Annual Groundwater Monitoring Report

Appalachian Power Company

John E. Amos Plant

Landfill CCR Management Unit

Winfield, West Virginia

January 2021

Prepared by:
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I. Overview

This *Annual Groundwater Monitoring and Corrective Action Report* (Report) has been prepared to report the status of activities for the preceding year for an existing Landfill CCR unit at Appalachian Power Company's, a wholly-owned subsidiary of American Electric Power Company (AEP), John E. Amos Power Plant. The USEPA's CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31.

In general, the following activities were completed:

- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units.
- Groundwater data summary tables, groundwater velocity, and flow direction maps are included in **Appendix 1**.
- The Amos Landfill (AMLF) continued in detection monitoring throughout all of 2020.
- Statistically significant increase (SSI) was confirmed at MW-5 for calcium from the November 2019 detection monitoring event which included re-sampling in February 2020 in accordance with the statistical analysis plan. Statistical analysis for this event was completed in April 2020. An alternative source demonstration (ASD) was successfully completed in June 2020. The AMLF continued in detection monitoring.
- SSI was confirmed at MW-2 for calcium for the May 2020 detection monitoring event which included re-sampling in July 2020. Statistical analysis for this event was completed in August 2020. An ASD was successfully completed in October 2020. The AMLF continued in detection monitoring.
- A detection monitoring event was conducted at the AMLF in November 2020. From the initial sampling, potential SSI's have been noted. Those are:
    - MW-4: chloride and fluoride
    - MW-1801: chloride
    - MW-1802: chloride

  A re-sampling occurred in January 2021 for the above mentioned parameters and well locations in accordance with the statistical analysis plan. Statistical analysis is ongoing. If any of the above potential SSI's are confirmed following statistical analysis, an ASD will be completed to determine if the unit can remain in detection monitoring or if it must transition to assessment monitoring in accordance with the CCR rule.
- The two additional downgradient groundwater monitoring wells that were installed at the CCR Unit in 2018 completed background sampling of eight events at the end of 2019. The additional wells were officially added to the AMLF CCR Groundwater Monitoring

Network (GWMN) in May 2020 replacing two of the previously used downgradient monitoring wells, MW-1 and MW-5. MW-1 and MW-5 remain intact for the state groundwater monitoring program. MW-1 and MW-5 were removed from the CCR GWMN due to the shallow monitoring depth not monitoring the uppermost aquifer but the shallow perched groundwater table. The CCR GWMN Report was revised and uploaded to the facility electronic operating record and the publically available website for CCR Rule compliance data and information in May 2020. Boring logs and well construction forms for MW-1801 and MW-1802 are included in that report and were included in the annual report that was completed January 31, 2020.

- Statistical analysis reports completed in 2020 for the above mentioned events (November 2019 and May 2020) are included in **Appendix 2**. The November 2020 event statistical analysis is still on-going.
- Also included in **Appendix 2** is the statistical background update for the original monitoring well network and the statistical background development for the two new wells, MW-1801 and MW-1802.
- Alternative source demonstrations completed in 2020 are included in **Appendix 3**.

The major components of this annual report, to the extent applicable at this time, are presented in sections that follow:

- A map/aerial photograph showing the Amos Landfill CCR management unit, all groundwater monitoring wells, and monitoring well identification numbers.
- All of the monitoring data collected, including the rate and direction of groundwater flow, plus a summary showing the number of samples collected per monitoring well, the dates the samples were collected and whether the sample was collected as part of detection monitoring or assessment monitoring programs (**Appendix 1**).
- Results of the required statistical analysis of groundwater monitoring results (**Appendix 2**).
- Discussion of the alternative source demonstrations (**Appendix 3**).
- A summary of any transition between monitoring programs or an alternate monitoring frequency, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring, in addition to identifying the constituents detected at a statistically significant increase over background concentrations, if applicable (Appendix 4). This is not applicable to this report
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened (Appendix 5). This is not applicable to this report.

- Other information required to be included in the annual report such as assessment of corrective measures, if applicable.

In addition, this report summarizes key actions completed, and where applicable, describes any problems encountered and actions taken to resolve those problems. The report includes a projection of key activities for the upcoming year.

II. Groundwater Monitoring Well Locations and Identification Numbers

Figure 1 depicts the PE-certified groundwater monitoring network, the monitoring well locations, and their corresponding identification numbers. The groundwater monitoring well network was updated in 2020. MW-1801 and MW-1802 replaced MW-1 and MW-5. Additional information regarding this change to the monitoring well network can be found at https://aep.com/Assets/docs/requiredpostings/ccr/2020/AM-JEALF-GWMonitoringSystemDesignConstructionCert-052820.pdf

The monitoring well distribution adequately covers downgradient and upgradient areas as detailed in the revised *Groundwater Monitoring Network Evaluation Report*, referenced above, that was placed on the American Electric Power CCR public internet site on June 5, 2020.The groundwater quality monitoring network includes the following:

- Five upgradient wells: MW-6, MW-7R, MW-8, MW-9, and MW-10; and
- Four downgradient wells: MW-1801, MW-1802, MW-2, and MW-4.

Legend

- Upgradient Sampling Location
- Downgradient Sampling Location
- FGD Landfill

Notes

- Monitoring well coordinates provided by AEP.

700 350 0 700 Feet

Site Layout
FGD Landfill

AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/01/28

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\AEP-Amos_Landfill_Site_Layout.mxd. ARevezzo. 1/28/2021. CHA8423/04/08.

III. Monitoring Wells Installed or Decommissioned

No monitoring wells were installed or decommissioned in 2020.

IV. Groundwater Quality Data and Static Water Elevation Data, With Flow Rate and Direction Calculations and Discussion

Appendix 1 contains tables showing the groundwater quality data collected since initiating CCR background sampling through results received in 2020 as part of the detection monitoring program. Static water elevation data from each monitoring event in 2020 are also shown in **Appendix 1**, along with the groundwater velocity calculations, groundwater flow direction, and potentiometric maps developed after each sampling event.

V. Groundwater Quality Data Statistical Analysis

Statistical analysis of the November 2019 detection monitoring samples was completed in April 2020. An SSI in the Appendix III parameter of calcium at MW-5 was documented in the April 3, 2020 *Evaluation of Detection Monitoring Data at Amos Plant's Landfill* memorandum (**Appendix 2**). An alternative source demonstration was undertaken for this parameter and was successful. That demonstration is discussed in the next section of this report.

Statistical analysis of the May 2020 detection monitoring samples was completed in August 2020. An SSI in the Appendix III parameter of calcium at MW-2 was documented in the July 29, 2020 *Evaluation of Detection Monitoring Data at Amos Plant's Landfill* memorandum (**Appendix 2**). An alternative source demonstration was undertaken for this parameter and was successful. That demonstration is discussed in the next section of this report.

The November 2020 detection monitoring samples received indicate potential SSI's at MW-4 and MW-1802 for chloride. The re-sampling event in accordance with the statistical analysis plan was conducted in early January 2021 and statistical analysis will be completed in early 2021. If any SSI's are confirmed, an ASD will be attempted. If successful, the AMLF will remain in detection monitoring. However, if unsuccessful, the AMLF will transition into assessment monitoring.

VI. Alternative Source Demonstration

An alternative source demonstration (ASD) relative to the Appendix III SSI (MW-5: Calcium) resulting from the November 2019 detection monitoring event was completed in June 2020. The demonstration concluded that the groundwater quality and Appendix III indicator parameter SSI

identified in the statistical evaluation is attributable to an alternative source. The successful ASD for the Appendix III parameter is attached in **Appendix 3**.

An alternative source demonstration (ASD) relative to the Appendix III SSI (MW-2: Calcium) resulting from the May 2020 detection monitoring event completed in October 2020. The demonstration concluded that the groundwater quality and Appendix III indicator parameter SSI identified in the statistical evaluation is attributable to an alternative source. The successful ASD for the Appendix III parameter is attached in **Appendix 3**.

VII. Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency

As of this annual report date there has been no transition between detection monitoring and assessment monitoring. Detection monitoring will continue in 2021 pending the results of the aforementioned statistical analysis regarding the November 2020 groundwater sampling event. If the statistical analysis confirms any SSIs, an ASD will be performed if applicable. The sampling frequency of twice per year will be maintained for the Appendix III parameters upon a successful alternative source demonstration. If necessary, a transition to the assessment monitoring program will occur.

Regarding defining an alternate monitoring frequency, the groundwater velocity and monitoring well production are high enough at this facility that no modification to the semiannual assessment monitoring frequency is needed.

VIII. Other Information Required

All required information has been included in this annual groundwater monitoring report.

IX. Description of Any Problems Encountered in 2020 and Actions Taken

No significant problems were encountered. The low flow sampling effort went smoothly and the schedule was met to support the 2020 annual groundwater report preparation covering the year 2020 groundwater monitoring activities.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2021 include:

- Complete the statistical evaluation of the November 2020 detection monitoring results and subsequent verification sampling, looking for any confirmed statistically significant increases.
- Perform an ASD, if necessary, for the November 2020 detection monitoring event if any SSI's are confirmed. If the ASD if necessary and is unsuccessful, the CCR unit will transition into assessment monitoring. If it is successful or no SSI's are confirmed, the CCR unit will continue detection monitoring on a semi-annual basis.
- Respond to any new data received in light of what the CCR rule requires.
- Preparation of the 2021 annual groundwater report.

APPENDIX 1

Tables follow, showing the groundwater monitoring data collected and received in 2020 or prior, the rate and direction of groundwater flow, and a summary showing the number of samples collected per monitoring well. The dates that the samples were collected also is shown.

Table 1 - Groundwater Data Summary: MW-1
Amos - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/23/2016	Background	0.044	31.1	3.45	0.09 J	6.2	30.6	182
10/18/2016	Background	0.060	29.0	3.31	0.09	6.5	30.8	232
11/9/2016	Background	0.076	29.9	3.42	0.10	6.5	31.3	194
12/13/2016	Background	0.065	29.3	3.08	0.07 J	6.1	27.7	250
2/9/2017	Background	0.050	26.8	3.16	0.09	6.3	27.9	234
3/16/2017	Background	0.046	28.4	3.32	0.09	7.5	29.4	216
5/23/2017	Background	0.123	30.2	3.19	0.09	6.6	28.5	215
6/21/2017	Background	0.037	28.1	4.94	0.08	6.4	31.9	204
11/1/2017	Detection	0.047	28.7	3.08	0.10	6.4	30.2	224
5/2/2018	Detection	0.134	27.2	3.22	0.10	6.5	29.9	194
11/29/2018	Detection	0.143	26.4	3.07	0.11	6.7	27.8	191
12/18/2018	Detection	0.07 J	--	--	--	6.5	--	--
6/11/2019	Detection	0.04 J	28.1	2.86	0.11	7.0	29.9	184
11/6/2019	Detection	0.04 J	30.1	3.20	0.10	6.2	29.4	193

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-1
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/23/2016	Background	0.04 J	0.27	207	0.024	0.02 J	0.3	0.097	0.0848	0.09 J	0.186	0.017	< 0.002 U	0.04 J	0.9	0.01 J
10/18/2016	Background	0.04 J	0.62	206	0.050	0.03	0.627	0.306	1.24	0.09	0.567	0.017	0.002 J	0.08 J	1.4	0.05 J
11/9/2016	Background	0.04 J	0.44	210	0.036	0.03	0.564	0.200	1.001	0.10	0.450	0.020	< 0.002 U	0.14	1.3	0.088
12/13/2016	Background	0.05 J	1.09	232	0.100	0.01 J	2.16	0.613	0.6701	0.07 J	1.45	0.027	< 0.002 U	0.11	1.7	0.02 J
2/9/2017	Background	0.03 J	0.37	184	0.026	0.02 J	0.401	0.174	0.836	0.09	0.340	0.015	< 0.002 U	0.21	1.6	0.02 J
3/16/2017	Background	0.06	0.67	200	0.057	0.06	0.993	0.393	0.73	0.09	1.03	0.012	0.003 J	0.10	1.1	0.02 J
5/23/2017	Background	0.08	0.40	211	0.032	0.05	0.555	0.292	3.243	0.09	0.697	0.026	< 0.002 U	0.11	1.1	0.01 J
6/21/2017	Background	0.07	0.43	200	0.031	0.06	0.547	0.289	1.379	0.08	0.753	0.013	< 0.002 U	0.10	1.2	0.02 J

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-2
Amos - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/23/2016	Background	0.201	1.99	4.00	1.34	8.7	12.0	362
10/17/2016	Background	0.198	1.53	4.21	1.26	9.1	11.8	354
11/8/2016	Background	0.216	1.46	4.13	1.30	8.2	11.3	378
12/13/2016	Background	0.217	1.65	2.99	1.19	8.5	7.6	350
2/8/2017	Background	0.190	1.56	2.66	1.33	8.7	7.4	374
3/14/2017	Background	0.184	1.81	3.91	1.20	8.4	7.7	354
5/23/2017	Background	0.187	1.42	4.23	1.17	8.7	8.1	354
6/21/2017	Background	0.189	1.56	3.47	1.19	8.5	7.4	356
11/1/2017	Detection	0.202	1.88	2.34	1.46	8.8	8.6	394
1/8/2018	Detection	0.251	--	--	1.07	8.4	--	353
5/1/2018	Detection	0.241	3.50	3.90	1.45	8.5	9.4	344
6/19/2018	Detection	0.338	1.79	--	1.28	8.5	--	--
9/24/2018	Detection	0.215	--	--	--	--	--	--
11/28/2018	Detection	0.235	1.84	5.09	1.15	8.5	8.5	355
12/17/2018	Detection	--	--	--	--	8.6	--	--
1/24/2019	Detection	0.218	--	--	--	--	--	--
6/11/2019	Detection	0.215	1.80	3.26	1.63	8.7	9.4	379
7/22/2019	Detection	--	--	--	1.41	8.7	--	--
11/6/2019	Detection	0.203	1.73	3.44	1.66	8.6	9.5	379
2/11/2020	Detection	--	--	--	1.37	8.5	--	--
5/5/2020	Detection	0.174	2.76	5.08	1.37	8.6	7.8	368
7/7/2020	Detection	--	2.74	--	--	8.5	--	--
11/3/2020	Detection	0.179	1.69	4.31	1.45	8.8	9.0	378

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-2
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/23/2016	Background	0.03 J	6.57	51.8	0.129	0.14	1.3	1.02	0.904	1.34	1.24	0.009	< 0.002 U	6.04	0.2 J	0.03 J
10/17/2016	Background	0.01 J	3.94	25.7	0.040	0.005 J	0.592	0.290	0.208	1.26	0.258	0.010	< 0.002 U	3.70	0.09 J	0.067
11/8/2016	Background	0.01 J	3.54	23.7	0.02 J	< 0.004 U	0.295	0.107	0.8825	1.30	0.077	0.008	< 0.002 U	3.84	0.05 J	< 0.01 U
12/13/2016	Background	0.01 J	4.36	27.1	0.009 J	< 0.004 U	0.952	0.075	0.288	1.19	0.068	0.011	< 0.002 U	6.11	0.05 J	< 0.01 U
2/8/2017	Background	< 0.01 U	4.09	25.5	0.032	0.005 J	0.571	0.287	1.109	1.33	0.279	0.009	< 0.002 U	5.55	0.1	0.02 J
3/14/2017	Background	0.02 J	3.72	31.9	0.071	0.02	1.01	0.573	2.863	1.20	0.651	0.010	0.002 J	3.46	0.2	0.02 J
5/23/2017	Background	0.03 J	3.59	27.2	0.043	0.009 J	0.605	0.341	0.796	1.17	0.333	0.010	< 0.002 U	3.70	0.1	< 0.01 U
6/21/2017	Background	0.03 J	3.80	27.7	0.028	0.01 J	0.490	0.234	1.1188	1.19	0.229	0.004	0.003 J	4.57	0.08 J	0.03 J

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-4
Amos - LF
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/23/2016	Background	0.173	0.914	14.1	1.49	9.9	10.7	368
10/18/2016	Background	0.165	0.807	13.9	1.33	9.8	11.7	386
11/7/2016	Background	0.203	0.842	14.6	1.44	9.5	11.1	376
12/13/2016	Background	0.180	0.836	15.7	1.34	9.0	8.0	372
2/8/2017	Background	0.170	0.807	14.9	1.40	9.3	8.0	412
3/14/2017	Background	0.173	0.855	14.5	1.46	8.8	7.4	381
5/23/2017	Background	0.190	0.750	15.3	1.38	9.2	7.9	390
6/20/2017	Background	0.161	0.814	15.1	1.36	9.1	7.6	392
11/1/2017	Detection	0.194	0.766	14.2	1.36	9.4	9.3	404
1/8/2018	Detection	0.145	--	--	1.37	3.3	--	--
5/1/2018	Detection	0.199	0.783	14.9	1.47	9.2	9.0	380
11/28/2018	Detection	0.188	0.807	14.1	1.42	8.8	8.8	383
6/12/2019	Detection	0.167	0.788	14.4	1.46	8.6	9.0	415
11/6/2019	Detection	0.173	0.761	14.9	1.49	9.2	9.4	382
5/5/2020	Detection	0.150	0.790	15.2	1.37	9.2	8.4	397
11/3/2020	Detection	0.157	0.783	17.1	1.53	9.4	9.7	397

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-4
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/23/2016	Background	0.01 J	9.61	24.1	0.020	0.11	0.9	0.158	0.444	1.49	0.371	0.008	< 0.002 U	8.82	0.09 J	< 0.01 U
10/18/2016	Background	< 0.01 U	8.81	20.2	< 0.005 U	0.006 J	0.064	0.014	0.152	1.33	0.021	0.002	< 0.002 U	8.01	< 0.03 U	0.03 J
11/7/2016	Background	< 0.01 U	9.07	21.5	< 0.005 U	< 0.004 U	1.68	0.029	1.56	1.44	0.007 J	0.003	< 0.002 U	8.14	< 0.03 U	< 0.01 U
12/13/2016	Background	< 0.01 U	9.44	22.4	< 0.005 U	< 0.004 U	0.169	0.011	0.16	1.34	0.009 J	0.007	< 0.002 U	8.94	< 0.03 U	0.02 J
2/8/2017	Background	< 0.01 U	8.78	19.2	0.006 J	< 0.004 U	0.122	0.043	0.567	1.40	0.064	0.006	< 0.002 U	8.15	< 0.03 U	0.03 J
3/14/2017	Background	< 0.01 U	10.1	20.4	0.005 J	0.005 J	0.523	0.041	1.456	1.46	0.114	0.006	< 0.002 U	9.70	< 0.03 U	< 0.01 U
5/23/2017	Background	0.02 J	8.96	21.1	< 0.004 U	< 0.005 U	0.104	0.008 J	0.872	1.38	0.01 J	0.012	< 0.002 U	8.21	< 0.03 U	< 0.01 U
6/20/2017	Background	0.02 J	9.15	21.8	0.004 J	0.005 J	0.157	0.037	0.905	1.36	0.039	0.005	< 0.002 U	7.86	0.05 J	< 0.01 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-5
Amos - LF
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/23/2016	Background	0.032	18.4	3.59	0.14	9.9	29.3	124
10/18/2016	Background	0.034	15.6	3.61	0.12	6.4	29.3	148
11/8/2016	Background	0.034	14.3	3.52	0.11	6.3	25.5	92
12/13/2016	Background	0.015	14.6	3.61	0.07	8.2	24.3	100
2/8/2017	Background	0.030	14.1	3.54	0.09	6.4	24.0	126
3/16/2017	Background	0.026	15.9	3.72	0.09	7.0	24.9	158
5/23/2017	Background	0.032	13.7	3.70	0.09	6.3	24.2	108
6/20/2017	Background	0.017	14.5	3.66	0.08	6.0	27.8	102
11/1/2017	Detection	0.046	15.6	4.09	0.09	6.1	28.4	136
1/8/2018	Detection	--	--	4.22	--	6.7	--	--
5/2/2018	Detection	0.123	14.3	4.39	0.09	6.2	26.3	122
6/20/2018	Detection	0.126	--	4.61	--	6.1	--	--
11/29/2018	Detection	0.122	14.1	4.86	0.13	7.4	24.5	113
12/17/2018	Detection	--	--	4.77	--	6.2	--	--
6/12/2019	Detection	0.02 J	16.2	4.60	0.11	6.1	26.4	132
7/22/2019	Detection	--	--	4.61	--	6.0	--	--
11/6/2019	Detection	0.03 J	18.3	5.21	0.10	6.0	28.3	131
2/11/2020	Detection	--	18.5	--	--	5.8	--	--

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-5
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/23/2016	Background	0.04 J	0.47	93.3	0.02 J	0.07	0.3	0.188	1.025	0.14	0.263	0.006	< 0.002 U	0.17	0.1	0.01 J
10/18/2016	Background	0.04 J	0.34	82.5	0.02 J	0.02	0.546	0.198	0.353	0.12	0.250	0.005	< 0.002 U	0.16	0.2	0.03 J
11/8/2016	Background	0.04 J	0.49	80.1	0.050	0.05	0.945	0.446	1.847	0.11	0.698	< 0.0002 U	< 0.002 U	0.14	0.1	0.01 J
12/13/2016	Background	0.04 J	0.51	80.9	0.033	0.03	0.622	0.339	1.18	0.07	0.442	0.010	< 0.002 U	0.18	0.2	0.070
2/8/2017	Background	0.02 J	0.30	70.2	0.022	0.02 J	0.465	0.217	0.5868	0.09	0.257	0.005	< 0.002 U	0.14	0.1	0.02 J
3/16/2017	Background	0.09	2.32	121	0.183	0.21	4.43	2.92	1.096	0.09	3.77	0.002	0.008	0.40	0.9	0.04 J
5/23/2017	Background	0.06	0.21	77.7	0.01 J	0.02	0.248	0.072	1.312	0.09	0.093	0.011	< 0.002 U	0.14	0.09 J	< 0.01 U
6/20/2017	Background	0.02 J	0.25	80.6	0.01 J	0.03	0.291	0.092	1.141	0.08	0.097	< 0.0002 U	< 0.002 U	0.09 J	0.09 J	< 0.01 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-6
Amos - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/24/2016	Background	0.095	40.7	7.78	0.26	7.6	41.3	408
10/19/2016	Background	0.093	39.8	7.67	0.23	7.9	51.1	438
11/7/2016	Background	0.147	42.7	7.76	0.25	7.7	51.6	426
12/12/2016	Background	0.109	44.4	8.17	0.20	7.5	54.0	414
2/7/2017	Background	0.122	36.7	7.20	0.23	7.5	31.1	380
3/16/2017	Background	0.098	37.1	7.09	0.24	7.9	29.1	388
5/22/2017	Background	0.171	33.7	6.89	0.23	7.7	24.7	359
6/19/2017	Background	0.154	37.2	7.01	0.21	7.4	33.1	386
11/2/2017	Detection	0.159	41.3	7.77	0.22	7.5	51.8	440
5/1/2018	Detection	0.163	33.4	6.94	0.26	7.4	24.7	358
11/28/2018	Detection	0.156	35.8	6.85	0.24	7.6	22.9	333
6/12/2019	Detection	0.08 J	32.8	6.85	0.28	7.7	21.9	363
11/6/2019	Detection	0.100	39.8	8.00	0.24	7.4	33.2	390
5/7/2020	Detection	0.092	37.0	6.61	0.21	7.6	14.9	349
11/4/2020	Detection	0.088	38.4	7.63	0.28	7.7	32.5	375

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-6
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/24/2016	Background	0.04 J	6.03	245	0.036	0.03	0.5	0.183	2.318	0.26	0.461	0.015	< 0.002 U	0.77	0.09 J	0.138
10/19/2016	Background	0.02 J	6.42	235	0.033	0.005 J	0.413	0.148	0.697	0.23	0.381	0.015	< 0.002 U	0.36	0.09 J	0.02 J
11/7/2016	Background	0.01 J	6.64	250	0.009 J	< 0.004 U	0.160	0.023	2.7	0.25	0.053	0.011	< 0.002 U	0.36	< 0.03 U	< 0.01 U
12/12/2016	Background	0.01 J	7.36	246	0.006 J	0.01 J	0.104	0.020	1.878	0.20	0.039	0.023	< 0.002 U	0.39	0.04 J	0.03 J
2/7/2017	Background	< 0.01 U	5.47	199	0.02 J	< 0.004 U	0.207	0.073	1.151	0.23	0.160	0.013	< 0.002 U	0.44	0.05 J	0.01 J
3/16/2017	Background	0.03 J	4.44	224	< 0.005 U	0.005 J	0.498	0.028	1.844	0.24	0.048	0.009	0.003 J	0.53	0.03 J	< 0.01 U
5/22/2017	Background	0.04 J	4.58	218	0.02 J	0.009 J	0.175	0.063	2.4	0.23	0.117	0.019	< 0.002 U	0.50	0.04 J	0.01 J
6/19/2017	Background	0.03 J	4.86	233	0.01 J	< 0.005 U	0.274	0.051	1.617	0.21	0.136	0.011	< 0.002 U	0.44	0.04 J	< 0.01 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-7R
Amos - LF
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/24/2016	Background	0.106	31.0	4.13	0.36	7.7	228	678
10/18/2016	Background	0.083	30.9	3.86	0.32	8.0	229	706
11/8/2016	Background	0.102	33.5	3.78	0.31	7.0	209	618
12/14/2016	Background	0.084	32.2	3.94	0.26	7.6	217	606
2/9/2017	Background	0.071	37.7	3.45	0.22	7.6	186	542
3/14/2017	Background	0.078	33.6	3.79	0.30	7.7	215	640
5/24/2017	Background	0.072	30.4	3.80	0.29	7.6	226	663
6/21/2017	Background	0.092	32.5	3.60	0.26	7.6	246	680
11/2/2017	Detection	0.109	31.7	3.59	0.28	7.6	211	636
5/1/2018	Detection	0.145	30.3	4.09	0.36	7.7	239	688
11/28/2018	Detection	0.118	44.4	3.65	0.26	7.4	201	627
6/12/2019	Detection	0.1 J	36.8	3.75	0.35	7.4	226	700
11/6/2019	Detection	0.099	26.6	4.15	0.34	7.5	217	655
5/6/2020	Detection	0.079	41.7	3.68	0.28	7.5	208	629
11/3/2020	Detection	0.077	37.9	3.93	0.35	7.6	247	731

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-7R
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/24/2016	Background	0.11	8.37	60.8	0.155	0.04	1.0	0.368	1.043	0.36	1.52	0.016	0.004 J	25.7	0.4	0.061
10/18/2016	Background	0.07	7.13	51.4	0.111	0.01 J	0.760	0.279	0.959	0.32	0.961	0.012	0.002 J	23.2	0.3	0.03 J
11/8/2016	Background	0.08	5.81	42.2	0.026	0.02	2.82	0.084	1.895	0.31	0.261	0.013	< 0.002 U	17.5	0.2	0.01 J
12/14/2016	Background	0.09	7.33	44.3	0.028	0.01 J	1.73	0.103	0.962	0.26	0.249	0.014	< 0.002 U	24.6	0.2	0.02 J
2/9/2017	Background	0.05	4.21	41.7	0.01 J	0.01 J	0.217	0.065	0.0996	0.22	0.156	0.012	< 0.002 U	11.7	0.08 J	0.02 J
3/14/2017	Background	0.08	7.02	40.2	0.01 J	0.01 J	0.234	0.064	2.735	0.30	0.154	0.010	< 0.002 U	24.6	0.1	0.02 J
5/24/2017	Background	0.10	7.48	42.0	0.01 J	0.01 J	0.242	0.080	0.3888	0.29	0.171	0.016	< 0.002 U	25.7	0.2	0.01 J
6/21/2017	Background	0.08	6.69	39.1	0.006 J	0.006 J	0.154	0.043	1.497	0.26	0.064	0.010	< 0.002 U	22.9	0.1	0.01 J

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-8
Amos - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/24/2016	Background	0.021	141	13.3	0.16	7.0	73.6	578
10/19/2016	Background	0.037	135	12.6	0.15	7.2	66.5	538
11/9/2016	Background	0.029	137	5.12	0.07	6.9	26.1	532
12/14/2016	Background	0.017	136	14.2	0.13	6.8	59.7	504
2/8/2017	Background	0.092	132	12.9	0.15	6.9	67.5	540
3/15/2017	Background	0.074	151	13.5	0.16	7.2	74.5	623
5/24/2017	Background	0.031	137	13.9	0.14	6.8	73.2	596
6/20/2017	Background	0.034	139	12.6	0.13	6.9	77.2	574
11/2/2017	Detection	0.031	125	12.1	0.15	6.8	63.1	526
5/1/2018	Detection	0.065	136	13.1	0.17	6.9	78.8	592
11/29/2018	Detection	0.05 J	126	13.2	0.17	6.8	58.8	558
6/12/2019	Detection	0.03 J	125	8.58	0.20	7.6	54.5	540
11/6/2019	Detection	< 0.02 U	134	21.2	0.16	6.8	78.6	613
5/7/2020	Detection	< 0.02 U	115	15.3	0.15	7.0	98.4	590
11/4/2020	Detection	< 0.02 U	112	9.87	0.20	6.8	87.3	549

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-8
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/24/2016	Background	0.04 J	0.41	221	0.021	0.04	0.4	0.270	0.776	0.16	0.393	0.013	< 0.002 U	0.40	0.2	0.03 J
10/19/2016	Background	0.03 J	0.35	195	0.01 J	0.04	0.158	0.140	0.746	0.15	0.279	0.006	< 0.002 U	0.07 J	0.2	0.02 J
11/9/2016	Background	0.02 J	0.25	209	0.008 J	< 0.004 U	0.164	0.082	1.113	0.07	0.028	0.004	< 0.002 U	0.08 J	0.2	0.02 J
12/14/2016	Background	0.03 J	0.32	212	0.008 J	0.008 J	0.097	0.083	1.582	0.13	0.062	0.013	< 0.002 U	0.10	0.2	0.02 J
2/8/2017	Background	0.03 J	0.37	192	0.01 J	0.007 J	0.131	0.059	1.223	0.15	0.109	0.007	< 0.002 U	0.47	0.1	0.136
3/15/2017	Background	0.05 J	1.44	270	0.069	0.02 J	2.39	1.02	3.405	0.16	1.43	0.011	0.003 J	0.28	0.4	0.02 J
5/24/2017	Background	0.07	0.47	201	0.02 J	0.009 J	0.354	0.201	1.257	0.14	0.260	0.016	< 0.002 U	0.11	0.2	0.01 J
6/20/2017	Background	0.03 J	0.35	182	0.02 J	0.007 J	0.192	0.077	1.065	0.13	0.142	0.005	< 0.002 U	0.07 J	0.3	0.02 J

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-9
Amos - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/24/2016	Background	0.064	80.1	6.30	0.24	7.3	37.3	414
10/19/2016	Background	0.042	103	6.09	0.18	7.5	36.4	444
11/9/2016	Background	0.076	90.6	6.11	0.22	7.2	34.5	420
12/13/2016	Background	0.057	94.4	6.59	0.18	7.1	35.1	390
2/8/2017	Background	0.052	99.0	6.22	0.16	7.1	34.9	382
3/15/2017	Background	0.093	99.1	6.26	0.22	7.4	35.8	402
5/23/2017	Background	0.084	86.4	6.21	0.18	7.1	34.8	438
6/20/2017	Background	0.079	93.8	6.17	0.15	7.0	38.4	424
11/2/2017	Detection	0.075	79.1	5.97	0.20	7.1	33.1	404
5/1/2018	Detection	0.200	73.1	6.14	0.26	7.2	30.9	402
11/29/2018	Detection	0.09 J	78.8	6.08	0.21	7.1	31.6	412
6/11/2019	Detection	0.04 J	97.6	6.03	0.20	7.3	37.9	436
11/7/2019	Detection	0.04 J	85.8	6.11	0.19	7.3	38.2	442
5/6/2020	Detection	0.03 J	80.3	2.53	0.22	7.2	22.4	333
11/4/2020	Detection	0.056	61.5	2.73	0.30	7.1	28.4	362

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-9
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/24/2016	Background	0.07	1.45	443	0.025	0.03	0.8	0.464	1.831	0.24	0.565	0.017	< 0.002 U	0.48	0.2	0.03 J
10/19/2016	Background	0.04 J	3.75	441	0.025	0.01 J	0.625	0.372	3.035	0.18	0.478	0.010	< 0.002 U	0.27	0.1	0.03 J
11/9/2016	Background	0.05 J	1.12	491	< 0.005 U	0.02 J	0.207	0.020	1.735	0.22	0.046	0.008	< 0.002 U	0.41	0.1	0.03 J
12/13/2016	Background	0.04 J	1.23	497	< 0.005 U	0.04	0.540	0.032	0.39	0.18	0.084	0.019	< 0.002 U	0.56	0.2	< 0.01 U
2/8/2017	Background	0.02 J	1.78	388	< 0.005 U	0.03	0.078	0.033	1.448	0.16	0.058	0.012	< 0.002 U	0.27	0.1	0.02 J
3/15/2017	Background	0.04 J	4.40	603	0.074	0.04	1.43	1.51	2.365	0.22	1.81	0.009	0.002 J	0.37	0.5	0.04 J
5/23/2017	Background	0.07	0.96	425	< 0.004 U	0.02 J	0.117	0.021	2.173	0.18	0.063	0.021	< 0.002 U	0.37	0.2	0.02 J
6/20/2017	Background	0.05 J	1.35	441	< 0.004 U	0.03	0.094	0.066	1.992	0.15	0.038	0.014	< 0.002 U	0.33	0.07 J	0.02 J

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-10
Amos - LF
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
8/24/2016	Background	0.087	1.68	5.54	0.89	9.0	19.1	512
10/19/2016	Background	0.081	1.09	4.49	0.72	9.6	18.0	504
11/9/2016	Background	0.118	2.31	5.46	0.92	8.9	16.9	546
12/13/2016	Background	0.076	1.24	4.15	0.38	8.7	14.1	482
2/8/2017	Background	0.113	1.37	4.24	0.57	9.1	14.4	504
3/14/2017	Background	0.125	1.18	4.60	0.50	8.7	13.3	499
5/24/2017	Background	0.081	1.16	4.19	0.43	8.9	14.3	467
6/20/2017	Background	0.078	1.04	4.11	0.44	8.6	14.9	492
11/2/2017	Detection	0.095	1.12	5.08	0.55	9.2	17.0	508
5/2/2018	Detection	0.157	1.74	5.67	0.69	9.2	16.7	522
11/29/2018	Detection	0.174	1.03	5.27	0.59	8.7	15.3	506
6/11/2019	Detection	0.08 J	1.03	5.12	0.72	9.0	16.0	524
11/6/2019	Detection	0.076	1.43	5.62	0.52	8.7	16.8	490
5/6/2020	Detection	0.074	1.25	4.90	0.60	8.6	13.0	526
11/4/2020	Detection	0.071	1.18	5.77	0.73	8.9	16.5	523

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-10
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
8/24/2016	Background	0.36	24.5	105	0.058	0.26	0.5	0.367	0.769	0.89	1.11	0.010	0.003 J	3.08	0.5	0.01 J
10/19/2016	Background	0.26	19.4	62.4	0.02 J	0.01 J	0.373	0.102	0.0283	0.72	0.357	0.008	< 0.002 U	2.58	0.4	0.082
11/9/2016	Background	0.38	21.5	144	0.264	0.05	3.96	1.66	0.168	0.92	3.41	0.007	0.004 J	2.53	1.1	0.057
12/13/2016	Background	0.63	17.1	69.8	0.029	0.20	1.63	0.212	0.0992	0.38	0.895	0.019	< 0.002 U	2.79	0.7	< 0.01 U
2/8/2017	Background	0.38	22.8	92.9	0.124	0.04	2.28	0.850	0.14643	0.57	1.89	0.008	0.003 J	2.76	1.9	0.071
3/14/2017	Background	0.32	21.2	69.0	0.039	0.01 J	0.965	0.280	2.089	0.50	0.635	0.010	0.003 J	3.38	2.3	0.02 J
5/24/2017	Background	0.23	9.07	55.6	0.022	0.02 J	0.500	0.151	1.06	0.43	0.469	0.011	< 0.002 U	3.52	0.5	0.01 J
6/20/2017	Background	0.30	17.7	61.7	0.025	0.01 J	0.577	0.170	0.1376	0.44	0.448	0.004	< 0.002 U	2.40	1.0	0.01 J

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-1801
Amos - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
12/18/2018	Background	0.273	1.76	10.4	5.01	8.9	8.1	498
1/24/2019	Background	0.247	1.59	10.8	5.19	8.9	7.2	490
2/21/2019	Background	0.219	1.38	11.0	5.26	9.0	6.8	550
3/13/2019	Background	0.251	1.55	11.1	5.32	9.0	6.6	509
4/23/2019	Background	0.246	1.50	11.3	5.35	9.1	8.2	507
6/11/2019	Background	0.260	1.45	10.4	5.03	9.4	6.5	506
7/23/2019	Background	0.246	1.41	10.8	5.47	8.8	7.2	502
11/5/2019	Background	0.255	1.46	11.7	5.36	8.7	7.0	501
5/7/2020	Detection	0.252	1.65	11.6	4.98	8.9	6.8	541
11/4/2020	Detection	0.215	1.52	12.5	5.34	9.0	7.5	535

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-1801
Amos - LF
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
12/18/2018	Background	0.30	13.5	39.3	0.113	0.07	3.30	0.876	0.816	5.01	0.966	< 0.009 U	< 0.002 U	58.4	0.3	< 0.1 U
1/24/2019	Background	0.14	11.8	34.6	0.08 J	< 0.01 U	2.56	0.436	0.983	5.19	0.544	0.032	< 0.002 U	64.5	0.2 J	< 0.1 U
2/21/2019	Background	0.14	10.4	28.7	0.02 J	< 0.01 U	0.585	0.162	0.175	5.26	0.272	< 0.009 U	< 0.002 U	66.3	0.1 J	< 0.1 U
3/13/2019	Background	0.1 J	9.02	26.6	< 0.02 U	< 0.01 U	0.463	0.143	0.58	5.32	0.116	< 0.009 U	< 0.002 U	60.8	0.05 J	< 0.1 U
4/23/2019	Background	0.14	9.95	30.9	0.02 J	< 0.01 U	0.722	0.180	0.751	5.35	0.240	< 0.009 U	< 0.002 U	69.4	0.06 J	< 0.1 U
6/11/2019	Background	0.1 J	7.80	25.4	< 0.02 U	< 0.01 U	0.336	0.120	0.208	5.03	0.09 J	< 0.009 U	< 0.002 U	61.6	0.05 J	< 0.1 U
7/23/2019	Background	0.06 J	7.95	26.2	< 0.02 U	< 0.01 U	0.229	0.092	0.569	5.47	0.07 J	< 0.02 U	< 0.002 U	62.7	< 0.03 U	< 0.1 U
11/5/2019	Background	0.04 J	7.74	25.9	< 0.02 U	< 0.01 U	0.483	0.073	0.29	5.36	0.07 J	0.00829	< 0.002 U	62.8	< 0.03 U	< 0.1 U

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: MW-1802
Amos - LF
Appendix III Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
12/17/2018	Background	0.267	0.821	8.33	4.79	9.1	20.6	482
1/25/2019	Background	0.249	0.924	8.87	4.82	9.1	20.3	451
2/21/2019	Background	0.233	0.840	8.94	4.87	9.3	20.1	532
3/13/2019	Background	0.234	0.860	9.21	4.75	9.3	18.8	477
4/24/2019	Background	0.242	0.910	9.13	5.04	9.2	21.2	478
6/12/2019	Background	0.253	0.876	9.01	4.54	9.0	19.1	476
7/23/2019	Background	0.236	0.865	8.80	5.16	9.0	20.7	476
11/5/2019	Background	0.254	0.892	9.90	4.84	8.9	19.7	460
5/7/2020	Detection	0.258	0.963	9.12	4.91	8.8	15.2	490
11/5/2020	Detection	0.223	0.974	10.7	4.89	9.2	19.0	494

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed

Table 1 - Groundwater Data Summary: MW-1802
Amos - LF
Appendix IV Constituents

Geosyntec Consultants, Inc.

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
12/17/2018	Background	0.03 J	6.08	15.5	< 0.02 U	< 0.01 U	0.296	0.081	0.445	4.79	0.1 J	< 0.009 U	< 0.002 U	22.7	0.04 J	< 0.1 U
1/25/2019	Background	0.05 J	6.00	17.1	0.03 J	< 0.01 U	0.497	0.219	0.522	4.82	0.214	0.03 J	< 0.002 U	23.1	0.05 J	< 0.1 U
2/21/2019	Background	0.03 J	6.42	16.1	< 0.02 U	< 0.01 U	0.232	0.083	0.1739	4.87	0.08 J	< 0.009 U	< 0.002 U	24.9	< 0.03 U	< 0.1 U
3/13/2019	Background	0.04 J	6.28	15.2	< 0.02 U	< 0.01 U	0.269	0.074	0.0735	4.75	0.1 J	< 0.009 U	< 0.002 U	23.9	< 0.03 U	< 0.1 U
4/24/2019	Background	0.08 J	6.24	17.0	< 0.02 U	< 0.01 U	0.300	0.099	0.281	5.04	0.142	< 0.009 U	< 0.002 U	28.0	0.06 J	< 0.1 U
6/12/2019	Background	0.02 J	5.66	13.6	< 0.02 U	< 0.01 U	0.08 J	0.03 J	0.418	4.54	0.04 J	< 0.009 U	< 0.002 U	23.3	< 0.03 U	< 0.1 U
7/23/2019	Background	0.04 J	6.43	15.5	< 0.02 U	< 0.01 U	0.281	0.071	0.0519	5.16	0.1 J	< 0.02 U	< 0.002 U	26.9	0.05 J	< 0.1 U
11/5/2019	Background	0.04 J	6.37	14.6	< 0.02 U	< 0.01 U	0.273	0.04 J	0.2057	4.84	0.06 J	0.00714	< 0.002 U	26.8	0.05 J	< 0.1 U

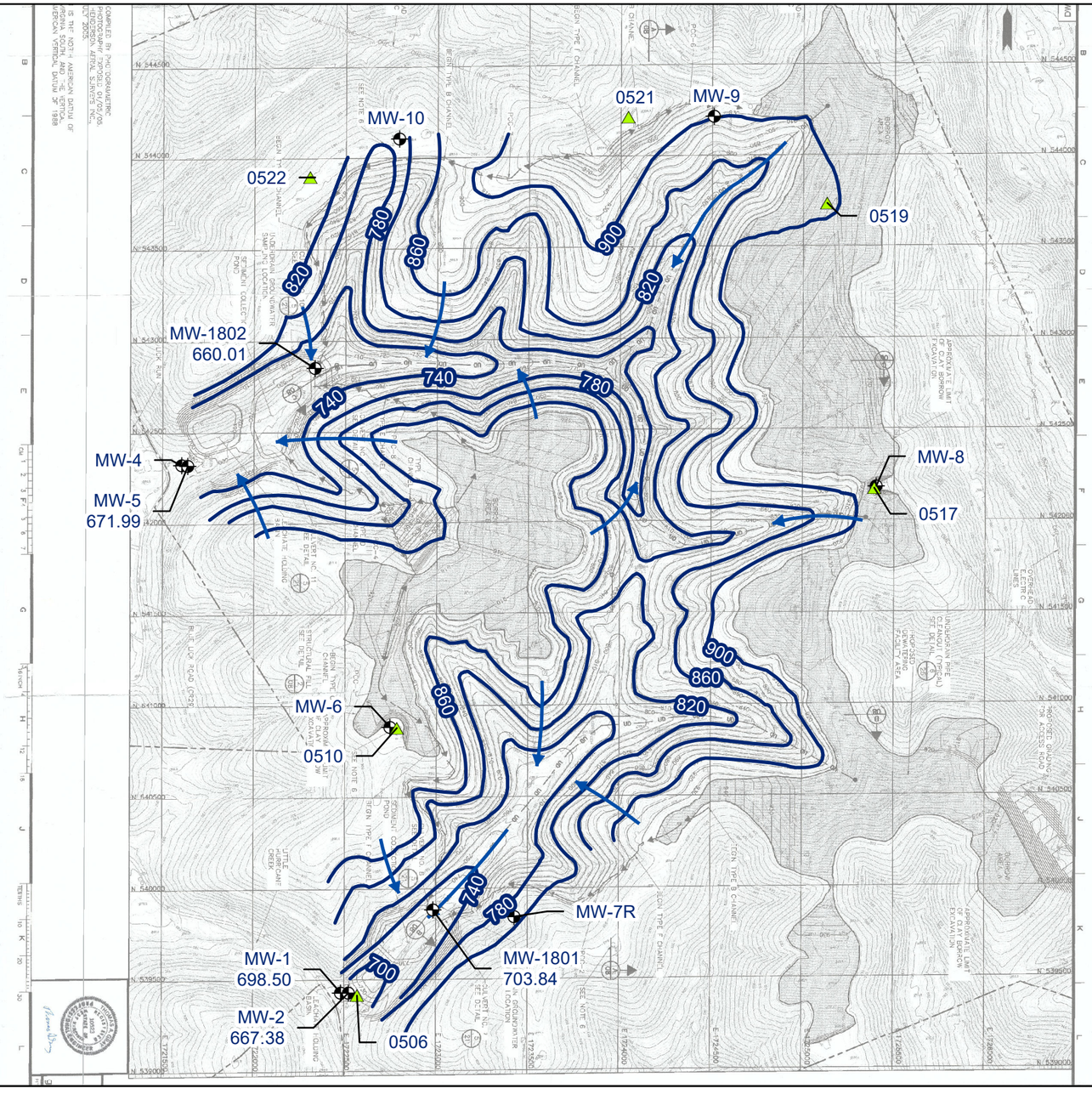
Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
J: Estimated value. Parameter was detected at concentration below the reporting limit
- -: Not analyzed
pCi/L: picocuries per liter

Table 2: Residence Time Calculation Summary
Amos Landfill

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2018-12		2019-01		2019-02		2019-03		2019-04	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	MW-1 [2]	2.0	3.1	19.4	3.1	19.4	NC	NC	NC	NC	NC	NC
	MW-2 [2]	2.0	0.6	94.6	1.2	49.5	0.6	95.2	NC	NC	NC	NC
	MW-4 [2]	2.0	NC	NC	1.7	35.3	NC	NC	NC	NC	NC	NC
	MW-5 [2]	2.0	1.9	32.7	2.0	30.1	NC	NC	NC	NC	NC	NC
	MW-6 [1]	2.0	NC	NC	1.6	37.7	NC	NC	NC	NC	NC	NC
	MW-7R [1]	2.0	NC	NC	0.9	70.5	NC	NC	NC	NC	NC	NC
	MW-8 [1]	2.0	NC	NC	2.5	24.6	NC	NC	NC	NC	NC	NC
	MW-9 [1]	2.0	NC	NC	5.7	10.7	NC	NC	NC	NC	NC	NC
	MW-10 [1]	2.0	NC	NC	0.7	81.2	NC	NC	NC	NC	NC	NC
	MW-1801 [2]	2.0	2.3	27.0	2.3	27.0	2.3	26.8	2.3	26.4	2.3	26.4
	MW-1802 [2]	2.0	2.5	23.9	2.5	24.0	2.6	23.8	2.6	23.2	2.6	23.6

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2019-06		2019-07		2019-11		2020-05		2020-11	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	MW-1 [2]	2.0	3.5	17.6	3.2	18.9	3.5	17.3	3.4	17.6	3.5	17.3
	MW-2 [2]	2.0	0.6	106	0.6	94.5	0.6	104	0.6	107	0.6	104
	MW-4 [2]	2.0	1.8	33.5	1.8	33.3	1.8	34.4	1.7	36.4	1.8	34.5
	MW-5 [2]	2.0	1.8	33.5	1.8	33.2	1.8	33.2	1.9	31.2	1.8	33.3
	MW-6 [1]	2.0	1.9	31.3	2.1	29.6	2.1	28.4	1.6	38.6	2.2	27.4
	MW-7R [1]	2.0	0.8	72.3	0.8	73.1	0.7	83.6	0.9	67.5	0.7	89.4
	MW-8 [1]	2.0	2.3	26.2	2.1	28.3	2.4	25.8	3.1	19.7	2.3	26.9
	MW-9 [1]	2.0	3.4	18.2	2.1	28.4	0.0	1,441	3.4	18.0	2.1	29.3
	MW-10 [1]	2.0	1.1	56.7	0.9	71.1	0.6	95.7	4.6	13.3	0.6	95.0
	MW-1801 [2]	2.0	2.3	26.3	2.3	26.3	2.3	26.6	2.3	26.3	2.3	26.6
	MW-1802 [2]	2.0	2.6	23.5	2.6	23.5	2.6	23.6	2.6	23.6	2.6	23.5

Notes:
[1] - Background Well
[2] - Downgradient Well
NC - Not Calculated



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on December 17, 2018) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.
- Locations without groundwater elevation data were not gauged during this event.

