62	7.62

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original

Concentrations (SU)

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 13
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 13
There is 1 background location

Loc.	Meas.	ND	Date	Conc.	Original
W-100/R	13	0 (0%)	9/25/2015	7.09	7.09
			12/11/2015	6.94	6.94
			3/17/2016	7.01	7.01
			6/15/2016	7.13	7.13
			9/15/2016	7.1	7.1
			12/15/2016	6.95	6.95
			3/23/2017	6.89	6.89
			6/28/2017	6.95	6.95
			9/21/2017	7.04	7.04
			3/21/2018	7.31	7.31
			9/20/2018	6.79	6.79
			3/19/2019	7.12	7.12
			9/18/2019	7.28	7.28

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
W-100A/R	13	0 (0%)	9/25/2015	7.25	7.25
			12/11/2015	7.11	7.11
			3/17/2016	7.22	7.22
			6/15/2016	7.29	7.29
			9/15/2016	7.04	7.04
			12/15/2016	7.11	7.11
			3/23/2017	7.11	7.11
			6/28/2017	6.9	6.9
			9/21/2017	7.01	7.01
			3/21/2018	6.96	6.96
			9/20/2018	7.36	7.36
			3/19/2019	6.85	6.85
			9/18/2019	6.97	6.97
W-105	13	0 (0%)	9/23/2015	7.4	7.4
			12/9/2015	7.23	7.23
			3/16/2016	7.28	7.28
			6/16/2016	7.37	7.37
			9/14/2016	7.23	7.23
			12/15/2016	7.08	7.08
			3/23/2017	7.29	7.29
			6/28/2017	7.17	7.17

			9/21/2017	7.33	7.33
			3/22/2018	7.55	7.55
			9/20/2018	7.18	7.18
			3/20/2019	6.97	6.97
			9/19/2019	7.52	7.52
W-106	13	0 (0%)	12/28/2015	7.21	7.21
			3/18/2016	7.43	7.43
			6/16/2016	7.51	7.51
			9/14/2016	7.33	7.33
			12/14/2016	7.43	7.43
			1/27/2017	7.43	7.43
			3/23/2017	7.4	7.4
			6/28/2017	7.21	7.21
			9/21/2017	6.99	6.99
			3/22/2018	7.63	7.63
			9/20/2018	7.31	7.31
			3/20/2019	7.13	7.13
			9/19/2019	7.62	7.62

Dixon's Test for Outliers

Parameter: PH, FIELD

All Locations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 13 Measurements...
5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.428571	0.306122	0.521	None

Loc.	Date	Conc.	Outlier
W-100/R	9/25/2015	7.09	FALSE
	12/11/2015	6.94	FALSE
	3/17/2016	7.01	FALSE
	6/15/2016	7.13	FALSE
	9/15/2016	7.1	FALSE
	12/15/2016	6.95	FALSE
	3/23/2017	6.89	FALSE
	6/28/2017	6.95	FALSE
	9/21/2017	7.04	FALSE
	3/21/2018	7.31	FALSE
	9/20/2018	6.79	FALSE
	3/19/2019	7.12	FALSE
	9/18/2019	7.28	FALSE

Shapiro-Wilks Test of Normality

Parameter: PH, FIELD

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 6 for 13 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	6.79	7.31	0.52	0.5359	0.278668
2	6.89	7.28	0.39	0.3325	0.129675
3	6.94	7.13	0.19	0.2412	0.045828
4	6.95	7.12	0.17	0.1707	0.029019
5	6.95	7.1	0.15	0.1099	0.016485
6	7.01	7.09	0.08	0.0539	0.004312
7	7.04	7.04	0		
8	7.09	7.01	-0.08		
9	7.1	6.95	-0.15		
10	7.12	6.95	-0.17		
11	7.13	6.94	-0.19		
12	7.28	6.89	-0.39		
13	7.31	6.79	-0.52		

Sum of b values = 0.503987
Sample Standard Deviation = 0.14796
W Statistic = 0.966865

5% Critical value of 0.866 is less than 0.966865
Data is normally distributed at 95% level of significance

1% Critical value of 0.814 is less than 0.966865
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (Two-Tailed)

Background observations = 13
Background mean = 7.04615
Background standard deviation = 0.14796
Two-sided normal tolerance factor (K) at 95% confidence = 2.954
Upper tolerance limit = 7.48323
Lower tolerance limit = 6.60908

Location	Date	Value	Significant
W-100/R			

Concentrations (SU)

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 13
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 13
There is 1 background location

Loc.	Meas.	ND	Date	Conc.	Original
W-105	13	0 (0%)	9/23/2015	7.4	7.4
			12/9/2015	7.23	7.23
			3/16/2016	7.28	7.28
			6/16/2016	7.37	7.37
			9/14/2016	7.23	7.23
			12/15/2016	7.08	7.08
			3/23/2017	7.29	7.29
			6/28/2017	7.17	7.17
			9/21/2017	7.33	7.33
			3/22/2018	7.55	7.55
			9/20/2018	7.18	7.18
			3/20/2019	6.97	6.97
			9/19/2019	7.52	7.52

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
W-106	13	0 (0%)	12/28/2015	7.21	7.21
			3/18/2016	7.43	7.43
			6/16/2016	7.51	7.51
			9/14/2016	7.33	7.33
			12/14/2016	7.43	7.43
			1/27/2017	7.43	7.43
			3/23/2017	7.4	7.4
			6/28/2017	7.21	7.21
			9/21/2017	6.99	6.99
			3/22/2018	7.63	7.63
			9/20/2018	7.31	7.31
			3/20/2019	7.13	7.13
			9/19/2019	7.62	7.62
W-100/R	13	0 (0%)	9/25/2015	7.09	7.09
			12/11/2015	6.94	6.94
			3/17/2016	7.01	7.01
			6/15/2016	7.13	7.13
			9/15/2016	7.1	7.1
			12/15/2016	6.95	6.95
			3/23/2017	6.89	6.89
			6/28/2017	6.95	6.95