700 350 0 700 Feet

Potentiometric Surface Map - Uppermost Aquifer
December 2018

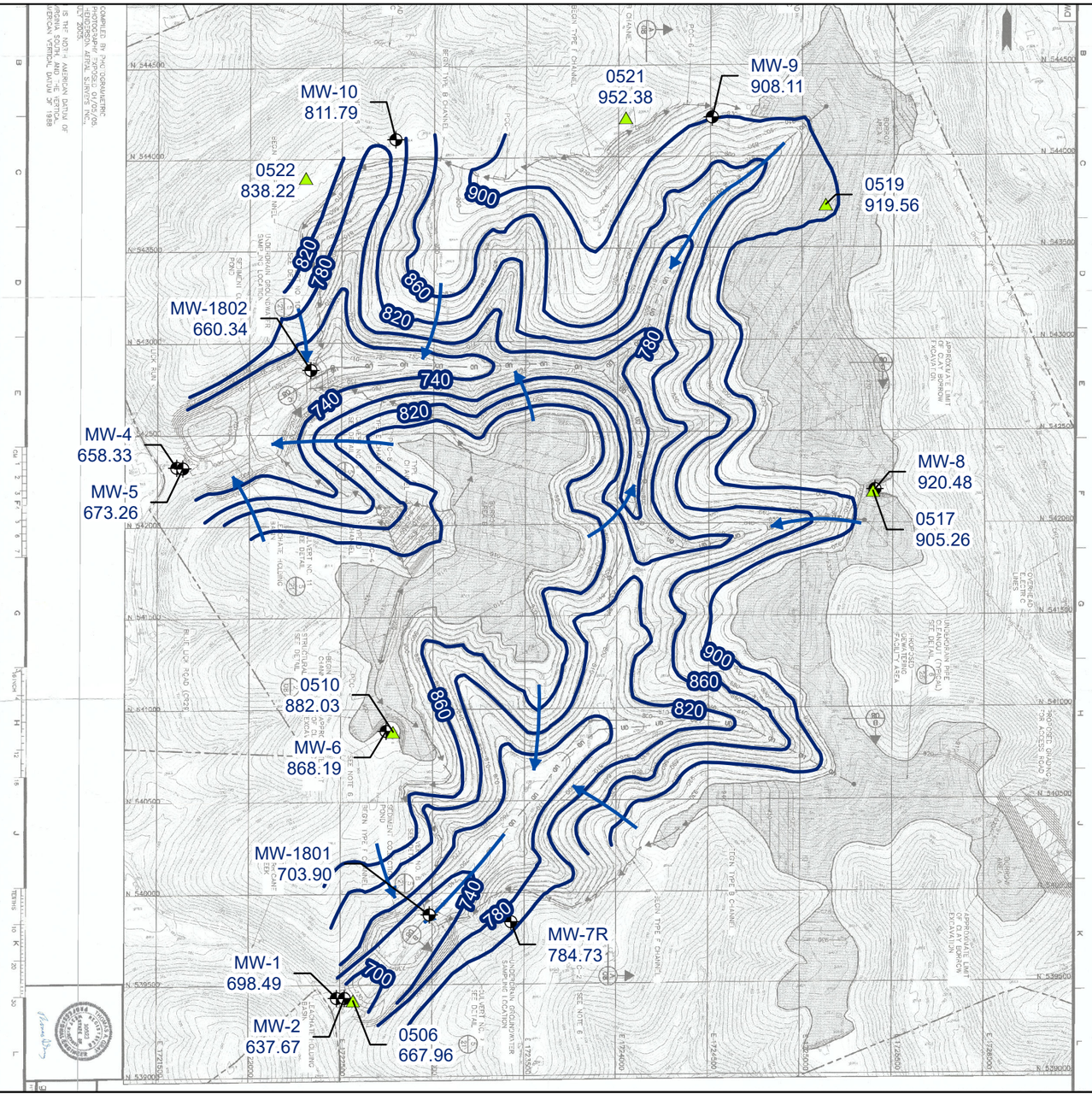
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/01/28

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\MW-1801 MW-1802 Background\AEP-Amos_Landfill_GW_2018-12.mxd. ARevezzo. 1/28/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on January 24, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.
- Locations without groundwater elevation data were not gauged during this event.

Potentiometric Surface Map - Uppermost Aquifer
January 2019

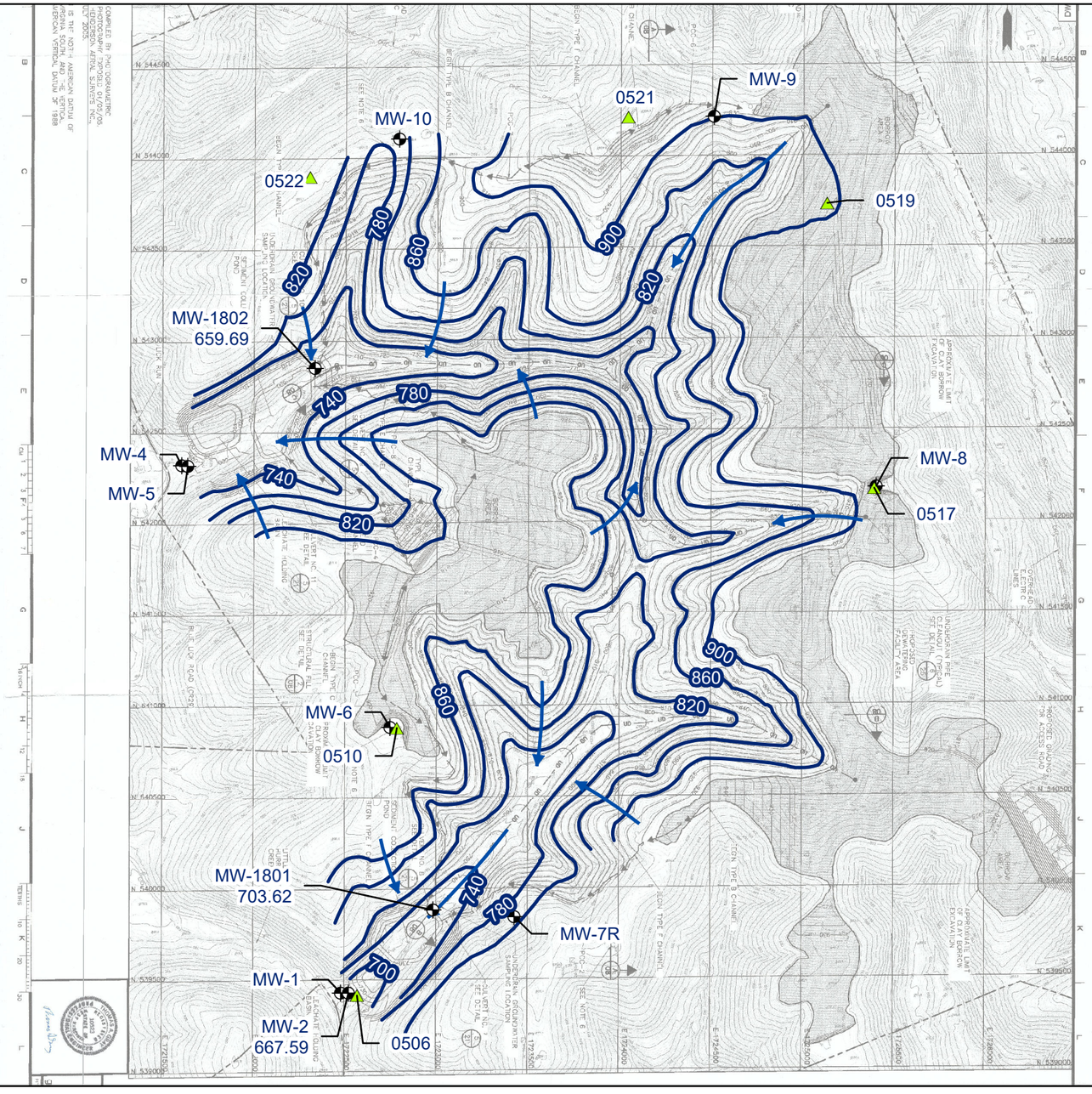
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/01/28

Figure **3**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\MW-1801 MW-1802 Background\AEP-Amos_Landfill_GW_2019-01.mxd. ARevezzo. 1/28/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on February 21, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.
- Locations without groundwater elevation data were not gauged during this event.

700 350 0 700 Feet

Potentiometric Surface Map - Uppermost Aquifer
February 2019

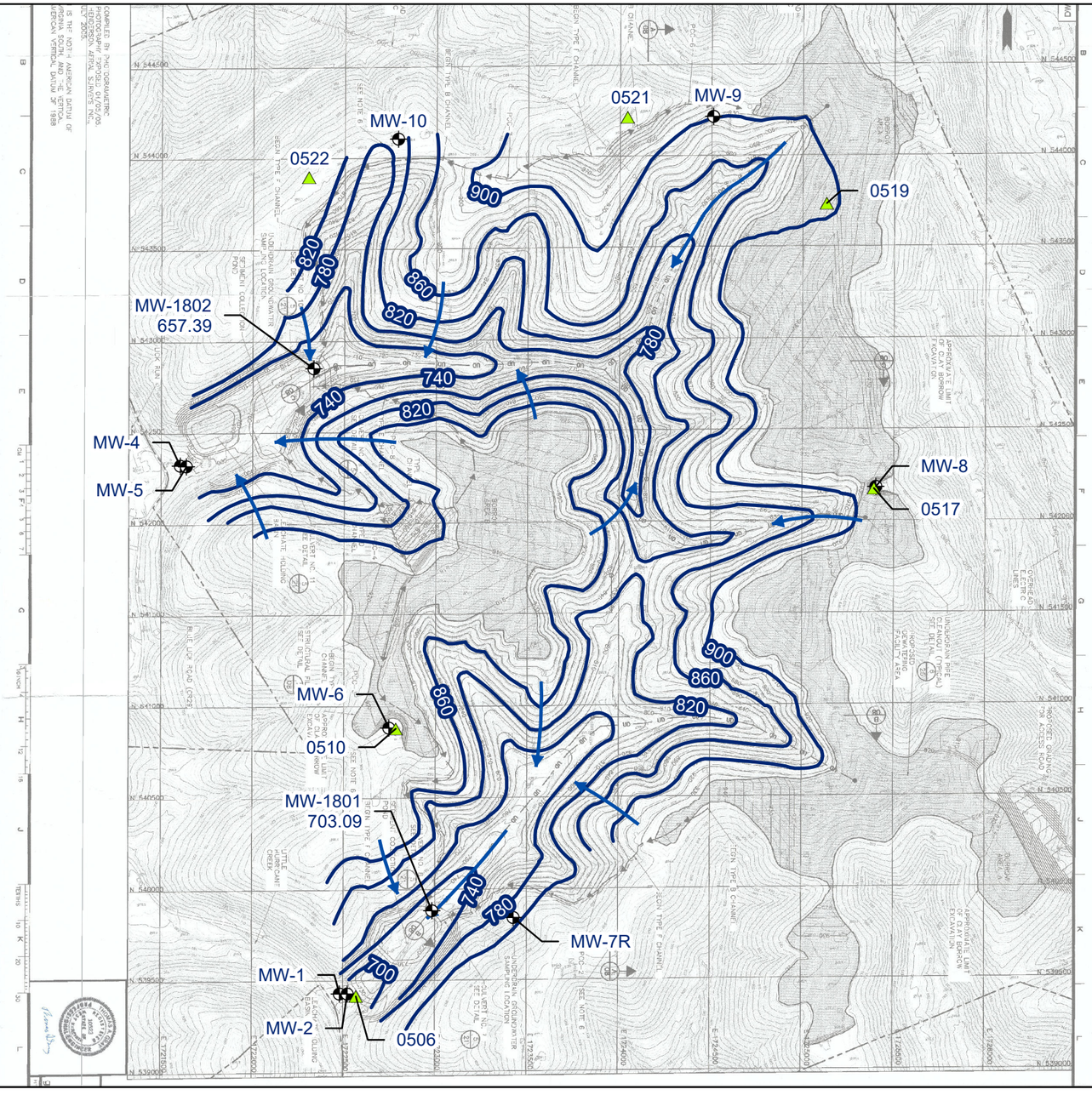
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/01/28

Figure **4**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\MW-1801 MW-1802 Background\AEP-Amos_Landfill_GW_2019-02.mxd. ARevezzo. 1/28/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on March 31, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.
- Locations without groundwater elevation data were not gauged during this event.

700 350 0 700
Feet

Potentiometric Surface Map - Uppermost Aquifer
March 2019

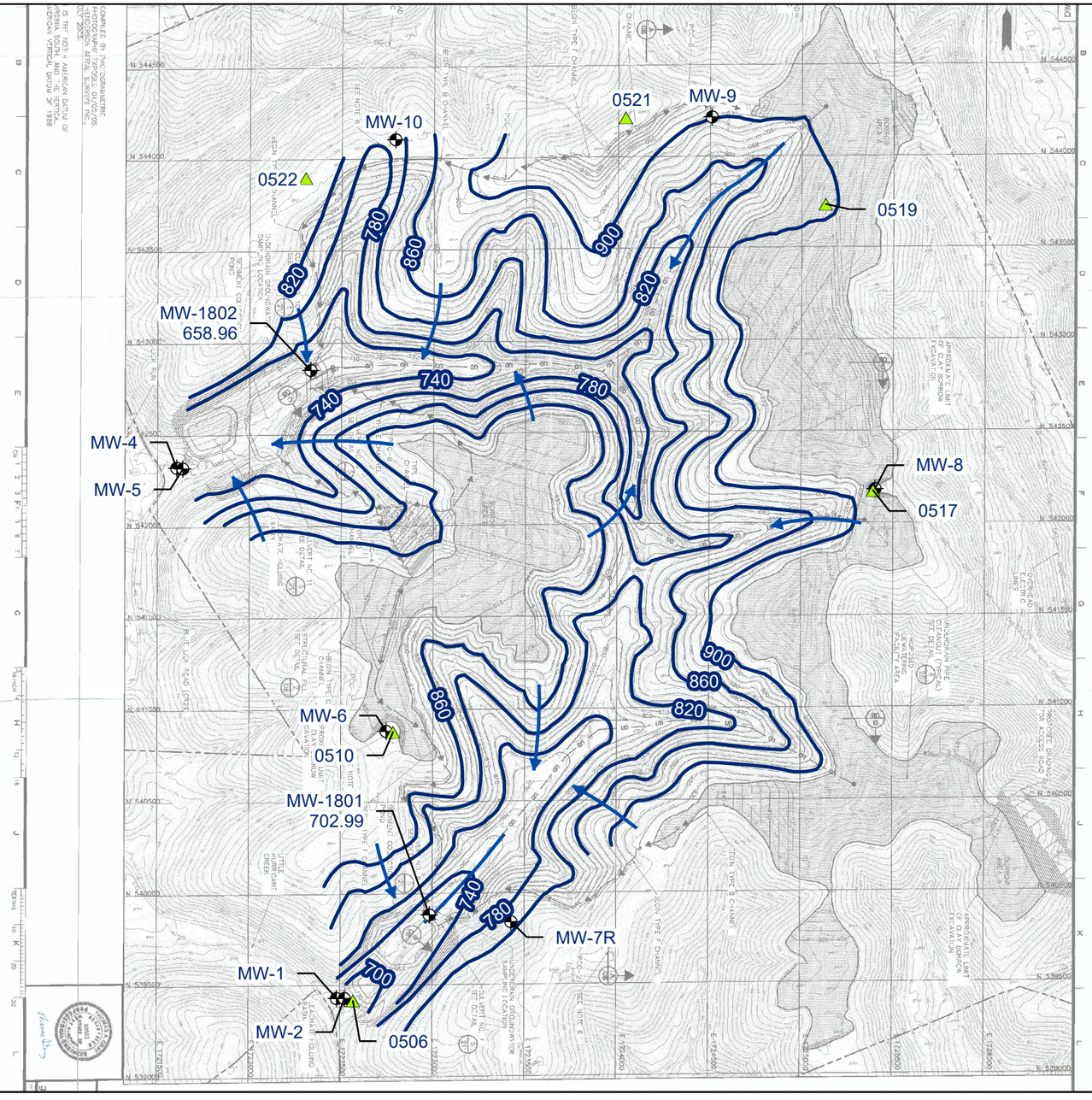
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/01/28

Figure **5**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\MW-1801 MW-1802 Background\AEP-Amos_Landfill_GW_2019-03.mxd. ARevezzo. 1/28/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on April 23, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.
- Locations without groundwater elevation data were not gauged during this event.

700 350 0 700
Feet

Potentiometric Surface Map - Uppermost Aquifer
April 2019

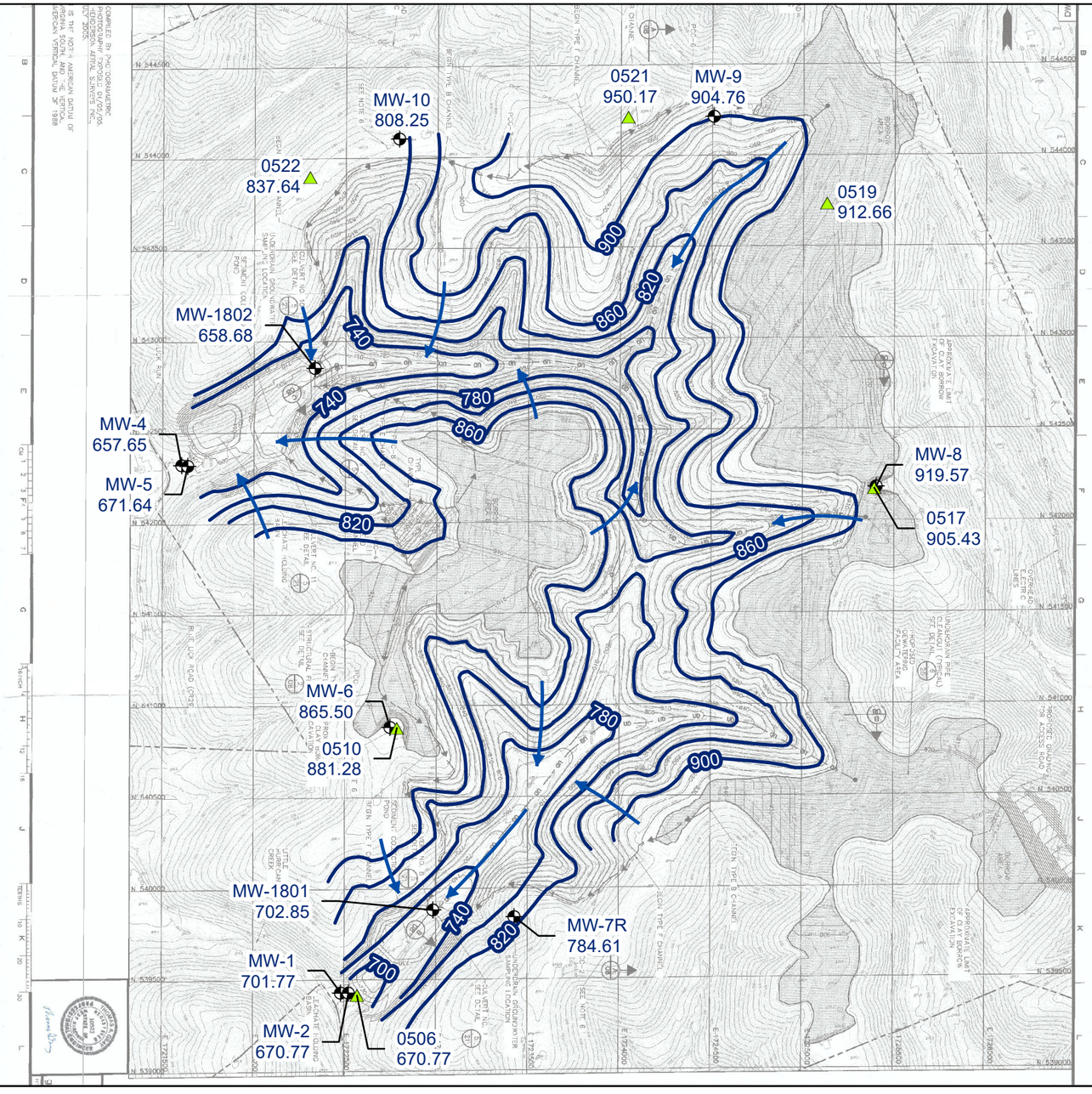
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/01/28

Figure **6**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\MW-1801 MW-1802 Background\AEP-Amos_Landfill_GW_2019-04.mxd. ARevezzo. 1/28/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on June 10, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.

700 350 0 700
Feet

Potentiometric Surface Map - Uppermost Aquifer
June 2019

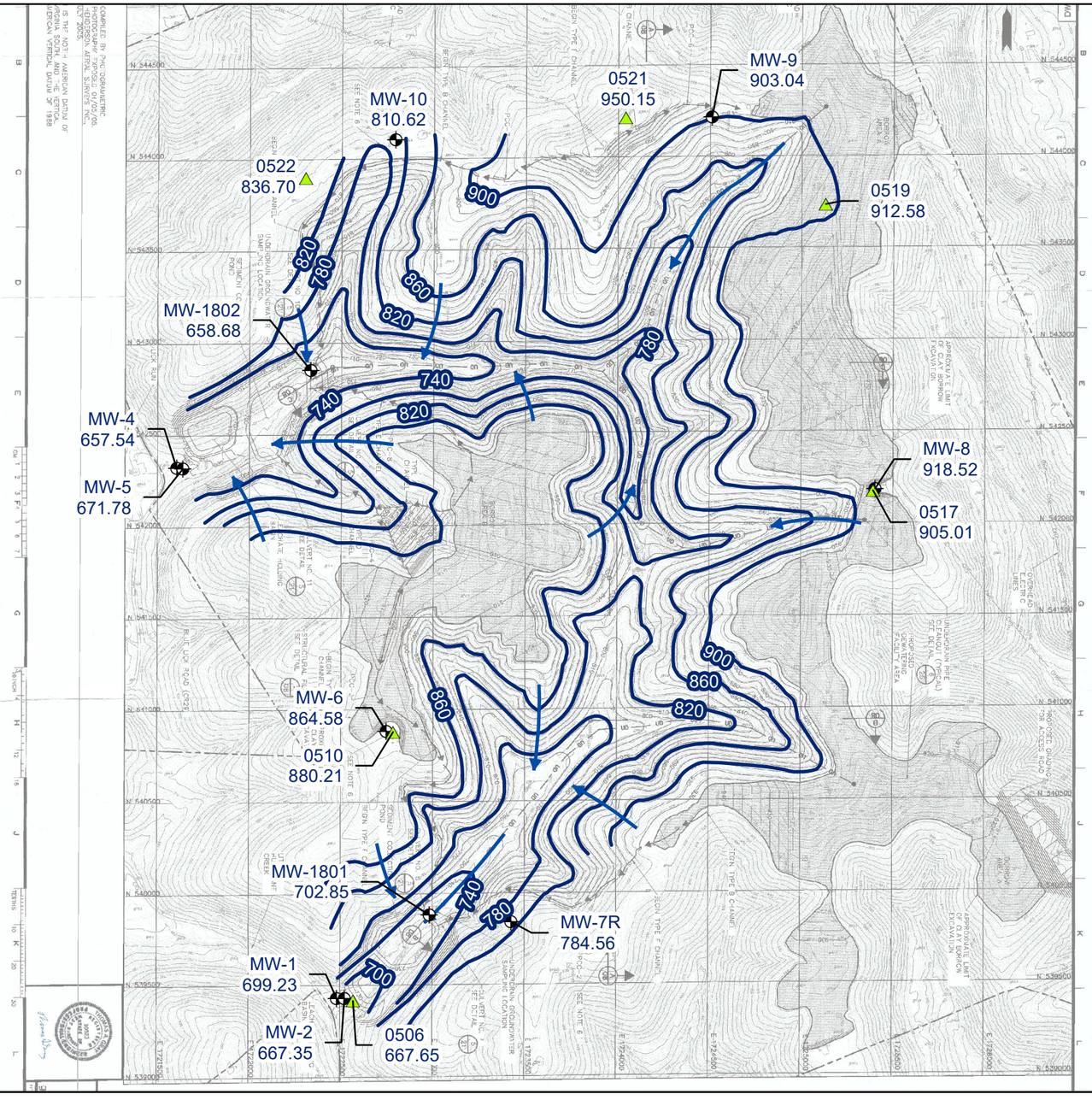
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/02/01

Figure **7**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2019\AEP-Amos_Landfill_GW_2019-06.mxd. NWilliams. 2/1/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on July 22, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.

700 350 0 700 Feet

Potentiometric Surface Map - Uppermost Aquifer
July 2019

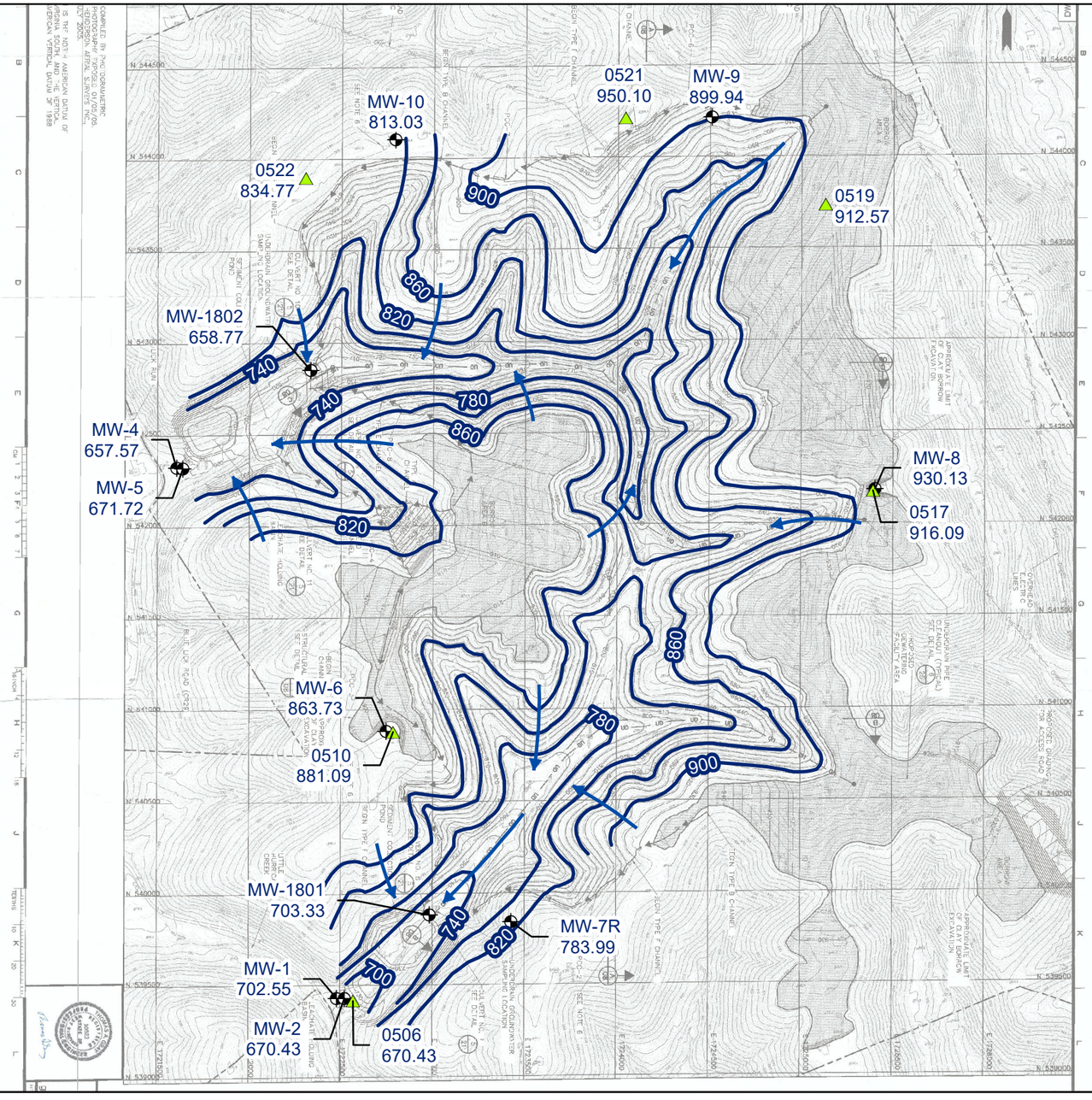
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/01/28

Figure **8**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\MW-1801 MW-1802 Background\AEP-Amos_Landfill_GW_2019-07.mxd. ARevezzo. 1/28/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on November 4, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.

700 350 0 700
Feet

Potentiometric Surface Map - Uppermost Aquifer
November 2019

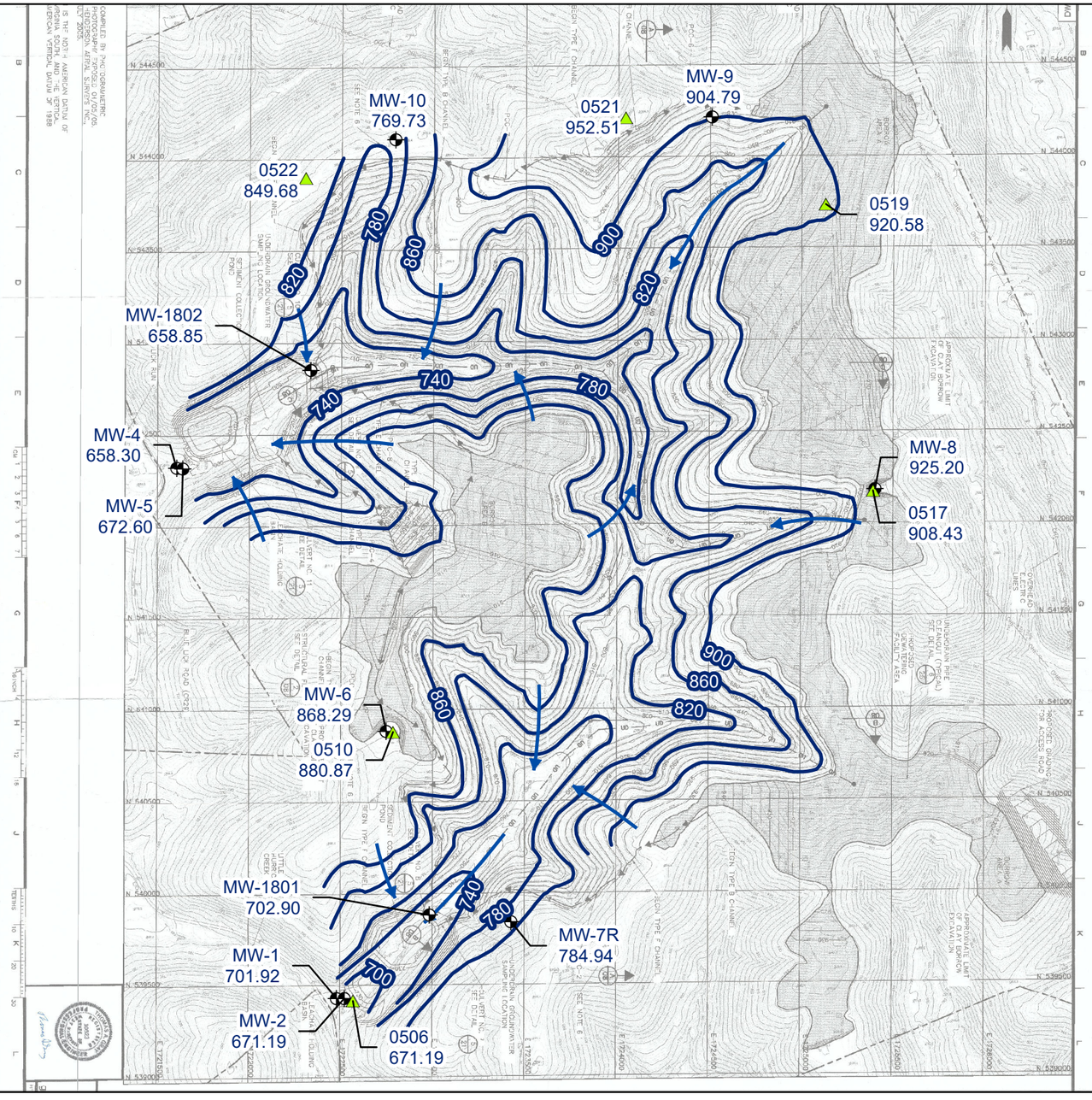
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/02/01

Figure **9**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2019\AEP-Amos_Landfill_GW_2019-11.mxd. NWilliams. 2/1/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on May 4, 2020) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.

700 350 0 700
Feet

Potentiometric Surface Map - Uppermost Aquifer
May 2020

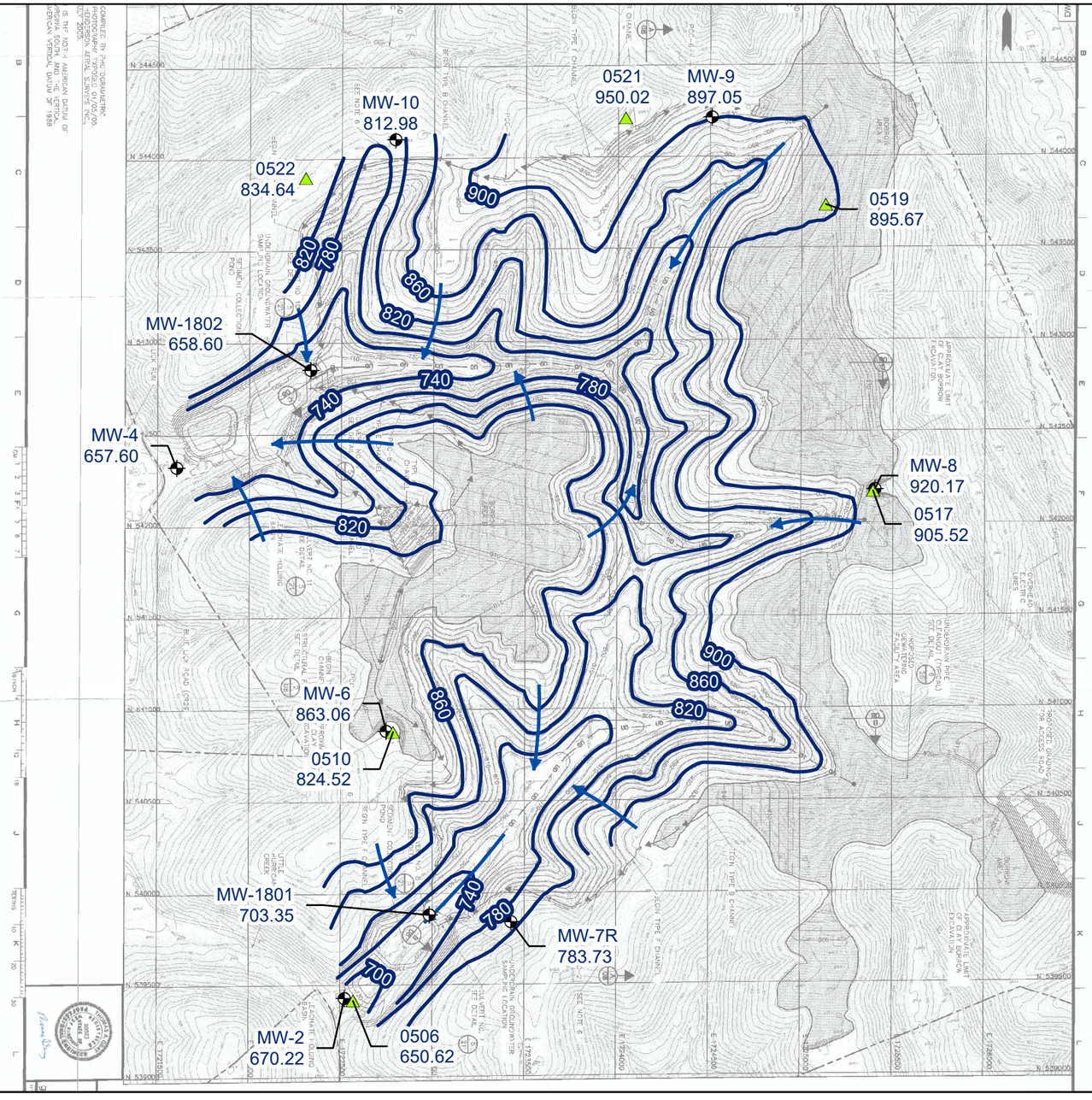
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/02/01

Figure **10**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2020\AEP-Amos_Landfill_GW_2020-05.mxd. NWilliams. 2/1/2021. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on November 2, 2020) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.

700 350 0 700
Feet

Potentiometric Surface Map - Uppermost Aquifer
November 2020

AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2021/02/01

Figure **11**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2020\AEP-Amos_Landfill_GW_2020-11.mxd. NWilliams. 2/1/2021. CHA8423/04/08.

APPENDIX 2

The statistical analysis reports, background update, and background development for the monitoring wells added to the groundwater monitoring network follow.

STATISTICAL ANALYSIS SUMMARY-
Background Update Calculations
Landfill – John E. Amos Plant
Winfield, West Virginia

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, Ohio 43221

February 27, 2020

CHA8473

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Value
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LF	Landfill
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
NELAP	National Environmental Laboratory Accreditation Program
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the landfill (LF), an existing CCR unit at the John E. Amos Power Plant located in Winfield, West Virginia.

Eight monitoring events were completed prior to June 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. Four semiannual detection monitoring events were conducted between November 2017 and July 2019. Data from these four events, including both initial and verification results, were evaluated for inclusion in the background dataset. Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The detection monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. The compliance data were reviewed for outliers, with select values removed prior to updating upper prediction limits (UPLs) for each Appendix III parameter to represent background values. Oversight on the use of statistical calculations was provided by Dr. Kirk Cameron of MacStat Consulting, Ltd. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

LANDFILL EVALUATION

2.1 Previous Background Calculations

Eight background monitoring events were completed between August 2016 and June 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. The data were reviewed for outliers and trends prior to calculating upper prediction limits (UPLs) for each Appendix III parameter. Lower prediction limits (LPLs) were also established for pH. Intrawell prediction limits were selected for all parameters with a one-of-two resampling procedure. The statistical analyses to establish background levels were previously documented in the January 2018 *Statistical Analysis Summary* report (Geosyntec, 2017).

A review of groundwater geochemistry at the site identified two types of groundwater, which are referred to as Group 1 and Group 2. Group 1 groundwater is predominantly composed of sodium and bicarbonate, whereas Group 2 has notable concentrations of calcium and magnesium in addition to sodium and bicarbonate. Group 1 consists of upgradient well MW-10 and downgradient wells MW-2 and MW-4. Group 2 consists of upgradient wells MW-6, MW-7R, MW-8 and MW-9 and downgradient wells MW-1 and MW-5. As the two groups of groundwater have distinct geochemistries, the statistics for boron and fluoride were revised to an intrawell approach (Geosyntec, 2018a).

2.2 Data Validation & QA/QC

Since November 2017, four semiannual detection monitoring events have been conducted at the LF. If a possible exceedance was identified for the initial detection monitoring event, verification sampling was completed on an individual well/parameter basis to confirm or refute the exceedance. Thus, a minimum of four samples were collected from each compliance well. A summary of data collected during these detection monitoring events may be found in Table 1. Select boron values at MW-2 were excluded from the dataset, as they were likely biased high due to field sampling procedures (Geosyntec, 2018b; Geosyntec, 2019).

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) procedures including laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs) were performed by the analytical laboratory.

The analytical data were imported into a Microsoft Access database, where checks were performed to assess the accuracy of sample identification and analyte results. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.23 statistics software. The export was checked

against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.3 Statistical Analysis

The detection monitoring data used to conduct the statistical analyses described below are summarized in Table 1. Statistical analyses for the LF were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. The complete statistical analysis results are included in Attachment B.

Time series plots of Appendix III parameters are included in Attachment B and were used to evaluate concentrations over time and to provide an initial screening of suspected outliers and trends for each Group of monitoring wells. Box plots were also compiled to provide visual representation of variations between wells and within individual wells for each grouping of monitoring wells (Attachment B).

2.3.1 Outlier Evaluation

Potential outliers were evaluated using Tukey's outlier test; i.e., data points were considered potential outliers if they met one of the following criteria:

$$x_i < \tilde{x}_{0.25} - 3 \times IQR \quad (1)$$

or

$$x_i > \tilde{x}_{0.75} + 3 \times IQR \quad (2)$$

where:

$x_i =$ individual data point
$\tilde{x}_{0.25} =$ first quartile
$\tilde{x}_{0.75} =$ third quartile
$IQR =$ the interquartile range $= \tilde{x}_{0.75} - \tilde{x}_{0.25}$

Data that were evaluated as potential outliers are summarized in Attachment B. Tukey's outlier test and visual inspection indicated two potential outliers in the data collected for the four most recent detection monitoring events. Next, the data were reviewed to identify possible sources of errors or discrepancies, including data recording errors, unusual sampling conditions, laboratory quality, or inconsistent sample turbidity. After further review the two values were deselected from the database prior to construction of prediction limits to allow more conservative limits. These outliers included the reported calcium value of 3.5 mg/L for the May 2018 event at well MW-2 and the reported boron value of 0.338 mg/L for the June 2018 event at well MW-2. While the reported pH value of 3.3 SU during the January 2018 sampling event at MW-4 was not identified as an outlier using Tukey's test, it was deselected from the database as it was considerably lower than other measurements within MW-4.

2.3.2 Establishment of Updated Background Levels

Analysis of variance (ANOVA) was conducted during the initial background screening to assist in identifying if intrawell tests are the most appropriate statistical approach for assessing Appendix III parameters. Intrawell tests compare compliance data from a single well to background data within the same well and are most appropriate when 1) upgradient wells exhibit spatial variation; 2) when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; or 3) when downgradient water quality is not impacted compared to upgradient water quality for the same parameter. Periodic updating of background statistical limits is necessary as natural systems continuously change due to physical changes to the environment. For intrawell analyses, data for all wells and constituents are re-evaluated when a minimum of four new data points are available. These four (or more) new data points are used to determine if earlier concentrations are representative of present-day groundwater quality.

Mann-Whitney (Wilcoxon rank-sum) tests were used to compare the medians of historical data (August 2016 - June 2017) to the new compliance samples (November 2017 – July 2019). Results were evaluated to determine if the medians of the two groups were similar at the 99% confidence level. Where no significant difference was found, the new compliance data were added to the background dataset. Where a statistically significant difference was found between the medians of the two groups, the data were reviewed to evaluate the cause of the difference and to determine if adding newer data to the background dataset, replacing the background dataset with the newer data, or continuing to use the existing background dataset was most appropriate. If the differences appeared to have been caused by a release, then the previous background dataset would have continued to be used.

The complete Mann-Whitney test results and a summary of the significant findings can be found in Attachment B. Statistical differences were noted between historic and recent chloride results at monitoring well MW-5 and fluoride results at monitoring well MW-1, both of which are in the Group 2 groundwater type. Typically, when the test concludes that the medians of the two groups are significantly different the background is not updated to include the newer data; however, the more recent concentrations noted in these wells for these constituents were similar to or lower than concentrations noted in upgradient wells. Therefore, the most recent eight samples, which are the more stable and more reflective of present-day conditions, were used to update intrawell prediction limits for chloride at MW-5 and fluoride at MW-1.

2.3.3 Updated Prediction Limits

After the revised background set was established, a parametric or non-parametric analysis was selected based on the distribution of the data and the frequency of non-detect data. Estimated results less than the practical quantitation limit (PQL) – i.e., "J-flagged" data – were considered detections and the estimated results were used in the statistical analyses. Non-parametric analyses were selected for datasets with at least 50% non-detect data or datasets that could not be normalized. Parametric analyses were selected for datasets (either transformed or untransformed) that passed the Shapiro-Wilk / Shapiro-Francía test for normality. The Kaplan-Meier non-detect

adjustment was applied to datasets with between 15% and 50% non-detect data. For datasets with fewer than 15% non-detect data, non-detect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or non-parametric) and transformation (where applicable) for each background dataset are shown in Attachment B.

Intrawell UPLs were updated using all the historical data through July 2019 to represent background values. Intrawell LPLs were also generated for pH. The only exceptions were for chloride and fluoride at MW-5 and MW-1, respectively, as described in Section 2.3.2. The updated prediction limits are summarized in Table 2.

The intrawell UPLs were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result did not exceed the UPL, a second sample was not collected. The retesting procedures allowed achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.4 Conclusions

Four detection monitoring events were completed in accordance with the CCR Rule. The laboratory and field data from these events were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. Mann-Whitney tests were completed to evaluate whether data from the detection monitoring events could be added to the existing background dataset. Where appropriate, the background datasets were updated, and UPLs and LPLs were recalculated. Intrawell tests using a one-of-two retesting procedure were utilized for Appendix III parameters.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – John E. Amos Plant. January.

Geosyntec Consultants, 2017. Statistical Analysis Summary. Landfill – John E. Amos Plant. January.

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United States Environmental Protection Agency (USEPA). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March.

TABLES

Table 1: Groundwater Data Summary
Amos - Landfill

Component	Unit	MW-1					MW-2									
		11/1/2017	5/2/2018	11/29/2018	12/17/2018	6/11/2019	11/1/2017	1/8/2018	5/1/2018	6/19/2018	9/24/2018	11/28/2018	12/17/2018	1/24/2019	6/11/2019	7/22/2019
		D-1	2018-D1	2018-D2	2018-D2-R1	2019-D1	D-1	D-R1	2018-D1	2018-D1-R1	2018-D1-R2	2018-D2	2018-D2-R1	2018-D2-R1	2019-D1	2019-D1-R1
Boron	mg/L	0.0470	0.134	0.143	0.0700 J	0.0400 J	0.202	0.251	--	0.338	0.215	--	--	0.218	0.215	--
Calcium	mg/L	28.7	27.2	26.4	--	28.1	1.88	--	3.50	1.79	--	1.84	--	--	1.80	--
Chloride	mg/L	3.08	3.22	3.07	--	2.86	2.34	--	3.90	--	--	5.09	--	--	3.26	--
Fluoride	mg/L	0.100	0.100	0.110	--	0.110	1.46	1.07	1.45	1.28	--	1.15	--	--	1.63	1.41
Total Dissolved Solids	mg/L	224	194	191	--	184	394	353	344	--	--	355	--	--	379	--
Sulfate	mg/L	30.2	29.9	27.8	--	29.9	8.6	--	9.40	--	--	8.50	--	--	9.40	--
pH	SU	6.4	6.5	6.7	6.5	7.0	8.8	8.4	8.5	8.5	--	8.5	8.6	--	8.7	8.7

Component	Unit	MW-4					MW-5							
		11/1/2017	1/8/2018	5/1/2018	11/28/2018	6/12/2019	11/1/2017	1/8/2018	5/2/2018	6/20/2018	11/29/2018	12/17/2018	6/12/2019	7/22/2019
		D-1	D-R1	2018-D1	2018-D2	2019-D1	D-1	D-R1	2018-D1	2018-D1-R1	2018-D2	2018-D2-R1	2019-D1	2019-D1-R1
Boron	mg/L	0.194	0.145	0.199	0.188	0.167	0.0460	--	0.123	0.126	0.100 U	--	0.0200 J	--
Calcium	mg/L	0.766	--	0.783	0.807	0.788	15.6	--	14.3	--	14.1	--	16.2	--
Chloride	mg/L	14.2	--	14.9	14.1	14.4	4.09	4.22	4.39	4.61	4.86	4.77	4.60	4.61
Fluoride	mg/L	1.36	1.37	1.47	1.42	1.46	0.0900	--	0.0900	--	0.130	--	0.110	--
Total Dissolved Solids	mg/L	404	--	380	383	415	136	--	122	--	113	--	132	--
Sulfate	mg/L	9.30	--	9.00	8.80	9.00	28.4	--	26.3	--	24.5	--	26.4	--
pH	SU	9.4	3.3	9.2	8.8	8.6	6.1	6.7	6.2	6.1	7.4	6.2	6.1	6.0

Component	Unit	MW-6				MW-7R				MW-8			
		11/2/2017	5/1/2018	11/28/2018	6/12/2019	11/2/2017	5/1/2018	11/28/2018	6/12/2019	11/2/2017	5/1/2018	11/29/2018	6/12/2019
		D-1	2018-D1	2018-D2	2019-D1	D-1	2018-D1	2018-D2	2019-D1	D-1	2018-D1	2018-D2	2019-D1
Boron	mg/L	0.159	0.163	0.156	0.0800 J	0.109	0.145	0.118	0.100 J	0.0310	0.0650	0.0500 J	0.0300 J
Calcium	mg/L	41.3	33.4	35.8	32.8	31.7	30.3	44.4	36.8	125	136	126	125
Chloride	mg/L	7.77	6.94	6.85	6.85	3.59	4.09	3.65	3.75	12.1	13.1	13.2	8.58
Fluoride	mg/L	0.220	0.260	0.240	0.280	0.280	0.360	0.260	0.350	0.150	0.170	0.170	0.200
Total Dissolved Solids	mg/L	440	358	333	363	636	688	627	700	526	592	558	540
Sulfate	mg/L	51.8	24.7	22.9	21.9	211	239	201	226	63.1	78.8	58.8	54.5
pH	SU	7.5	7.4	7.6	7.7	7.6	7.7	7.4	7.4	6.8	6.9	6.8	7.6

Component	Unit	MW-9				MW-10			
		11/2/2017	5/1/2018	11/29/2018	6/11/2019	11/2/2017	5/2/2018	11/29/2018	6/11/2019
		D-1	2018-D1	2018-D2	2019-D1	2018-D1	2018-D2	2018-D2	2019-D1
Boron	mg/L	0.0750	0.200	0.0900 J	0.0400 J	0.0950	0.157	0.174	0.0800 J
Calcium	mg/L	79.1	73.1	78.8	97.6	1.12	1.74	1.03	1.03
Chloride	mg/L	5.97	6.14	6.08	6.03	5.08	5.67	5.27	5.12
Fluoride	mg/L	0.200	0.260	0.210	0.200	0.550	0.690	0.590	0.720
Total Dissolved Solids	mg/L	404	402	412	436	508	522	506	524
Sulfate	mg/L	33.1	30.9	31.6	37.9	17.0	16.7	15.3	16.0
pH	SU	7.1	7.2	7.1	7.3	9.2	9.2	8.7	9.0

Notes:
mg/L: milligrams per liter
SU: standard unit
U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit
J: Estimated value. Parameter was detected in concentrations below the reporting limit
--: Not Measured
D1: First semi-annual detection monitoring event of the year
D2: Second semi-annual detection monitoring event of the year
R1: First verification event associated with detection monitoring round

Table 2: Background Level Summary
Amos - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	Description	MW-1	MW-2	MW-4	MW-5
Boron	mg/L	Intrawell Background Value (UPL)	0.162	0.247	0.214	0.135
Calcium	mg/L	Intrawell Background Value (UPL)	31.7	2.10	0.912	18.1
Chloride	mg/L	Intrawell Background Value (UPL)	3.60	5.40	15.9	5.37
Fluoride	mg/L	Intrawell Background Value (UPL)	0.124	1.61	1.52	0.148
pH	SU	Intrawell Background Value (UPL)	7.3	9.0	10.1	8.2
		Intrawell Background Value (LPL)	5.8	8.2	8.3	6.0
Sulfate	mg/L	Intrawell Background Value (UPL)	32.8	12.9	12.2	30.7
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	259	394	422	166

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit

ATTACHMENT A

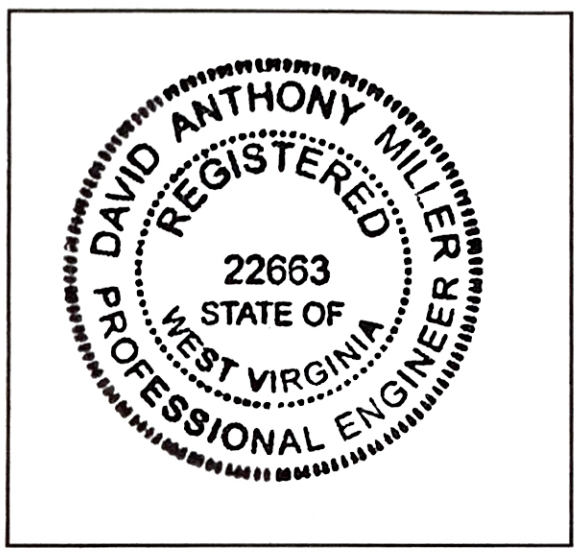
Certification by a Qualified Professional Engineer

Certification by a Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the John E. Amos Landfill CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer



David Anthony Miller

Signature

22663	WEST VIRGINIA	02.27.2020
License Number	Licensing State	Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

November 5, 2019

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

RE: Amos Landfill Background Update

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the background update and statistical analysis of the groundwater data for 2019 at American Electric Power's Amos Landfill. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at Amos Landfill for the CCR program in 2016, and at least 8 background samples have been collected at each of the groundwater monitoring wells. The monitoring well network, as provided by Geosyntec Consultants, is divided into two zones based on groundwater properties and geochemistry, which are referred to as Group 1 and Group 2.

Group 1 consists of the following wells:

- **Upgradient well:** LF-MW-10
- **Downgradient wells:** LF-MW-2 and LF-MW-4

Group 2 consists of the following wells:

- **Upgradient wells:** MF-MW-6, LF-MW-7R, LF-MW-8 and LF-MW-9
- **Downgradient wells:** LF-MW-1 and LF-MW-5

Data were provided electronically to Groundwater Stats Consulting (GSC), and the statistical analysis was reviewed by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting and primary author of the USEPA Unified Guidance. The statistical analysis was performed according to the groundwater data screening that was performed in April 2018 by GSC and approved by Dr. Cameron.

The following constituents were evaluated:

- **Appendix III parameters** – boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

Time series plots for Appendix III parameters at all wells for each Group are provided for the purpose of updating data at these wells (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells.

Data at all wells were originally evaluated during the background screening conducted in March 2018 (summarized below) for the following: 1) outliers; 2) trends; 3) most appropriate statistical method for Appendix III parameters based on site characteristics of groundwater data upgradient of the facility; and 4) eligibility of downgradient wells when intrawell statistical methods are recommended. Power curves were provided with the previous screening to demonstrate that the selected statistical methods for Appendix III parameters comply with the USEPA Unified Guidance recommendations as discussed below.

Summary of Statistical Methods:

1) Intrawell prediction limits, combined with a 1-of-2 resample plan for boron, calcium, chloride, fluoride, pH, sulfate and TDS.

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are nondetects, a nonparametric test is utilized. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits.

- No statistical analyses are required on wells and analytes containing 100% nondetects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% nondetects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for nondetects is the practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% nondetects, the Kaplan-Meier nondetect adjustment is applied to the background data. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric prediction limits are used on data containing greater than 50% nondetects.

Historical Summary - April 2018 Background Screening

Outlier Evaluation

Time series plots are used to identify suspected outliers, or extreme values that would result in limits that are not conservative from a regulatory perspective, in proposed background data. Suspected outliers at all wells for Appendix III parameters were formally tested using Tukey's box plot method and, when identified, flagged in the computer database with "o" and deselected prior to construction of statistical limits.

A couple outliers were noted for Group 1 which included arsenic and barium in well LF-MW-2. While outliers were noted for cadmium in wells LF-MW-2 and LF-MW-4, no values were flagged due to similar patterns noted in upgradient well LF-MW-10.

Tukey's outlier test did not identify any outliers for the upgradient wells in Group 2 except for thallium which were trace values and, therefore, not flagged. Outliers were noted for barium and molybdenum in downgradient well LF-MW-5 which were flagged in the database. The outlier noted by Tukey's test for chloride in well LF-MW-1 was not flagged as an outlier because the concentration is similar to those in neighboring wells. Additionally, it was the most recent value at the time and more information would be needed as more data are collected to determine if that concentration is unlike the others. A summary of these results were included in the previous screening.

No true seasonal patterns were observed on the time series plots for any of the detected data; therefore, no deseasonalizing adjustments were made to the data. When

seasonal patterns are observed, data may be deseasonalized so that the resulting limits will correctly account for the seasonality as a predictable pattern rather than random variation or a release.

While trends may be visual, a quantification of the trend and its significance is needed. The Sen's Slope/Mann Kendall trend test was used to evaluate all data at each well to identify statistically significant increasing or decreasing trends. In the absence of suspected contamination, significant trending data are typically not included as part of the background data used for construction of prediction limits. This step serves to eliminate the trend and, thus, reduce variation in background. When statistically significant decreasing trends are present, earlier data are evaluated to determine whether earlier concentration levels are significantly different than current reported concentrations and will be deselected as necessary. When the historical records of data are truncated for the reasons above, a summary report will be provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed Appendix III concentrations were stable over time with no statistically significant increasing or decreasing trends for Groups 1 and 2. A summary table of the trend test results accompanied the trend tests. Therefore, none of the data sets required any adjustments at that time.

Appendix III – Determination of Spatial Variation

The Analysis of Variance (ANOVA) was used to statistically evaluate differences in average concentrations among upgradient wells at Group 2, which assists in identifying the most appropriate statistical approach. The ANOVA requires a minimum of two upgradient wells; therefore, Group 1 could not be tested as there is only one upgradient well.

Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when average concentrations are similar across upgradient wells. Intrawell tests, which compare compliance data from a single well to screened historical data within the same well, are appropriate when upgradient wells exhibit spatial variation; when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; and when downgradient water quality is unimpacted compared to upgradient water quality for the same parameter.

The ANOVA identified variation for all Appendix III parameters in Group 2. Therefore, all parameters in Groups 1 and 2 were further evaluated as described for the appropriateness of intrawell testing to accommodate the groundwater quality. A summary table of the ANOVA results for Group 2 was included with the previous screening.

Appendix III – Intrawell Method Eligibility Screening

Intrawell limits constructed from carefully screened background data from within each well serve to provide statistical limits that are conservative (i.e. lower) from a regulatory perspective, and that will rapidly identify a change in more recent compliance data from within a given well. This statistical method removes the element of variation from across wells and eliminates the chance of mistaking natural spatial variation for a release from the facility. Prior to performing intrawell prediction limits, several steps were required to reasonably demonstrate downgradient water quality does not have existing impacts from the practices of the facility.

Exploratory data analysis was used as a general comparison of concentrations in downgradient wells for all Appendix III parameters recommended for intrawell analyses to concentrations reported in upgradient wells. Upper tolerance limits were used in conjunction with confidence intervals to determine whether the estimated averages in downgradient wells are higher than observed levels upgradient of the facility. The upper tolerance limits were constructed to represent the extreme upper range of possible background levels at the site.

In cases where downgradient average concentrations are higher than observed concentrations upgradient for a given constituent, an independent study and hydrogeological investigation would be required to identify local geochemical conditions and expected groundwater quality for the region to justify an intrawell approach. Such an assessment is beyond the scope of services provided by Groundwater Stats Consulting. When there is not an obvious explanation for observed concentration differences in downgradient wells relative to reported concentrations in upgradient wells, interwell prediction limits were initially be selected for the statistical method until further evidence shows that concentrations are due to natural variation rather than a result of the facility.

Parametric tolerance limits were constructed with a target of 99% confidence and 95% coverage using pooled upgradient well data for each of the Appendix III parameters. The confidence and coverage levels for nonparametric tolerance limits are dependent

upon the number of background samples. As more data are collected, the background population is better represented and the confidence and coverage levels increase.

Confidence intervals were constructed on downgradient wells for each of the Appendix III parameters, using the tolerance limits discussed above, to determine intrawell eligibility. When the entire confidence interval is above a background standard for a given parameter, interwell methods are initially recommended as the statistical method. Therefore, only parameters with confidence intervals which did not exceed background standards were eligible for intrawell prediction limits.

Confidence intervals for the above parameters in Group 1 were found to be within their respective background limits for calcium, fluoride, pH, sulfate, and TDS; while confidence intervals were above their respective background limits in at least one well for boron and chloride. Therefore, intrawell methods would typically be recommended for calcium, fluoride, pH, sulfate and TDS, and interwell methods recommended for boron and chloride; however, evidence provided by Geosyntec supports the use of intrawell analyses for all parameters in Group 1 based on additional studies conducted.

Confidence intervals for the above parameters in Group 2 were all found to be within their respective background limits for all Appendix III parameters. Therefore, these parameters are eligible for intrawell methods.

All available data through October 2017 at each well were used to establish intrawell background limits for Groups 1 and 2 for each of the Appendix III parameters based on a 1-of-2 resample plan that will be used for future comparisons. Future compliance observations at each well will be compared to these background limits during each subsequent semi-annual sampling event.

Background Update Summary – October 2019

Prior to updating background data, samples were re-evaluated for both Groups using Tukey's outlier test and visual screening with the June/July 2019 samples (Figure C). A few outliers were noted in both groups and those values were flagged. While Tukey's test did not identify the following values as outliers, these values were flagged and deselected in the database as they are considerably lower than the majority of measurements within each well: pH in Group 1 well MW-4; and chloride and sulfate in Group 2 well MW-8.

As mentioned above, flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. An updated summary of Tukey's test results and flagged outliers follows this letter.

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through October 2017 to the new compliance samples at each well through June/July 2019 to evaluate whether the groups are statistically similar at the 99% confidence level, in which case background data may be updated with compliance data (Figure D). While no statistically significant differences were found between the two groups for the well/constituent pairs in Group 1, differences were noted for chloride in well MW-5 and fluoride in MW-1 for Group 2.

Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background are not updated to include the newer data but will be reconsidered in the future. The concentrations noted in these wells for these constituents, however, are similar to or lower than concentrations noted in upgradient wells. Therefore, at a minimum, the most 8 recent samples through June/July 2019, which are more stable and reflective of present-day conditions, will be used for construction of intrawell prediction limits. A summary of these results follows this letter and the test results are included with the Mann Whitney test section at the end of this report. Additionally, a summary of well/constituent pairs using a truncated portion of their records follows this letter.

Intrawell prediction limits using all historical data through June/July 2019 (except for the two cases noted above), combined with a 1-of-2 resample plan, were constructed and a summary of the updated limits follows this letter (Figure E). Future compliance observations at each well will be compared to these background limits during each subsequent semi-annual sampling event.

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Amos Landfill. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Andrew T. Collins
Groundwater Analyst

Kristina L. Rayner
Groundwater Statistician

Date Ranges

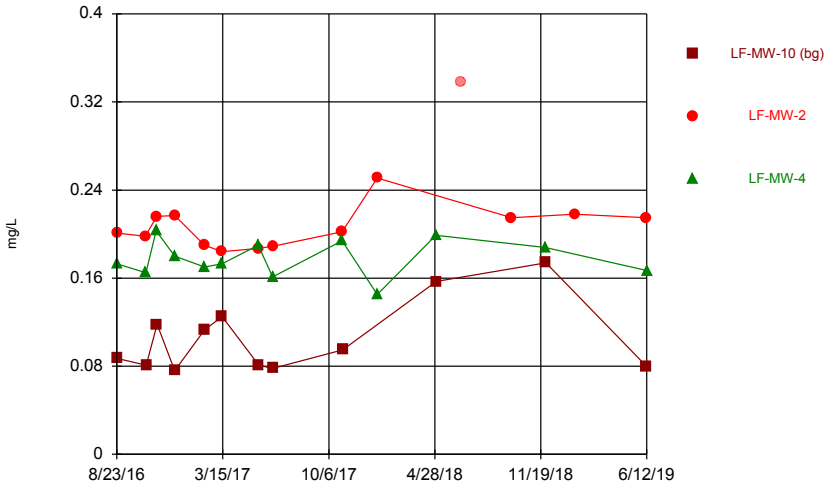
Date: 10/25/2019 9:09 AM

Amos Landfill Client: Geosyntec Data: Amos Landfill

Chloride, total (mg/L)
LF-MW-5 background:6/20/2017-7/22/2019
Fluoride, total (mg/L)
LF-MW-1 background:2/7/2017-7/22/2019

FIGURE A: TIME SERIES

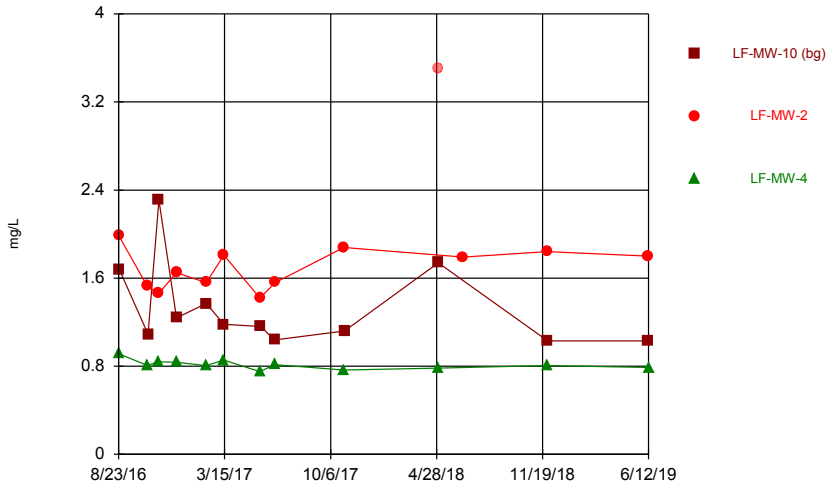
Time Series



Constituent: Boron, total Analysis Run 10/24/2019 3:57 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

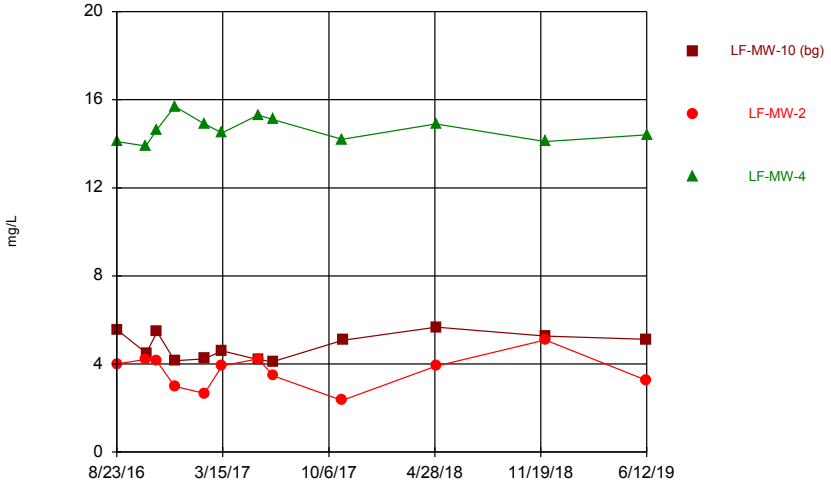
Time Series



Constituent: Calcium, total Analysis Run 10/24/2019 3:57 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

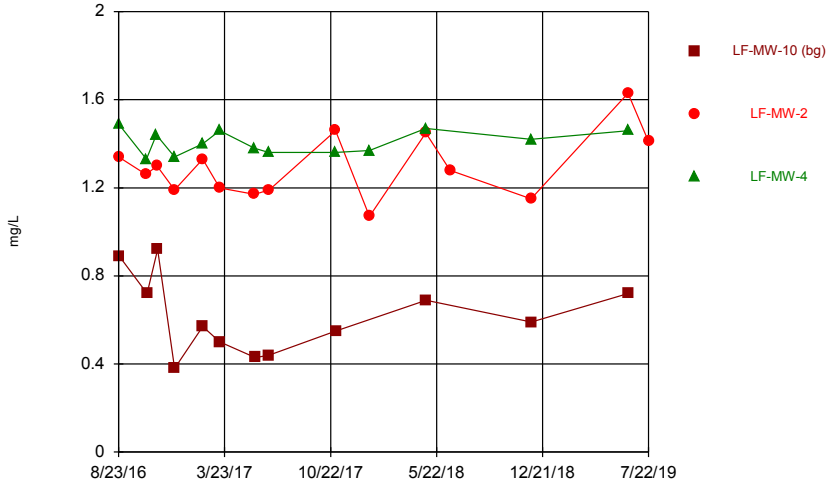
Time Series



Constituent: Chloride, total Analysis Run 10/24/2019 3:57 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

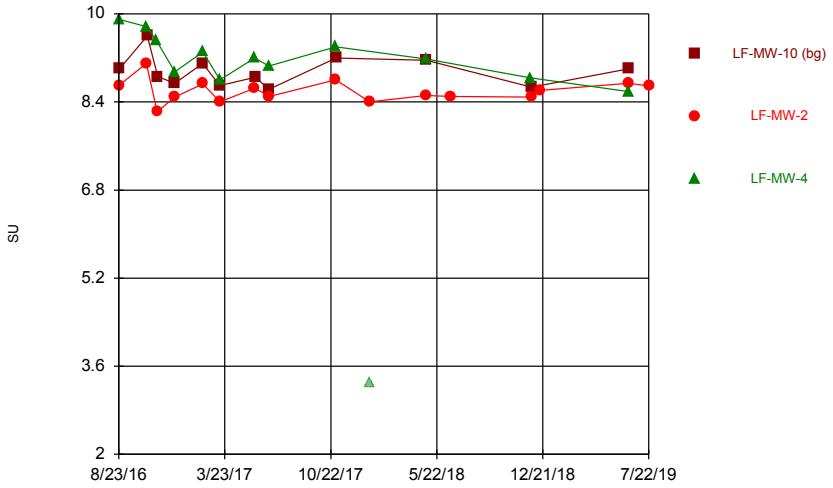
Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Time Series



Constituent: Fluoride, total Analysis Run 10/24/2019 3:57 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

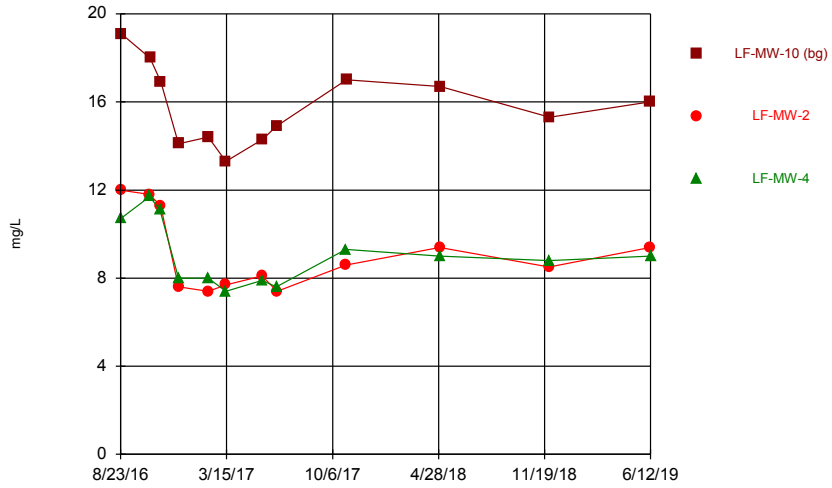
Time Series



Constituent: pH, field Analysis Run 10/24/2019 3:57 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

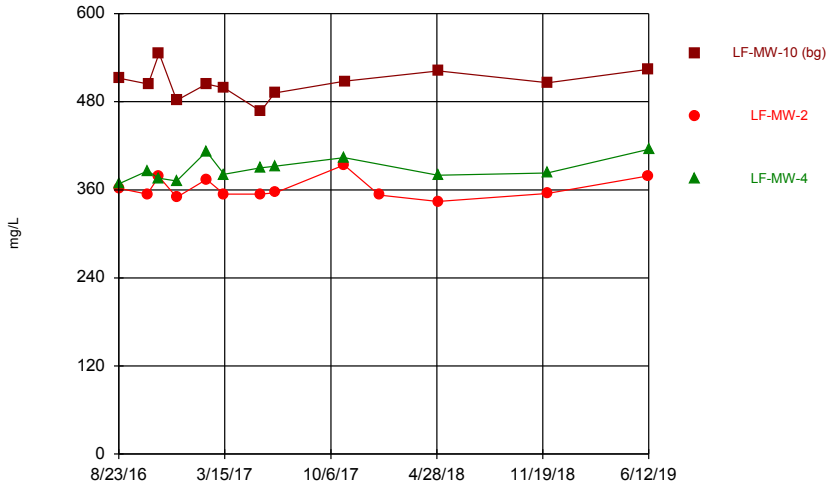
Time Series



Constituent: Sulfate, total Analysis Run 10/24/2019 3:57 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

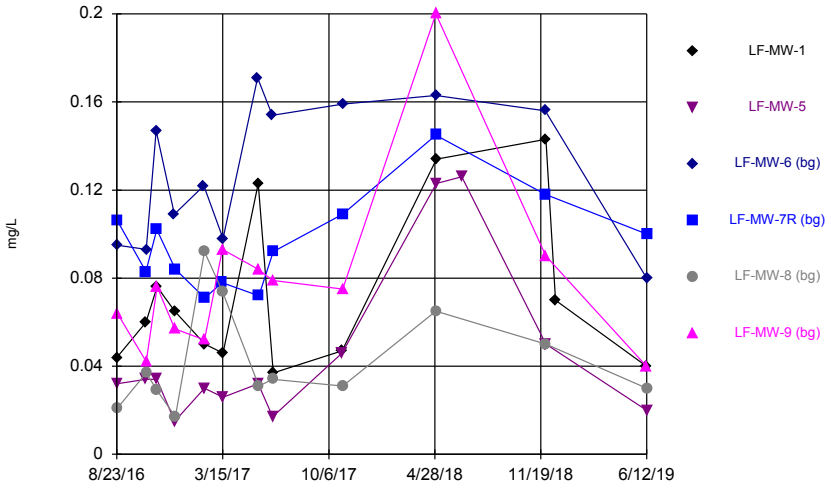
Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 3:57 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

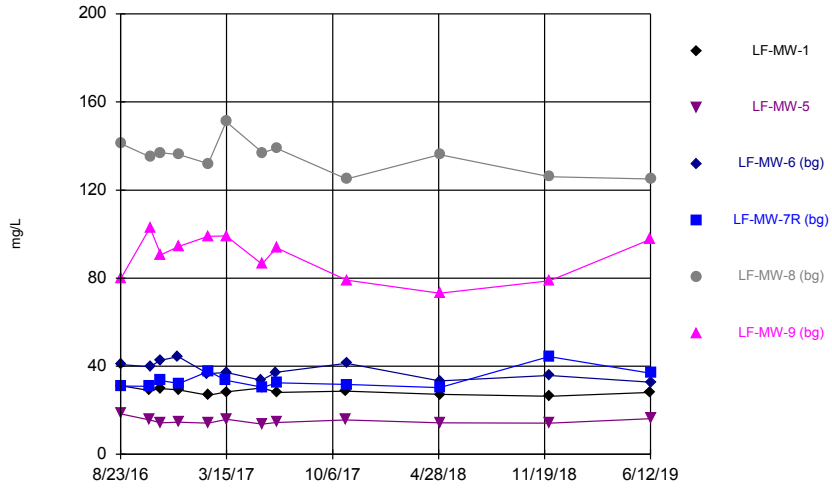
Time Series



Constituent: Boron, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

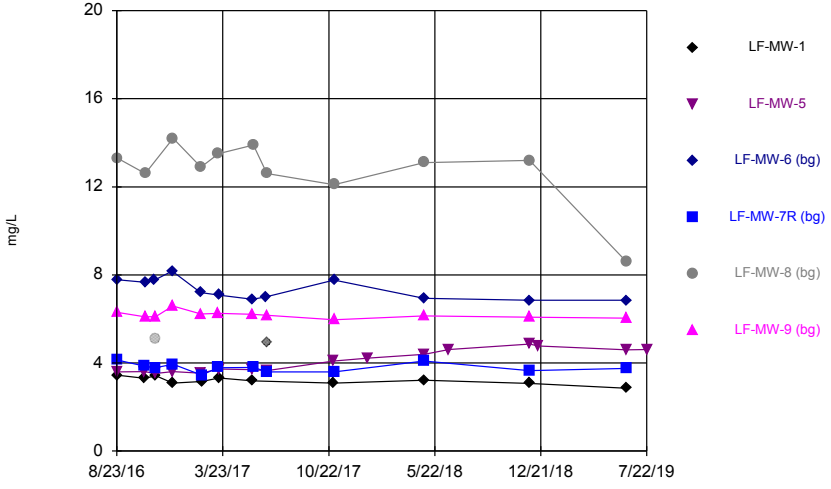
Time Series



Constituent: Calcium, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

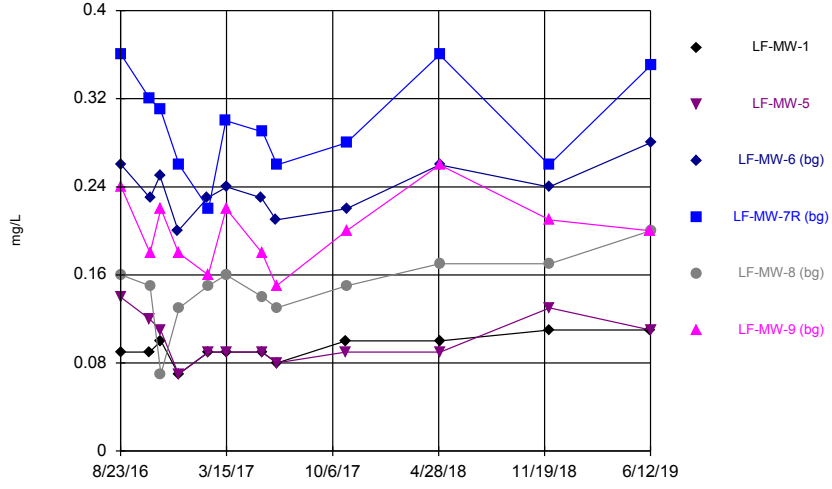
Time Series



Constituent: Chloride, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

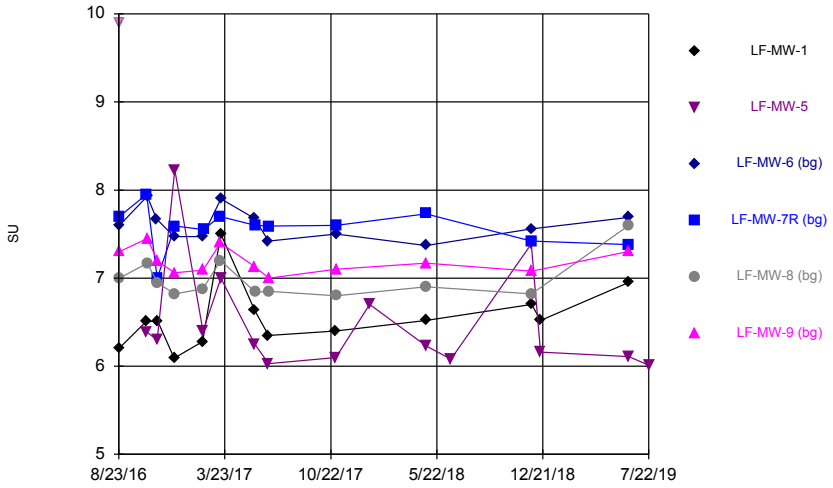
Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Time Series



Constituent: Fluoride, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

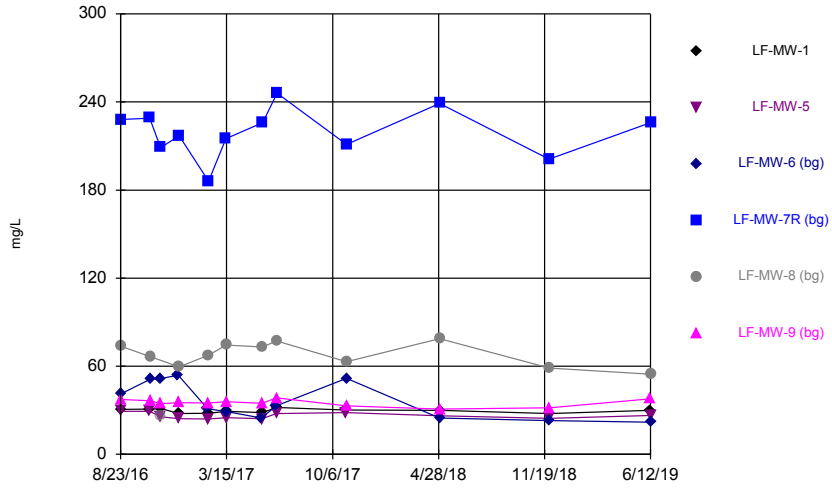
Time Series



Constituent: pH, field Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Time Series



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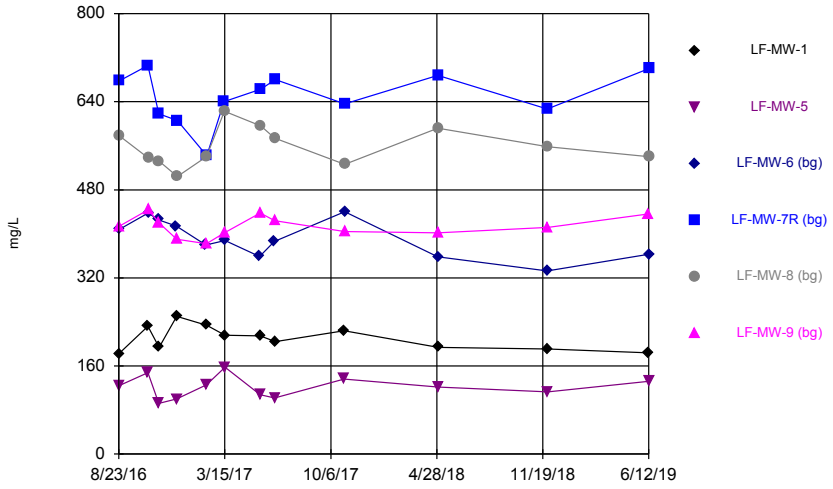
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

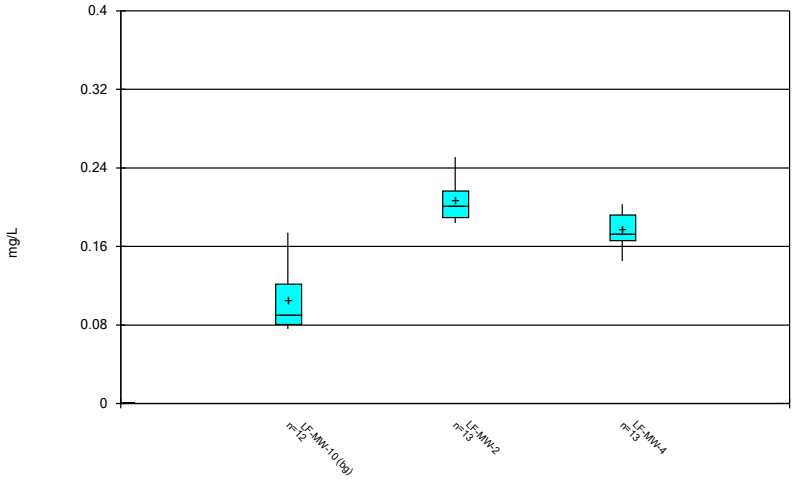
Time Series



Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

FIGURE B: BOX PLOTS

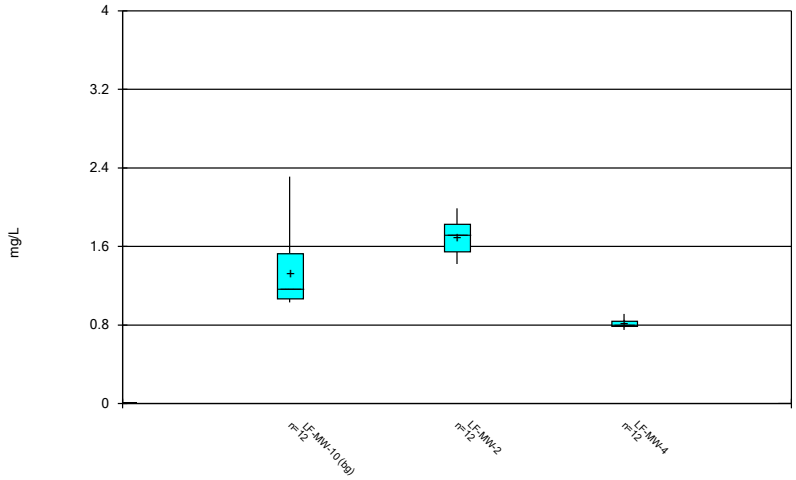
Box & Whiskers Plot



Constituent: Boron, total Analysis Run 10/24/2019 4:27 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

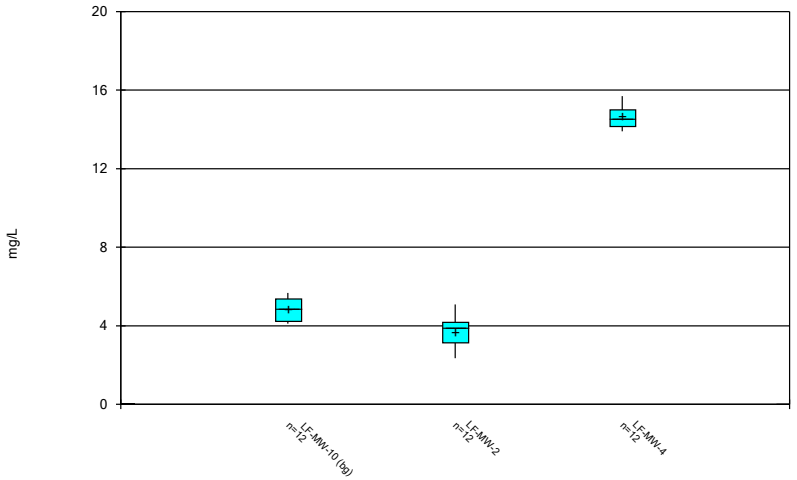
Box & Whiskers Plot



Constituent: Calcium, total Analysis Run 10/24/2019 4:27 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

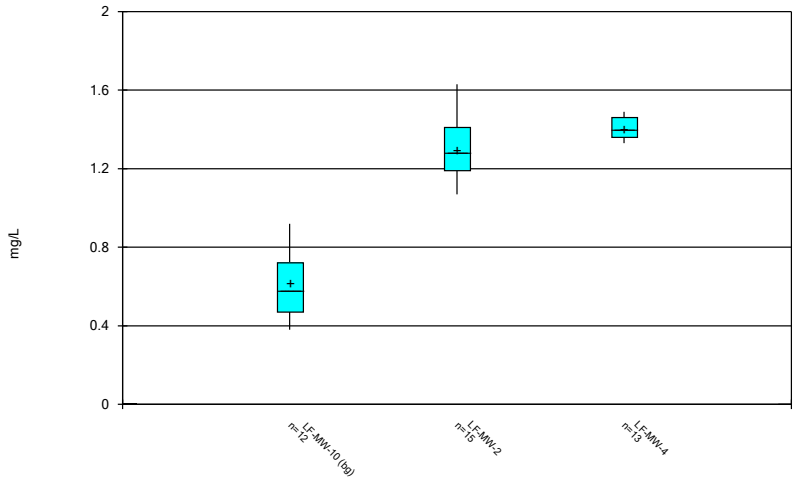
Box & Whiskers Plot



Constituent: Chloride, total Analysis Run 10/24/2019 4:27 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

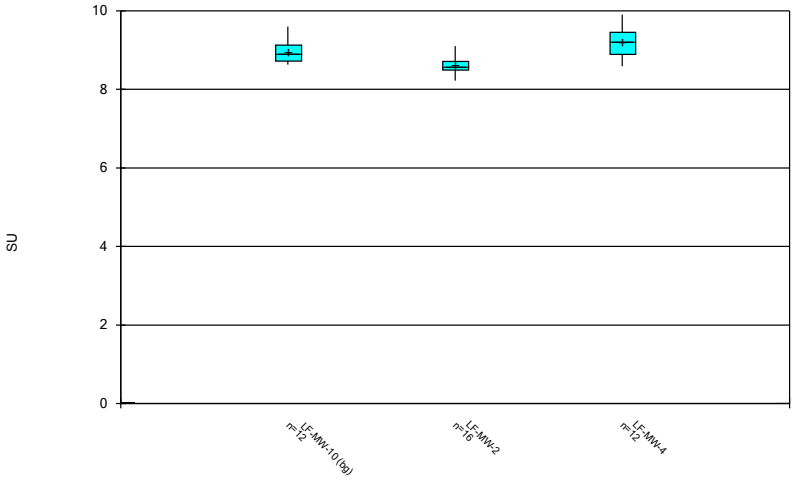
Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Fluoride, total Analysis Run 10/24/2019 4:27 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

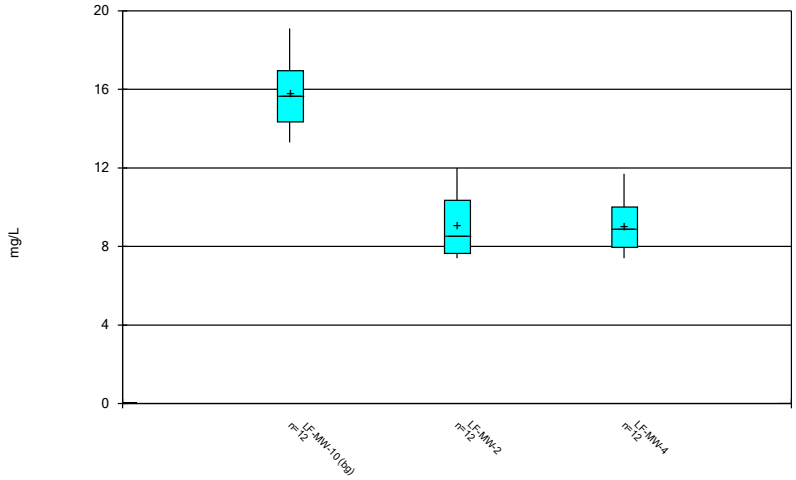
Box & Whiskers Plot



Constituent: pH, field Analysis Run 10/24/2019 4:27 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