			9/21/2017	7.04	7.04
			3/21/2018	7.31	7.31
			9/20/2018	6.79	6.79
			3/19/2019	7.12	7.12
			9/18/2019	7.28	7.28
W-100A/R	13	0 (0%)	9/25/2015	7.25	7.25
			12/11/2015	7.11	7.11
			3/17/2016	7.22	7.22
			6/15/2016	7.29	7.29
			9/15/2016	7.04	7.04
			12/15/2016	7.11	7.11
			3/23/2017	7.11	7.11
			6/28/2017	6.9	6.9
			9/21/2017	7.01	7.01
			3/21/2018	6.96	6.96
			9/20/2018	7.36	7.36
			3/19/2019	6.85	6.85
			9/18/2019	6.97	6.97

Dixon's Test for Outliers

Parameter: PH, FIELD

All Locations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 13 Measurements...
5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.319149	0.363636	0.521	None

Loc.	Date	Conc.	Outlier
W-105	9/23/2015	7.4	FALSE
	12/9/2015	7.23	FALSE
	3/16/2016	7.28	FALSE
	6/16/2016	7.37	FALSE
	9/14/2016	7.23	FALSE
	12/15/2016	7.08	FALSE
	3/23/2017	7.29	FALSE
	6/28/2017	7.17	FALSE
	9/21/2017	7.33	FALSE
	3/22/2018	7.55	FALSE
	9/20/2018	7.18	FALSE
	3/20/2019	6.97	FALSE
	9/19/2019	7.52	FALSE

Shapiro-Wilks Test of Normality

Parameter: PH, FIELD

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 6 for 13 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	6.97	7.55	0.58	0.5359	0.310822
2	7.08	7.52	0.44	0.3325	0.1463
3	7.17	7.4	0.23	0.2412	0.055476
4	7.18	7.37	0.19	0.1707	0.032433
5	7.23	7.33	0.1	0.1099	0.01099
6	7.23	7.29	0.06	0.0539	0.003234
7	7.28	7.28	0		
8	7.29	7.23	-0.06		
9	7.33	7.23	-0.1		
10	7.37	7.18	-0.19		
11	7.4	7.17	-0.23		
12	7.52	7.08	-0.44		
13	7.55	6.97	-0.58		

Sum of b values = 0.559255
Sample Standard Deviation = 0.162961
W Statistic = 0.981452

5% Critical value of 0.866 is less than 0.981452
Data is normally distributed at 95% level of significance

1% Critical value of 0.814 is less than 0.981452
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (Two-Tailed)

Background observations = 13
Background mean = 7.27692
Background standard deviation = 0.162961
Two-sided normal tolerance factor (K) at 95% confidence = 2.954
Upper tolerance limit = 7.75831
Lower tolerance limit = 6.79554

Location	Date	Value	Significant
W-105			

Concentrations (SU)

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 13
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 13
There is 1 background location

Loc.	Meas.	ND	Date	Conc.	Original
W-106	13	0 (0%)	12/28/2015	7.21	7.21
			3/18/2016	7.43	7.43
			6/16/2016	7.51	7.51
			9/14/2016	7.33	7.33
			12/14/2016	7.43	7.43
			1/27/2017	7.43	7.43
			3/23/2017	7.4	7.4
			6/28/2017	7.21	7.21
			9/21/2017	6.99	6.99
			3/22/2018	7.63	7.63
			9/20/2018	7.31	7.31
			3/20/2019	7.13	7.13
			9/19/2019	7.62	7.62

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
W-100/R	13	0 (0%)	9/25/2015	7.09	7.09
			12/11/2015	6.94	6.94
			3/17/2016	7.01	7.01
			6/15/2016	7.13	7.13
			9/15/2016	7.1	7.1
			12/15/2016	6.95	6.95
			3/23/2017	6.89	6.89
			6/28/2017	6.95	6.95
			9/21/2017	7.04	7.04
			3/21/2018	7.31	7.31
			9/20/2018	6.79	6.79
			3/19/2019	7.12	7.12
			9/18/2019	7.28	7.28
W-100A/R	13	0 (0%)	9/25/2015	7.25	7.25
			12/11/2015	7.11	7.11
			3/17/2016	7.22	7.22
			6/15/2016	7.29	7.29
			9/15/2016	7.04	7.04
			12/15/2016	7.11	7.11
			3/23/2017	7.11	7.11
			6/28/2017	6.9	6.9

			9/21/2017	7.01	7.01
			3/21/2018	6.96	6.96
			9/20/2018	7.36	7.36
			3/19/2019	6.85	6.85
			9/18/2019	6.97	6.97
W-105	13	0 (0%)	9/23/2015	7.4	7.4
			12/9/2015	7.23	7.23
			3/16/2016	7.28	7.28
			6/16/2016	7.37	7.37
			9/14/2016	7.23	7.23
			12/15/2016	7.08	7.08
			3/23/2017	7.29	7.29
			6/28/2017	7.17	7.17
			9/21/2017	7.33	7.33
			3/22/2018	7.55	7.55
			9/20/2018	7.18	7.18
			3/20/2019	6.97	6.97
			9/19/2019	7.52	7.52

Dixon's Test for Outliers

Parameter: PH, FIELD

All Locations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 13 Measurements...
5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.24	0.349206	0.521	None

Loc.	Date	Conc.	Outlier
W-106	12/28/2015	7.21	FALSE
	3/18/2016	7.43	FALSE
	6/16/2016	7.51	FALSE
	9/14/2016	7.33	FALSE
	12/14/2016	7.43	FALSE
	1/27/2017	7.43	FALSE
	3/23/2017	7.4	FALSE
	6/28/2017	7.21	FALSE
	9/21/2017	6.99	FALSE
	3/22/2018	7.63	FALSE
	9/20/2018	7.31	FALSE
	3/20/2019	7.13	FALSE
	9/19/2019	7.62	FALSE

Shapiro-Wilks Test of Normality

Parameter: PH, FIELD

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 6 for 13 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	6.99	7.63	0.64	0.5359	0.342976
2	7.13	7.62	0.49	0.3325	0.162925
3	7.21	7.51	0.3	0.2412	0.07236
4	7.21	7.43	0.22	0.1707	0.037554
5	7.31	7.43	0.12	0.1099	0.013188
6	7.33	7.43	0.1	0.0539	0.00539
7	7.4	7.4	0		
8	7.43	7.33	-0.1		
9	7.43	7.31	-0.12		
10	7.43	7.21	-0.22		
11	7.51	7.21	-0.3		
12	7.62	7.13	-0.49		
13	7.63	6.99	-0.64		