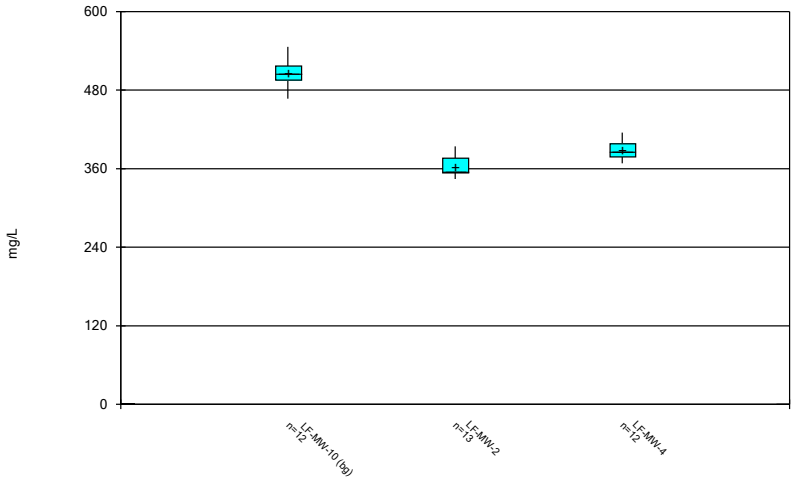
Box & Whiskers Plot



Constituent: Sulfate, total Analysis Run 10/24/2019 4:27 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

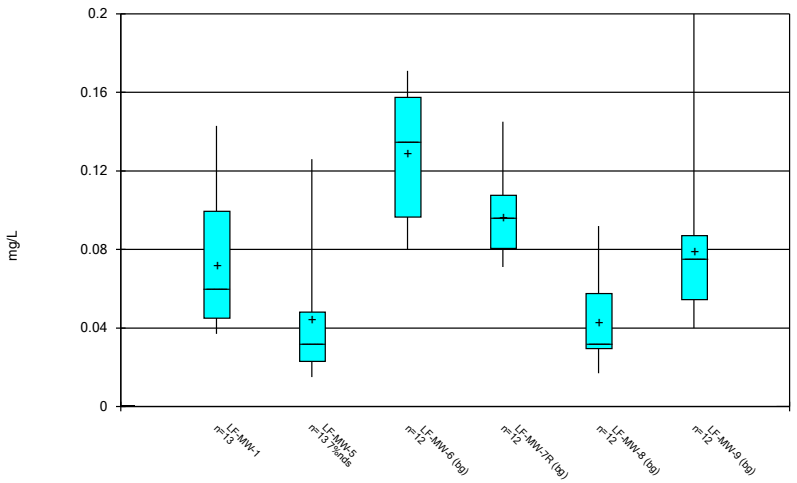
Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:27 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

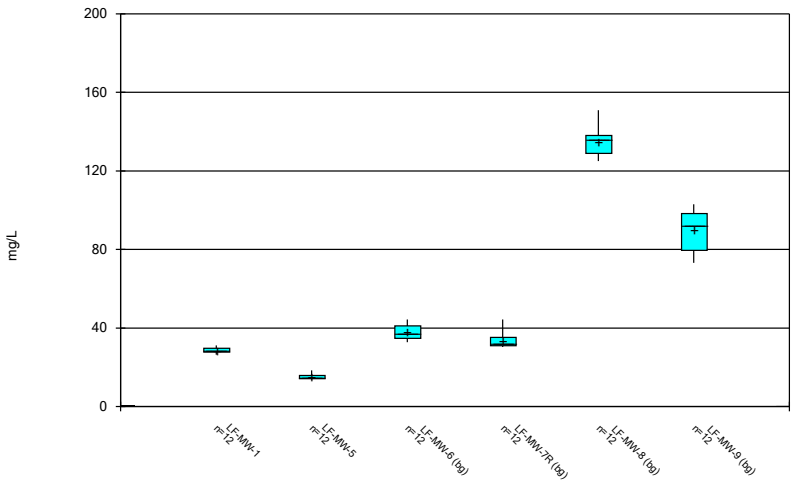
Box & Whiskers Plot



Constituent: Boron, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

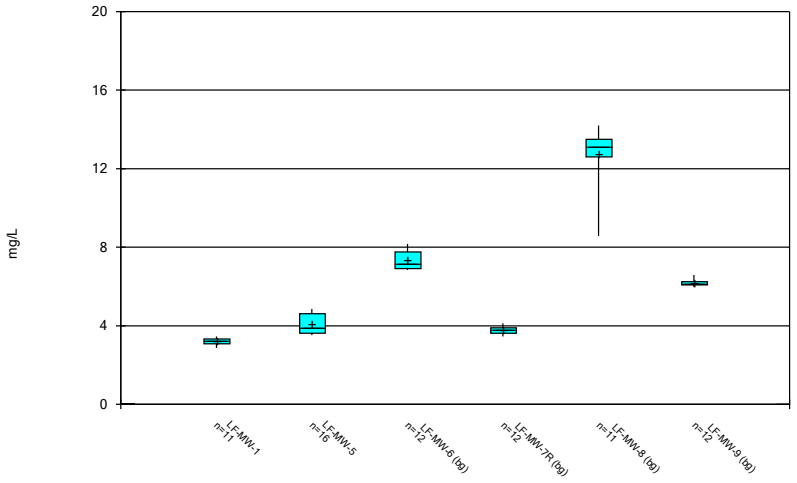
Box & Whiskers Plot



Constituent: Calcium, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

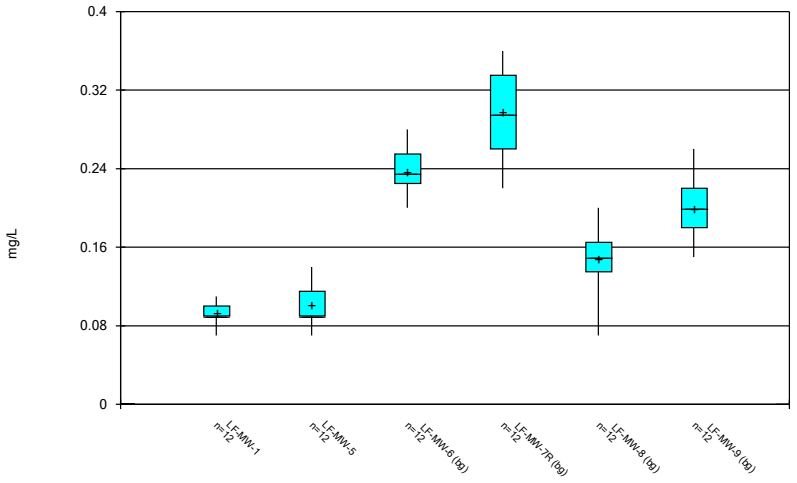
Box & Whiskers Plot



Constituent: Chloride, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

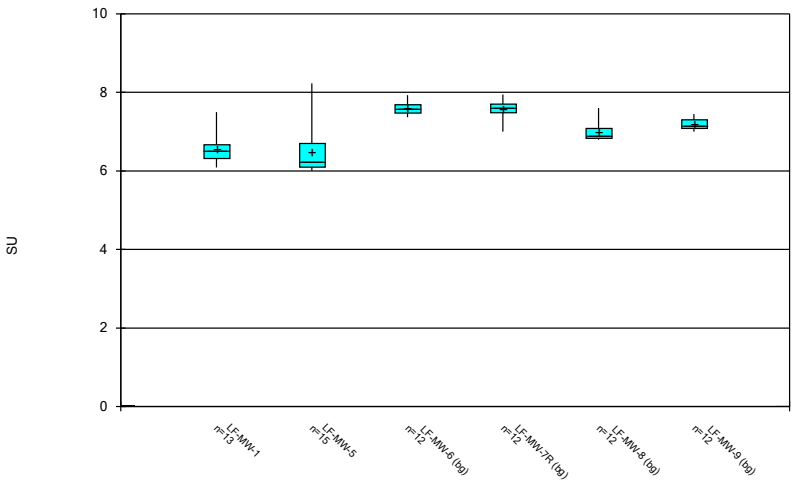
Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Fluoride, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

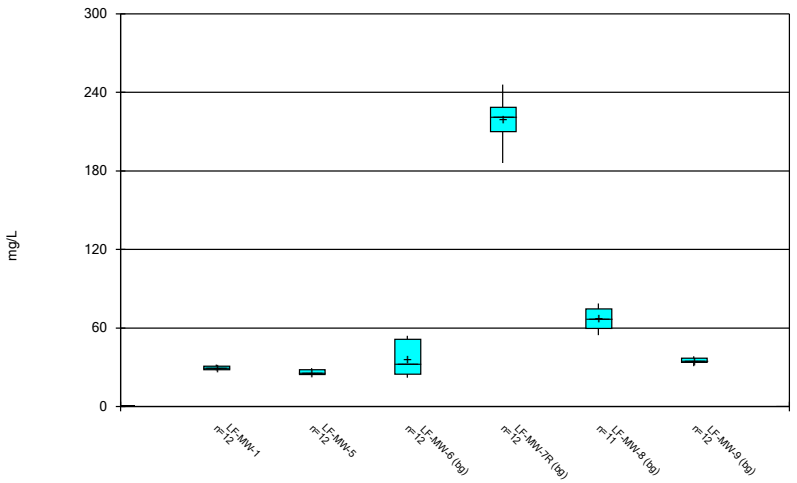
Box & Whiskers Plot



Constituent: pH, field Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

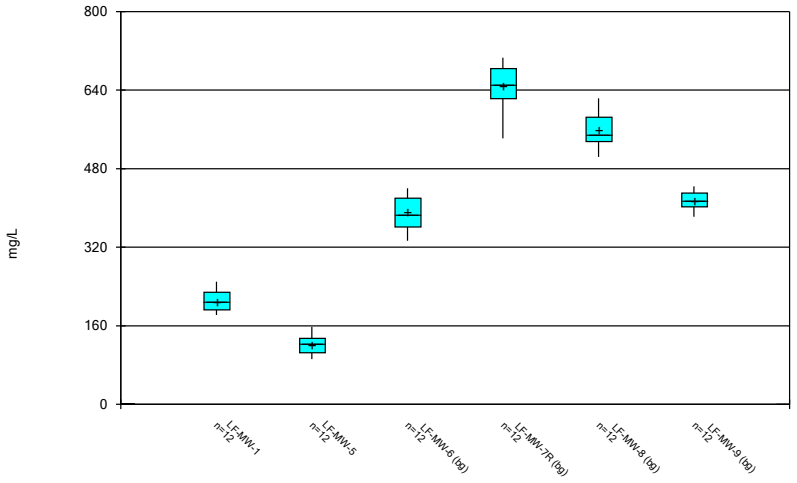
Box & Whiskers Plot



Constituent: Sulfate, total Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:32 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

FIGURE C: OUTLIER SUMMARY

Outlier Summary - Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/24/2019, 3:58 PM

	LF-MW-2 Boron, total (mg/L)	LF-MW-2 Calcium, total (mg/L)	LF-MW-4 pH, field (SU)
1/8/2018			3.3 (o)
5/1/2018		3.5 (o)	
6/19/2018	0.338 (o)		

Outlier Analysis - Significant Results - Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/24/2019, 3:53 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	**LF-MW-2**	**Yes**	**0.338**	**6/19/2018**	**NP**	**NaN**	**14**	**0.2158**	**0.03935**	**ln(x)**	**ShapiroWilk**
Calcium, total (mg/L)	**LF-MW-2**	**Yes**	**3.5**	**5/1/2018**	**NP**	**NaN**	**13**	**1.83**	**0.5318**	**ln(x)**	**ShapiroWilk**

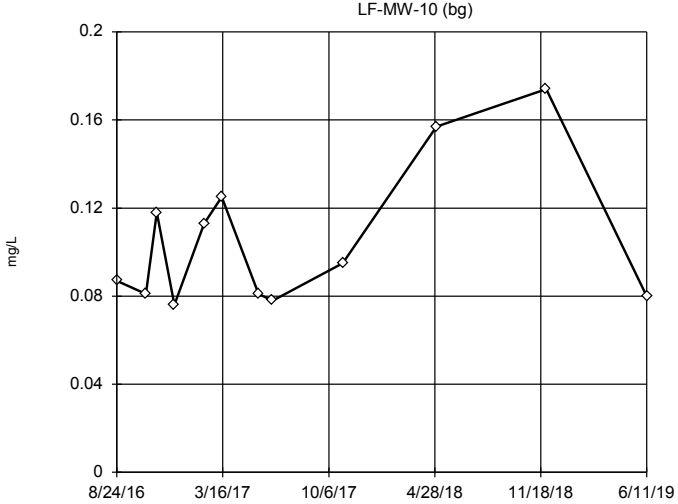
Outlier Analysis - All Results - Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/24/2019, 3:53 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	12	0.1054	0.03285	ln(x)	ShapiroWilk
Boron, total (mg/L)	**LF-MW-2**	**Yes**	**0.338**	**6/19/2018**	**NP**	**NaN**	**14**	**0.2158**	**0.03935**	**ln(x)**	**ShapiroWilk**
Boron, total (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	13	0.1775	0.01671	x^2	ShapiroWilk
Calcium, total (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	12	1.333	0.3906	ln(x)	ShapiroWilk
Calcium, total (mg/L)	**LF-MW-2**	**Yes**	**3.5**	**5/1/2018**	**NP**	**NaN**	**13**	**1.83**	**0.5318**	**ln(x)**	**ShapiroWilk**
Calcium, total (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	12	0.8141	0.04383	ln(x)	ShapiroWilk
Chloride, total (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	12	4.827	0.5919	x^2	ShapiroWilk
Chloride, total (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	12	3.683	0.7693	normal	ShapiroWilk
Chloride, total (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	12	14.64	0.5485	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	12	0.6167	0.1749	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	15	1.295	0.1463	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	13	1.406	0.05378	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	12	8.959	0.2798	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-2	No	n/a	n/a	NP	NaN	16	8.596	0.2036	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-4	No	n/a	n/a	NP	NaN	13	8.754	1.682	x^6	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	12	15.83	1.748	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	12	9.1	1.714	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	12	9.042	1.428	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	12	505.5	20.38	sqrt(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	13	362.1	14.55	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	12	388.3	15.14	ln(x)	ShapiroWilk

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.4171, low cutoff = 0.02344, based on IQR multiplier of 3.

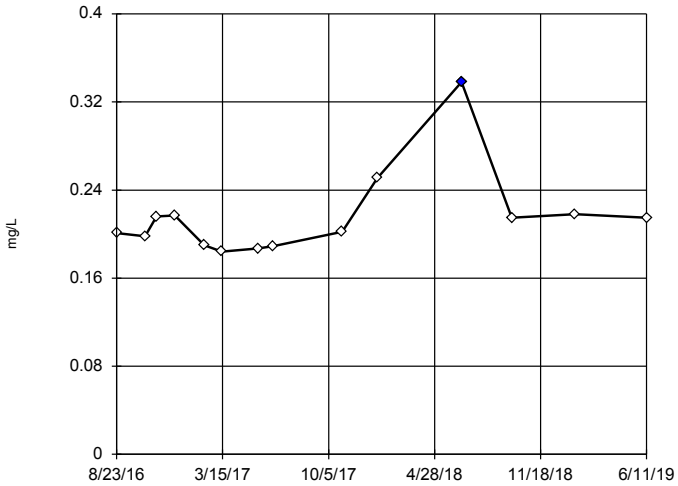
Constituent: Boron, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 14

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3289, low cutoff = 0.1253, based on IQR multiplier of 3.

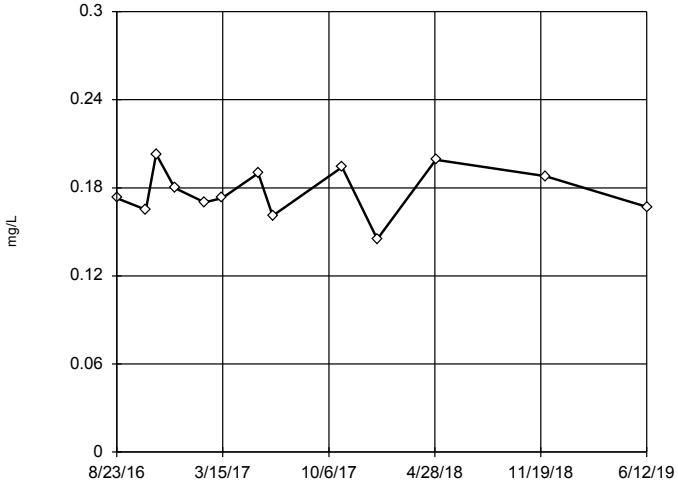
Constituent: Boron, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 13

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2546, low cutoff = -0.01939, based on IQR multiplier of 3.

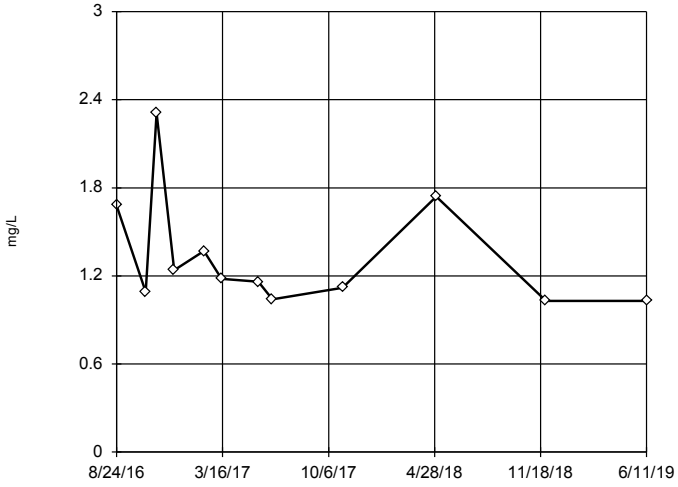
Constituent: Boron, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

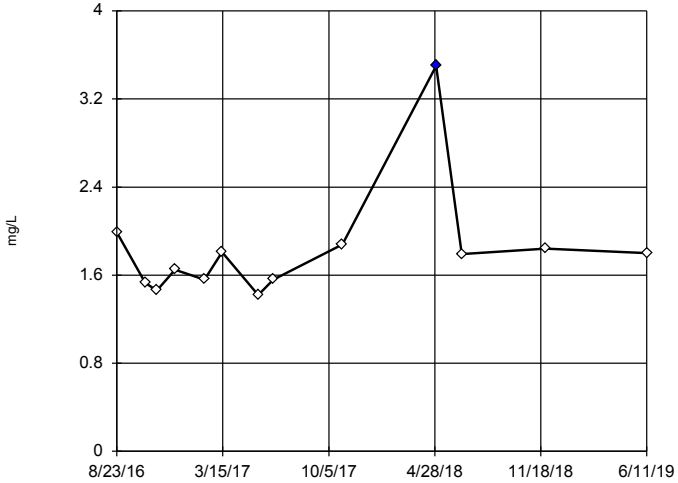
High cutoff = 4.389, low cutoff = 0.368, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-2



n = 13

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 3.245, low cutoff = 0.8855, based on IQR multiplier of 3.

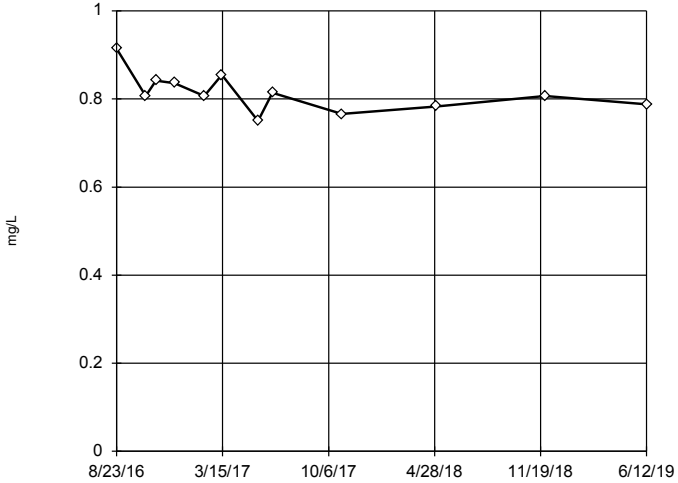
Constituent: Calcium, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1.022, low cutoff = 0.6446, based on IQR multiplier of 3.

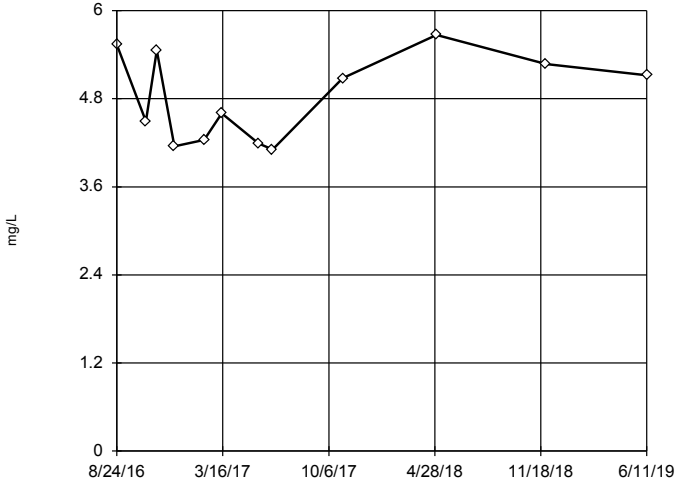
Constituent: Calcium, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.866, low cutoff = -3.913, based on IQR multiplier of 3.

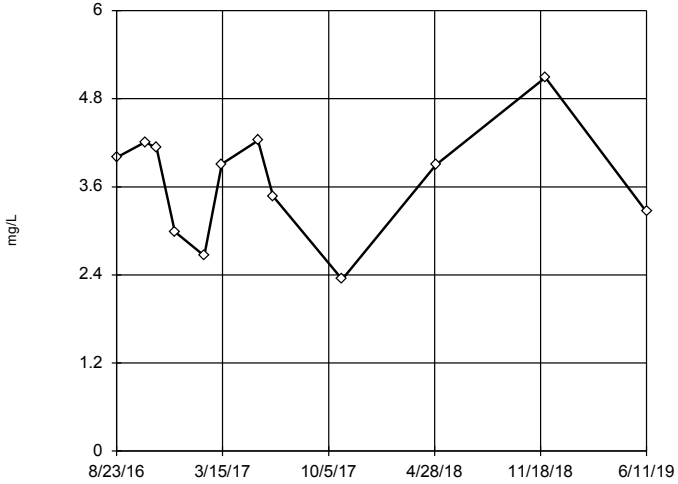
Constituent: Chloride, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 12

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

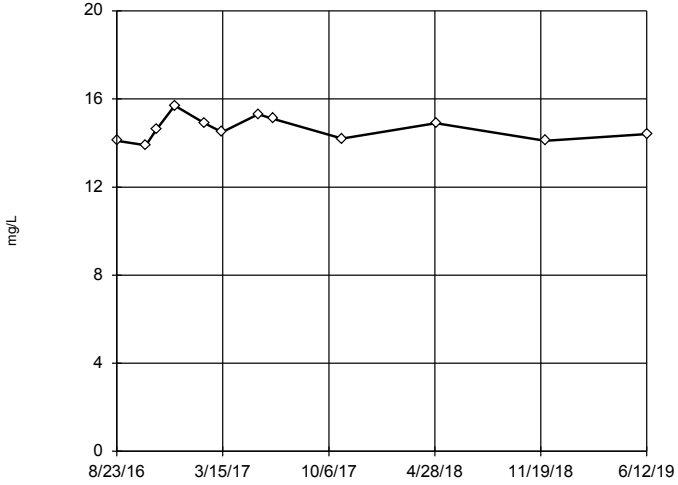
High cutoff = 7.305, low cutoff = -0.01, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 17.87, low cutoff = 11.88, based on IQR multiplier of 3.

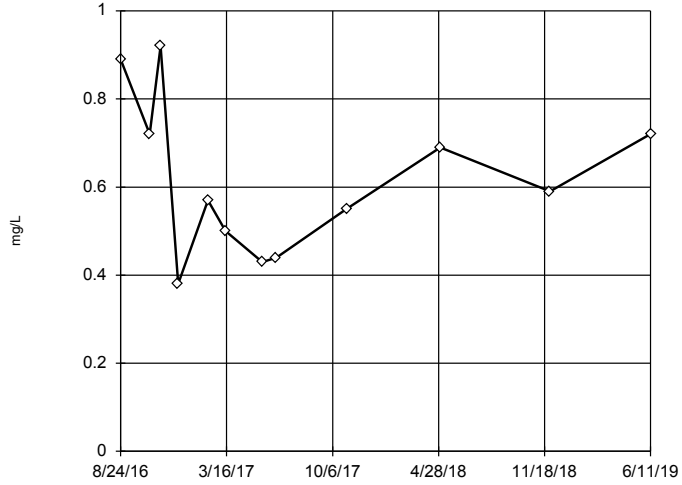
Constituent: Chloride, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2.604, low cutoff = 0.1297, based on IQR multiplier of 3.

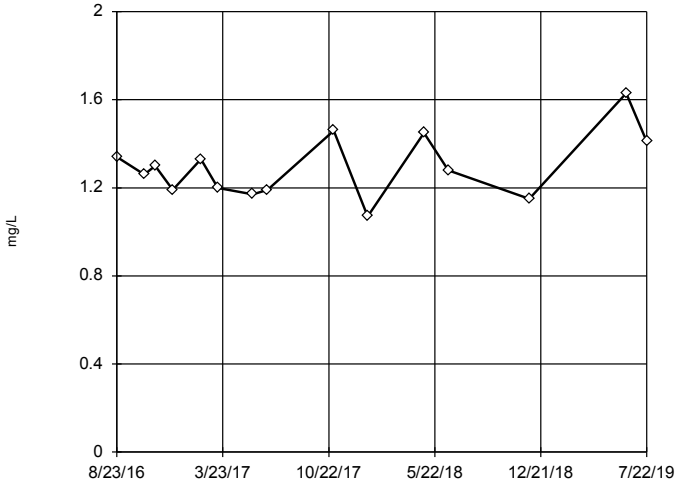
Constituent: Fluoride, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 15

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2.346, low cutoff = 0.7154, based on IQR multiplier of 3.

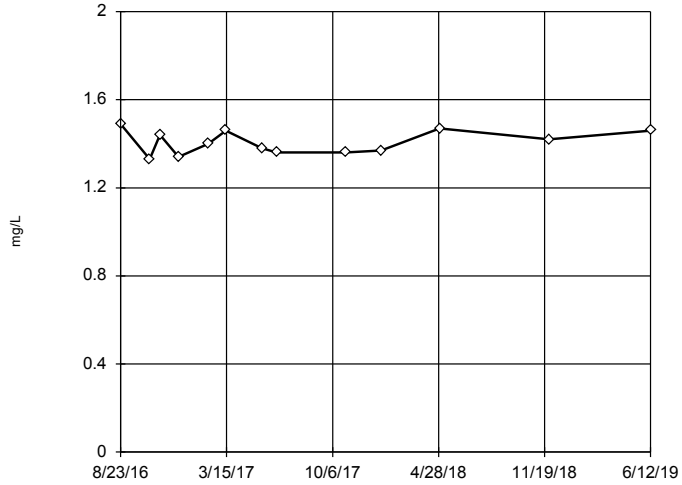
Constituent: Fluoride, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 13

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

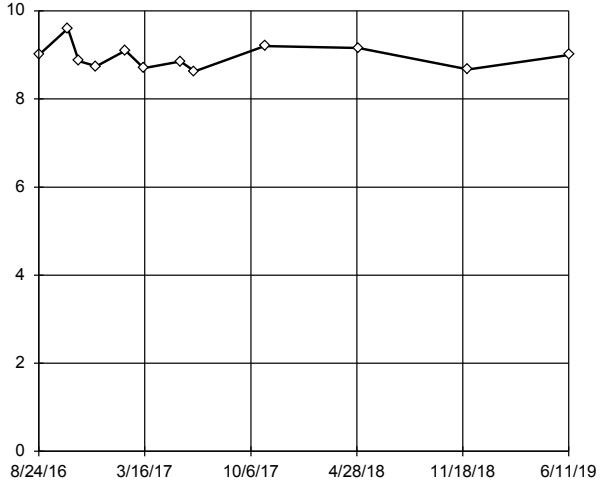
High cutoff = 1.806, low cutoff = 1.099, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 10.48, low cutoff = 7.597, based on IQR multiplier of 3.

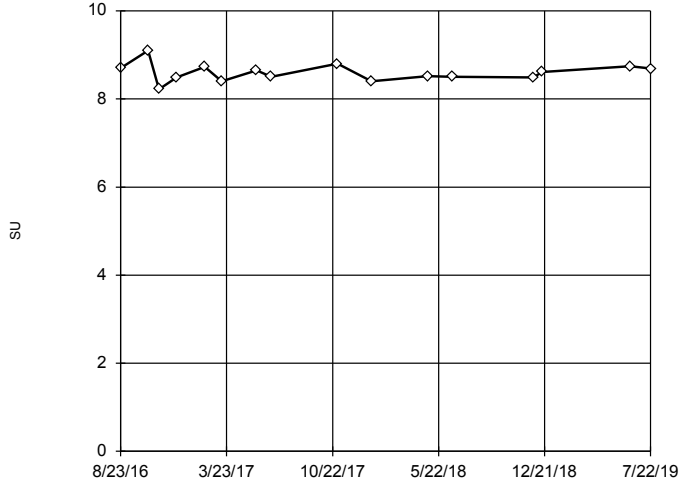
Constituent: pH, field Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 16

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 9.426, low cutoff = 7.849, based on IQR multiplier of 3.

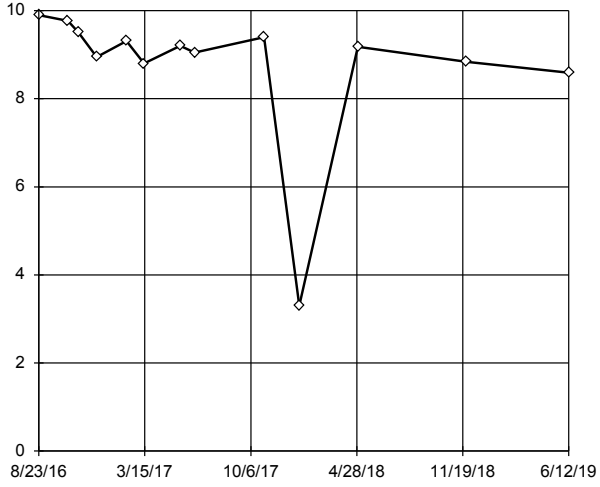
Constituent: pH, field Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 13

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 10.63, low cutoff = -7.995, based on IQR multiplier of 3.

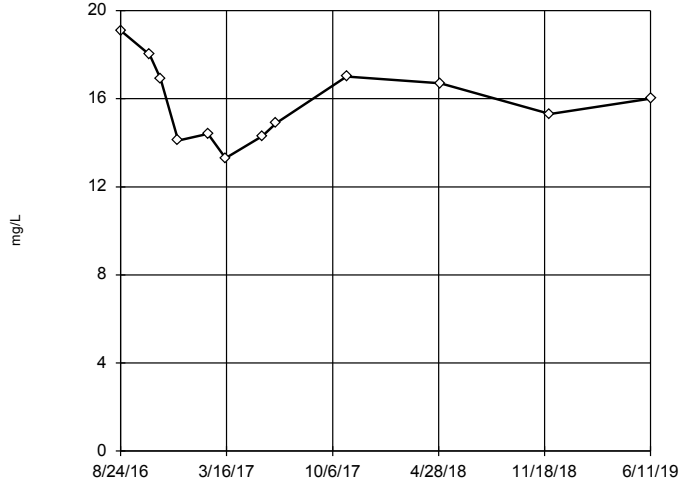
Constituent: pH, field Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

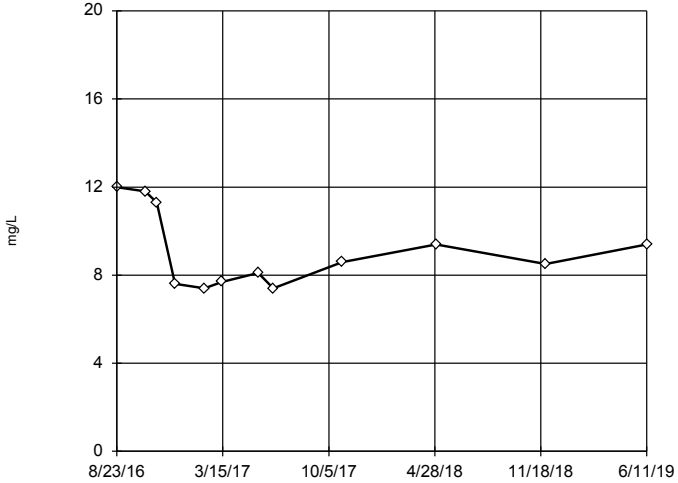
High cutoff = 27.93, low cutoff = 8.708, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-2



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 25.2, low cutoff = 3.128, based on IQR multiplier of 3.

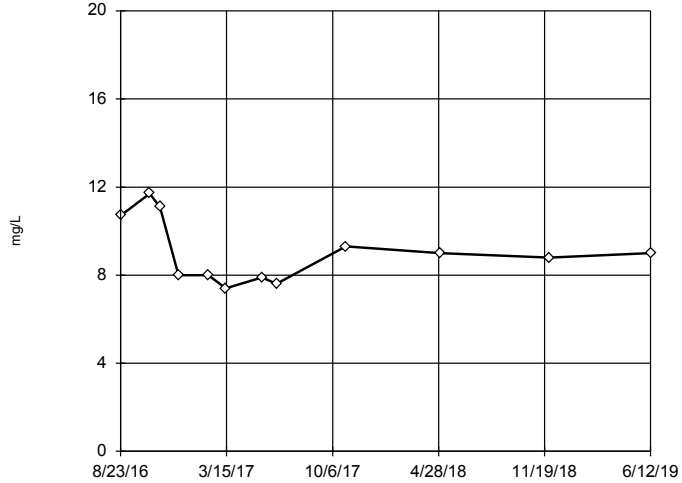
Constituent: Sulfate, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 19.71, low cutoff = 4.024, based on IQR multiplier of 3.

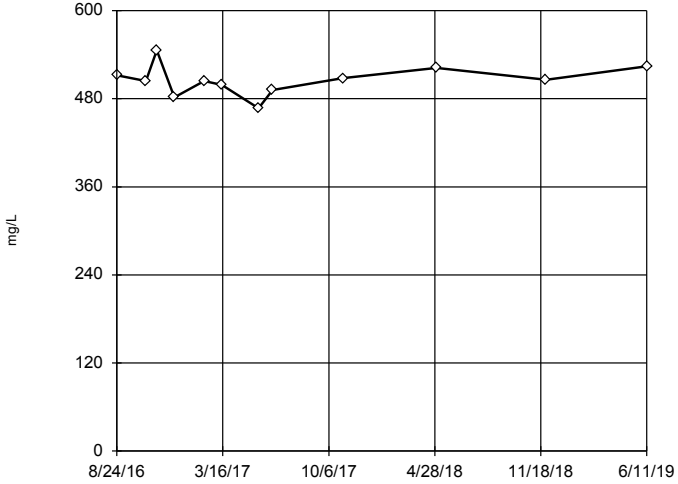
Constituent: Sulfate, total Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 584.2, low cutoff = 433.7, based on IQR multiplier of 3.

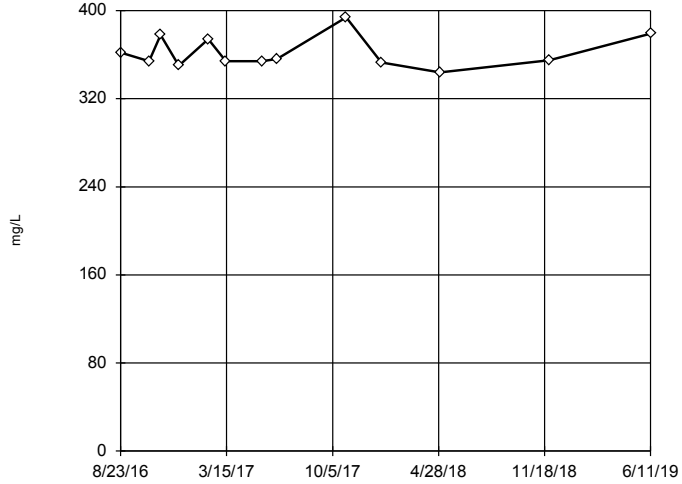
Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 13

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

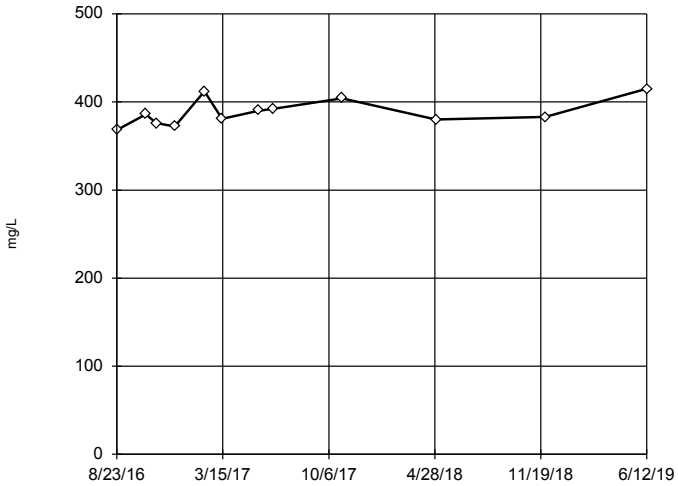
High cutoff = 452.4, low cutoff = 293.8, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 464.4, low cutoff = 323.9, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 3:51 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Outlier Summary - Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/24/2019, 4:29 PM

	LF-MW-1 Chloride, total (mg/L)	LF-MW-8 Chloride, total (mg/L)	LF-MW-5 pH, field (SU)	LF-MW-8 Sulfate, total (mg/L)
8/23/2016			9.9 (o)	
11/9/2016		5.12 (o)		26.1 (o)
6/21/2017	4.94 (o)			

Outlier Analysis - Significant Results - Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/24/2019, 4:20 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Chloride, total (mg/L)	**LF-MW-1**	**Yes**	**4.94**	**6/21/2017**	**NP**	**NaN**	**12**	**3.342**	**0.5298**	**ln(x)**	**ShapiroWilk**
pH, field (SU)	**LF-MW-5**	**Yes**	**9.9**	**8/23/2016**	**NP**	**NaN**	**16**	**6.705**	**1.04**	**ln(x)**	**ShapiroWilk**

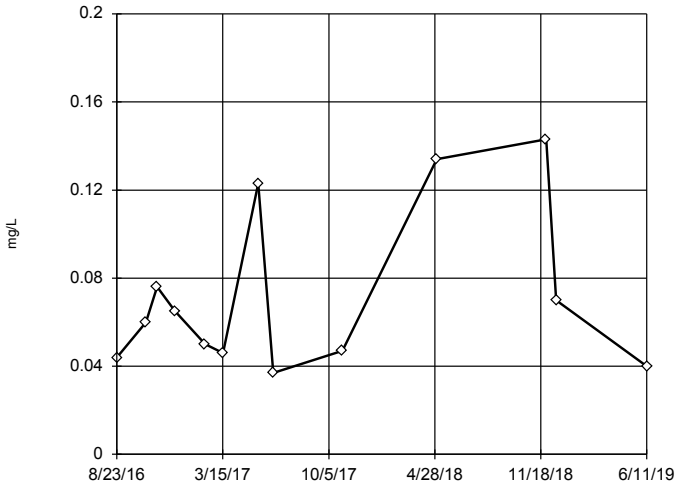
Outlier Analysis - All Results - Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/24/2019, 4:20 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	LF-MW-1	No	n/a	n/a	NP	NaN	13	0.07192	0.0371	ln(x)	ShapiroWilk
Boron, total (mg/L)	LF-MW-5	No	n/a	n/a	NP	NaN	13	0.045	0.03668	ln(x)	ShapiroWilk
Boron, total (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	12	0.1289	0.0327	normal	ShapiroWilk
Boron, total (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	12	0.09667	0.02144	ln(x)	ShapiroWilk
Boron, total (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	12	0.04258	0.02301	ln(x)	ShapiroWilk
Boron, total (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	12	0.07933	0.04192	ln(x)	ShapiroWilk
Calcium, total (mg/L)	LF-MW-1	No	n/a	n/a	NP	NaN	12	28.6	1.406	x^(1/3)	ShapiroWilk
Calcium, total (mg/L)	LF-MW-5	No	n/a	n/a	NP	NaN	12	15.11	1.317	ln(x)	ShapiroWilk
Calcium, total (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	12	37.97	3.803	ln(x)	ShapiroWilk
Calcium, total (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	12	33.75	4.105	ln(x)	ShapiroWilk
Calcium, total (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	12	135	7.435	ln(x)	ShapiroWilk
Calcium, total (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	12	89.58	9.833	x^4	ShapiroWilk
Chloride, total (mg/L)	**LF-MW-1**	**Yes**	**4.94**	**6/21/2017**	**NP**	**NaN**	**12**	**3.342**	**0.5298**	**ln(x)**	**ShapiroWilk**
Chloride, total (mg/L)	LF-MW-5	No	n/a	n/a	NP	NaN	16	4.069	0.5012	ln(x)	ShapiroWilk
Chloride, total (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	12	7.332	0.4657	ln(x)	ShapiroWilk
Chloride, total (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	12	3.786	0.2013	ln(x)	ShapiroWilk
Chloride, total (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	12	12.09	2.62	x^6	ShapiroWilk
Chloride, total (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	12	6.181	0.1603	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-1	No	n/a	n/a	NP	NaN	12	0.09333	0.01155	x^2	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-5	No	n/a	n/a	NP	NaN	12	0.1008	0.02109	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	12	0.2375	0.02261	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	12	0.2975	0.04454	x^(1/3)	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	12	0.1483	0.03129	x^2	ShapiroWilk
Fluoride, total (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	12	0.2	0.03219	x^(1/3)	ShapiroWilk
pH, field (SU)	LF-MW-1	No	n/a	n/a	NP	NaN	13	6.552	0.3614	ln(x)	ShapiroWilk
pH, field (SU)	**LF-MW-5**	**Yes**	**9.9**	**8/23/2016**	**NP**	**NaN**	**16**	**6.705**	**1.04**	**ln(x)**	**ShapiroWilk**
pH, field (SU)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	12	7.605	0.178	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	12	7.568	0.2316	x^6	ShapiroWilk
pH, field (SU)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	12	6.985	0.2349	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	12	7.189	0.1424	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-1	No	n/a	n/a	NP	NaN	12	29.66	1.418	x^6	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-5	No	n/a	n/a	NP	NaN	12	26.24	2.004	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	12	36.44	12.71	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	12	219.4	16.52	x^3	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	12	64.46	14.36	x^4	ShapiroWilk
Sulfate, total (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	12	35.06	2.338	x^4	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-1	No	n/a	n/a	NP	NaN	12	210	21.92	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-5	No	n/a	n/a	NP	NaN	12	121.8	19.88	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	12	391.1	34.47	x^(1/3)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	12	648.7	47.06	x^6	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	12	558.4	34.57	ln(x)	ShapiroWilk
Total Dissolved Solids [TDS] (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	12	414	19.28	ln(x)	ShapiroWilk

Tukey's Outlier Screening

LF-MW-1



n = 13

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

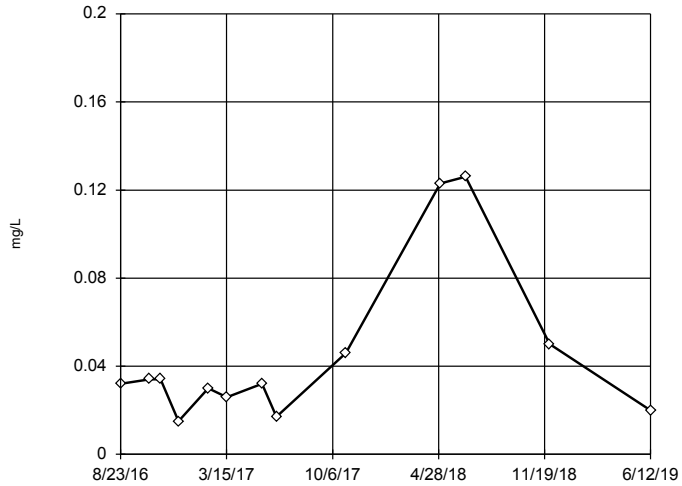
High cutoff = 0.9597, low cutoff = 0.004533, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 10/24/2019 4:17 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-5



n = 13

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

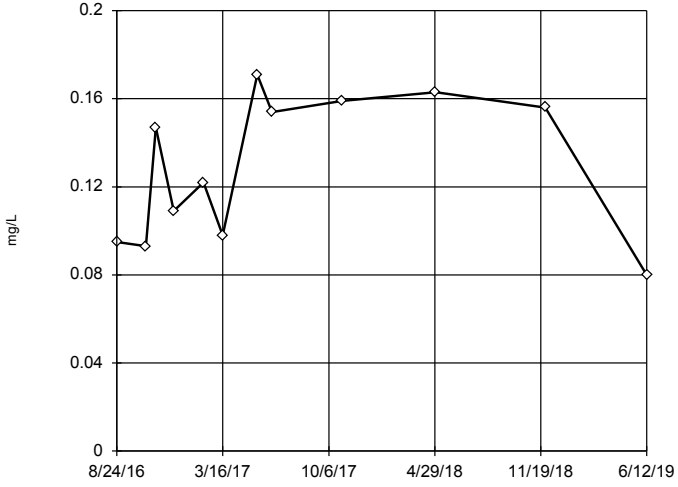
High cutoff = 0.4461, low cutoff = 0.002451, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 10/24/2019 4:17 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

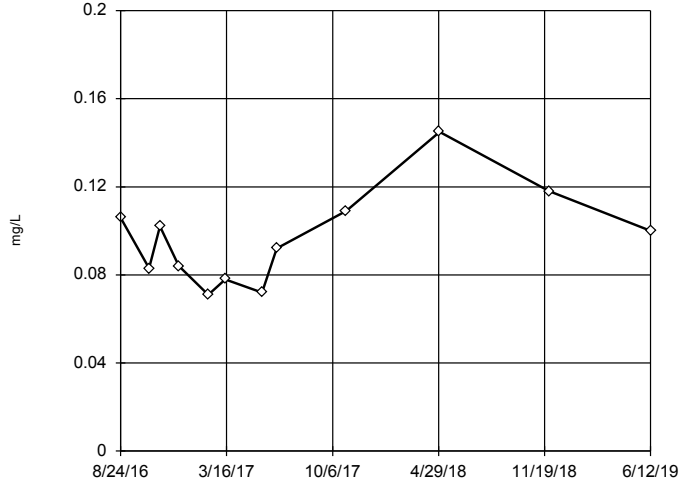
High cutoff = 0.3405, low cutoff = -0.0865, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 10/24/2019 4:17 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

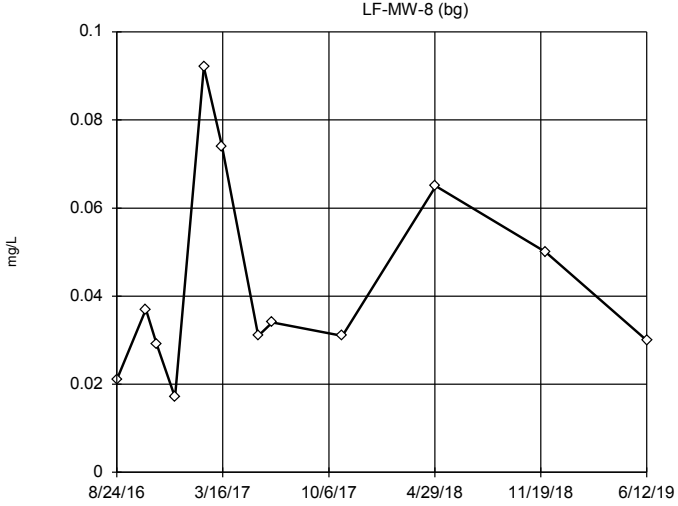
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2563, low cutoff = 0.03375, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 10/24/2019 4:17 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.4116, low cutoff = 0.004085, based on IQR multiplier of 3.

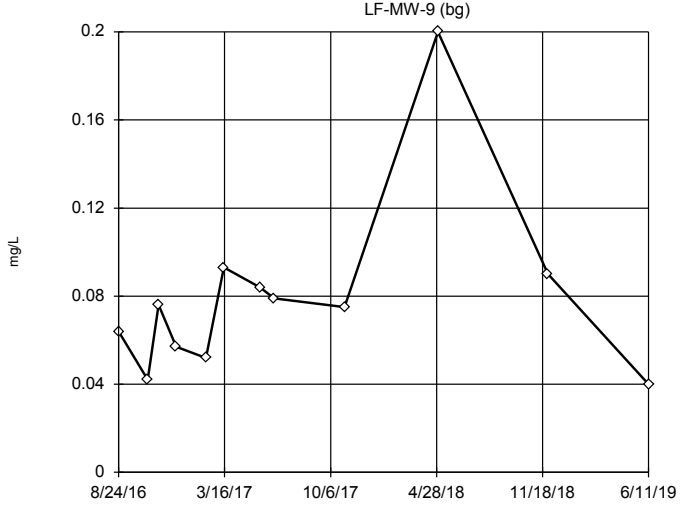
Constituent: Boron, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3542, low cutoff = 0.01337, based on IQR multiplier of 3.

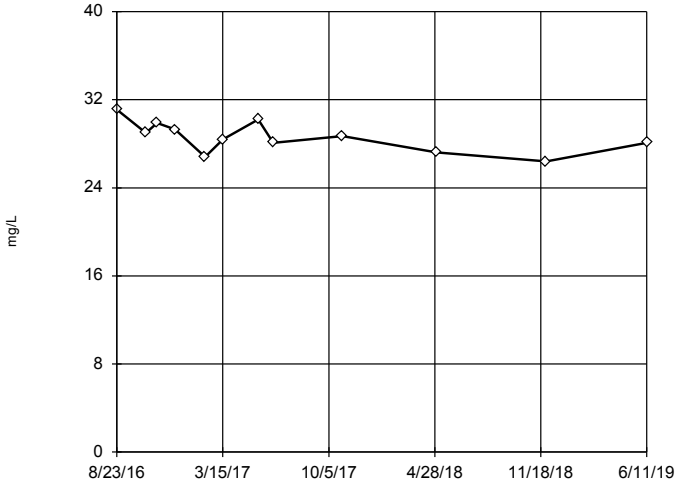
Constituent: Boron, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-1



n = 12

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 36, low cutoff = 22.31, based on IQR multiplier of 3.

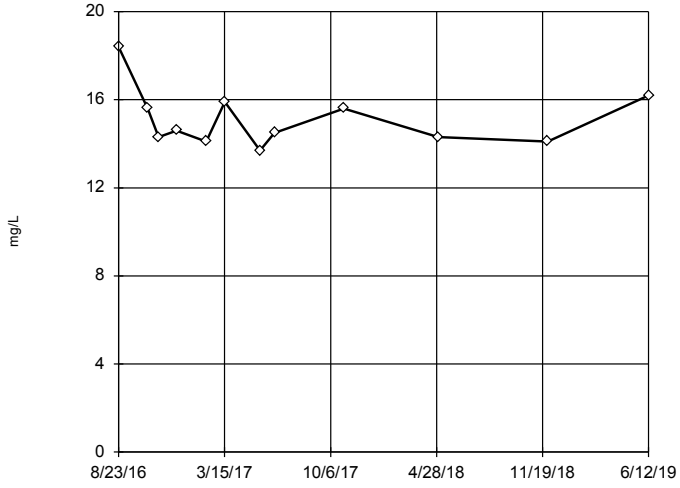
Constituent: Calcium, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-5



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

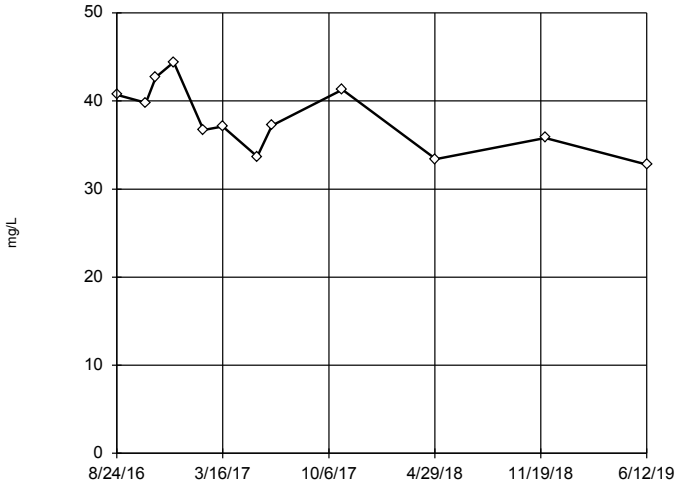
High cutoff = 21.49, low cutoff = 10.41, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 67.42, low cutoff = 21.12, based on IQR multiplier of 3.

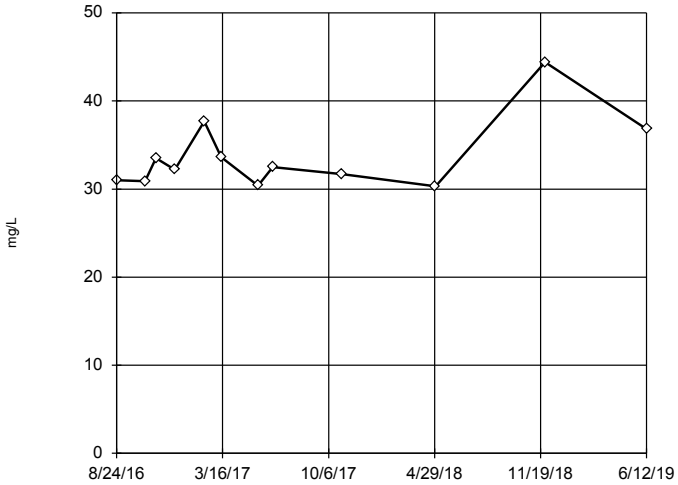
Constituent: Calcium, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 51.57, low cutoff = 21.1, based on IQR multiplier of 3.

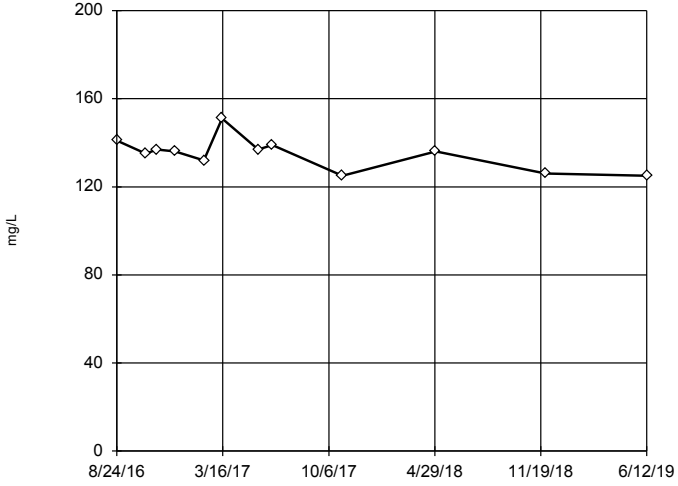
Constituent: Calcium, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 169.1, low cutoff = 105.3, based on IQR multiplier of 3.

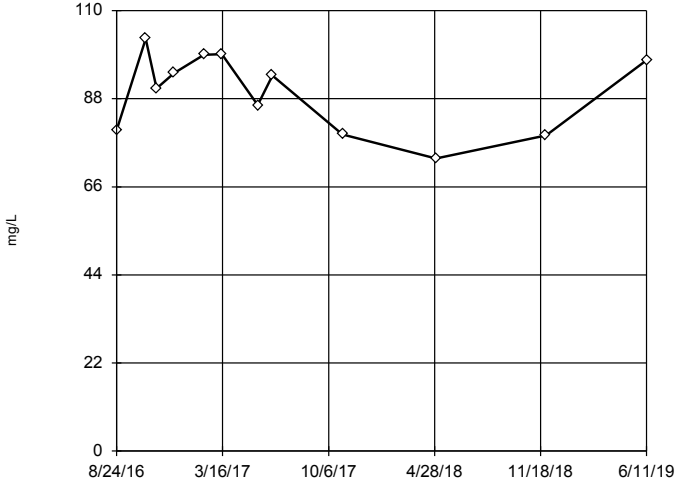
Constituent: Calcium, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

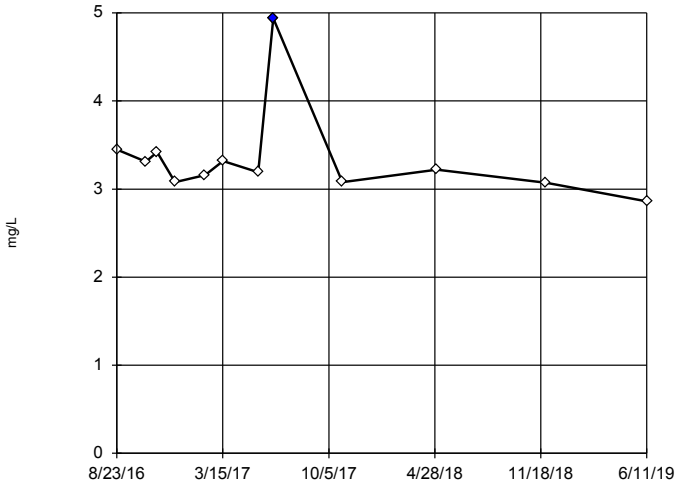
High cutoff = 126.1, low cutoff = -104.6, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-1



n = 12

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 4.412, low cutoff = 2.352, based on IQR multiplier of 3.

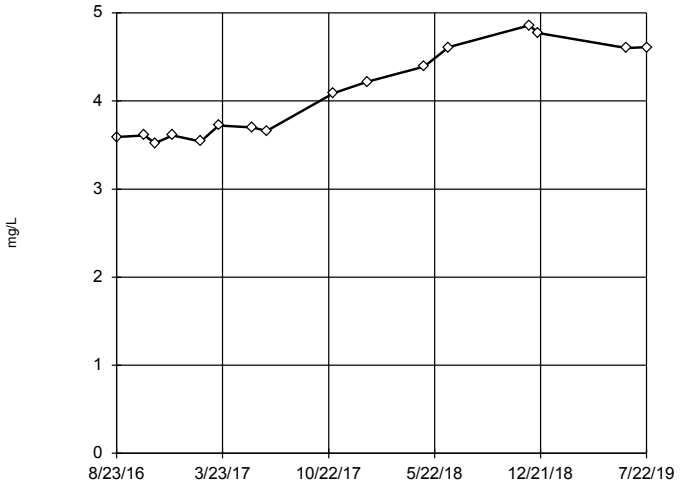
Constituent: Chloride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-5



n = 16

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 9.559, low cutoff = 1.739, based on IQR multiplier of 3.

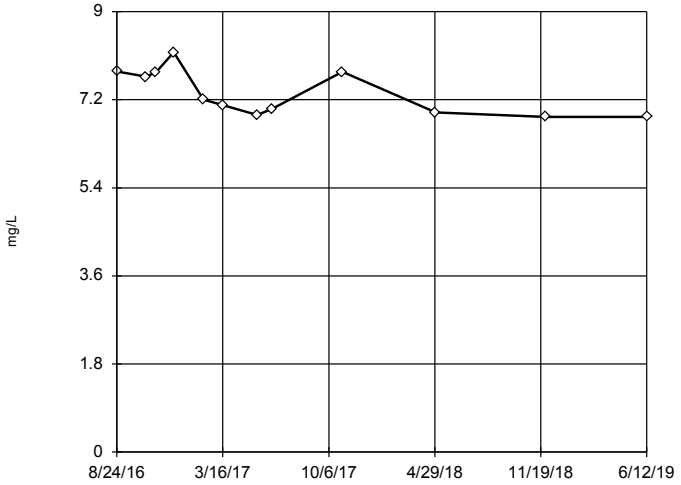
Constituent: Chloride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 11, low cutoff = 4.884, based on IQR multiplier of 3.

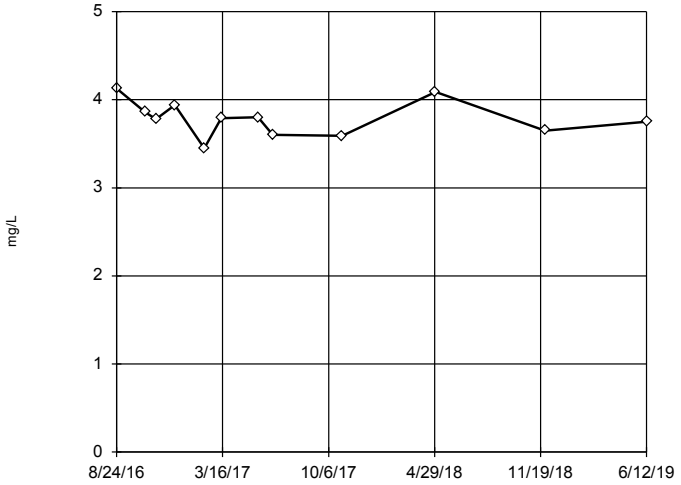
Constituent: Chloride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

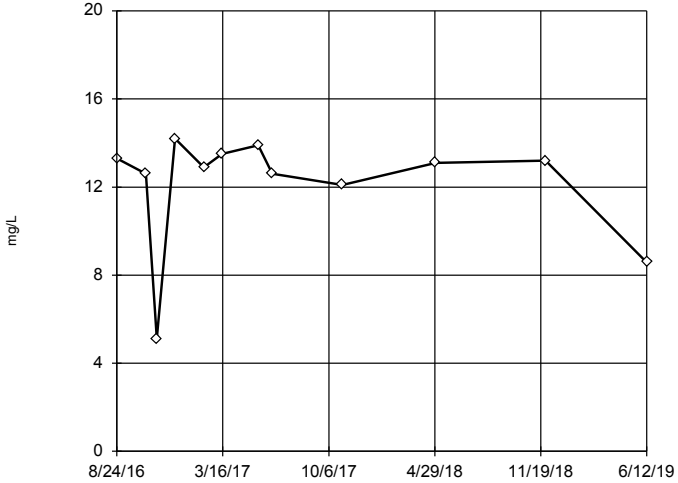
High cutoff = 4.856, low cutoff = 2.911, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 15.23, low cutoff = -12.08, based on IQR multiplier of 3.

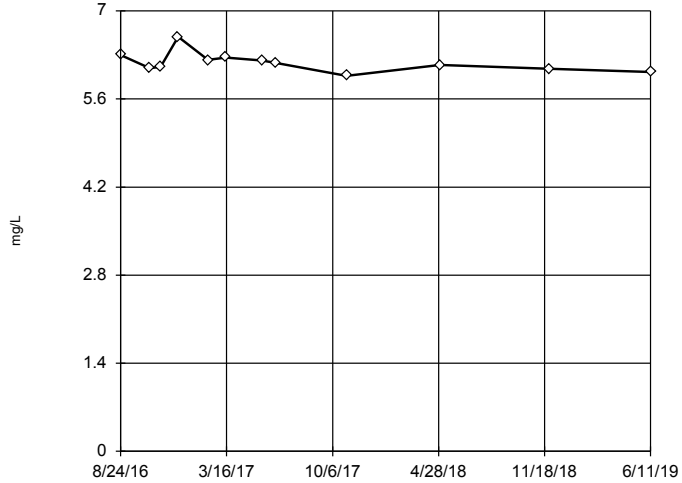
Constituent: Chloride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 6.729, low cutoff = 5.643, based on IQR multiplier of 3.

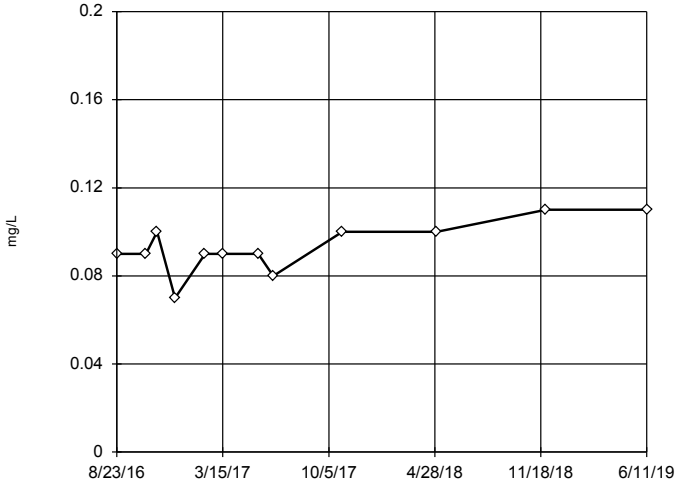
Constituent: Chloride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-1



n = 12

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.1253, low cutoff = 0.04899, based on IQR multiplier of 3.

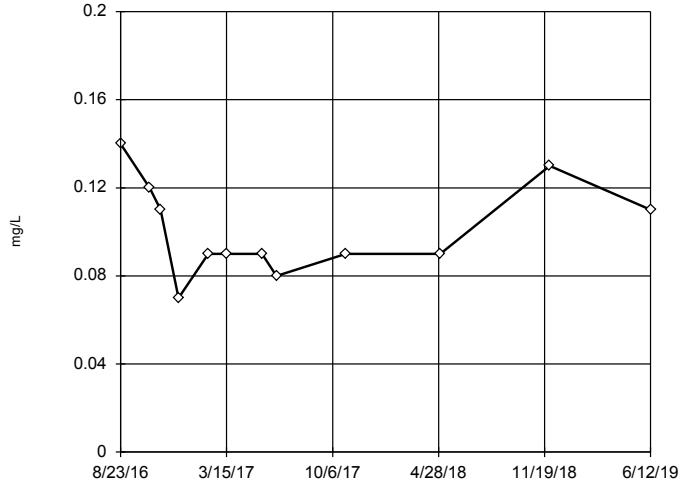
Constituent: Fluoride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-5



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

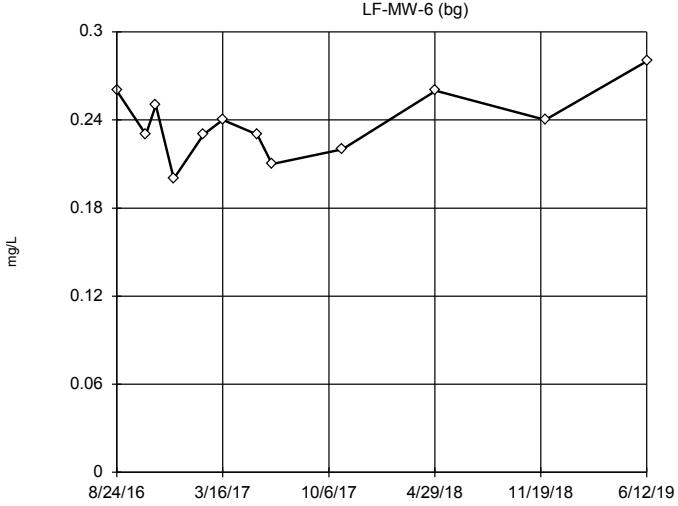
High cutoff = 0.239, low cutoff = 0.04326, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3712, low cutoff = 0.1545, based on IQR multiplier of 3.

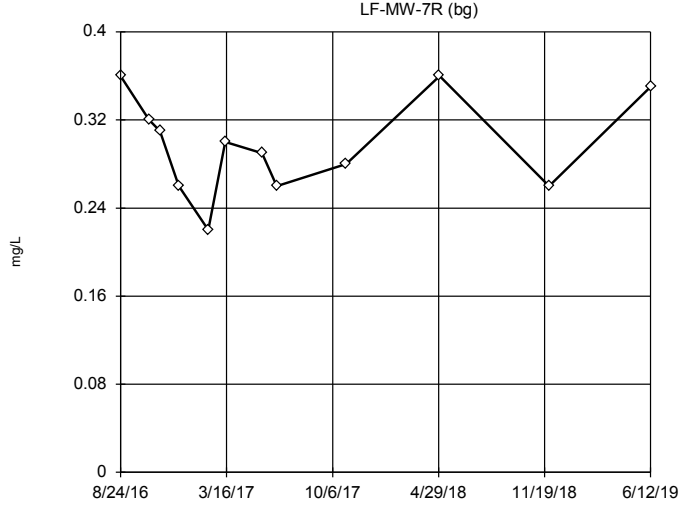
Constituent: Fluoride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.642, low cutoff = 0.1038, based on IQR multiplier of 3.

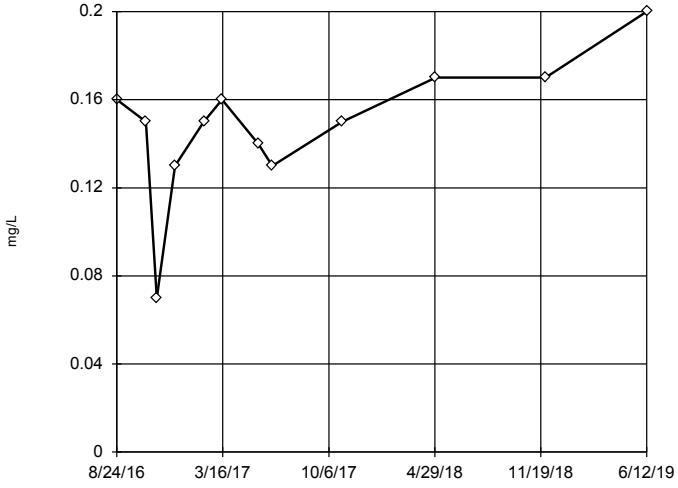
Constituent: Fluoride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2329, low cutoff = -0.09354, based on IQR multiplier of 3.

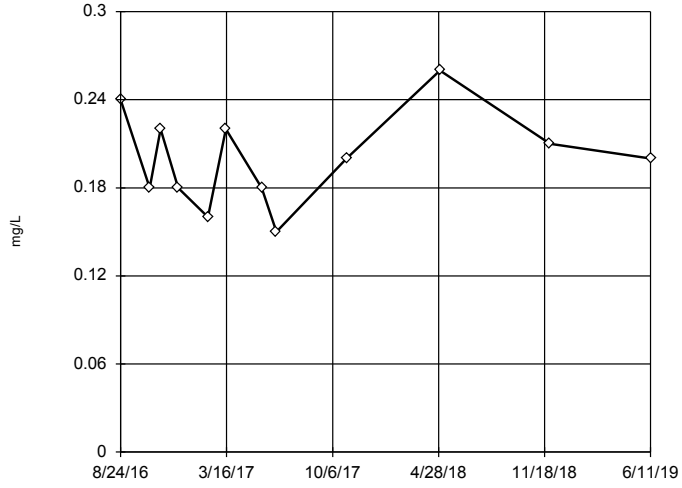
Constituent: Fluoride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

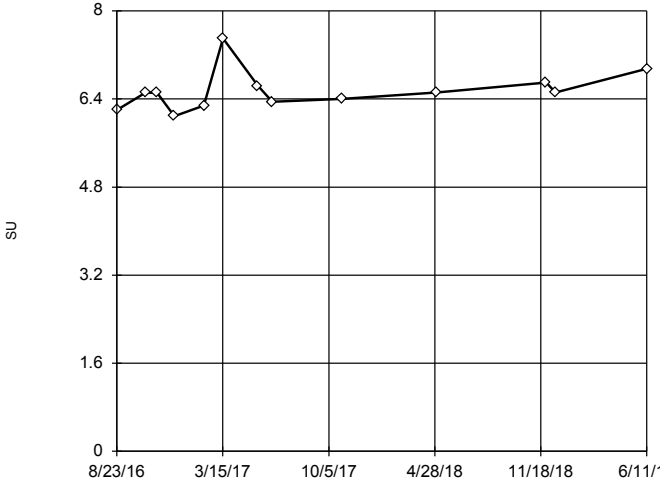
High cutoff = 0.3746, low cutoff = 0.08958, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-1



n = 13

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.859, low cutoff = 5.359, based on IQR multiplier of 3.

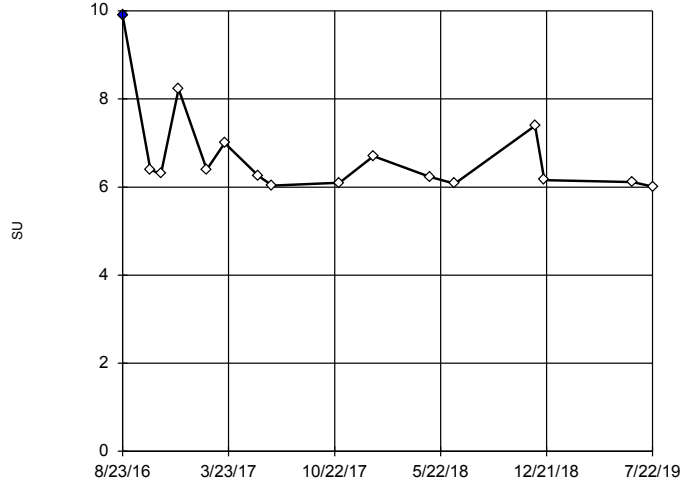
Constituent: pH, field Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-5



n = 16

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 9.667, low cutoff = 4.325, based on IQR multiplier of 3.

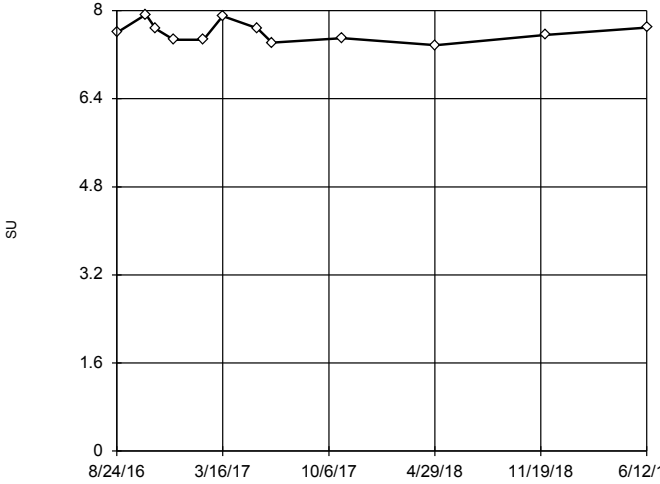
Constituent: pH, field Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 8.368, low cutoff = 6.86, based on IQR multiplier of 3.

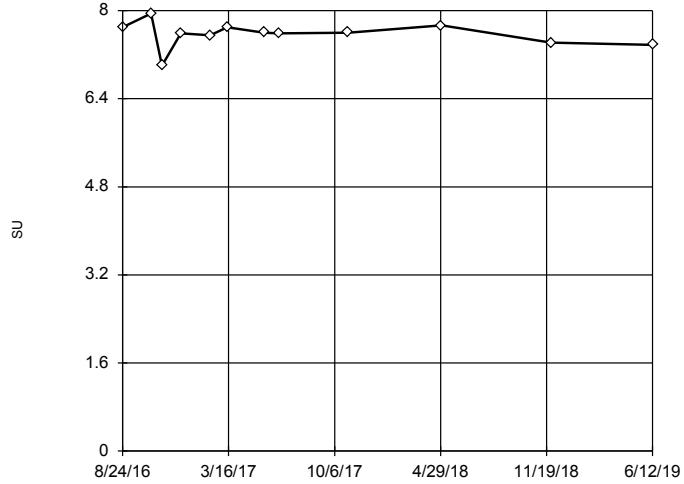
Constituent: pH, field Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

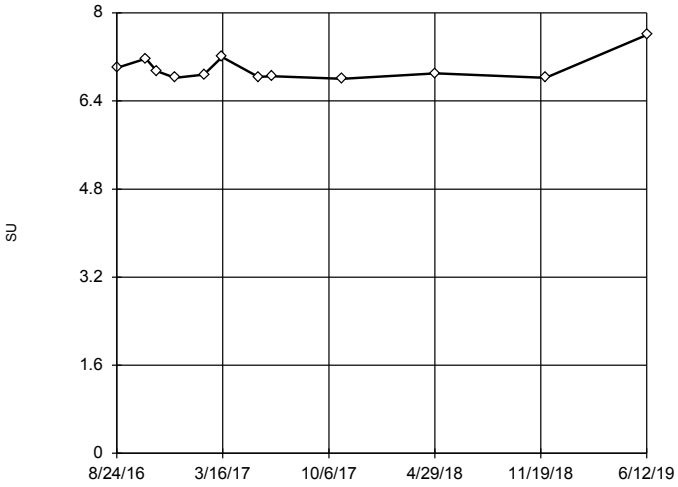
High cutoff = 8.207, low cutoff = 6.55, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.906, low cutoff = 6.12, based on IQR multiplier of 3.

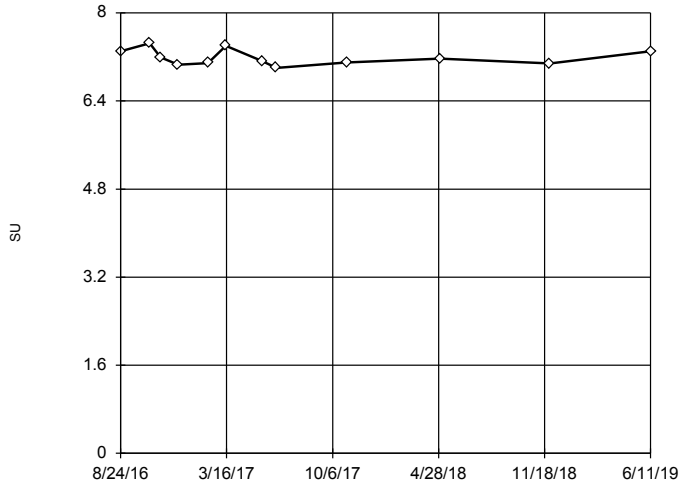
Constituent: pH, field Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.985, low cutoff = 6.477, based on IQR multiplier of 3.

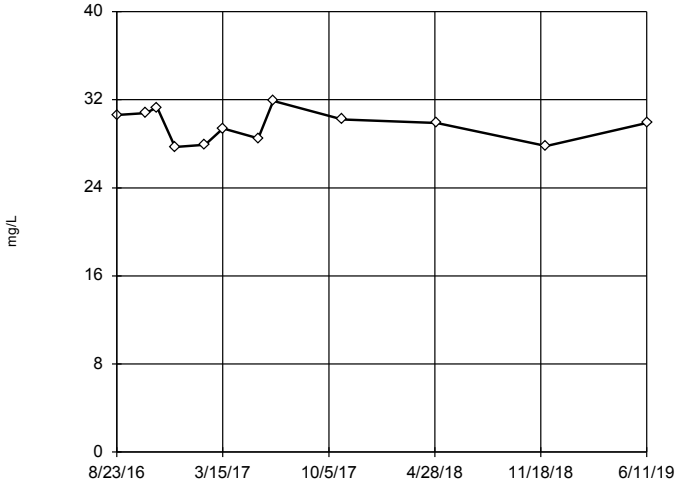
Constituent: pH, field Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-1



n = 12

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 35, low cutoff = -28.14, based on IQR multiplier of 3.

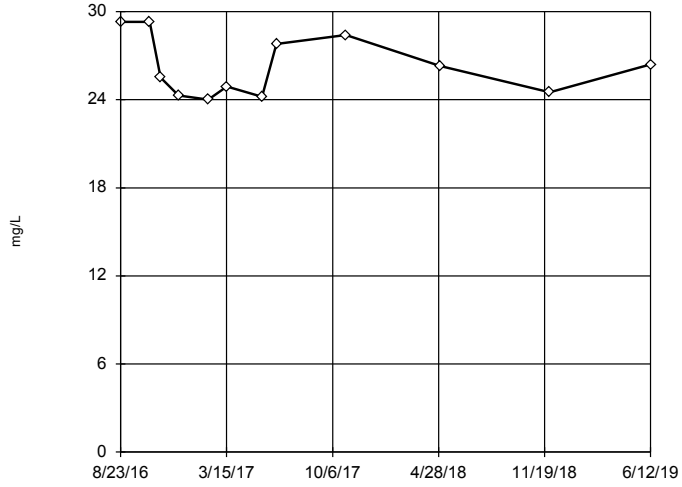
Constituent: Sulfate, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-5



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

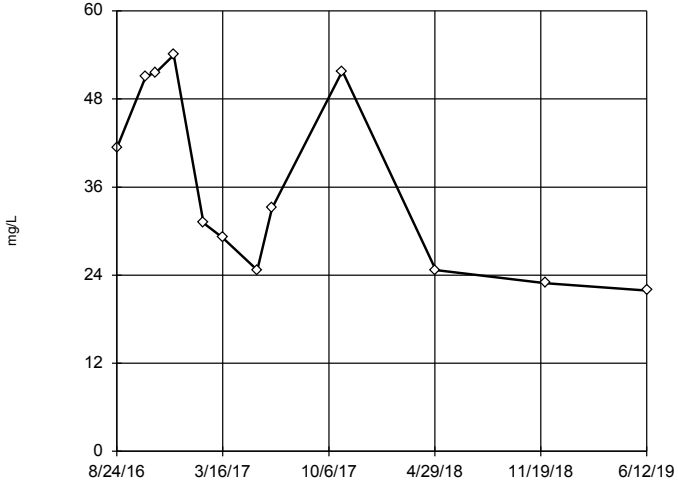
High cutoff = 42.91, low cutoff = 15.98, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 461.4, low cutoff = 2.749, based on IQR multiplier of 3.

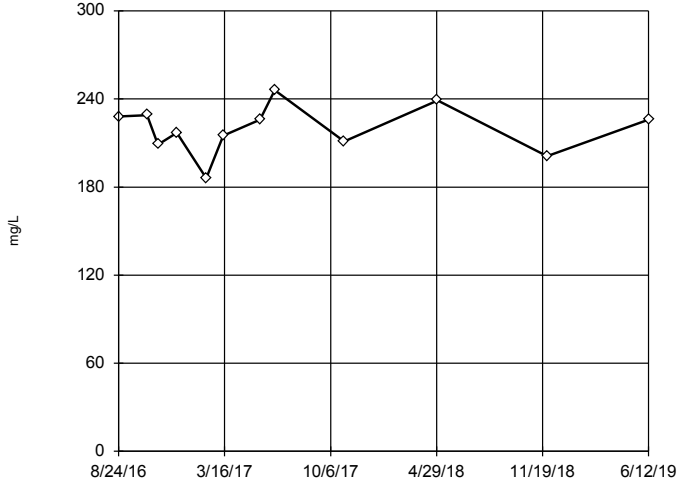
Constituent: Sulfate, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube transformed to achieve best W statistic (graph shown in original units).

High cutoff = 271.2, low cutoff = 107.9, based on IQR multiplier of 3.

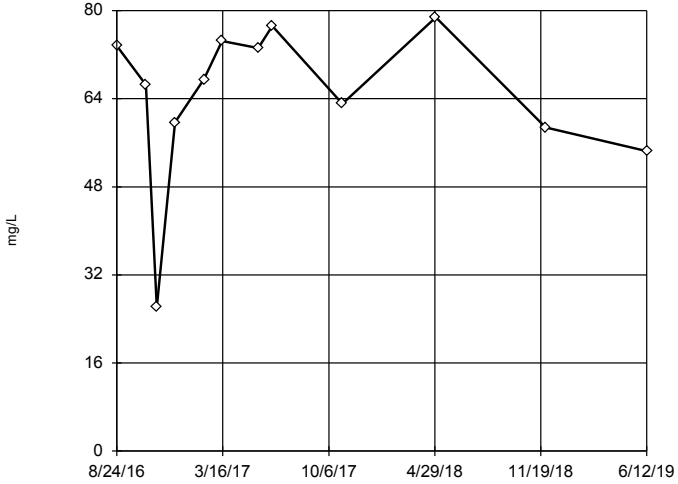
Constituent: Sulfate, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 95.54, low cutoff = -79.98, based on IQR multiplier of 3.

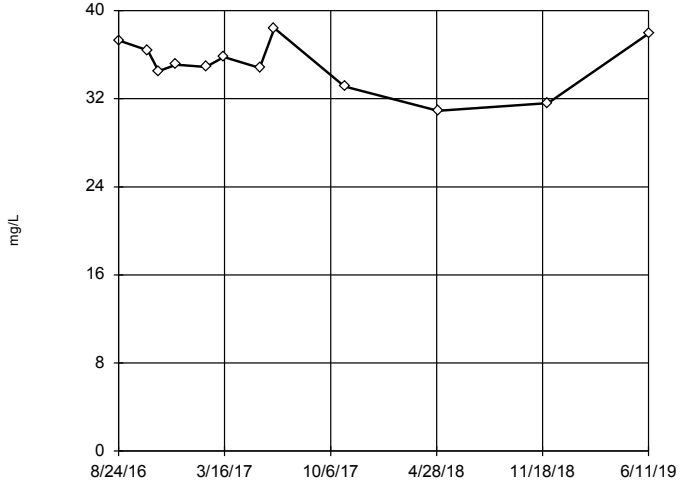
Constituent: Sulfate, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

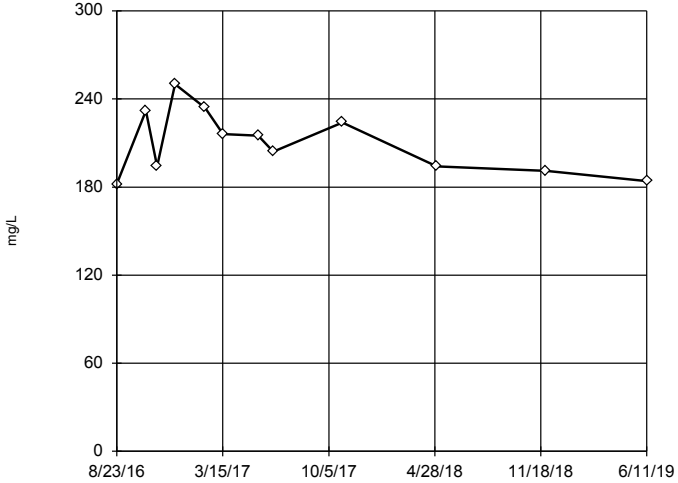
High cutoff = 43.12, low cutoff = -23.46, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-1



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 378.6, low cutoff = 115.9, based on IQR multiplier of 3.

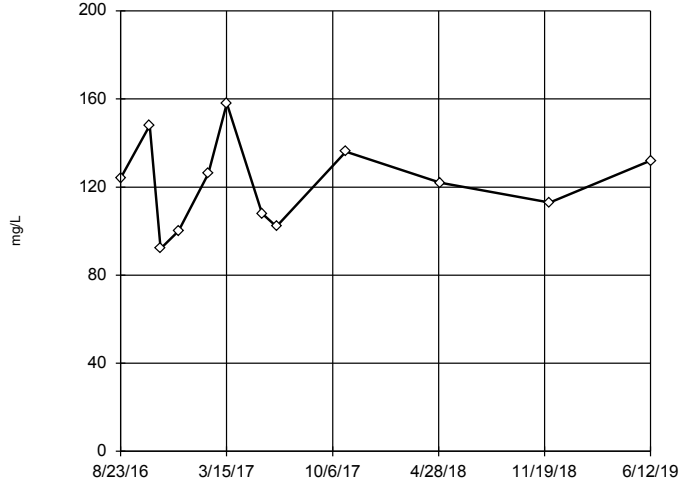
Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-5



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 278.7, low cutoff = 50.45, based on IQR multiplier of 3.

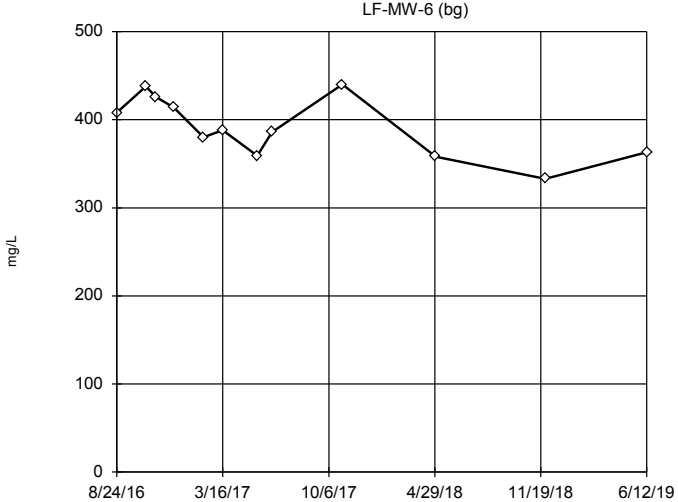
Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 634.7, low cutoff = 217.7, based on IQR multiplier of 3.

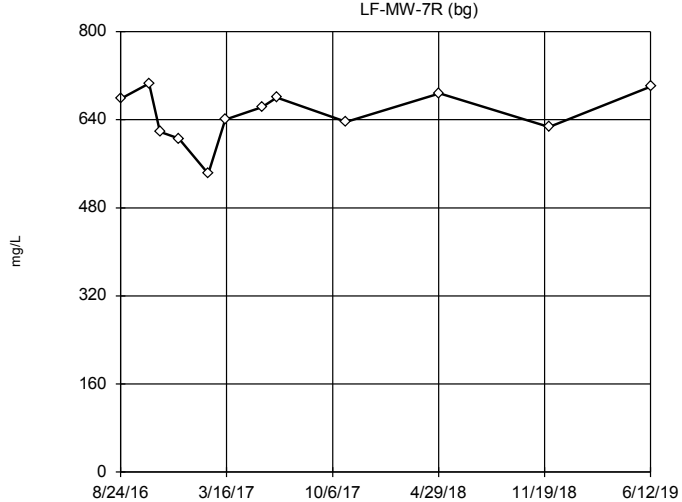
Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

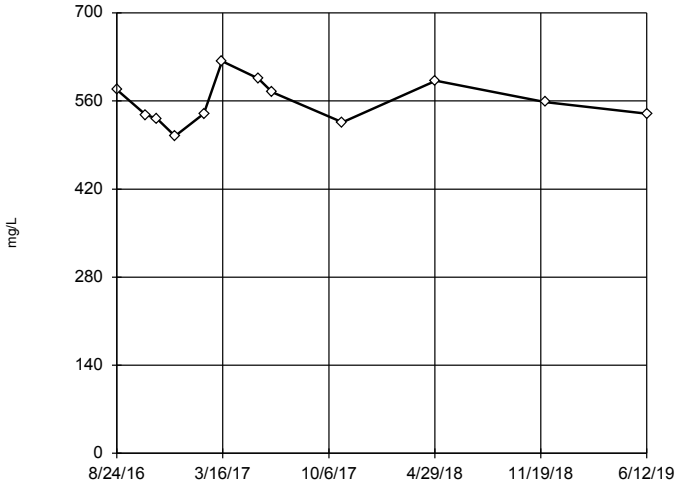
High cutoff = 785.6, low cutoff = -648.6, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 764.6, low cutoff = 409.3, based on IQR multiplier of 3.