Sum of b values = 0.634393
Sample Standard Deviation = 0.186482
W Statistic = 0.964407

5% Critical value of 0.866 is less than 0.964407
Data is normally distributed at 95% level of significance

1% Critical value of 0.814 is less than 0.964407
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (Two-Tailed)

Background observations = 13
Background mean = 7.35615
Background standard deviation = 0.186482
Two-sided normal tolerance factor (K) at 95% confidence = 2.954
Upper tolerance limit = 7.90702
Lower tolerance limit = 6.80529

Location	Date	Value	Significant
W-106			

Sulfate

Inter-well Background Statistics for 9/2015 – 9/2019
Pooled Results from W-101, W-107, W-102R, W-106, 100AR, W-105, and 100R

Concentrations (MG/L)

Parameter: SULFATE

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 39
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 39
There are 3 background locations

Loc.	Meas.	ND	Date	Conc.	Original
W-101	13	0 (0%)	9/23/2015	13.7	13.7
			12/10/2015	15	15
			3/17/2016	15.6	15.6
			6/16/2016	15.7	15.7
			9/15/2016	17.7	17.7
			12/14/2016	15.4	15.4
			3/22/2017	16.33	16.33
			6/28/2017	17.6	17.6
			9/20/2017	18.6	18.6
			3/21/2018	16.2	16.2
			9/19/2018	16.7	16.7
			3/19/2019	19.4	19.4
			9/19/2019	29	29
W-107	13	0 (0%)	9/23/2015	16.9	16.9
			12/11/2015	20.6	20.6
			3/17/2016	19.5	19.5
			6/15/2016	18.7	18.7
			9/14/2016	19	19
			12/14/2016	17.9	17.9
			3/22/2017	18.93	18.93
			6/27/2017	17.3	17.3
			9/20/2017	18	18
			3/21/2018	18.5	18.5
			9/19/2018	18.3	18.3
			3/21/2019	18.3	18.3
			9/17/2019	18.3	18.3
W-102/R	13	0 (0%)	9/23/2015	14.5	14.5
			12/10/2015	15.3	15.3
			3/18/2016	13.6	13.6
			6/16/2016	13.8	13.8
			9/14/2016	15.5	15.5
			12/14/2016	14.4	14.4
			3/23/2017	14.78	14.78
			6/28/2017	13.7	13.7
			9/20/2017	15	15
			3/21/2018	15.5	15.5
			9/19/2018	15	15
			3/19/2019	16.3	16.3
			9/18/2019	13.6	13.6

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 4 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
W-106	13	0 (0%)	12/28/2015	17.3	17.3
			3/18/2016	18	18
			6/16/2016	17.6	17.6
			9/14/2016	16.8	16.8
			12/14/2016	16.9	16.9
			1/27/2017	18.5	18.5
			3/23/2017	17.37	17.37
			6/28/2017	16.3	16.3
			9/21/2017	17.4	17.4
			3/22/2018	16.7	16.7
			9/20/2018	18.2	18.2
			3/20/2019	19.1	19.1
			9/19/2019	17.8	17.8
W-100A/R	13	0 (0%)	9/25/2015	15	15
			12/11/2015	14.4	14.4
			3/17/2016	16.6	16.6
			6/15/2016	16.5	16.5
			9/15/2016	17.5	17.5
			12/15/2016	17.5	17.5
			3/23/2017	18.45	18.45
			6/28/2017	16.5	16.5
			9/21/2017	17.5	17.5
			3/21/2018	17.2	17.2
			9/20/2018	17.9	17.9
			3/19/2019	15.7	15.7
			9/18/2019	14	14
W-105	13	0 (0%)	9/23/2015	11.5	11.5
			12/9/2015	13.5	13.5
			3/16/2016	13.5	13.5
			6/16/2016	12	12
			9/14/2016	13.9	13.9
			12/15/2016	11.9	11.9
			3/23/2017	13.44	13.44
			6/28/2017	13.8	13.8
			9/21/2017	13	13
			3/22/2018	13.8	13.8
			9/20/2018	15.1	15.1
			3/20/2019	13.4	13.4
			9/19/2019	13.2	13.2
W-100/R	13	0 (0%)	9/25/2015	32.7	32.7
			12/11/2015	14.1	14.1
			3/17/2016	14.8	14.8
			6/15/2016	14.3	14.3
			9/15/2016	16.4	16.4
			12/15/2016	18.3	18.3
			3/23/2017	20.63	20.63
			6/28/2017	16.6	16.6
			9/21/2017	16.6	16.6
			3/21/2018	14.8	14.8

9/20/2018	17.6	17.6
3/19/2019	15.9	15.9
9/18/2019	14.9	14.9

Shapiro-Wilks Test of Normality

Parameter: SULFATE

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 19 for 39 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	13.6	29	15.4	0.3989	6.14306
2	13.6	20.6	7	0.2755	1.9285
3	13.7	19.5	5.8	0.238	1.3804
4	13.7	19.4	5.7	0.2104	1.19928
5	13.8	19	5.2	0.188	0.9776
6	14.4	18.93	4.53	0.1689	0.765117
7	14.5	18.7	4.2	0.152	0.6384
8	14.78	18.6	3.82	0.1366	0.521812
9	15	18.5	3.5	0.1225	0.42875
10	15	18.3	3.3	0.1092	0.36036
11	15	18.3	3.3	0.0967	0.31911
12	15.3	18.3	3	0.0848	0.2544
13	15.4	18	2.6	0.0733	0.19058
14	15.5	17.9	2.4	0.0622	0.14928
15	15.5	17.7	2.2	0.0515	0.1133
16	15.6	17.6	2	0.0409	0.0818
17	15.7	17.3	1.6	0.0305	0.0488
18	16.2	16.9	0.7	0.0203	0.01421
19	16.3	16.7	0.4	0.0101	0.00404
20	16.33	16.33	0		
21	16.7	16.3	-0.4		
22	16.9	16.2	-0.7		
23	17.3	15.7	-1.6		
24	17.6	15.6	-2		
25	17.7	15.5	-2.2		
26	17.9	15.5	-2.4		
27	18	15.4	-2.6		
28	18.3	15.3	-3		
29	18.3	15	-3.3		
30	18.3	15	-3.3		
31	18.5	15	-3.5		
32	18.6	14.78	-3.82		
33	18.7	14.5	-4.2		
34	18.93	14.4	-4.53		
35	19	13.8	-5.2		
36	19.4	13.7	-5.7		
37	19.5	13.7	-5.8		
38	20.6	13.6	-7		
39	29	13.6	-15.4		