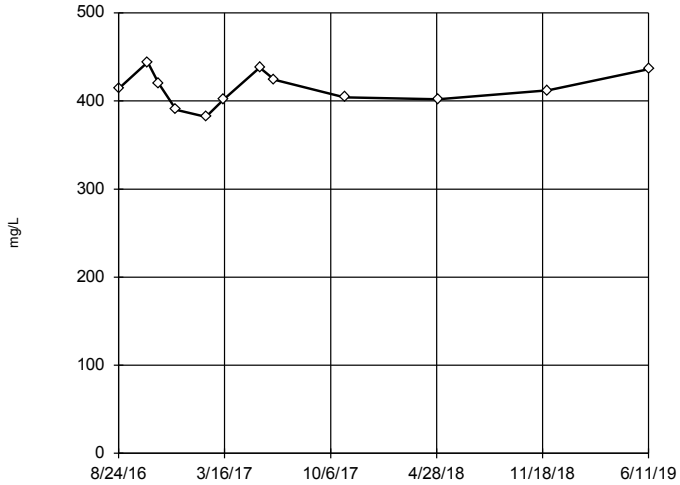
Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 526, low cutoff = 328.6, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:17 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

FIGURE D: MANN-WHITNEY ANALYSIS

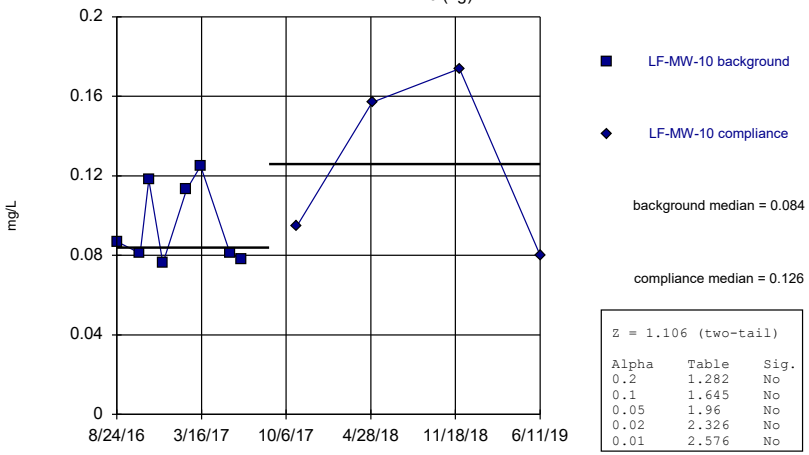
Welch's t-test/Mann-Whitney - All Results - Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 1/9/2020, 2:07 PM

Constituent	Well	Calc.	0.01	Method
Boron, total (mg/L)	LF-MW-10 (bg)	1.106	No	Mann-W
Boron, total (mg/L)	LF-MW-2	1.979	No	Mann-W
Boron, total (mg/L)	LF-MW-4	0.2199	No	Mann-W
Calcium, total (mg/L)	LF-MW-10 (bg)	-1.276	No	Mann-W
Calcium, total (mg/L)	LF-MW-2	1.616	No	Mann-W
Calcium, total (mg/L)	LF-MW-4	-1.967	No	Mann-W
Chloride, total (mg/L)	LF-MW-10 (bg)	1.613	No	Mann-W
Chloride, total (mg/L)	LF-MW-2	-0.5944	No	Mann-W
Chloride, total (mg/L)	LF-MW-4	-1.108	No	Mann-W
Fluoride, total (mg/L)	LF-MW-10 (bg)	0.5104	No	Mann-W
Fluoride, total (mg/L)	LF-MW-2	0.9846	No	Mann-W
Fluoride, total (mg/L)	LF-MW-4	0.5138	No	Mann-W
pH, field (SU)	LF-MW-10 (bg)	0.6806	No	Mann-W
pH, field (SU)	LF-MW-2	0.2105	No	Mann-W
pH, field (SU)	LF-MW-4	-1.274	No	Mann-W
Sulfate, total (mg/L)	LF-MW-10 (bg)	0.7643	No	Mann-W
Sulfate, total (mg/L)	LF-MW-2	0.5965	No	Mann-W
Sulfate, total (mg/L)	LF-MW-4	0.5965	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-10 (bg)	1.616	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-2	0.0736	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-4	0.9341	No	Mann-W

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



Z = 1.106 (two-tail)

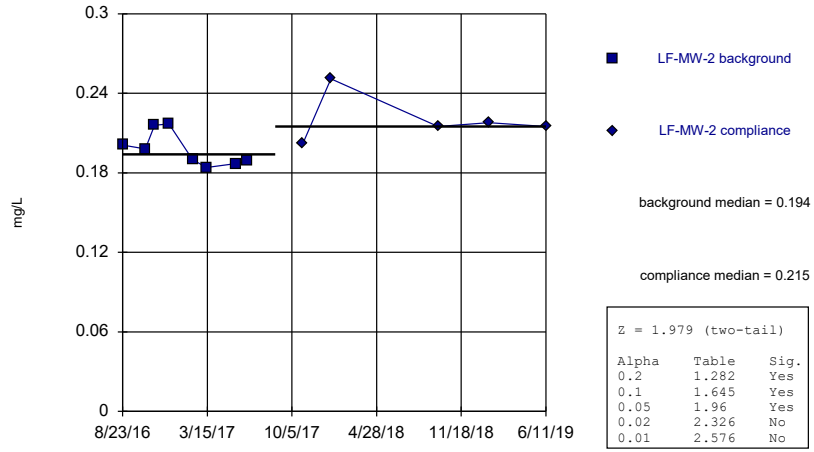
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



Z = 1.979 (two-tail)

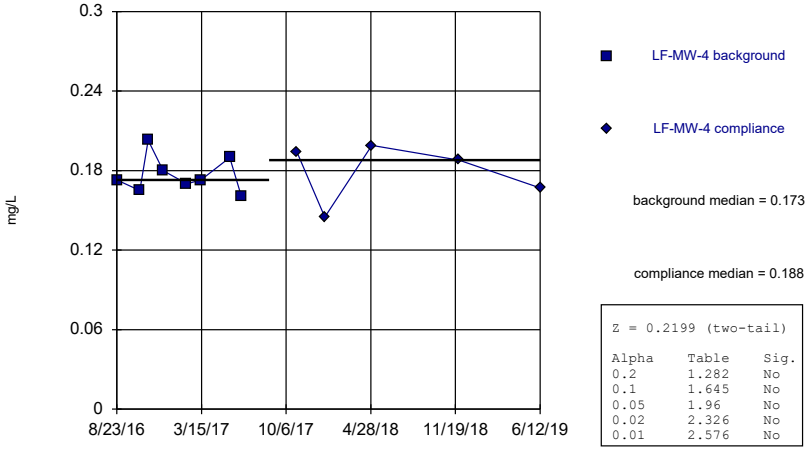
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



Z = 0.2199 (two-tail)

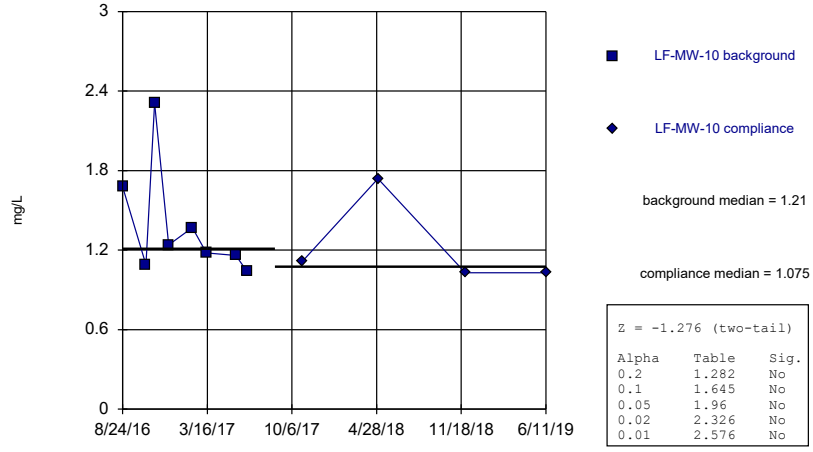
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



Z = -1.276 (two-tail)

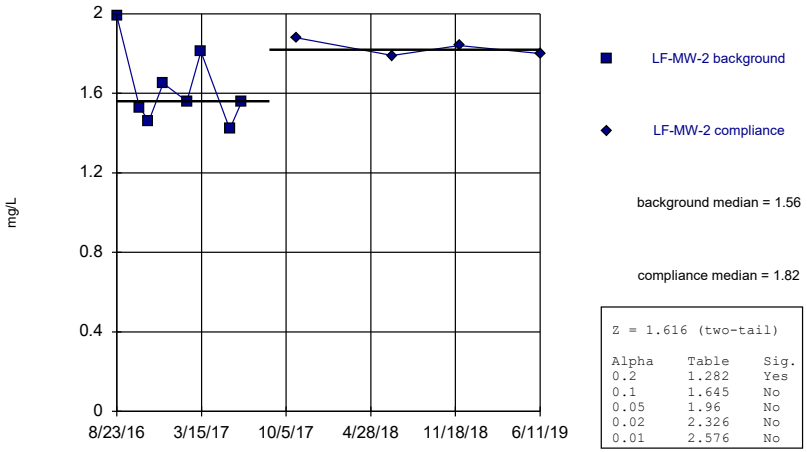
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



Z = 1.616 (two-tail)

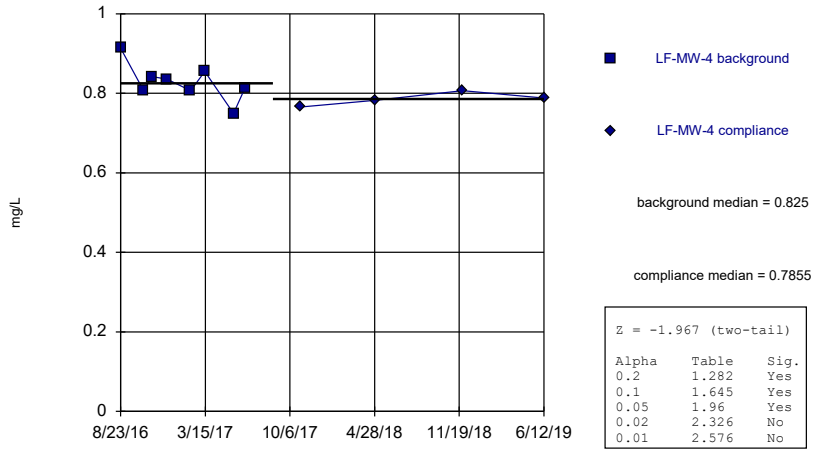
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



Z = -1.967 (two-tail)

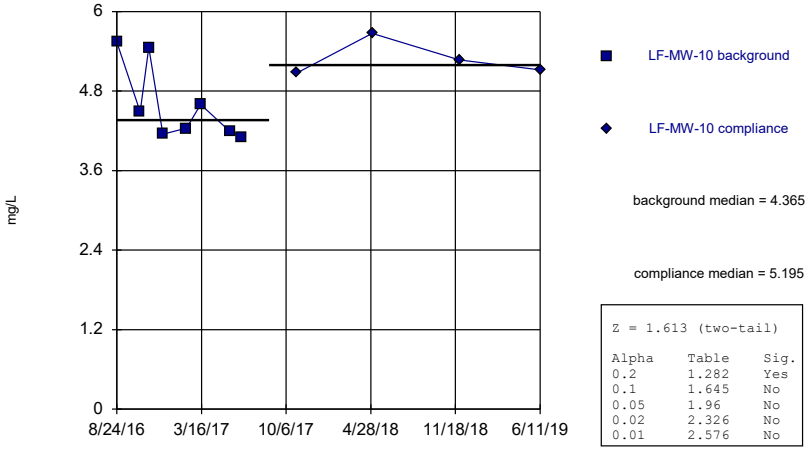
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



Z = 1.613 (two-tail)

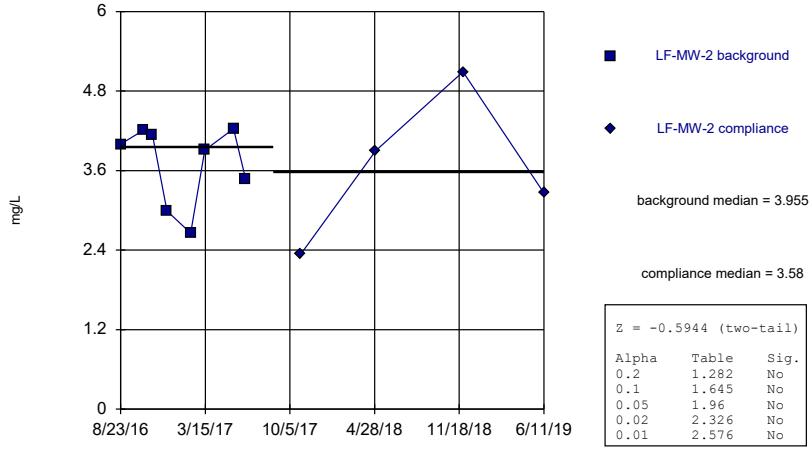
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



Z = -0.5944 (two-tail)

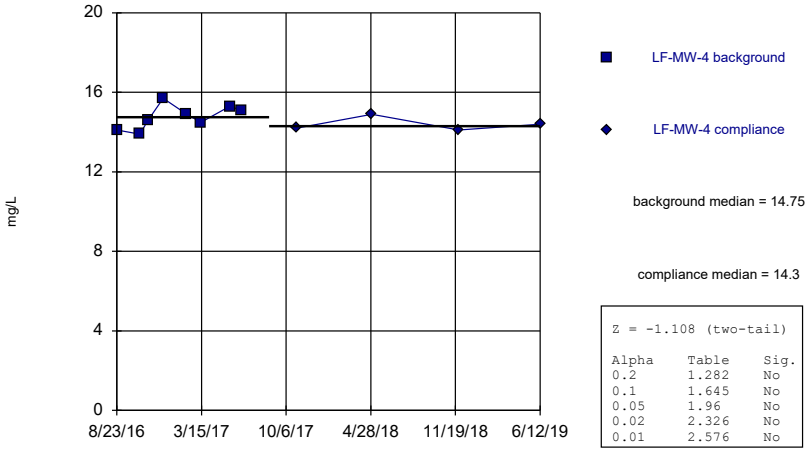
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



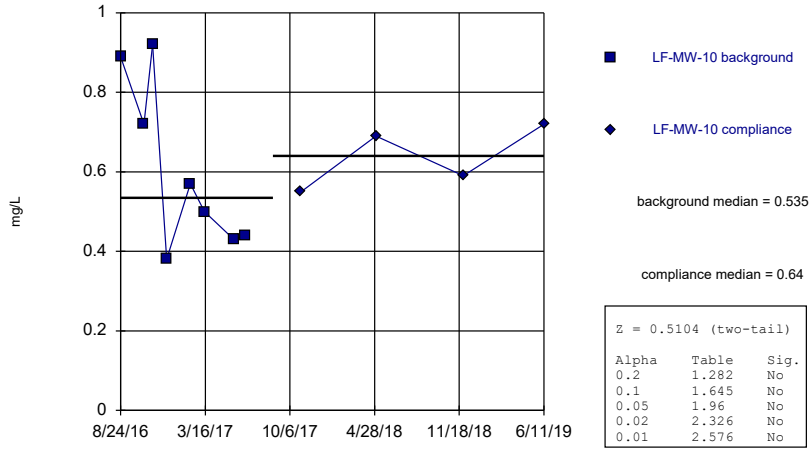
Constituent: Chloride, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



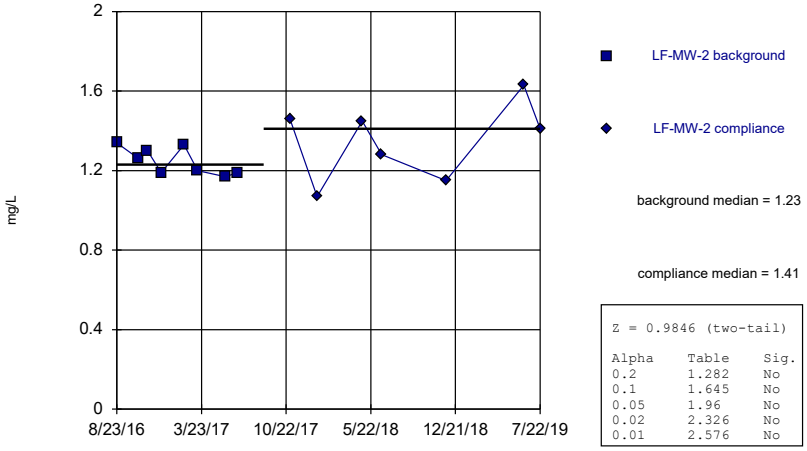
Constituent: Fluoride, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



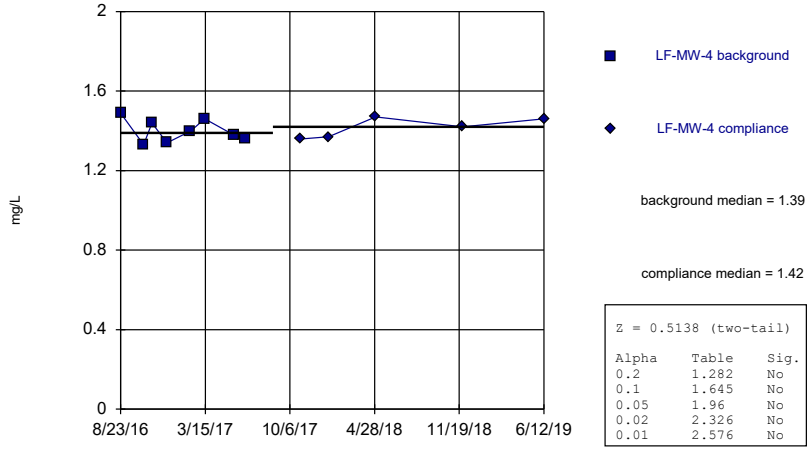
Constituent: Fluoride, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4

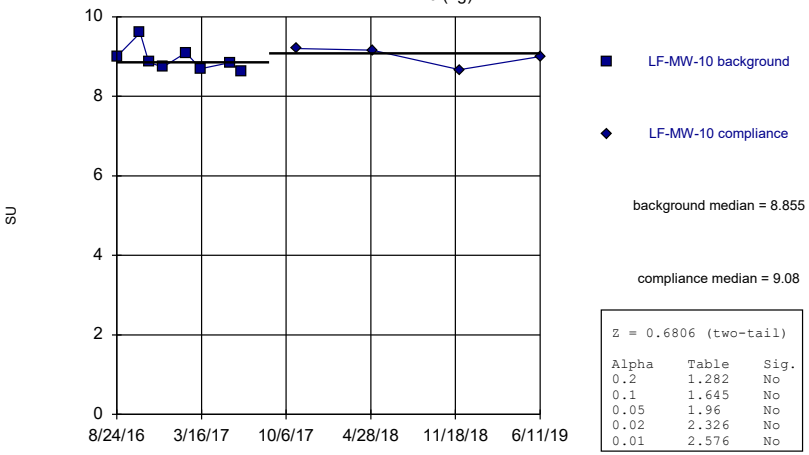


Constituent: Fluoride, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

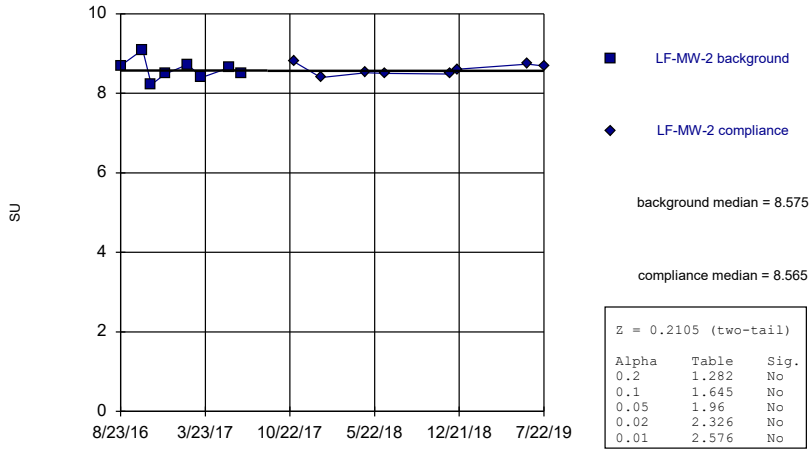
LF-MW-10 (bg)



Constituent: pH, field Analysis Run 1/9/2020 2:06 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

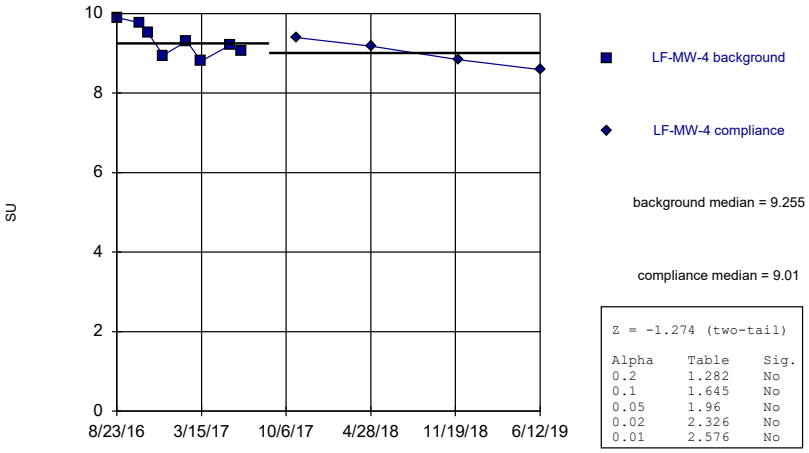
LF-MW-2



Constituent: pH, field Analysis Run 1/9/2020 2:06 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

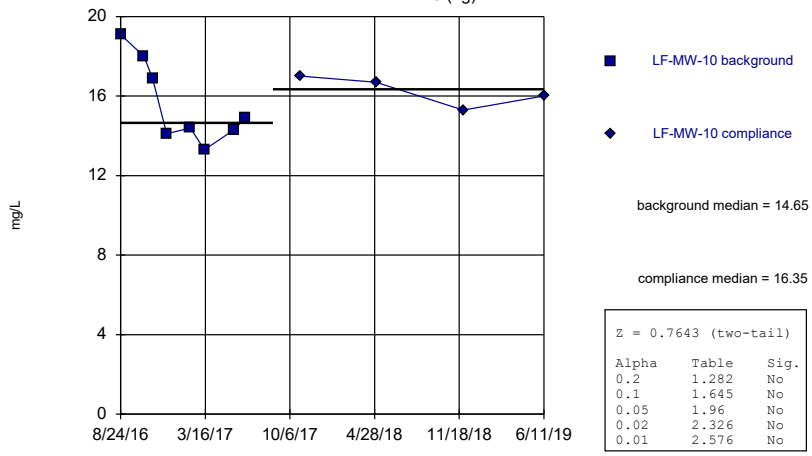
LF-MW-4



Constituent: pH, field Analysis Run 1/9/2020 2:06 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

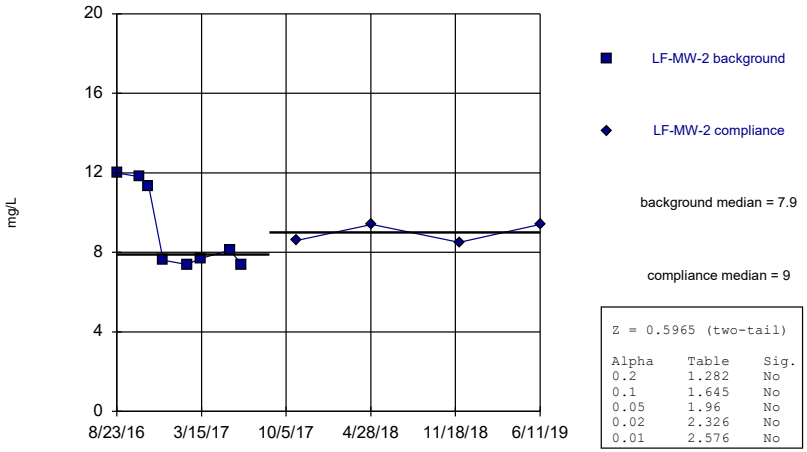
LF-MW-10 (bg)



Constituent: Sulfate, total Analysis Run 1/9/2020 2:06 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



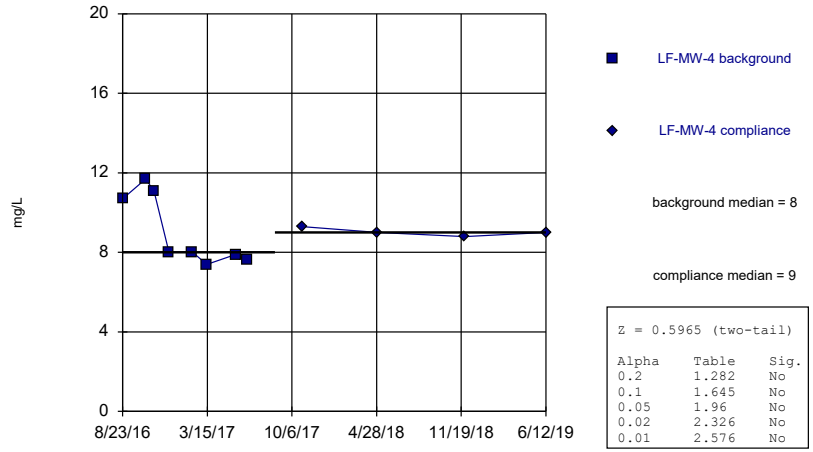
Constituent: Sulfate, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



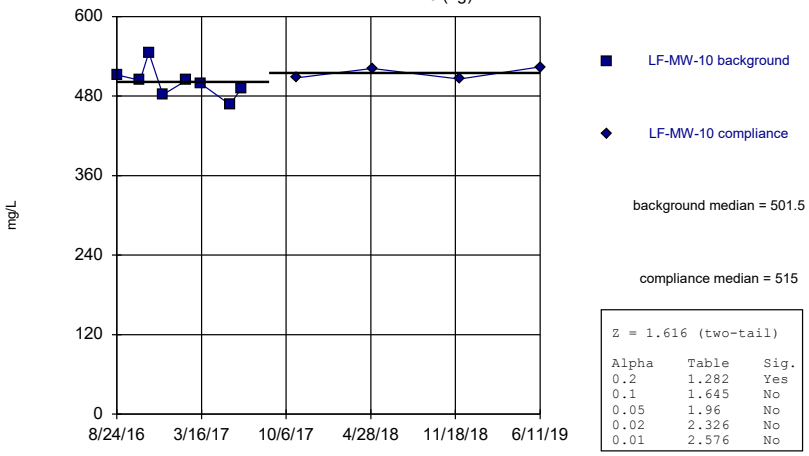
Constituent: Sulfate, total Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



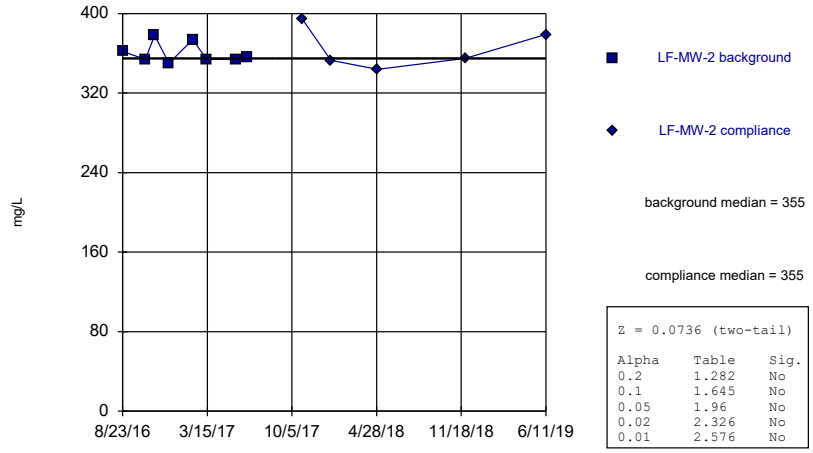
Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

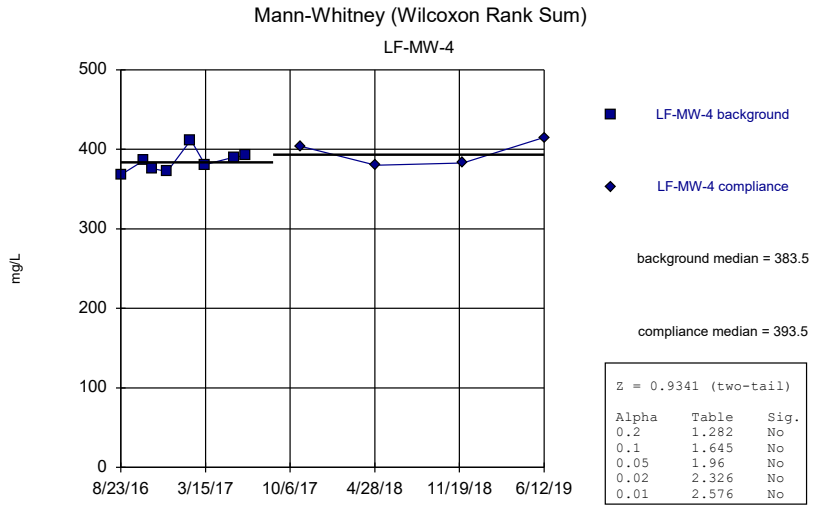
Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill



Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 2:06 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Welch's t-test/Mann-Whitney - Significant Results - Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 1/9/2020, 2:01 PM

Constituent	Well	Calc.	0.01	Method
Chloride, total (mg/L)	**LF-MW-5**	**3.313**	**Yes**	**Mann-W**
Fluoride, total (mg/L)	**LF-MW-1**	**2.578**	**Yes**	**Mann-W**

Welch's t-test/Mann-Whitney - All Results - Group 2

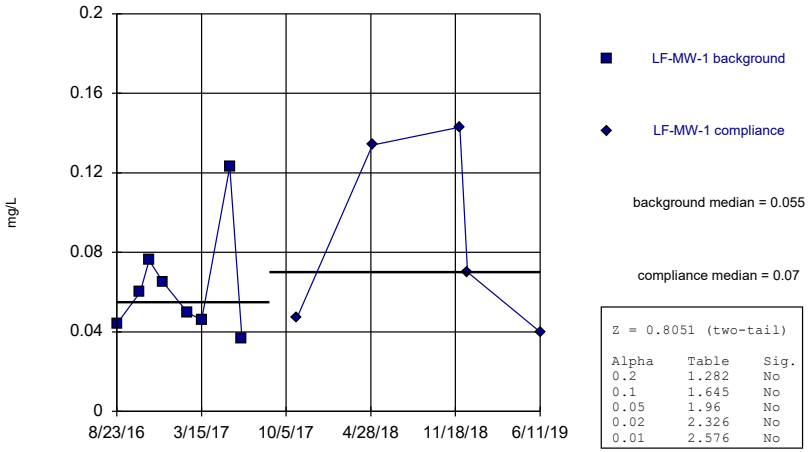
Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 1/9/2020, 2:01 PM

Constituent	Well	Calc.	0.01	Method
Boron, total (mg/L)	LF-MW-1	0.8051	No	Mann-W
Boron, total (mg/L)	LF-MW-5	1.982	No	Mann-W
Boron, total (mg/L)	LF-MW-6 (bg)	0.7643	No	Mann-W
Boron, total (mg/L)	LF-MW-7R (bg)	2.293	No	Mann-W
Boron, total (mg/L)	LF-MW-8 (bg)	0.3403	No	Mann-W
Boron, total (mg/L)	LF-MW-9 (bg)	0.4246	No	Mann-W
Calcium, total (mg/L)	LF-MW-1	-1.872	No	Mann-W
Calcium, total (mg/L)	LF-MW-5	0	No	Mann-W
Calcium, total (mg/L)	LF-MW-6 (bg)	-1.613	No	Mann-W
Calcium, total (mg/L)	LF-MW-7R (bg)	0.2548	No	Mann-W
Calcium, total (mg/L)	LF-MW-8 (bg)	-2.39	No	Mann-W
Calcium, total (mg/L)	LF-MW-9 (bg)	-1.953	No	Mann-W
Chloride, total (mg/L)	LF-MW-1	-2.212	No	Mann-W
Chloride, total (mg/L)	**LF-MW-5**	**3.313**	**Yes**	**Mann-W**
Chloride, total (mg/L)	LF-MW-6 (bg)	-1.616	No	Mann-W
Chloride, total (mg/L)	LF-MW-7R (bg)	-0.7643	No	Mann-W
Chloride, total (mg/L)	LF-MW-8 (bg)	-1.106	No	Mann-W
Chloride, total (mg/L)	LF-MW-9 (bg)	-2.463	No	Mann-W
Fluoride, total (mg/L)	**LF-MW-1**	**2.578**	**Yes**	**Mann-W**
Fluoride, total (mg/L)	LF-MW-5	0.5293	No	Mann-W
Fluoride, total (mg/L)	LF-MW-6 (bg)	1.116	No	Mann-W
Fluoride, total (mg/L)	LF-MW-7R (bg)	0.514	No	Mann-W
Fluoride, total (mg/L)	LF-MW-8 (bg)	2.149	No	Mann-W
Fluoride, total (mg/L)	LF-MW-9 (bg)	1.116	No	Mann-W
pH, field (SU)	LF-MW-1	1.394	No	Mann-W
pH, field (SU)	LF-MW-5	-1.733	No	Mann-W
pH, field (SU)	LF-MW-6 (bg)	-0.7656	No	Mann-W
pH, field (SU)	LF-MW-7R (bg)	-0.5122	No	Mann-W
pH, field (SU)	LF-MW-8 (bg)	-0.6806	No	Mann-W
pH, field (SU)	LF-MW-9 (bg)	-0.3403	No	Mann-W
Sulfate, total (mg/L)	LF-MW-1	-0.5955	No	Mann-W
Sulfate, total (mg/L)	LF-MW-5	0.4253	No	Mann-W
Sulfate, total (mg/L)	LF-MW-6 (bg)	-1.531	No	Mann-W
Sulfate, total (mg/L)	LF-MW-7R (bg)	-0.3403	No	Mann-W
Sulfate, total (mg/L)	LF-MW-8 (bg)	-0.7643	No	Mann-W
Sulfate, total (mg/L)	LF-MW-9 (bg)	-1.613	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-1	-1.361	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-5	0.5944	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-6 (bg)	-1.274	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-7R (bg)	0.5944	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-8 (bg)	-0.3403	No	Mann-W
Total Dissolved Solids [TDS] (mg/L)	LF-MW-9 (bg)	-0.3403	No	Mann-W

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-1



Z = 0.8051 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 1/9/2020 1:59 PM View: Group 2

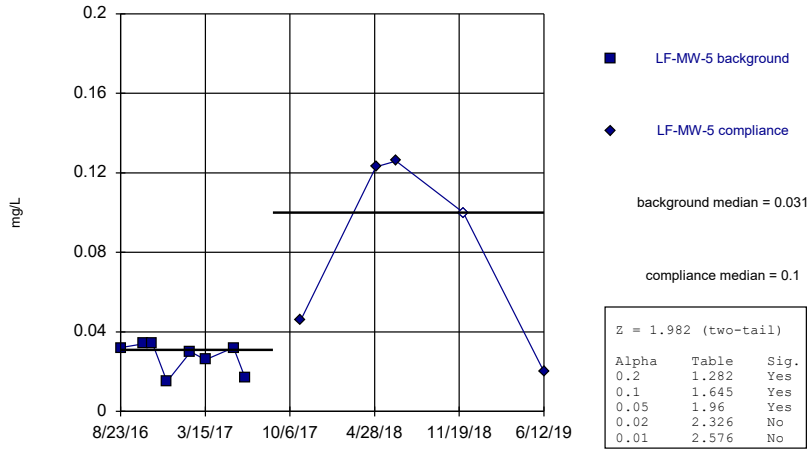
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-5



Z = 1.982 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

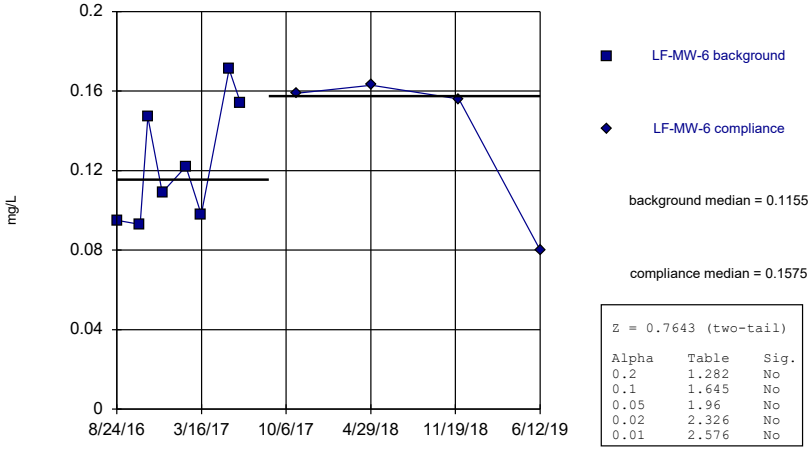
Constituent: Boron, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = 0.7643 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

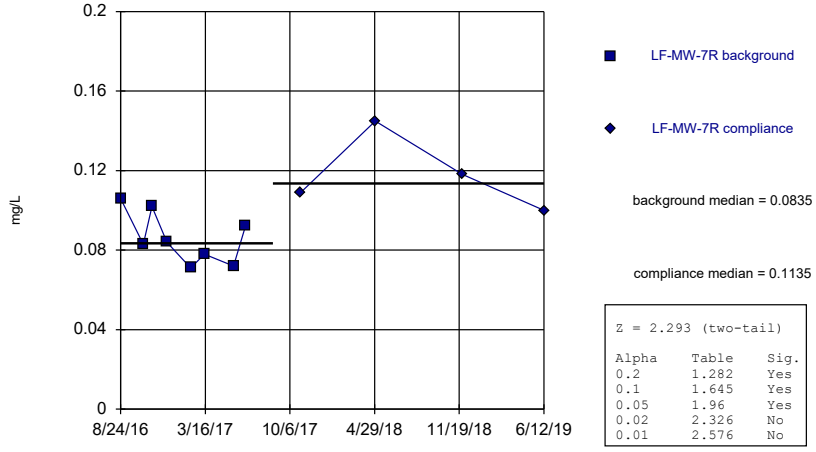
Constituent: Boron, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



Z = 2.293 (two-tail)

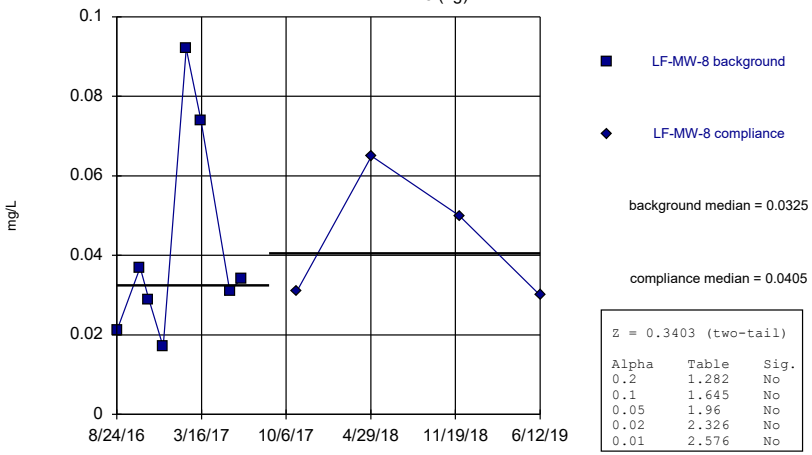
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Boron, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



background median = 0.0325

compliance median = 0.0405

Z = 0.3403 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

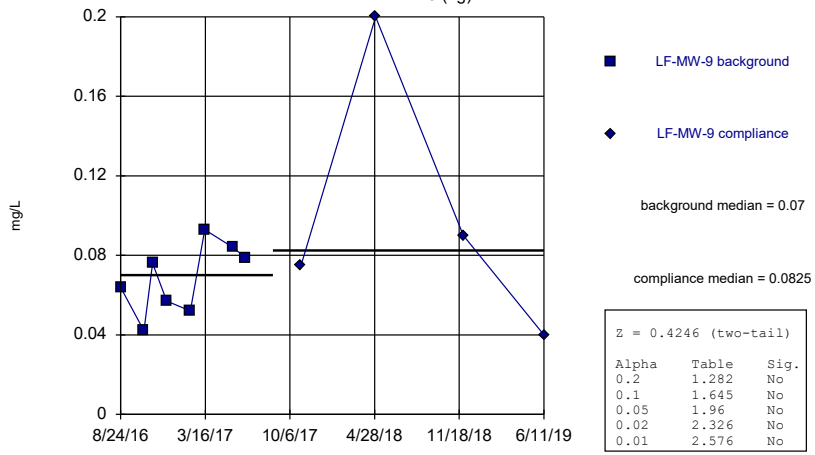
Constituent: Boron, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



background median = 0.07

compliance median = 0.0825

Z = 0.4246 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

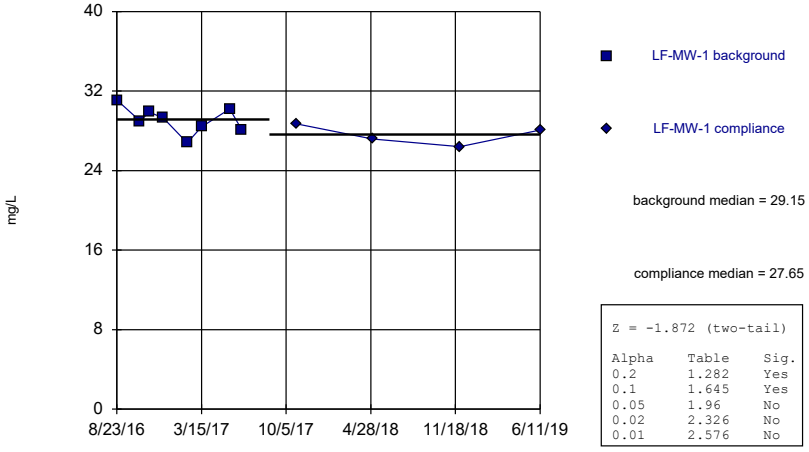
Constituent: Boron, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-1



background median = 29.15

compliance median = 27.65

Z = -1.872 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

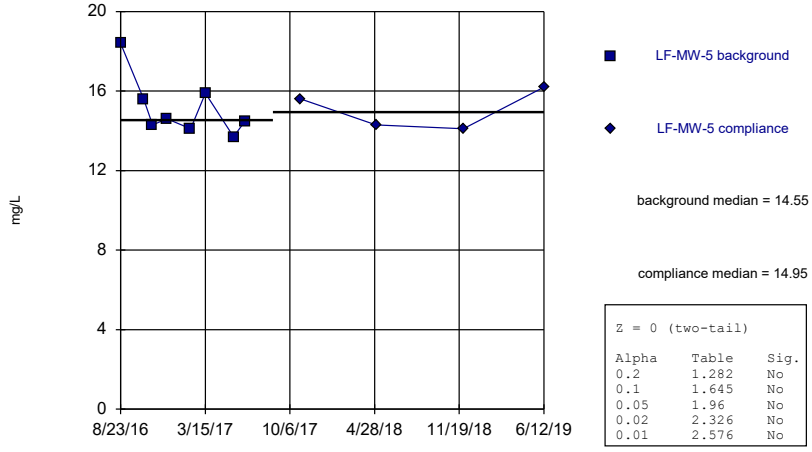
Constituent: Calcium, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-5



background median = 14.55

compliance median = 14.95

Z = 0 (two-tail)

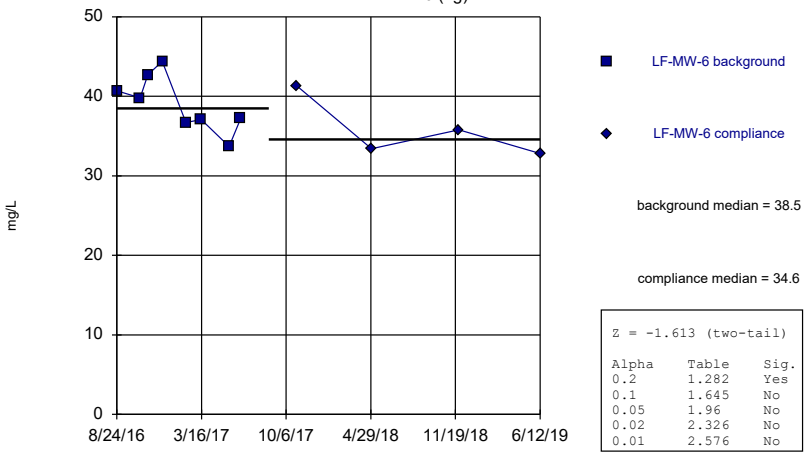
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



background median = 38.5

compliance median = 34.6

Z = -1.613 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

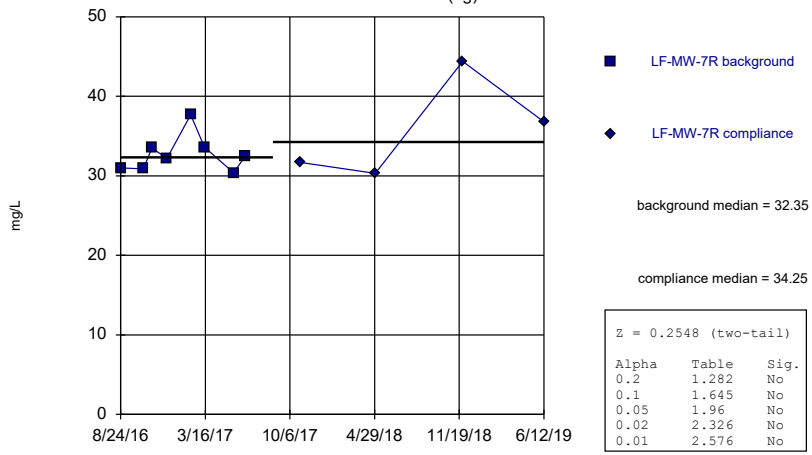
Constituent: Calcium, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



background median = 32.35

compliance median = 34.25

Z = 0.2548 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

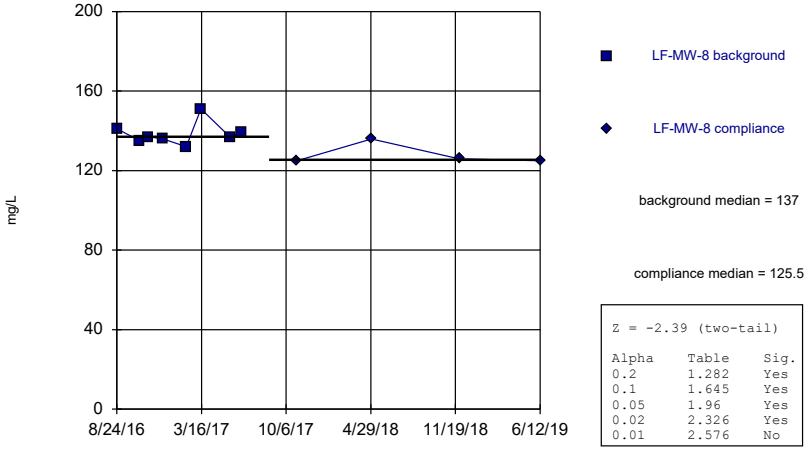
Constituent: Calcium, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



background median = 137

compliance median = 125.5

Z = -2.39 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	No

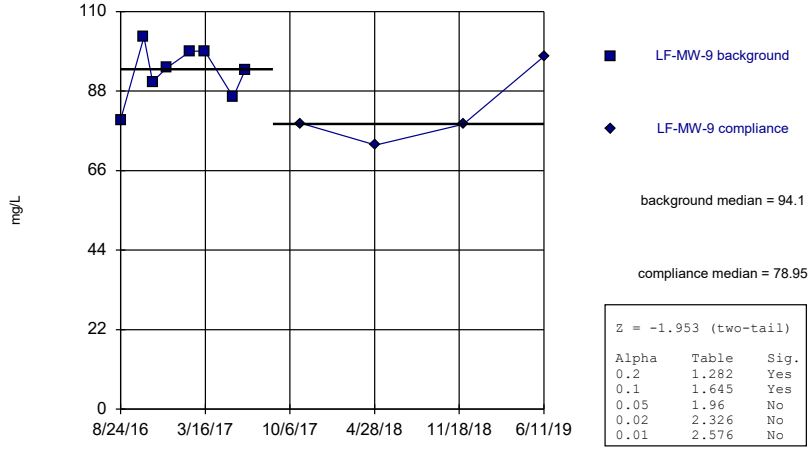
Constituent: Calcium, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



background median = 94.1

compliance median = 78.95

Z = -1.953 (two-tail)