Sum of b values = 15.5188
Sample Standard Deviation = 2.77188
W Statistic = 0.824865

5% Critical value of 0.939 exceeds 0.824865
Evidence of non-normality at 95% level of significance

1% Critical value of 0.917 exceeds 0.824865
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: SULFATE

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

Non-Detects Replaced with Detection Limit

K = 19 for 39 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	2.61007	3.3673	0.757226	0.3989	0.302057
2	2.61007	3.02529	0.415221	0.2755	0.114393
3	2.6174	2.97041	0.353019	0.238	0.0840184
4	2.6174	2.96527	0.347877	0.2104	0.0731934
5	2.62467	2.94444	0.31977	0.188	0.0601168
6	2.66723	2.94075	0.27352	0.1689	0.0461975
7	2.67415	2.92852	0.254375	0.152	0.038665
8	2.69327	2.92316	0.229887	0.1366	0.0314025
9	2.70805	2.91777	0.209721	0.1225	0.0256908
10	2.70805	2.9069	0.198851	0.1092	0.0217145
11	2.70805	2.9069	0.198851	0.0967	0.0192289
12	2.72785	2.9069	0.179048	0.0848	0.0151833
13	2.73437	2.89037	0.156004	0.0733	0.0114351
14	2.74084	2.8848	0.143961	0.0622	0.00895435
15	2.74084	2.87356	0.132725	0.0515	0.00683532
16	2.74727	2.8679	0.120628	0.0409	0.00493368
17	2.75366	2.85071	0.0970458	0.0305	0.0029599
18	2.78501	2.82731	0.0423024	0.0203	0.000858738
19	2.79117	2.81541	0.0242436	0.0101	0.00024486
20	2.793	2.793	0		
21	2.81541	2.79117	-0.0242436		
22	2.82731	2.78501	-0.0423024		
23	2.85071	2.75366	-0.0970458		
24	2.8679	2.74727	-0.120628		
25	2.87356	2.74084	-0.132725		
26	2.8848	2.74084	-0.143961		
27	2.89037	2.73437	-0.156004		
28	2.9069	2.72785	-0.179048		
29	2.9069	2.70805	-0.198851		
30	2.9069	2.70805	-0.198851		
31	2.91777	2.70805	-0.209721		
32	2.92316	2.69327	-0.229887		
33	2.92852	2.67415	-0.254375		
34	2.94075	2.66723	-0.27352		
35	2.94444	2.62467	-0.31977		
36	2.96527	2.6174	-0.347877		
37	2.97041	2.6174	-0.353019		
38	3.02529	2.61007	-0.415221		
39	3.3673	2.61007	-0.757226		

Sum of b values = 0.868084
Sample Standard Deviation = 0.147947
W Statistic = 0.905997

5% Critical value of 0.939 exceeds 0.905997
Evidence of non-normality at 95% level of significance

1% Critical value of 0.917 exceeds 0.905997
Evidence of non-normality at 99% level of significance

Non-Parametric Tolerance Interval

Parameter: SULFATE

Natural Logarithm Transformation

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Background measurements (n) = 39
Maximum Background Concentration = 3.3673
Minimum Coverage = 92.6%
Average Coverage = 97.5%

Location	Date	Value	Significant

Non-Parametric Tolerance Interval

Parameter: SULFATE

Natural Logarithm Transformation

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Background measurements (n) = 39
Maximum Background Concentration = 3.3673
Minimum Coverage = 92.6%
Average Coverage = 97.5%

Location	Date	Value	Significant
W-106	12/28/2015	2.85071	FALSE
W-106	3/18/2016	2.89037	FALSE
W-106	6/16/2016	2.8679	FALSE
W-106	9/14/2016	2.82138	FALSE
W-106	12/14/2016	2.82731	FALSE
W-106	1/27/2017	2.91777	FALSE
W-106	3/23/2017	2.85474	FALSE
W-106	6/28/2017	2.79117	FALSE
W-106	9/21/2017	2.85647	FALSE
W-106	3/22/2018	2.81541	FALSE
W-106	9/20/2018	2.90142	FALSE
W-106	3/20/2019	2.94969	FALSE
W-106	9/19/2019	2.8792	FALSE
W-100A/R	9/25/2015	2.70805	FALSE
W-100A/R	12/11/2015	2.66723	FALSE
W-100A/R	3/17/2016	2.8094	FALSE
W-100A/R	6/15/2016	2.80336	FALSE
W-100A/R	9/15/2016	2.8622	FALSE
W-100A/R	12/15/2016	2.8622	FALSE
W-100A/R	3/23/2017	2.91506	FALSE
W-100A/R	6/28/2017	2.80336	FALSE
W-100A/R	9/21/2017	2.8622	FALSE
W-100A/R	3/21/2018	2.84491	FALSE
W-100A/R	9/20/2018	2.8848	FALSE
W-100A/R	3/19/2019	2.75366	FALSE
W-100A/R	9/18/2019	2.63906	FALSE
W-105	9/23/2015	2.44235	FALSE
W-105	12/9/2015	2.60269	FALSE
W-105	3/16/2016	2.60269	FALSE
W-105	6/16/2016	2.48491	FALSE
W-105	9/14/2016	2.63189	FALSE
W-105	12/15/2016	2.47654	FALSE
W-105	3/23/2017	2.59824	FALSE
W-105	6/28/2017	2.62467	FALSE
W-105	9/21/2017	2.56495	FALSE
W-105	3/22/2018	2.62467	FALSE
W-105	9/20/2018	2.71469	FALSE
W-105	3/20/2019	2.59525	FALSE
W-105	9/19/2019	2.58022	FALSE

W-100/R	**9/25/2015**	**3.48738**	**TRUE**
W-100/R	12/11/2015	2.64617	FALSE
W-100/R	3/17/2016	2.69463	FALSE
W-100/R	6/15/2016	2.66026	FALSE
W-100/R	9/15/2016	2.79728	FALSE
W-100/R	12/15/2016	2.9069	FALSE
W-100/R	3/23/2017	3.02675	FALSE
W-100/R	6/28/2017	2.8094	FALSE
W-100/R	9/21/2017	2.8094	FALSE
W-100/R	3/21/2018	2.69463	FALSE
W-100/R	9/20/2018	2.8679	FALSE
W-100/R	3/19/2019	2.76632	FALSE
W-100/R	9/18/2019	2.70136	FALSE

Non-Parametric Tolerance Interval

Parameter: SULFATE

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Background measurements (n) = 39
Maximum Background Concentration = 29
Minimum Coverage = 92.6%
Average Coverage = 97.5%

Location	Date	Value	Significant

Non-Parametric Tolerance Interval

Parameter: SULFATE

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Background measurements (n) = 39
Maximum Background Concentration = 29
Minimum Coverage = 92.6%
Average Coverage = 97.5%

Location	Date	Value	Significant
W-106	12/28/2015	17.3	FALSE
W-106	3/18/2016	18	FALSE
W-106	6/16/2016	17.6	FALSE
W-106	9/14/2016	16.8	FALSE
W-106	12/14/2016	16.9	FALSE
W-106	1/27/2017	18.5	FALSE
W-106	3/23/2017	17.37	FALSE
W-106	6/28/2017	16.3	FALSE
W-106	9/21/2017	17.4	FALSE
W-106	3/22/2018	16.7	FALSE
W-106	9/20/2018	18.2	FALSE
W-106	3/20/2019	19.1	FALSE
W-106	9/19/2019	17.8	FALSE
W-100A/R	9/25/2015	15	FALSE
W-100A/R	12/11/2015	14.4	FALSE
W-100A/R	3/17/2016	16.6	FALSE
W-100A/R	6/15/2016	16.5	FALSE
W-100A/R	9/15/2016	17.5	FALSE
W-100A/R	12/15/2016	17.5	FALSE
W-100A/R	3/23/2017	18.45	FALSE
W-100A/R	6/28/2017	16.5	FALSE
W-100A/R	9/21/2017	17.5	FALSE
W-100A/R	3/21/2018	17.2	FALSE
W-100A/R	9/20/2018	17.9	FALSE
W-100A/R	3/19/2019	15.7	FALSE
W-100A/R	9/18/2019	14	FALSE
W-105	9/23/2015	11.5	FALSE
W-105	12/9/2015	13.5	FALSE
W-105	3/16/2016	13.5	FALSE
W-105	6/16/2016	12	FALSE
W-105	9/14/2016	13.9	FALSE
W-105	12/15/2016	11.9	FALSE
W-105	3/23/2017	13.44	FALSE
W-105	6/28/2017	13.8	FALSE
W-105	9/21/2017	13	FALSE
W-105	3/22/2018	13.8	FALSE
W-105	9/20/2018	15.1	FALSE
W-105	3/20/2019	13.4	FALSE
W-105	9/19/2019	13.2	FALSE

W-100/R	**9/25/2015**	**32.7**	**TRUE**
W-100/R	12/11/2015	14.1	FALSE
W-100/R	3/17/2016	14.8	FALSE
W-100/R	6/15/2016	14.3	FALSE
W-100/R	9/15/2016	16.4	FALSE
W-100/R	12/15/2016	18.3	FALSE
W-100/R	3/23/2017	20.63	FALSE
W-100/R	6/28/2017	16.6	FALSE
W-100/R	9/21/2017	16.6	FALSE
W-100/R	3/21/2018	14.8	FALSE
W-100/R	9/20/2018	17.6	FALSE
W-100/R	3/19/2019	15.9	FALSE
W-100/R	9/18/2019	14.9	FALSE

Attachment B

Statistical Analysis for Parameters that were not Modified

ChemStat™ Shapiro-Wilks Test of Normality and Tolerance Limit Outputs

W-100AR, Intra-well Background Statistics for 9/2015 – 6/2017

Shapiro-Wilks Test of Normality

Parameter: BORON

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	13.5	25.7	12.2	0.6052	7.38344
2	16.2	25.6	9.4	0.3164	2.97416
3	20	24.5	4.5	0.1743	0.78435
4	20	23.7	3.7	0.0561	0.20757
5	23.7	20	-3.7		
6	24.5	20	-4.5		
7	25.6	16.2	-9.4		
8	25.7	13.5	-12.2		

Sum of b values = 11.3495
Sample Standard Deviation = 4.534
W Statistic = 0.895147

5% Critical value of 0.818 is less than 0.895147
Data is normally distributed at 95% level of significance

1% Critical value of 0.749 is less than 0.895147
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: BORON

Original Data (Not Transformed)

Cohen's Adjustment

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 8
Background mean = 21.5333
Background standard deviation = 5.29855
One-sided normal tolerance factor (K) at 95% confidence = 3.188
Upper tolerance limit = 38.4251

Location	Date	Value	Significant

Shapiro-Wilks Test of Normality

Parameter: CALCIUM

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	71700	82600	10900	0.6052	6596.68
2	72700	79600	6900	0.3164	2183.16
3	73100	78900	5800	0.1743	1010.94
4	76000	78770	2770	0.0561	155.397
5	78770	76000	-2770		
6	78900	73100	-5800		
7	79600	72700	-6900		
8	82600	71700	-10900		

Sum of b values = 9946.18
Sample Standard Deviation = 3905.83
W Statistic = 0.926379

5% Critical value of 0.818 is less than 0.926379
Data is normally distributed at 95% level of significance

1% Critical value of 0.749 is less than 0.926379
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: CALCIUM

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 8
Background mean = 76671.3
Background standard deviation = 3905.83
One-sided normal tolerance factor (K) at 95% confidence = 3.188
Upper tolerance limit = 89123

Location	Date	Value	Significant

Concentrations (SU)

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 8
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 8
There is 1 background location

Loc.	Meas.	ND	Date	Conc.	Original
W-100A/R	8	0 (0%)	9/25/2015	7.25	7.25
			12/11/2015	7.11	7.11
			3/17/2016	7.22	7.22
			6/15/2016	7.29	7.29
			9/15/2016	7.04	7.04
			12/15/2016	7.11	7.11
			3/23/2017	7.11	7.11
			6/28/2017	6.9	6.9