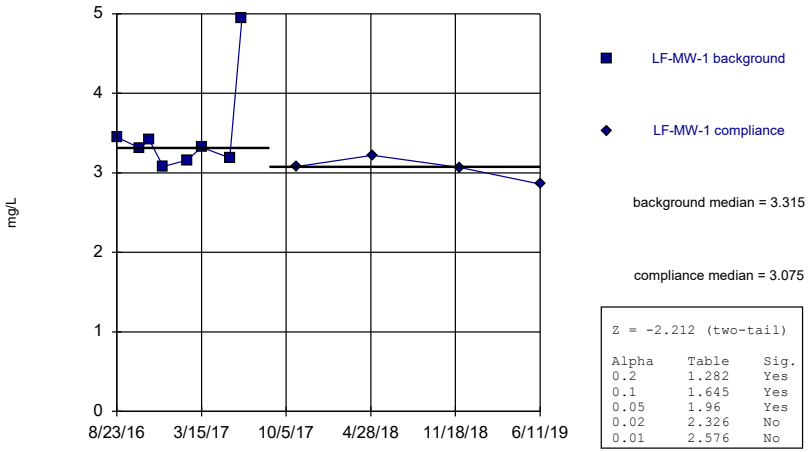
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-1



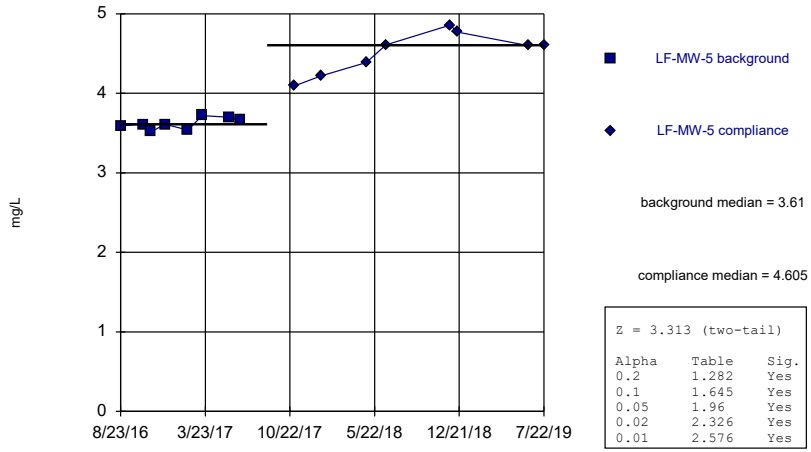
Constituent: Chloride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-5



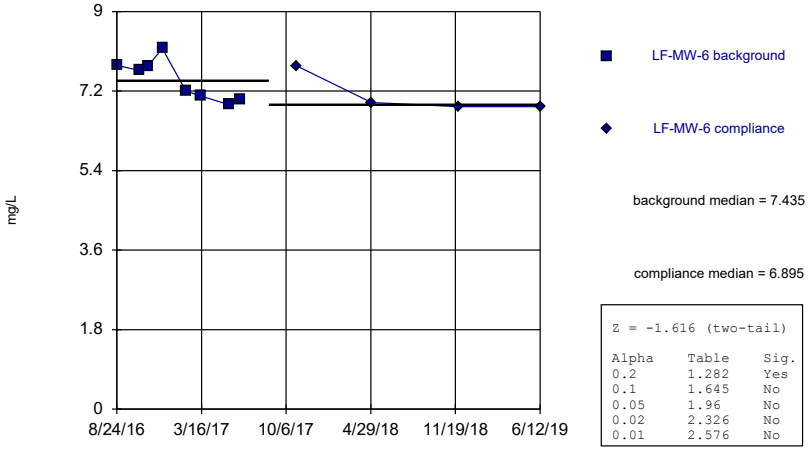
Constituent: Chloride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



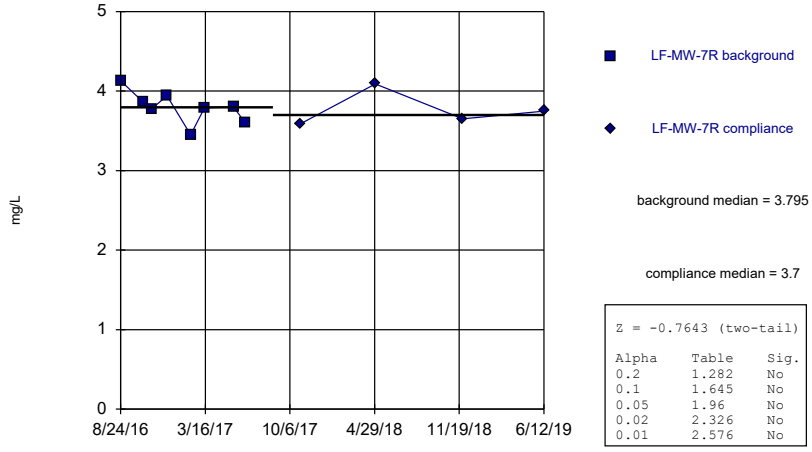
Constituent: Chloride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)

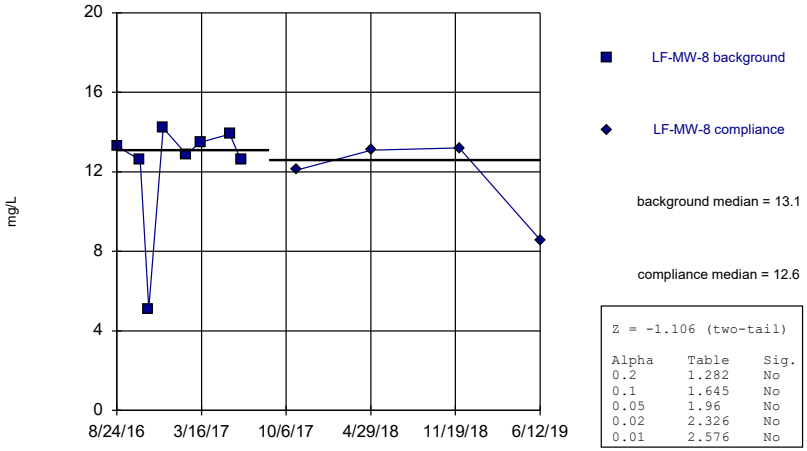


Constituent: Chloride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = -1.106 (two-tail)

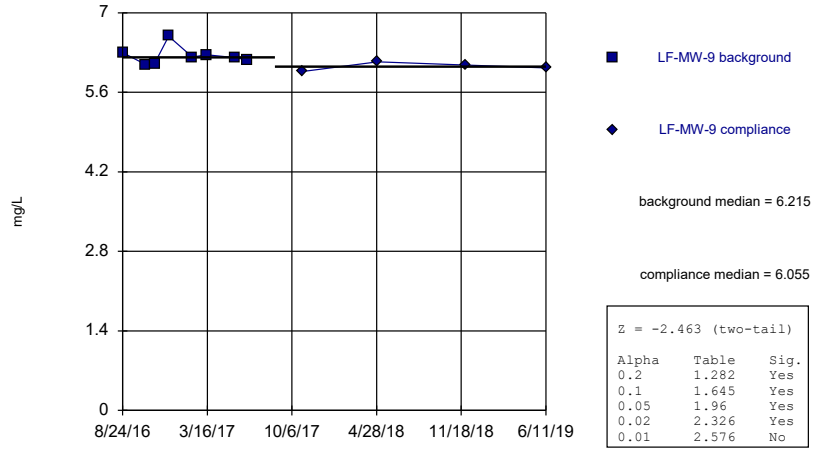
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = -2.463 (two-tail)

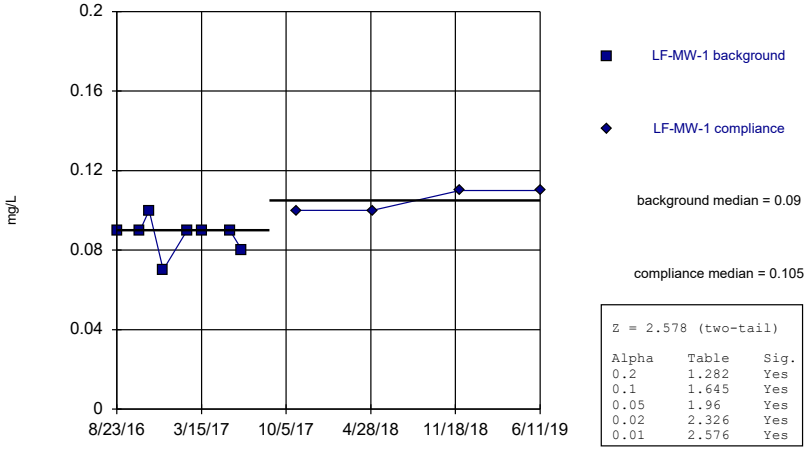
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	No

Constituent: Chloride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-1



Z = 2.578 (two-tail)

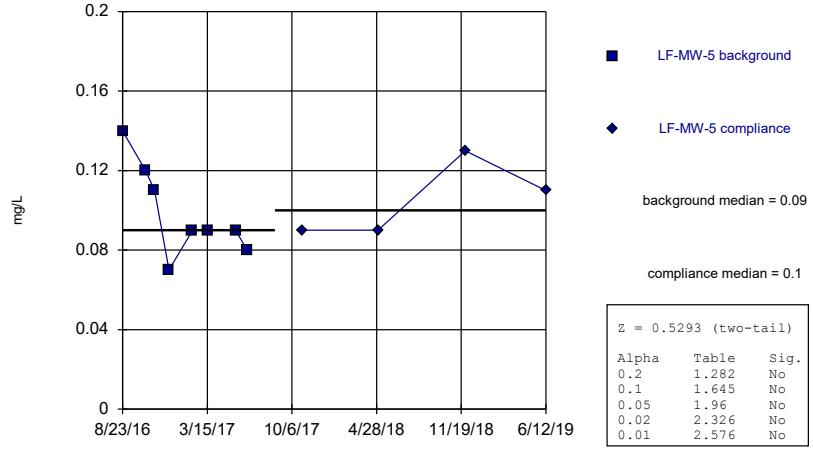
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Fluoride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-5



Z = 0.5293 (two-tail)

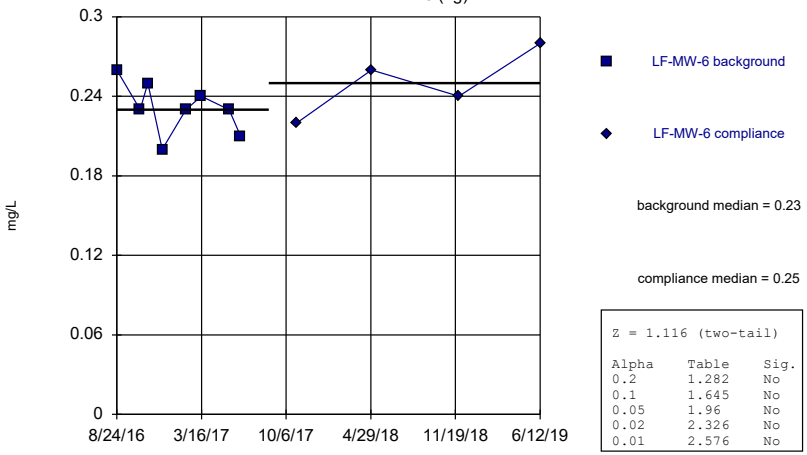
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = 1.116 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

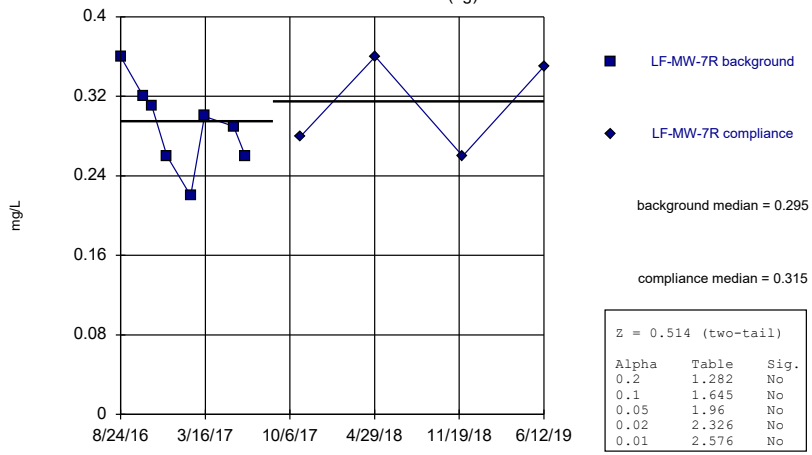
Constituent: Fluoride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



Z = 0.514 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

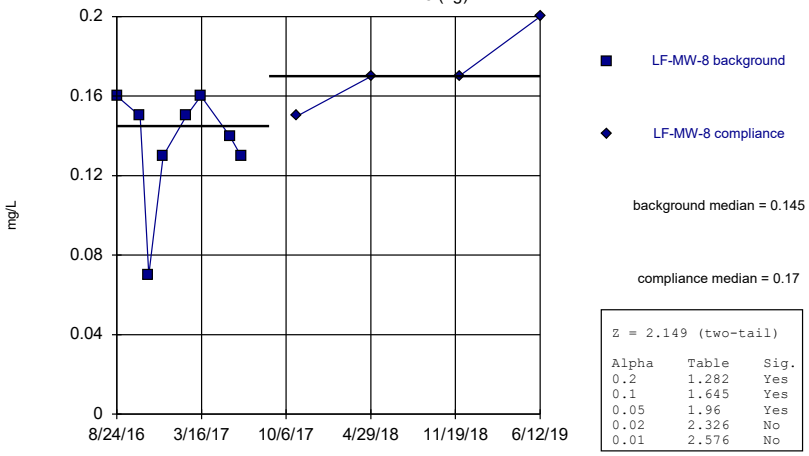
Constituent: Fluoride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = 2.149 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

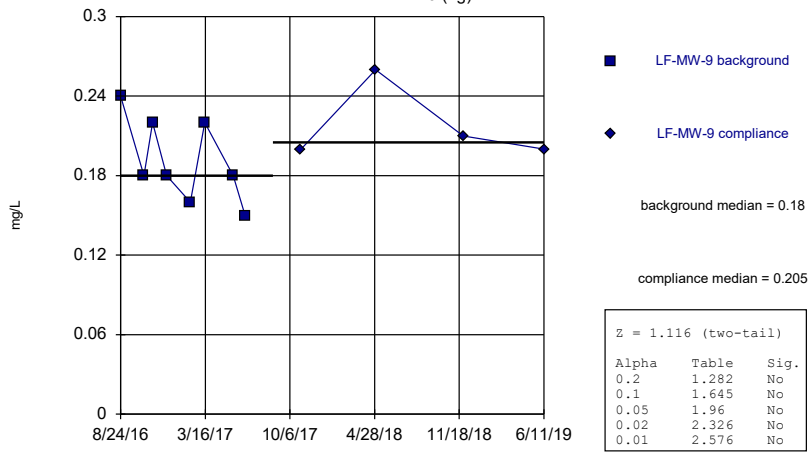
Constituent: Fluoride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = 1.116 (two-tail)

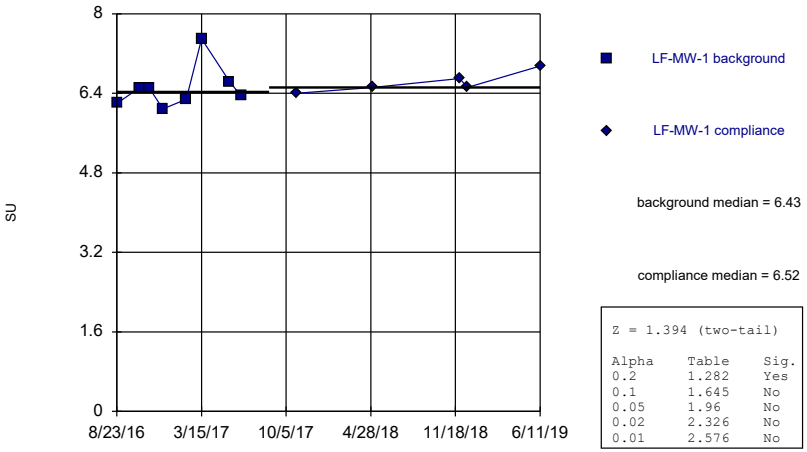
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-1



background median = 6.43

compliance median = 6.52

Z = 1.394 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

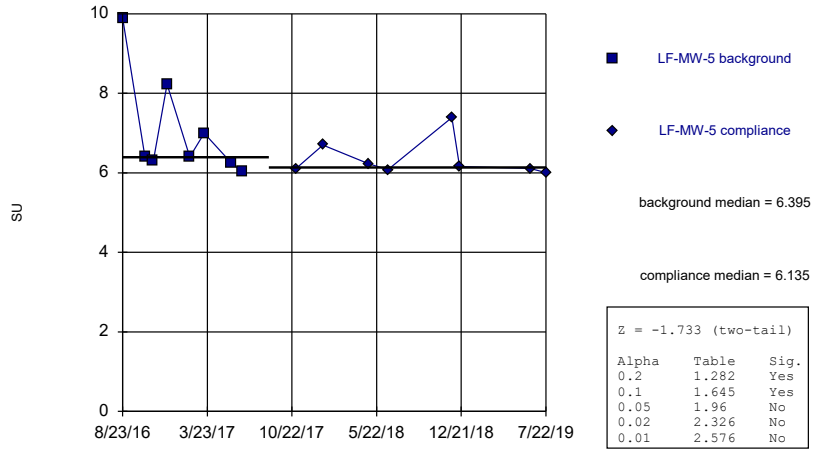
Constituent: pH, field Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-5



background median = 6.395

compliance median = 6.135

Z = -1.733 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

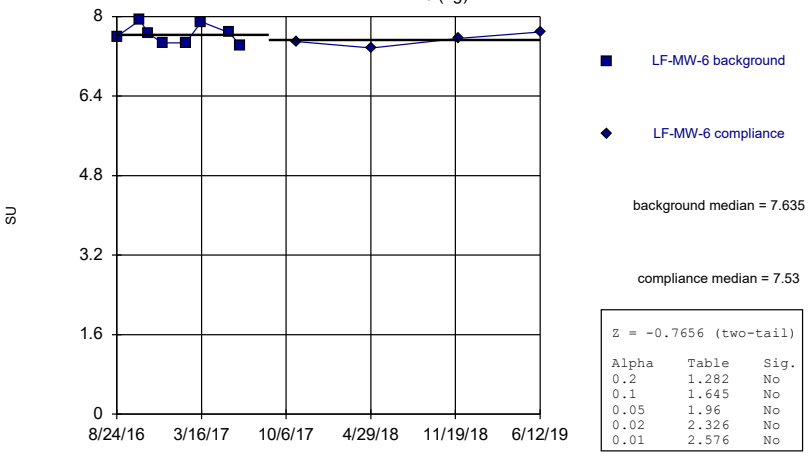
Constituent: pH, field Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



background median = 7.635

compliance median = 7.53

Z = -0.7656 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

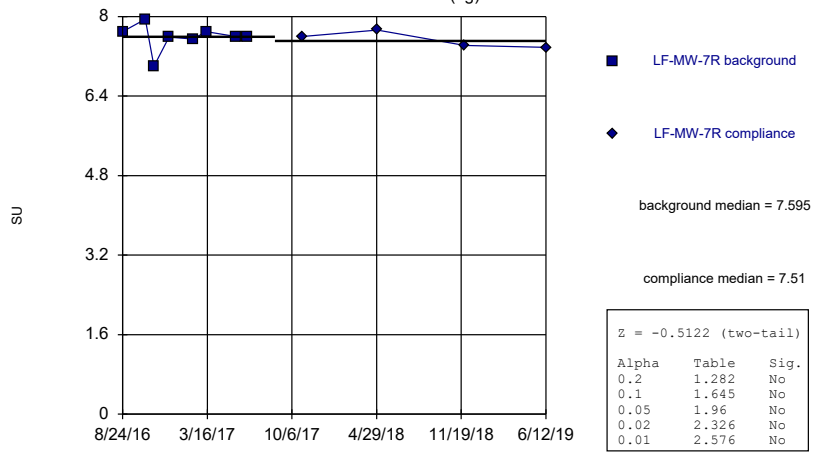
Constituent: pH, field Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



background median = 7.595

compliance median = 7.51

Z = -0.5122 (two-tail)

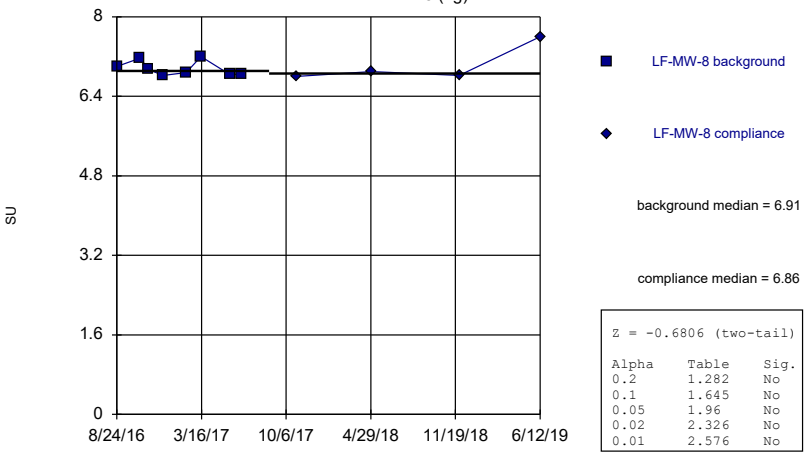
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = -0.6806 (two-tail)

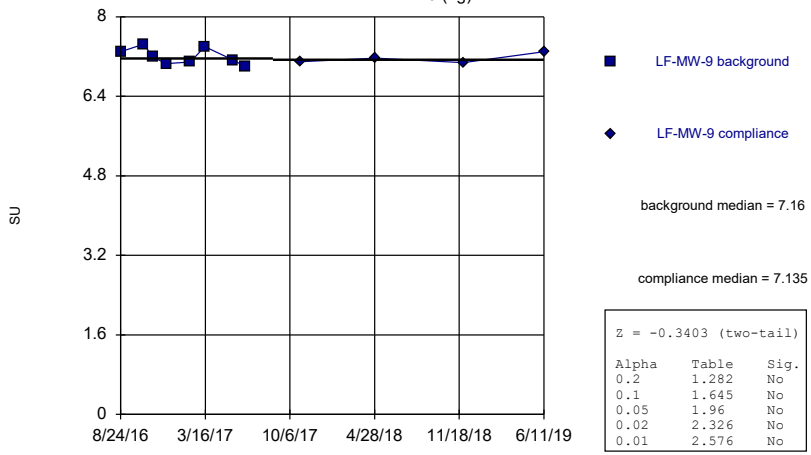
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 1/9/2020 1:59 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = -0.3403 (two-tail)

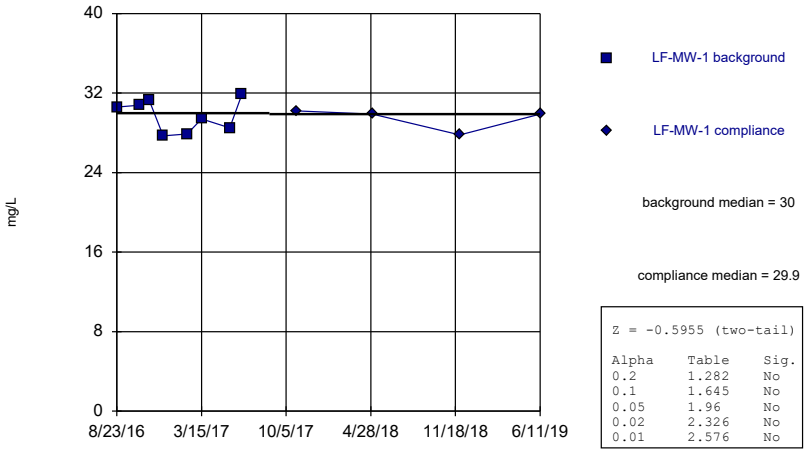
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 1/9/2020 1:59 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-1



Z = -0.5955 (two-tail)

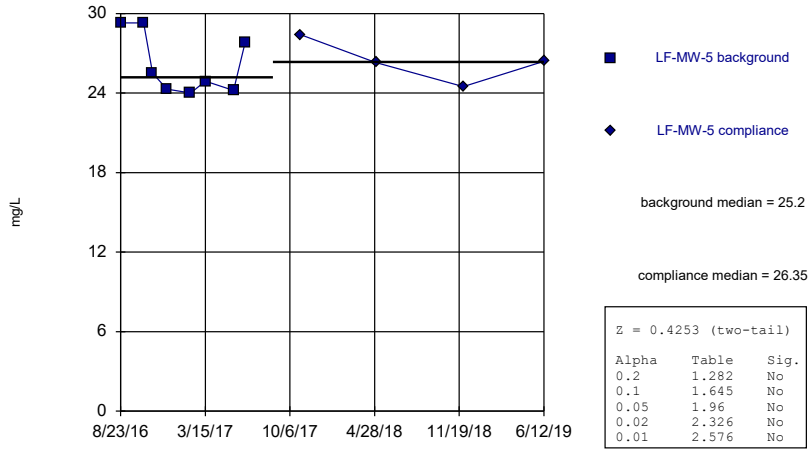
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 1/9/2020 1:59 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-5



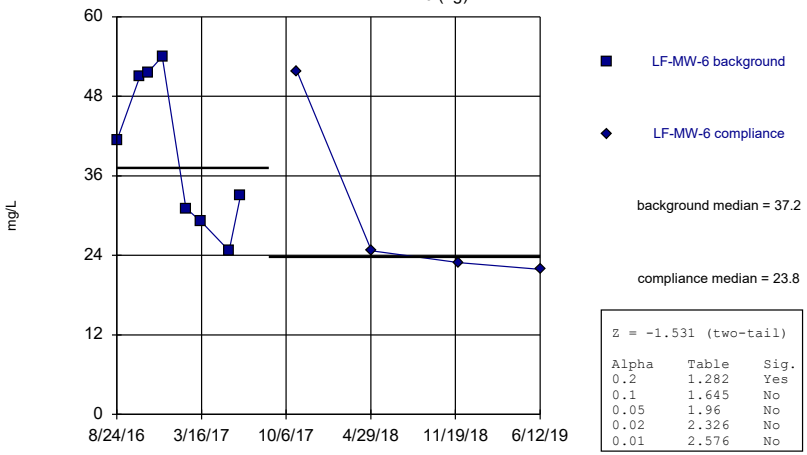
Z = 0.4253 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 1/9/2020 1:59 PM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = -1.531 (two-tail)

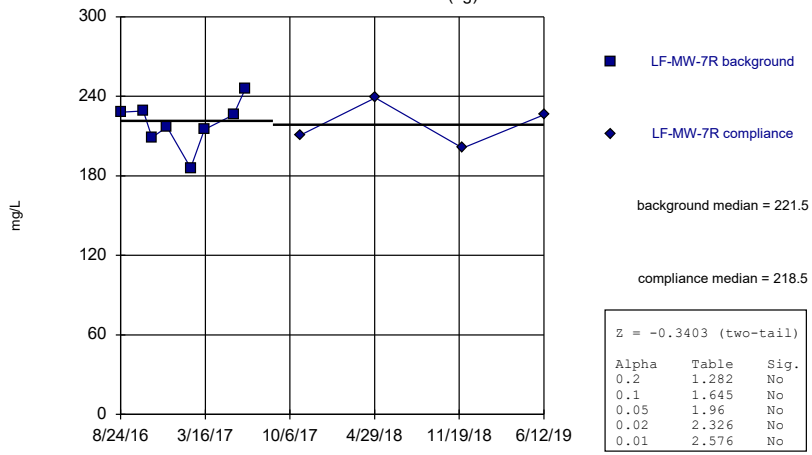
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



Z = -0.3403 (two-tail)

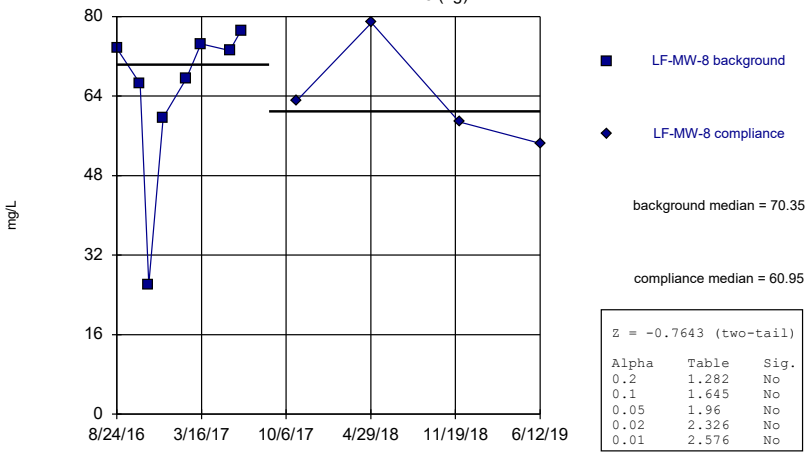
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = -0.7643 (two-tail)

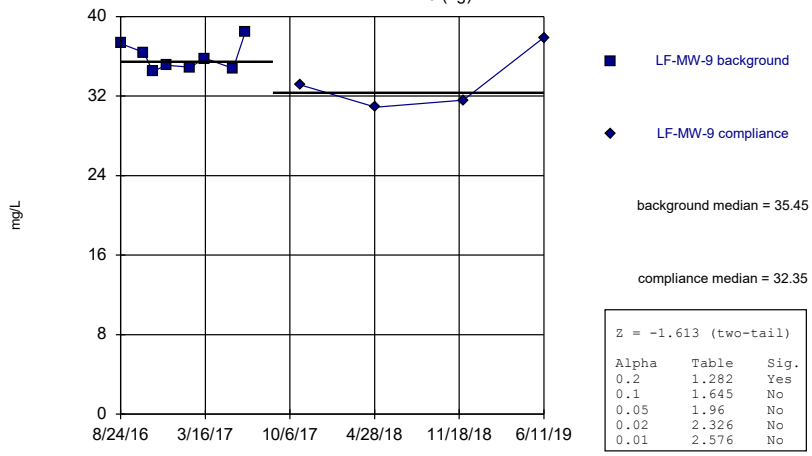
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = -1.613 (two-tail)

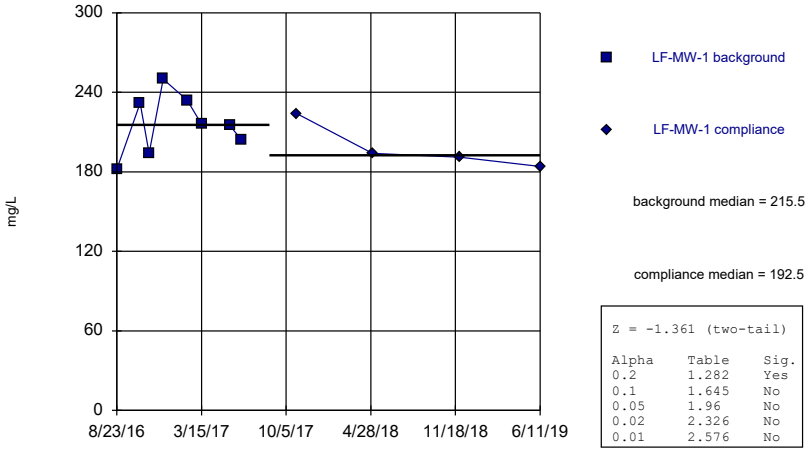
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate, total Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-1



Z = -1.361 (two-tail)

Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

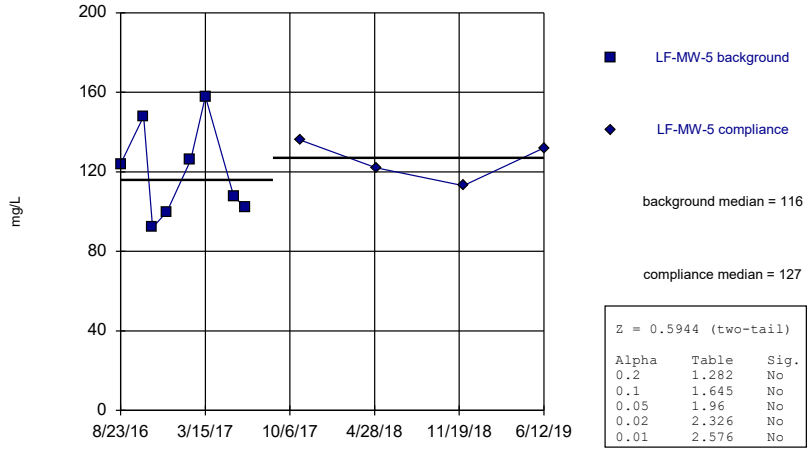
Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-5



Z = 0.5944 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

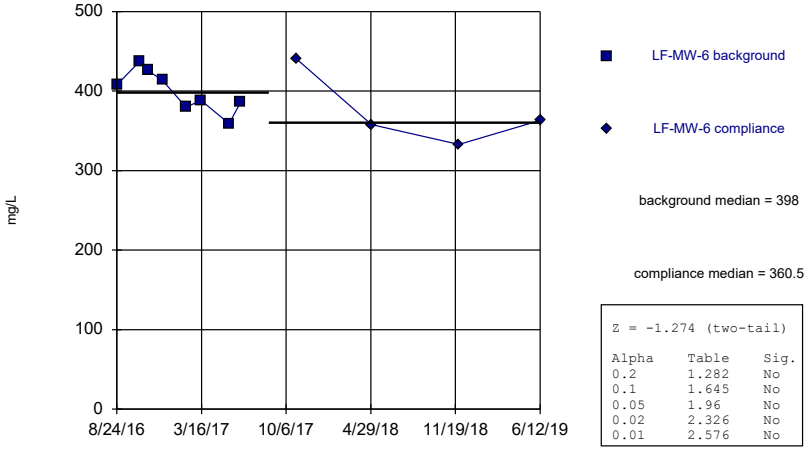
Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = -1.274 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

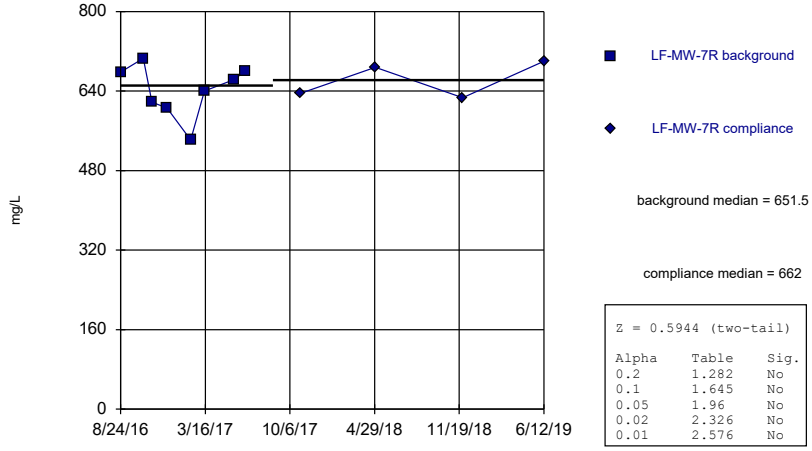
Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



Z = 0.5944 (two-tail)

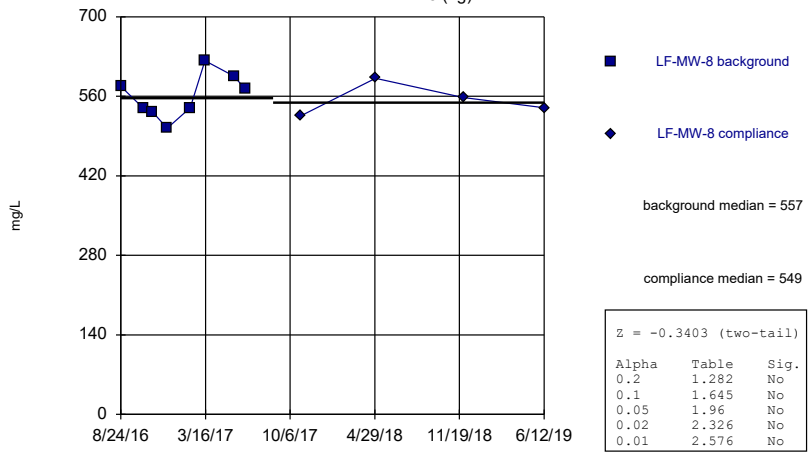
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = -0.3403 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

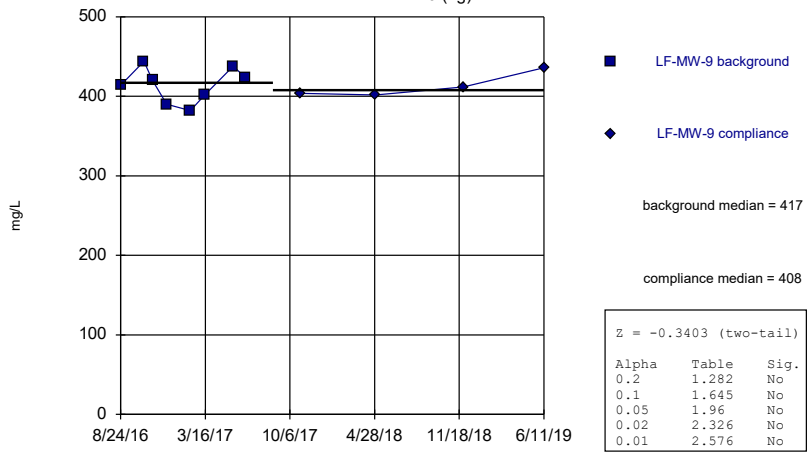
Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.24 Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = -0.3403 (two-tail)

Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids [TDS] Analysis Run 1/9/2020 1:59 PM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

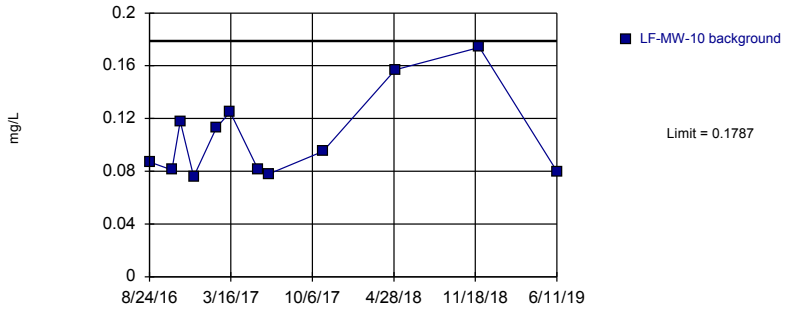
Intrawell Prediction Limit Summary Table - All Results - Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/24/2019, 4:13 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	LF-MW-10	0.1787	n/a	n/a	1 future	n/a	12	0.1054	0.03285	0	None	No	0.00188	Param Intra 1 of 2
Boron, total (mg/L)	LF-MW-2	0.2466	n/a	n/a	1 future	n/a	13	0.2064	0.01836	0	None	No	0.00188	Param Intra 1 of 2
Boron, total (mg/L)	LF-MW-4	0.2142	n/a	n/a	1 future	n/a	13	0.1775	0.01671	0	None	No	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-10	2.234	n/a	n/a	1 future	n/a	12	1.145	0.1569	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-2	2.101	n/a	n/a	1 future	n/a	12	1.691	0.1839	0	None	No	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-4	0.9119	n/a	n/a	1 future	n/a	12	0.8141	0.04383	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-10	6.148	n/a	n/a	1 future	n/a	12	4.827	0.5919	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-2	5.4	n/a	n/a	1 future	n/a	12	3.683	0.7693	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-4	15.87	n/a	n/a	1 future	n/a	12	14.64	0.5485	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-10	1.007	n/a	n/a	1 future	n/a	12	0.6167	0.1749	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-2	1.605	n/a	n/a	1 future	n/a	15	1.295	0.1463	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-4	1.524	n/a	n/a	1 future	n/a	13	1.406	0.05378	0	None	No	0.00188	Param Intra 1 of 2
pH, field (SU)	LF-MW-10	9.584	8.335	n/a	1 future	n/a	12	8.959	0.2798	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-2	9.019	8.174	n/a	1 future	n/a	16	8.596	0.2036	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-4	10.09	8.328	n/a	1 future	n/a	12	9.208	0.3942	0	None	No	0.0009398	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-10	19.74	n/a	n/a	1 future	n/a	12	15.83	1.748	0	None	No	0.00188	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-2	12.93	n/a	n/a	1 future	n/a	12	9.1	1.714	0	None	No	0.00188	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-4	12.23	n/a	n/a	1 future	n/a	12	9.042	1.428	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-10	551	n/a	n/a	1 future	n/a	12	505.5	20.38	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-2	394	n/a	n/a	1 future	n/a	13	362.1	14.55	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-4	422	n/a	n/a	1 future	n/a	12	388.3	15.14	0	None	No	0.00188	Param Intra 1 of 2

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



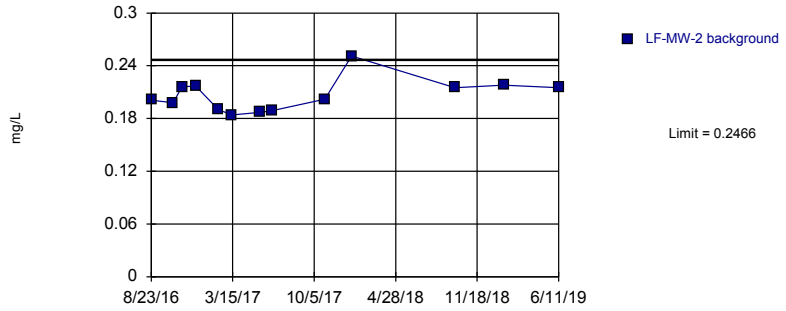
Background Data Summary: Mean=0.1054, Std. Dev.=0.03285, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.835, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



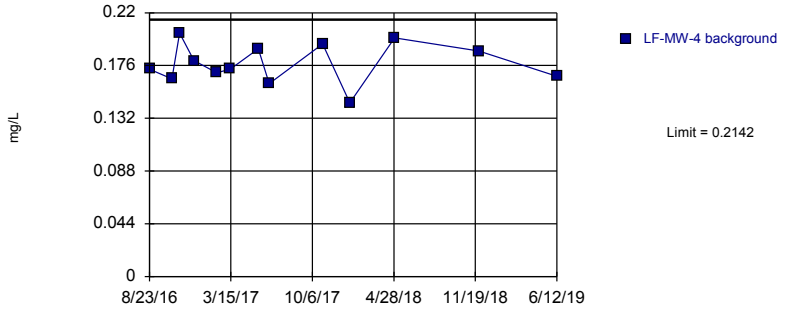
Background Data Summary: Mean=0.2064, Std. Dev.=0.01836, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8908, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



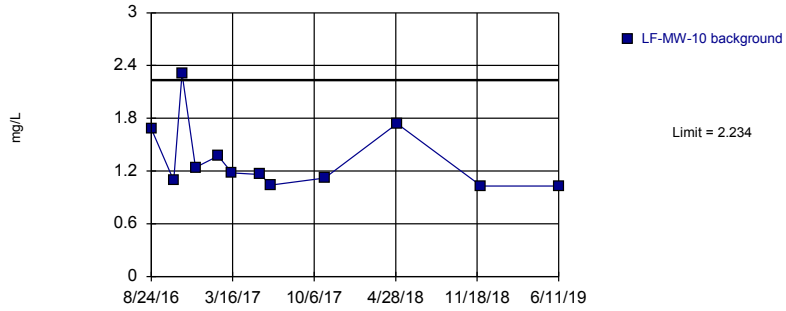
Background Data Summary: Mean=0.1775, Std. Dev.=0.01671, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9699, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)