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 3 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
W-106	9	0 (0%)	9/24/2015	7.7	7.7
			12/28/2015	7.21	7.21
			3/18/2016	7.43	7.43
			6/16/2016	7.51	7.51
			9/14/2016	7.33	7.33
			12/14/2016	7.43	7.43
			1/27/2017	7.43	7.43
			3/23/2017	7.4	7.4
			6/28/2017	7.21	7.21
W-105	8	0 (0%)	9/23/2015	7.4	7.4
			12/9/2015	7.23	7.23
			3/16/2016	7.28	7.28
			6/16/2016	7.37	7.37
			9/14/2016	7.23	7.23
			12/15/2016	7.08	7.08
			3/23/2017	7.29	7.29
			6/28/2017	7.17	7.17
W-100/R	8	0 (0%)	9/25/2015	7.09	7.09
			12/11/2015	6.94	6.94
			3/17/2016	7.01	7.01
			6/15/2016	7.13	7.13
			9/15/2016	7.1	7.1
			12/15/2016	6.95	6.95
			3/23/2017	6.89	6.89
			6/28/2017	6.95	6.95

Shapiro-Wilks Test of Normality

Parameter: PH, FIELD

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	6.9	7.29	0.39	0.6052	0.236028
2	7.04	7.25	0.21	0.3164	0.066444
3	7.11	7.22	0.11	0.1743	0.019173
4	7.11	7.11	0	0.0561	0
5	7.11	7.11	0		
6	7.22	7.11	-0.11		
7	7.25	7.04	-0.21		
8	7.29	6.9	-0.39		

Sum of b values = 0.321645
Sample Standard Deviation = 0.12552
W Statistic = 0.938053

5% Critical value of 0.818 is less than 0.938053
Data is normally distributed at 95% level of significance

1% Critical value of 0.749 is less than 0.938053
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: PH, FIELD

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (Two-Tailed)

Background observations = 8
Background mean = 7.12875
Background standard deviation = 0.12552
Two-sided normal tolerance factor (K) at 95% confidence = 3.732
Upper tolerance limit = 7.59719
Lower tolerance limit = 6.66031

Location	Date	Value	Significant

Shapiro-Wilks Test of Normality

Parameter: SOLIDS, TOTAL DISSOLVED

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	268	454	186	0.6052	112.567
2	358	415	57	0.3164	18.0348
3	373	403	30	0.1743	5.229
4	378	385	7	0.0561	0.3927
5	385	378	-7		
6	403	373	-30		
7	415	358	-57		
8	454	268	-186		

Sum of b values = 136.224
Sample Standard Deviation = 53.8934
W Statistic = 0.912717

5% Critical value of 0.818 is less than 0.912717
Data is normally distributed at 95% level of significance

1% Critical value of 0.749 is less than 0.912717
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: SOLIDS, TOTAL DISSOLVED

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 8
Background mean = 379.25
Background standard deviation = 53.8934
One-sided normal tolerance factor (K) at 95% confidence = 3.188
Upper tolerance limit = 551.062

Location	Date	Value	Significant

W-100R, Intra-well Background Statistics for 9/2015 – 6/2017

Shapiro-Wilks Test of Normality

Parameter: BORON

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	18.3	52.6	34.3	0.6052	20.7584
2	18.9	28.1	9.2	0.3164	2.91088
3	20	25.8	5.8	0.1743	1.01094
4	20	23.5	3.5	0.0561	0.19635
5	23.5	20	-3.5		
6	25.8	20	-5.8		
7	28.1	18.9	-9.2		
8	52.6	18.3	-34.3		

Sum of b values = 24.8765
Sample Standard Deviation = 11.3382
W Statistic = 0.687694

5% Critical value of 0.818 exceeds 0.687694
Evidence of non-normality at 95% level of significance

1% Critical value of 0.749 exceeds 0.687694
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: BORON

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

Non-Detects Replaced with Detection Limit

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	2.9069	3.96272	1.05582	0.6052	0.638979
2	2.93916	3.33577	0.396608	0.3164	0.125487
3	2.99573	3.25037	0.254642	0.1743	0.0443841
4	2.99573	3.157	0.161268	0.0561	0.00904714
5	3.157	2.99573	-0.161268		
6	3.25037	2.99573	-0.254642		
7	3.33577	2.93916	-0.396608		
8	3.96272	2.9069	-1.05582		

Sum of b values = 0.817897
Sample Standard Deviation = 0.346729
W Statistic = 0.79491

5% Critical value of 0.818 exceeds 0.79491
Evidence of non-normality at 95% level of significance

1% Critical value of 0.749 is less than 0.79491
Data is normally distributed at 99% level of significance

Non-Parametric Tolerance Interval

Parameter: BORON

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 25%
Background measurements (n) = 8
Maximum Background Concentration = 52.6
Minimum Coverage = 68.8%
Average Coverage = 88.8889%

Location	Date	Value	Significant

Shapiro-Wilks Test of Normality

Parameter: CALCIUM

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	66400	84000	17600	0.6052	10651.5
2	71700	79200	7500	0.3164	2373
3	73820	77100	3280	0.1743	571.704
4	74830	77100	2270	0.0561	127.347
5	77100	74830	-2270		
6	77100	73820	-3280		
7	79200	71700	-7500		
8	84000	66400	-17600		

Sum of b values = 13723.6
Sample Standard Deviation = 5231.48
W Statistic = 0.983077

5% Critical value of 0.818 is less than 0.983077
Data is normally distributed at 95% level of significance

1% Critical value of 0.749 is less than 0.983077
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: CALCIUM

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 8
Background mean = 75518.8
Background standard deviation = 5231.48
One-sided normal tolerance factor (K) at 95% confidence = 3.188
Upper tolerance limit = 92196.7

Location	Date	Value	Significant

Shapiro-Wilks Test of Normality

Parameter: SULFATE

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	14.1	32.7	18.6	0.6052	11.2567
2	14.3	20.63	6.33	0.3164	2.00281
3	14.8	18.3	3.5	0.1743	0.61005
4	16.4	16.6	0.2	0.0561	0.01122
5	16.6	16.4	-0.2		
6	18.3	14.8	-3.5		
7	20.63	14.3	-6.33		
8	32.7	14.1	-18.6		

Sum of b values = 13.8808
Sample Standard Deviation = 6.15193
W Statistic = 0.727292

5% Critical value of 0.818 exceeds 0.727292
Evidence of non-normality at 95% level of significance

1% Critical value of 0.749 exceeds 0.727292
Evidence of non-normality at 99% level of significance

Shapiro-Wilks Test of Normality

Parameter: SULFATE

All Locations

Normality Test of Parameter Concentrations

Natural Logarithm Transformation

Non-Detects Replaced with 1/2 DL

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	2.64617	3.48738	0.8412	0.6052	0.509094
2	2.66026	3.02675	0.366487	0.3164	0.115956
3	2.69463	2.9069	0.212274	0.1743	0.0369993
4	2.79728	2.8094	0.0121214	0.0561	0.000680008
5	2.8094	2.79728	-0.0121214		
6	2.9069	2.69463	-0.212274		
7	3.02675	2.66026	-0.366487		
8	3.48738	2.64617	-0.8412		

Sum of b values = 0.66273
Sample Standard Deviation = 0.277822
W Statistic = 0.812908

5% Critical value of 0.818 exceeds 0.812908
Evidence of non-normality at 95% level of significance

1% Critical value of 0.749 is less than 0.812908
Data is normally distributed at 99% level of significance

Non-Parametric Tolerance Interval

Parameter: SULFATE

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Total Percent Non-Detects = 0%
Background measurements (n) = 8
Maximum Background Concentration = 32.7
Minimum Coverage = 68.8%
Average Coverage = 88.8889%

Location	Date	Value	Significant

Shapiro-Wilks Test of Normality

Parameter: SOLIDS, TOTAL DISSOLVED

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

K = 4 for 8 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	333	452	119	0.6052	72.0188
2	360	389	29	0.3164	9.1756
3	361	383	22	0.1743	3.8346
4	366	378	12	0.0561	0.6732
5	378	366	-12		
6	383	361	-22		
7	389	360	-29		
8	452	333	-119		

Sum of b values = 85.7022
Sample Standard Deviation = 34.6482
W Statistic = 0.874025

5% Critical value of 0.818 is less than 0.874025
Data is normally distributed at 95% level of significance

1% Critical value of 0.749 is less than 0.874025
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: SOLIDS, TOTAL DISSOLVED

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 8
Background mean = 377.75
Background standard deviation = 34.6482
One-sided normal tolerance factor (K) at 95% confidence = 3.188
Upper tolerance limit = 488.209

Location	Date	Value	Significant

Inter-well Background Statistics for 9/2015 – 6/2017
Pooled Results from W-101, W-102R, and W-107

Concentrations (UG/L)

Parameter: BORON, TOTAL

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 24
Total Non-Detect: 23
Percent Non-Detects: 95.8333%
Total Background Measurements: 24
There are 3 background locations

Loc.	Meas.	ND	Date	Conc.	Original
W-102R	8	8 (100%)	9/23/2015	ND<20	ND<20
			12/10/2015	ND<20	ND<20
			3/18/2016	ND<20	ND<20
			6/16/2016	ND<10	ND<10
			9/14/2016	ND<10	ND<10
			12/14/2016	ND<10	ND<10
			3/23/2017	ND<10	ND<10
			6/28/2017	ND<10	ND<10
W-101	8	8 (100%)	9/23/2015	ND<20	ND<20
			12/10/2015	ND<20	ND<20
			3/17/2016	ND<20	ND<20
			6/16/2016	ND<10	ND<10
			9/15/2016	ND<10	ND<10
			12/14/2016	ND<10	ND<10
			3/22/2017	ND<10	ND<10
			6/28/2017	ND<10	ND<10
W-107	8	7 (87.5%)	9/23/2015	ND<20	ND<20
			12/11/2015	ND<20	ND<20
			3/17/2016	ND<20	ND<20
			6/15/2016	ND<10	ND<10
			9/14/2016	ND<10	ND<10
			12/14/2016	ND<10	ND<10
			3/22/2017	12.3	12.3
			6/27/2017	ND<10	ND<10

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original

Non-Parametric Tolerance Interval

Parameter: BORON, TOTAL

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 95.8333%
Background measurements (n) = 24
Maximum Background Concentration = 20
Minimum Coverage = 88.3%
Average Coverage = 96%

Location	Date	Value	Significant

Concentrations (MG/L)

Parameter: CHLORIDE, TOTAL

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Total Measurements: 24
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 24
There are 3 background locations

Loc.	Meas.	ND	Date	Conc.	Original
W-102R	8	0 (0%)	9/23/2015	4.7	4.7
			12/10/2015	4.7	4.7
			3/18/2016	4.7	4.7
			6/16/2016	5	5
			9/14/2016	3.9	3.9
			12/14/2016	3.5	3.5
			3/23/2017	3.6	3.6
			6/28/2017	3.4	3.4
W-101	8	0 (0%)	9/23/2015	6.9	6.9
			12/10/2015	6.9	6.9
			3/17/2016	7.1	7.1
			6/16/2016	7.4	7.4
			9/15/2016	6.4	6.4
			12/14/2016	6.4	6.4
			3/22/2017	6.7	6.7
			6/28/2017	6.6	6.6
W-107	8	0 (0%)	9/23/2015	7.7	7.7
			12/11/2015	10.3	10.3
			3/17/2016	10.5	10.5
			6/15/2016	10.7	10.7
			9/14/2016	9.4	9.4
			12/14/2016	10.5	10.5
			3/22/2017	11.1	11.1
			6/27/2017	11.6	11.6

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original

Shapiro-Wilks Test of Normality

Parameter: CHLORIDE, TOTAL

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

K = 12 for 24 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	3.4	11.6	8.2	0.4493	3.68426
2	3.5	11.1	7.6	0.3098	2.35448
3	3.6	10.7	7.1	0.2554	1.81334
4	3.9	10.5	6.6	0.2145	1.4157
5	4.7	10.5	5.8	0.1807	1.04806
6	4.7	10.3	5.6	0.1512	0.84672
7	4.7	9.4	4.7	0.1245	0.58515
8	5	7.7	2.7	0.0997	0.26919
9	6.4	7.4	1	0.0764	0.0764
10	6.4	7.1	0.7	0.0539	0.03773
11	6.6	6.9	0.3	0.0321	0.00963
12	6.7	6.9	0.2	0.0107	0.00214
13	6.9	6.7	-0.2		
14	6.9	6.6	-0.3		
15	7.1	6.4	-0.7		
16	7.4	6.4	-1		
17	7.7	5	-2.7		
18	9.4	4.7	-4.7		
19	10.3	4.7	-5.6		
20	10.5	4.7	-5.8		
21	10.5	3.9	-6.6		
22	10.7	3.6	-7.1		
23	11.1	3.5	-7.6		
24	11.6	3.4	-8.2		

Sum of b values = 12.1428
Sample Standard Deviation = 2.64238
W Statistic = 0.918164

5% Critical value of 0.916 is less than 0.918164
Data is normally distributed at 95% level of significance

1% Critical value of 0.884 is less than 0.918164
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: CHLORIDE, TOTAL

Original Data (Not Transformed)
Non-Detects Replaced with 1/2 DL

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 24
Background mean = 7.07083
Background standard deviation = 2.64238
One-sided normal tolerance factor (K) at 95% confidence = 2.309
Upper tolerance limit = 13.1721

Location	Date	Value	Significant

Concentrations (MG/L)

Parameter: FLUORIDE, TOTAL

Original Data (Not Transformed)

Non-Detects Replaced with 1/2 DL

Total Measurements: 24
Total Non-Detect: 23
Percent Non-Detects: 95.8333%
Total Background Measurements: 24
There are 3 background locations

Loc.	Meas.	ND	Date	Conc.	Original
W-102R	8	8 (100%)	9/23/2015	ND<0.1	ND<0.2
			12/10/2015	ND<0.1	ND<0.2
			3/18/2016	ND<0.1	ND<0.2
			6/16/2016	ND<0.1	ND<0.2
			9/14/2016	ND<0.1	ND<0.2
			12/14/2016	ND<0.05	ND<0.1
			3/23/2017	ND<0.05	ND<0.1
			6/28/2017	ND<0.05	ND<0.1
W-101	8	7 (87.5%)	9/23/2015	ND<0.1	ND<0.2
			12/10/2015	ND<0.1	ND<0.2
			3/17/2016	ND<0.1	ND<0.2
			6/16/2016	0.21	0.21
			9/15/2016	ND<0.1	ND<0.2
			12/14/2016	ND<0.05	ND<0.1
			3/22/2017	ND<0.05	ND<0.1
			6/28/2017	ND<0.05	ND<0.1
W-107	8	8 (100%)	9/23/2015	ND<0.1	ND<0.2
			12/11/2015	ND<0.1	ND<0.2
			3/17/2016	ND<0.1	ND<0.2
			6/15/2016	ND<0.1	ND<0.2
			9/14/2016	ND<0.1	ND<0.2
			12/14/2016	ND<0.05	ND<0.1
			3/22/2017	ND<0.05	ND<0.1
			6/27/2017	ND<0.05	ND<0.1

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original

Non-Parametric Tolerance Interval

Parameter: FLUORIDE, TOTAL

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 95.8333%
Background measurements (n) = 24
Maximum Background Concentration = 0.21
Minimum Coverage = 88.3%
Average Coverage = 96%

Location	Date	Value	Significant

Concentrations (MG/L)

Parameter: SOLIDS, TOTAL DISSOLVED

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 24
Total Non-Detect: 0
Percent Non-Detects: 0%
Total Background Measurements: 24
There are 3 background locations

Loc.	Meas.	ND	Date	Conc.	Original
W-102R	8	0 (0%)	9/23/2015	263	263
			12/10/2015	269	269
			3/18/2016	311	311
			6/16/2016	325	325
			9/14/2016	298	298
			12/14/2016	287	287
			3/23/2017	301	301
			6/28/2017	356	356
W-101	8	0 (0%)	9/23/2015	349	349
			12/10/2015	311	311
			3/17/2016	348	348
			6/16/2016	389	389
			9/15/2016	325	325
			12/14/2016	347	347
			3/22/2017	339	339
			6/28/2017	408	408
W-107	8	0 (0%)	9/23/2015	335	335
			12/11/2015	341	341
			3/17/2016	351	351
			6/15/2016	422	422
			9/14/2016	313	313
			12/14/2016	355	355
			3/22/2017	370	370
			6/27/2017	459	459

There are 0 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original

Shapiro-Wilks Test of Normality

Parameter: SOLIDS, TOTAL DISSOLVED

All Locations

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 12 for 24 measurements

i	x(i)	x(n-i+1)	x(n-1+1)-x(i)	a(n-i+1)	b(i)
1	263	459	196	0.4493	88.0628
2	269	422	153	0.3098	47.3994
3	287	408	121	0.2554	30.9034
4	298	389	91	0.2145	19.5195
5	301	370	69	0.1807	12.4683
6	311	356	45	0.1512	6.804
7	311	355	44	0.1245	5.478
8	313	351	38	0.0997	3.7886
9	325	349	24	0.0764	1.8336
10	325	348	23	0.0539	1.2397
11	335	347	12	0.0321	0.3852
12	339	341	2	0.0107	0.0214
13	341	339	-2		
14	347	335	-12		
15	348	325	-23		
16	349	325	-24		
17	351	313	-38		
18	355	311	-44		
19	356	311	-45		
20	370	301	-69		
21	389	298	-91		
22	408	287	-121		
23	422	269	-153		
24	459	263	-196		

Sum of b values = 217.904
Sample Standard Deviation = 46.4159
W Statistic = 0.958228

5% Critical value of 0.916 is less than 0.958228
Data is normally distributed at 95% level of significance

1% Critical value of 0.884 is less than 0.958228
Data is normally distributed at 99% level of significance

Parametric Tolerance Interval Analysis

Parameter: SOLIDS, TOTAL DISSOLVED

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

USEPA 1989 Guidance Tolerance Limit Formula (One-Tailed)

Background observations = 24
Background mean = 340.5
Background standard deviation = 46.4159
One-sided normal tolerance factor (K) at 95% confidence = 2.309
Upper tolerance limit = 447.674

Location	Date	Value	Significant