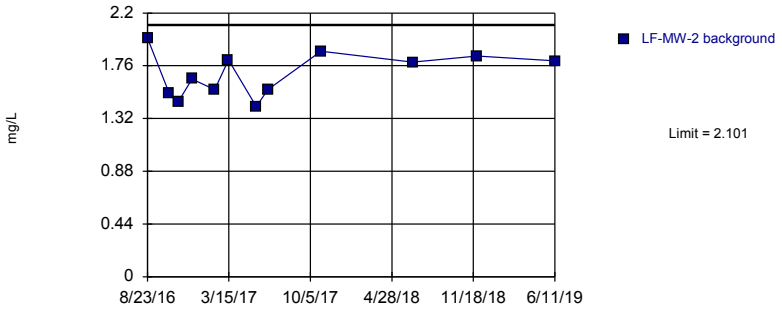


Background Data Summary (based on square root transformation): Mean=1.145, Std. Dev.=0.1569, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.809, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-2



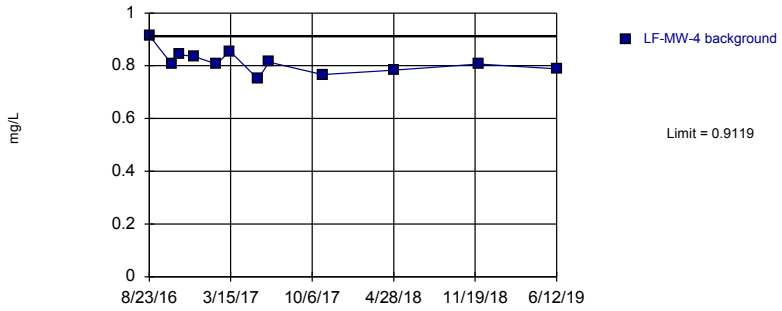
Background Data Summary: Mean=1.691, Std. Dev.=0.1839, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9376, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



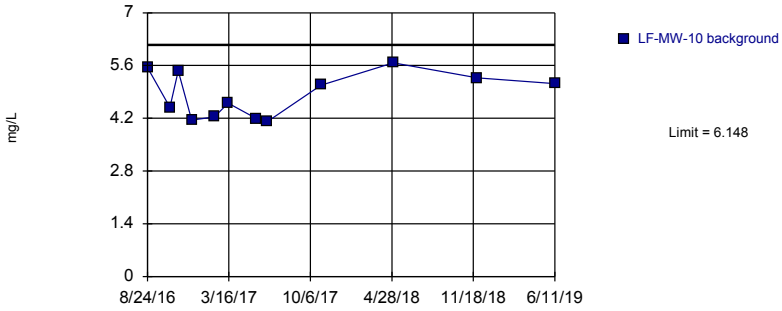
Background Data Summary: Mean=0.8141, Std. Dev.=0.04383, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9473, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



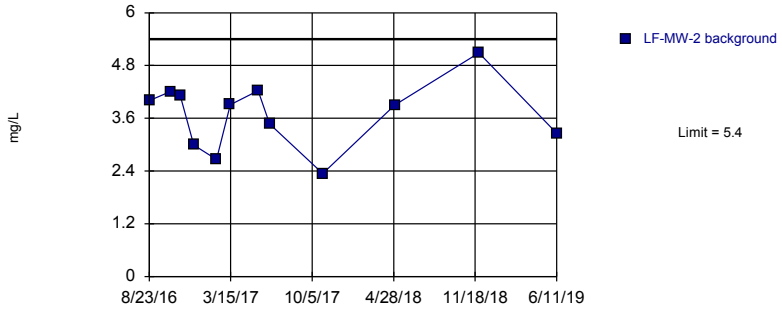
Background Data Summary: Mean=4.827, Std. Dev.=0.5919, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8884, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2

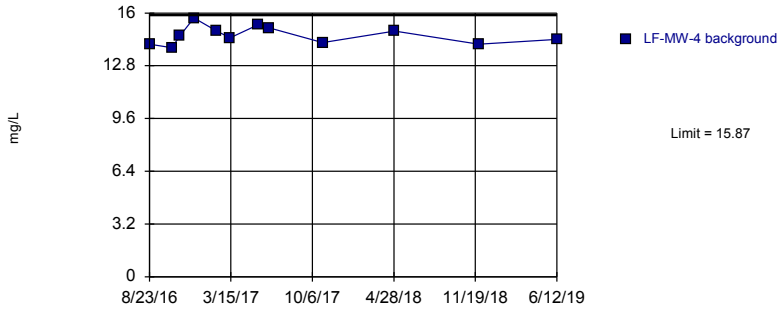


Background Data Summary: Mean=3.683, Std. Dev.=0.7693, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9609, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-4



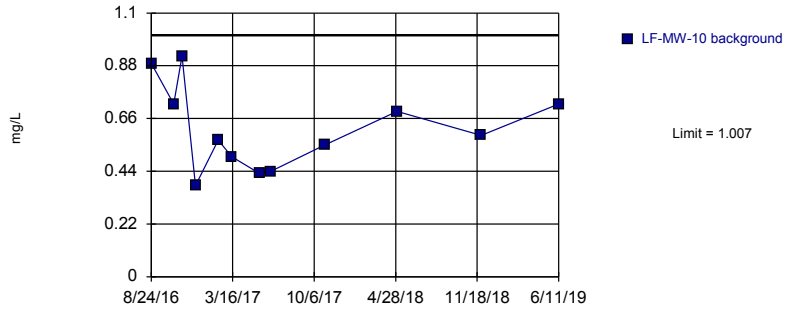
Background Data Summary: Mean=14.64, Std. Dev.=0.5485, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9568, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



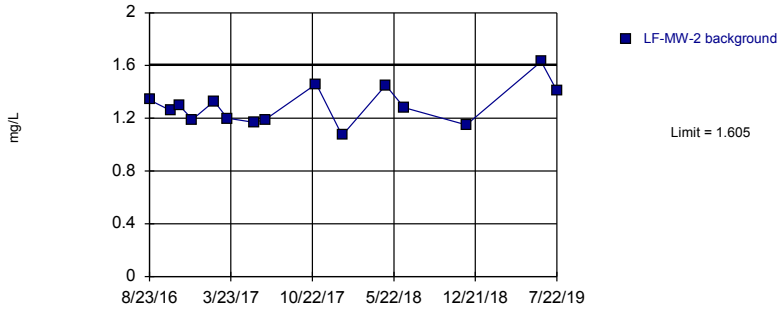
Background Data Summary: Mean=0.6167, Std. Dev.=0.1749, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9411, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



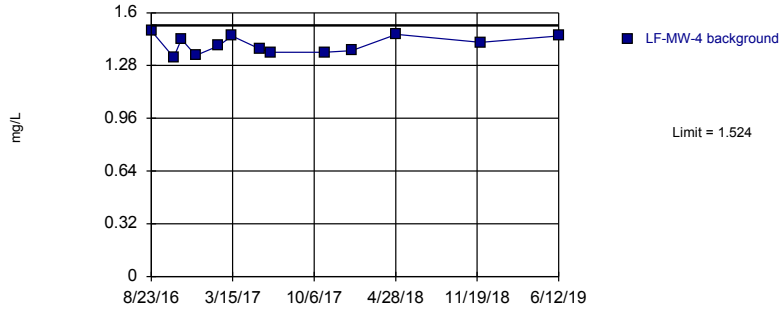
Background Data Summary: Mean=1.295, Std. Dev.=0.1463, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9567, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4

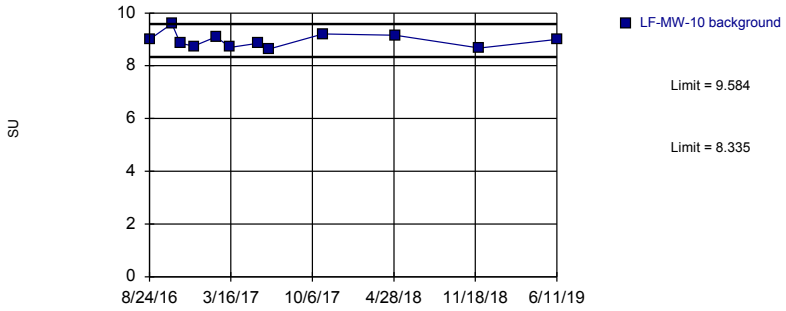


Background Data Summary: Mean=1.406, Std. Dev.=0.05378, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9336, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=8.959, Std. Dev.=0.2798, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9208, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

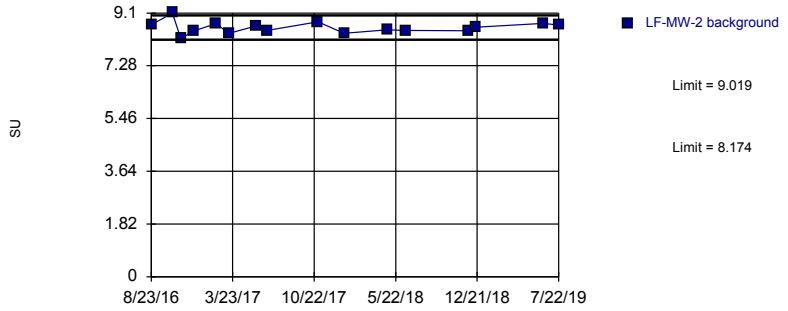
Constituent: pH, field Analysis Run 10/24/2019 4:12 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



Background Data Summary: Mean=8.596, Std. Dev.=0.2036, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9506, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

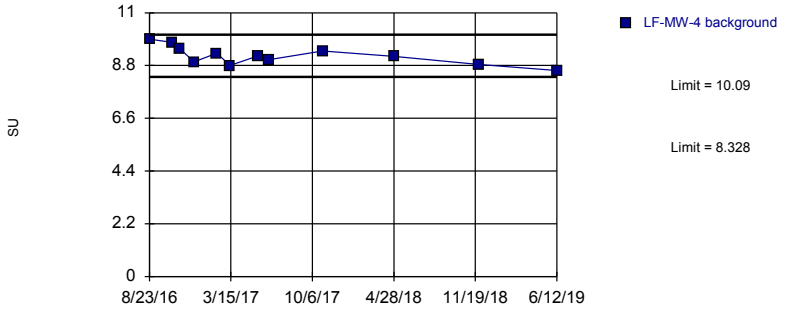
Constituent: pH, field Analysis Run 10/24/2019 4:12 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



Background Data Summary: Mean=9.208, Std. Dev.=0.3942, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.978, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

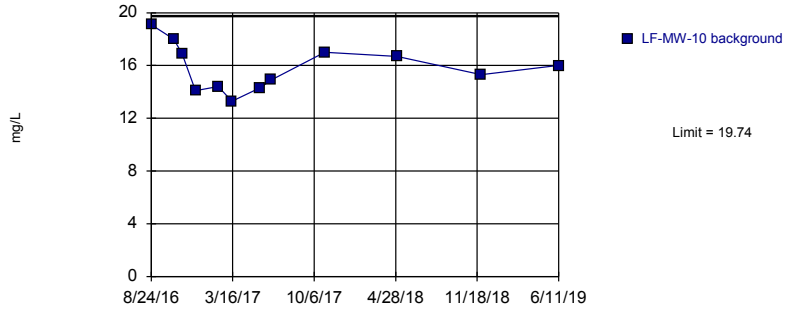
Constituent: pH, field Analysis Run 10/24/2019 4:12 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



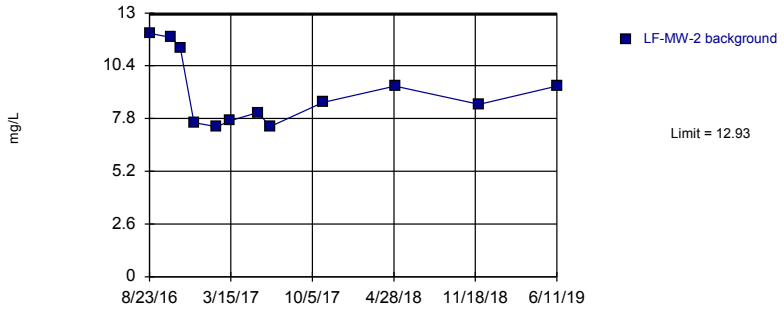
Background Data Summary: Mean=15.83, Std. Dev.=1.748, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9627, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/24/2019 4:12 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-2



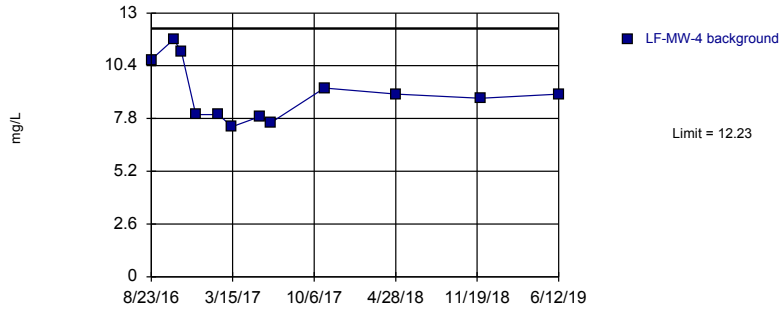
Background Data Summary: Mean=9.1, Std. Dev.=1.714, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8503, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



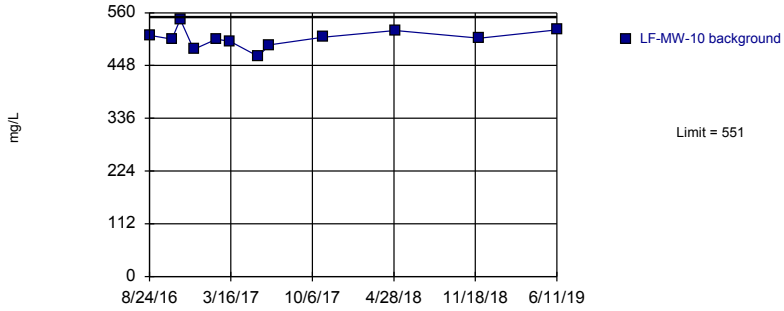
Background Data Summary: Mean=9.042, Std. Dev.=1.428, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8947, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



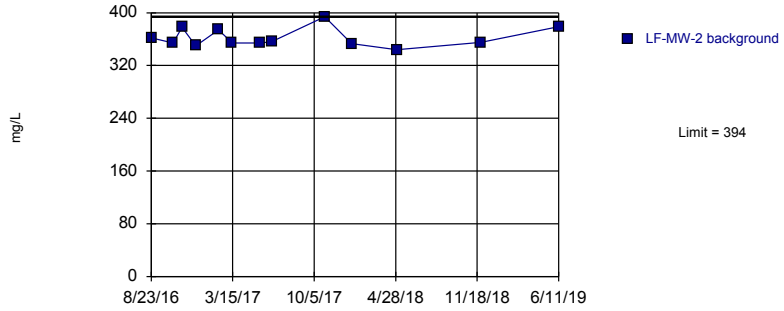
Background Data Summary: Mean=505.5, Std. Dev.=20.38, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9756, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2

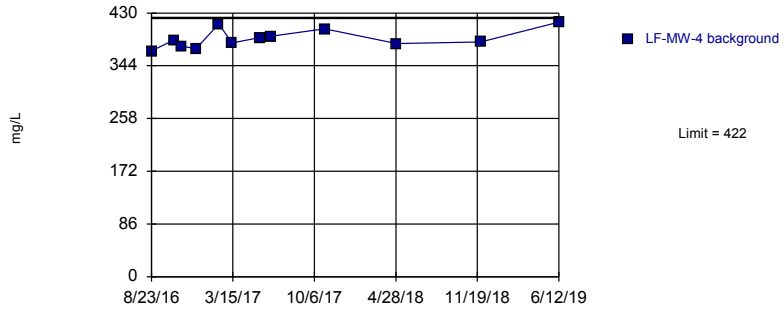


Background Data Summary: Mean=362.1, Std. Dev.=14.55, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8652, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:12 PM View: Group 1
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-4



Background Data Summary: Mean=388.3, Std. Dev.=15.14, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9298, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/24/2019 4:12 PM View: Group 1

Amos Landfill Client: Geosyntec Data: Amos Landfill

FIGURE E: INTRAWELL PREDICTION LIMITS

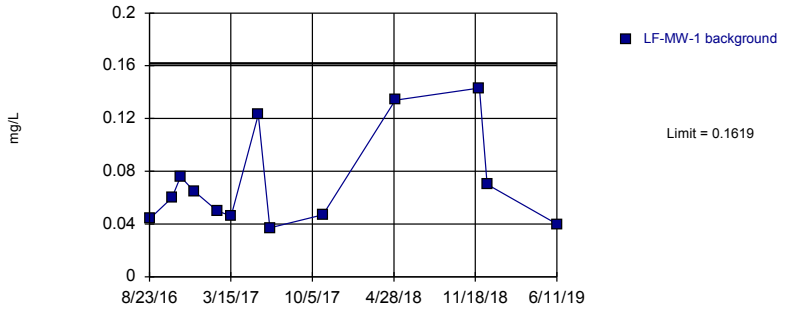
Intrawell Prediction Limit Summary Table - All Results - Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill Printed 10/25/2019, 9:12 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	LF-MW-1	0.1619	n/a	n/a	1 future	n/a	13	0.2609	0.06449	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Boron, total (mg/L)	LF-MW-5	0.1348	n/a	n/a	1 future	n/a	13	0.3377	0.07981	7.692	None	x^(1/3)	0.00188	Param Intra 1 of 2
Boron, total (mg/L)	LF-MW-6	0.2019	n/a	n/a	1 future	n/a	12	0.1289	0.0327	0	None	No	0.00188	Param Intra 1 of 2
Boron, total (mg/L)	LF-MW-7R	0.1445	n/a	n/a	1 future	n/a	12	0.09667	0.02144	0	None	No	0.00188	Param Intra 1 of 2
Boron, total (mg/L)	LF-MW-8	0.09394	n/a	n/a	1 future	n/a	12	0.04258	0.02301	0	None	No	0.00188	Param Intra 1 of 2
Boron, total (mg/L)	LF-MW-9	0.1756	n/a	n/a	1 future	n/a	12	0.2748	0.06465	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-1	31.74	n/a	n/a	1 future	n/a	12	28.6	1.406	0	None	No	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-5	18.05	n/a	n/a	1 future	n/a	12	15.11	1.317	0	None	No	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-6	46.46	n/a	n/a	1 future	n/a	12	37.97	3.803	0	None	No	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-7R	43.01	n/a	n/a	1 future	n/a	12	5.8	0.3395	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-8	151.6	n/a	n/a	1 future	n/a	12	135	7.435	0	None	No	0.00188	Param Intra 1 of 2
Calcium, total (mg/L)	LF-MW-9	111.5	n/a	n/a	1 future	n/a	12	89.58	9.833	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-1	3.595	n/a	n/a	1 future	n/a	11	3.196	0.1734	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-5	5.367	n/a	n/a	1 future	n/a	9	4.423	0.3788	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-6	8.371	n/a	n/a	1 future	n/a	12	7.332	0.4657	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-7R	4.235	n/a	n/a	1 future	n/a	12	3.786	0.2013	0	None	No	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-8	15.55	n/a	n/a	1 future	n/a	11	164	33.87	0	None	x^2	0.00188	Param Intra 1 of 2
Chloride, total (mg/L)	LF-MW-9	6.539	n/a	n/a	1 future	n/a	12	6.181	0.1603	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-1	0.124	n/a	n/a	1 future	n/a	8	0.09625	0.01061	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-5	0.1479	n/a	n/a	1 future	n/a	12	0.1008	0.02109	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-6	0.288	n/a	n/a	1 future	n/a	12	0.2375	0.02261	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-7R	0.3969	n/a	n/a	1 future	n/a	12	0.2975	0.04454	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-8	0.2182	n/a	n/a	1 future	n/a	12	0.1483	0.03129	0	None	No	0.00188	Param Intra 1 of 2
Fluoride, total (mg/L)	LF-MW-9	0.2719	n/a	n/a	1 future	n/a	12	0.2	0.03219	0	None	No	0.00188	Param Intra 1 of 2
pH, field (SU)	LF-MW-1	7.344	5.759	n/a	1 future	n/a	13	6.552	0.3614	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-5	8.23	6.01	n/a	1 future	n/a	15	n/a	n/a	0	n/a	n/a	0.01507	NP Intra (normality) 1 of 2
pH, field (SU)	LF-MW-6	8.002	7.208	n/a	1 future	n/a	12	7.605	0.178	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-7R	8.085	7.05	n/a	1 future	n/a	12	7.568	0.2316	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-8	7.6	6.8	n/a	1 future	n/a	12	n/a	n/a	0	n/a	n/a	0.02155	NP Intra (normality) 1 of 2
pH, field (SU)	LF-MW-9	7.507	6.871	n/a	1 future	n/a	12	7.189	0.1424	0	None	No	0.0009398	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-1	32.82	n/a	n/a	1 future	n/a	12	29.66	1.418	0	None	No	0.00188	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-5	30.71	n/a	n/a	1 future	n/a	12	26.24	2.004	0	None	No	0.00188	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-6	64.81	n/a	n/a	1 future	n/a	12	36.44	12.71	0	None	No	0.00188	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-7R	256.3	n/a	n/a	1 future	n/a	12	219.4	16.52	0	None	No	0.00188	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-8	86.69	n/a	n/a	1 future	n/a	11	67.95	8.15	0	None	No	0.00188	Param Intra 1 of 2
Sulfate, total (mg/L)	LF-MW-9	40.28	n/a	n/a	1 future	n/a	12	35.06	2.338	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-1	258.9	n/a	n/a	1 future	n/a	12	210	21.92	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-5	166.1	n/a	n/a	1 future	n/a	12	121.8	19.88	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-6	468	n/a	n/a	1 future	n/a	12	391.1	34.47	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-7R	753.7	n/a	n/a	1 future	n/a	12	648.7	47.06	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-8	635.6	n/a	n/a	1 future	n/a	12	558.4	34.57	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids [TDS] (mg/L)	LF-MW-9	457	n/a	n/a	1 future	n/a	12	414	19.28	0	None	No	0.00188	Param Intra 1 of 2

Prediction Limit

Intrawell Parametric, LF-MW-1

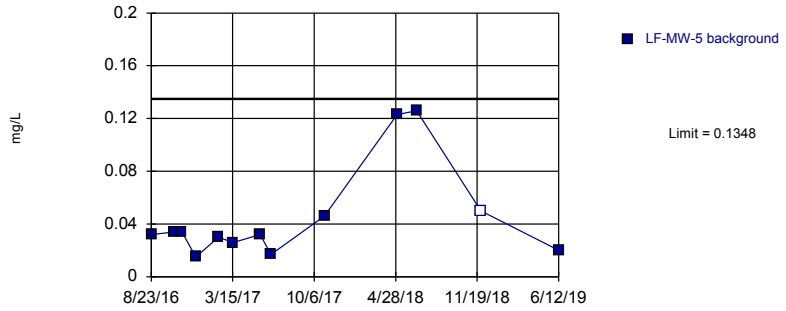


Background Data Summary (based on square root transformation): Mean=0.2609, Std. Dev.=0.06449, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8517, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-5

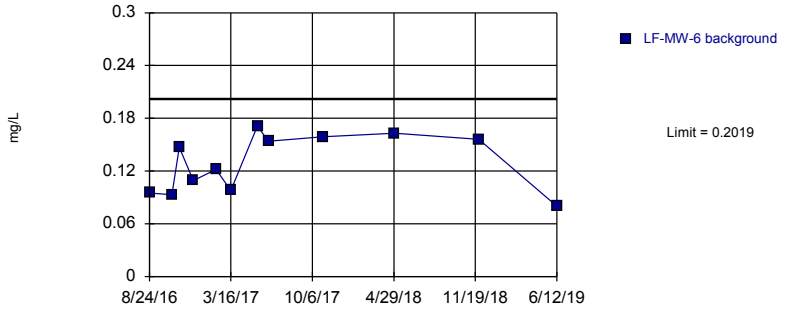


Background Data Summary (based on cube root transformation): Mean=0.3377, Std. Dev.=0.07981, n=13, 7.692% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8317, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)

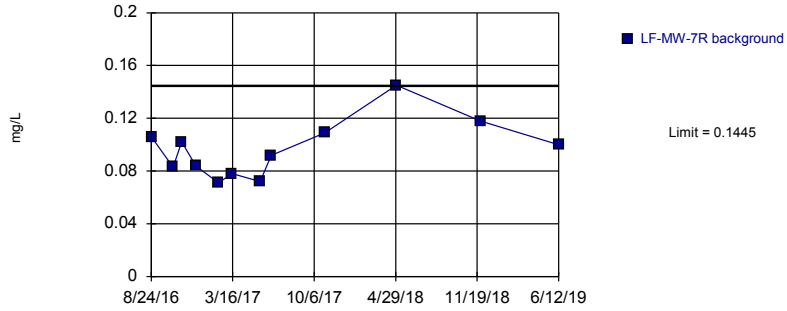


Background Data Summary: Mean=0.1289, Std. Dev.=0.0327, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8885, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)

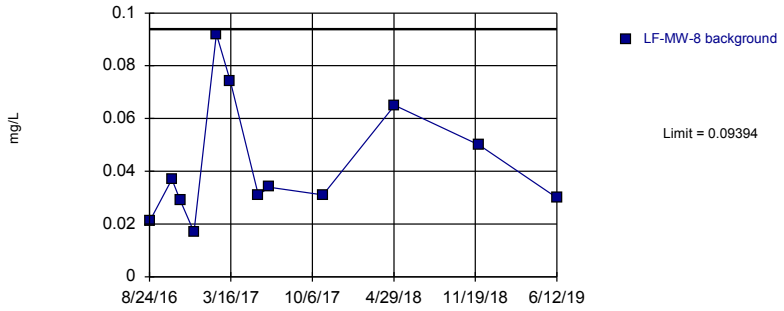


Background Data Summary: Mean=0.09667, Std. Dev.=0.02144, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.932, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)

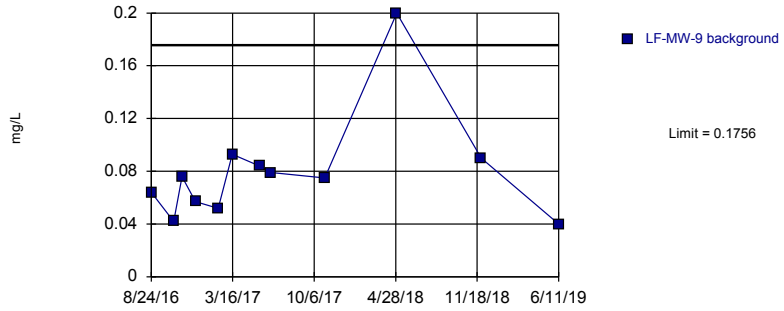


Background Data Summary: Mean=0.04258, Std. Dev.=0.02301, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8645, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)

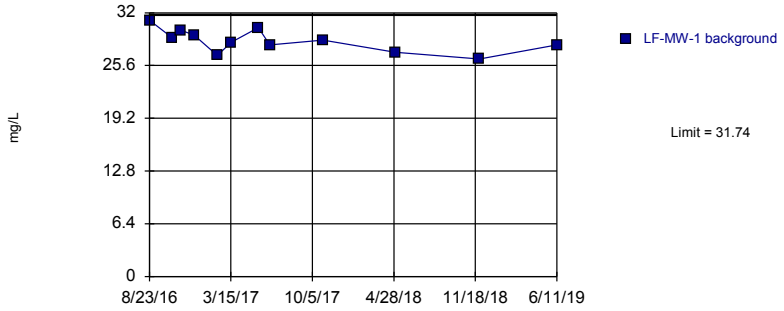


Background Data Summary (based on square root transformation): Mean=0.2748, Std. Dev.=0.06465, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8376, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-1

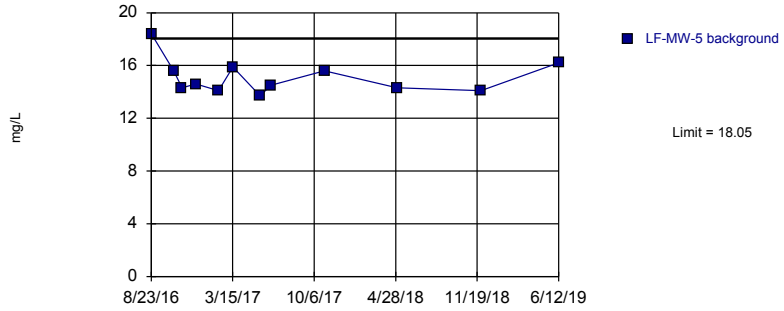


Background Data Summary: Mean=28.6, Std. Dev.=1.406, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9817, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-5

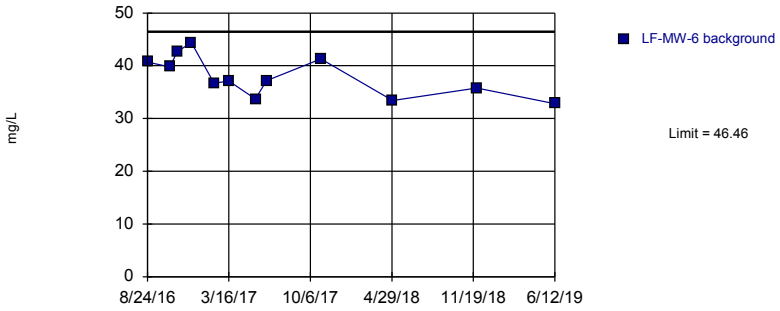


Background Data Summary: Mean=15.11, Std. Dev.=1.317, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8479, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



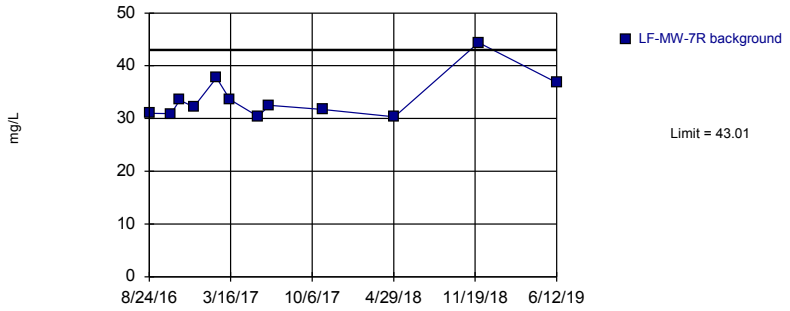
Background Data Summary: Mean=37.97, Std. Dev.=3.803, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9497, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



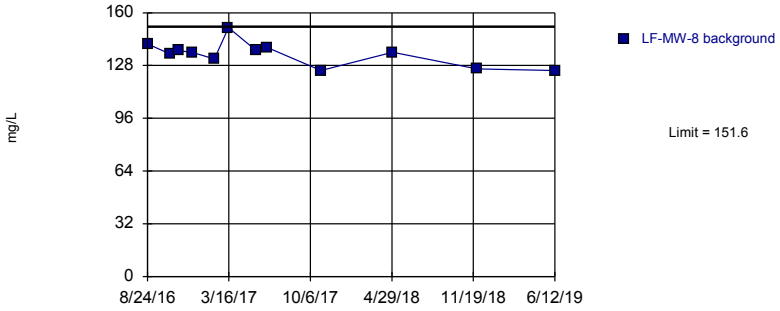
Background Data Summary (based on square root transformation): Mean=5.8, Std. Dev.=0.3395, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8101, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



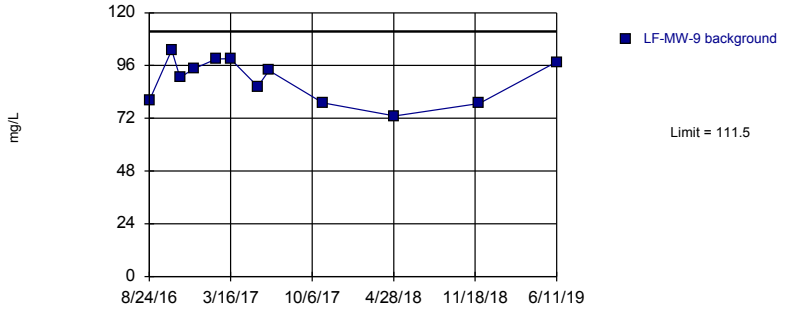
Background Data Summary: Mean=135, Std. Dev.=7.435, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9148, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)

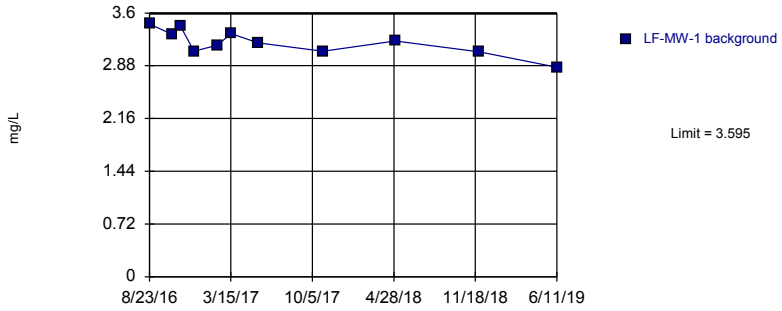


Background Data Summary: Mean=89.58, Std. Dev.=9.833, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9271, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-1



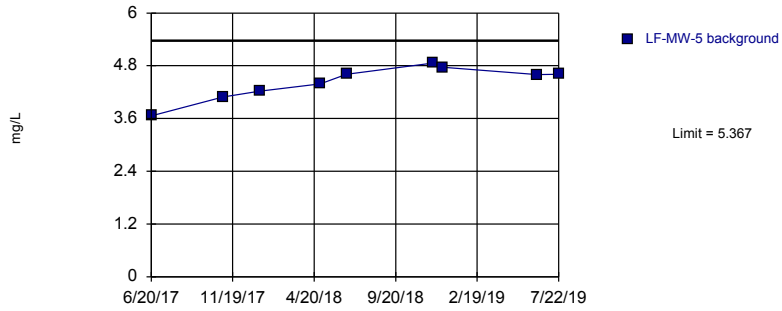
Background Data Summary: Mean=3.196, Std. Dev.=0.1734, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9619, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-5



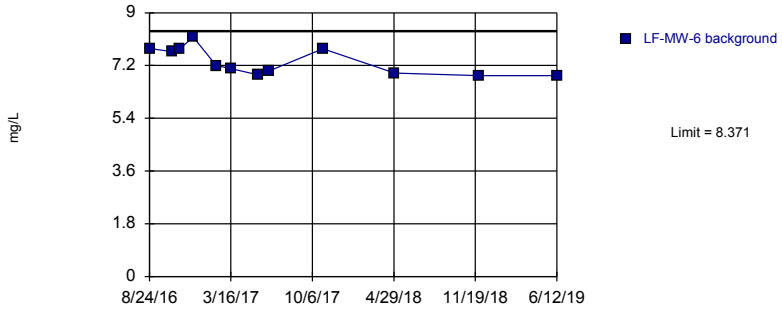
Background Data Summary: Mean=4.423, Std. Dev.=0.3788, n=9. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9153, critical = 0.764. Kappa = 2.492 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



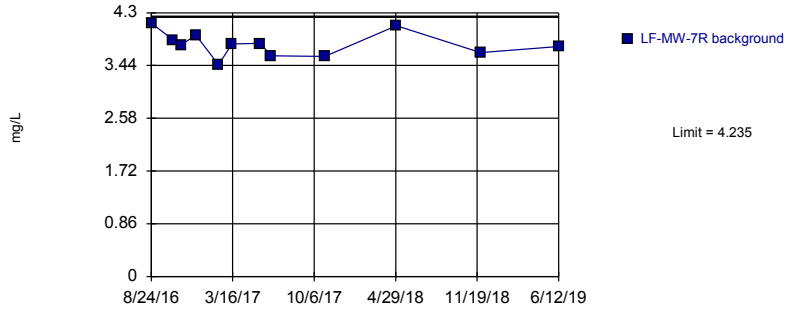
Background Data Summary: Mean=7.332, Std. Dev.=0.4657, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8604, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)

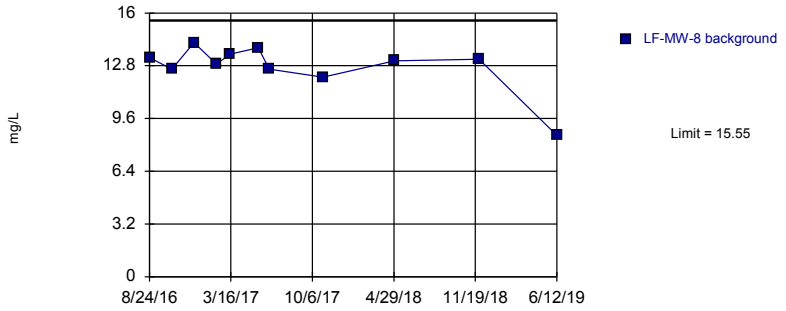


Background Data Summary: Mean=3.786, Std. Dev.=0.2013, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9668, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



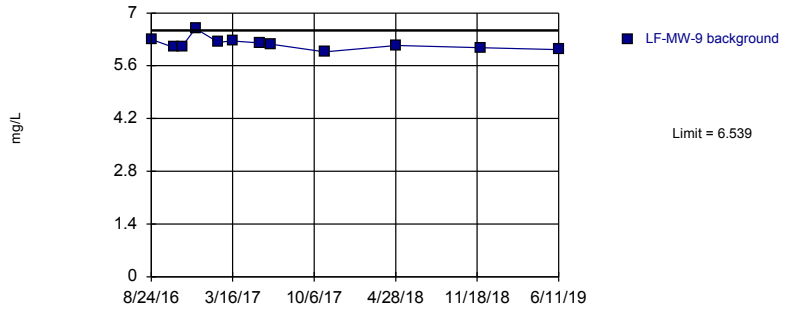
Background Data Summary (based on square transformation): Mean=164, Std. Dev.=33.87, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7978, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



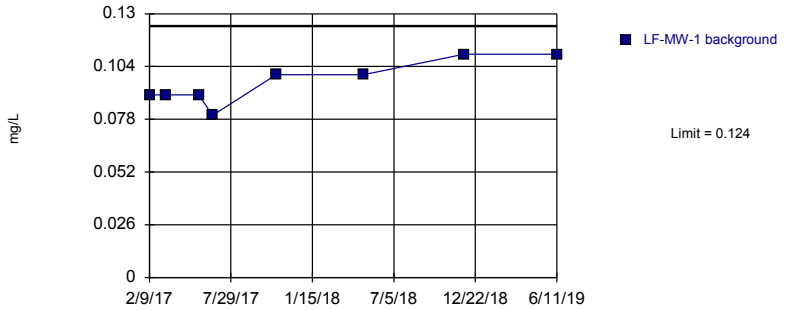
Background Data Summary: Mean=6.181, Std. Dev.=0.1603, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8922, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-1



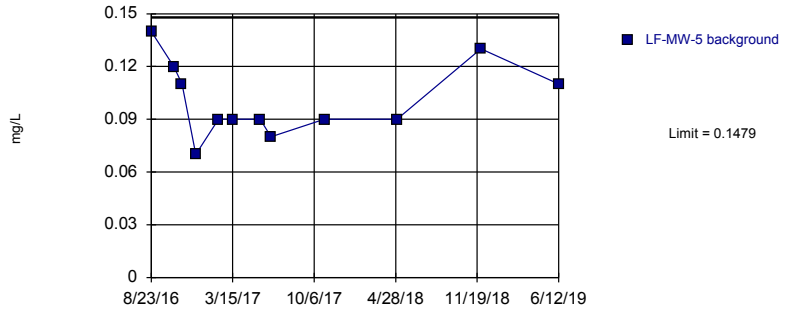
Background Data Summary: Mean=0.09625, Std. Dev.=0.01061, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9112, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-5

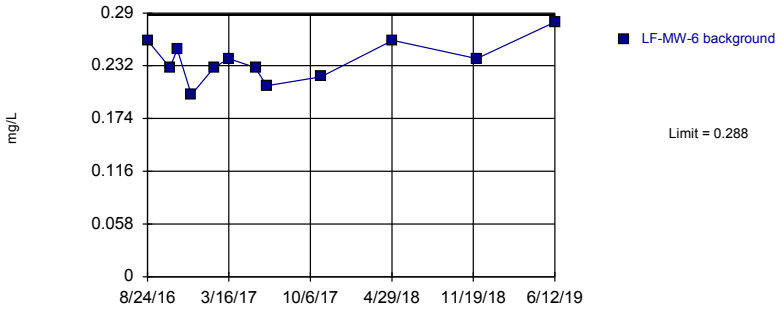


Background Data Summary: Mean=0.1008, Std. Dev.=0.02109, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9179, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)

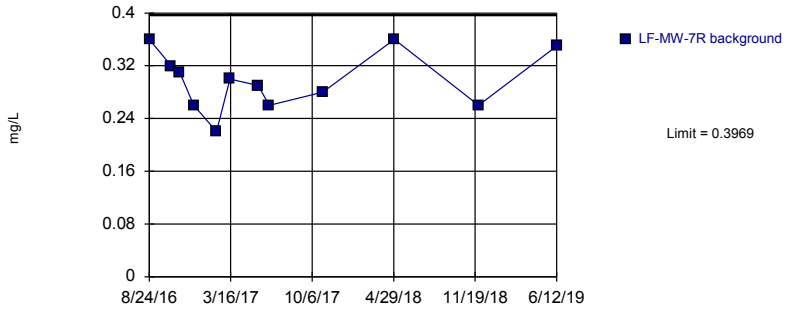


Background Data Summary: Mean=0.2375, Std. Dev.=0.02261, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.979, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)

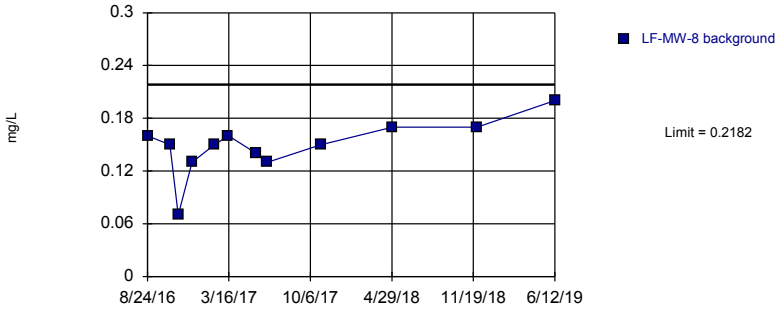


Background Data Summary: Mean=0.2975, Std. Dev.=0.04454, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9449, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)

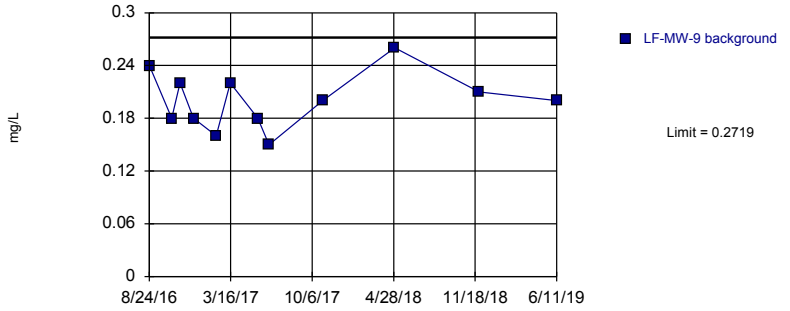


Background Data Summary: Mean=0.1483, Std. Dev.=0.03129, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8912, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)

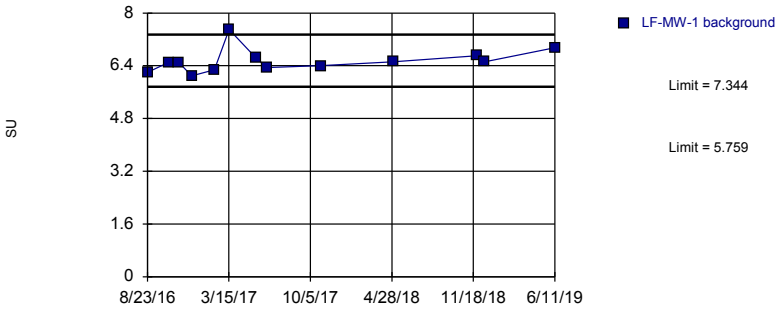


Background Data Summary: Mean=0.2, Std. Dev.=0.03219, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9731, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-1



Background Data Summary: Mean=6.552, Std. Dev.=0.3614, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8726, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

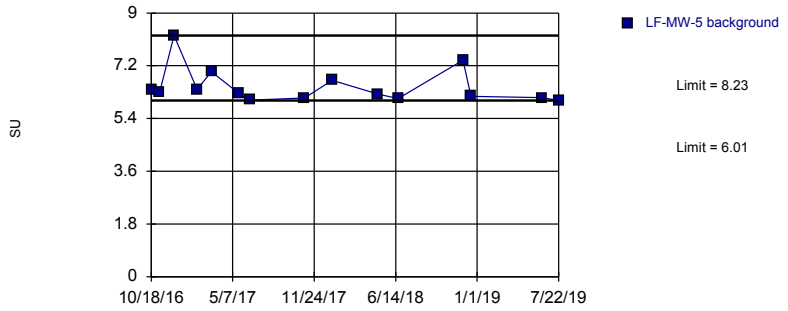
Constituent: pH, field Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, LF-MW-5



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 15 background values. Well-constituent pair annual alpha = 0.03002. Individual comparison alpha = 0.01507 (1 of 2). Assumes 1 future value.

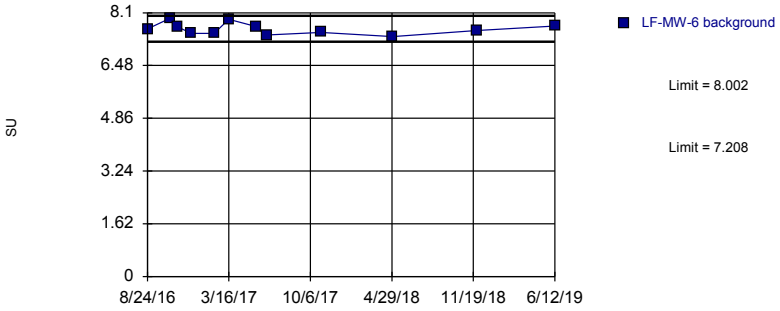
Constituent: pH, field Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



Background Data Summary: Mean=7.605, Std. Dev.=0.178, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9253, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

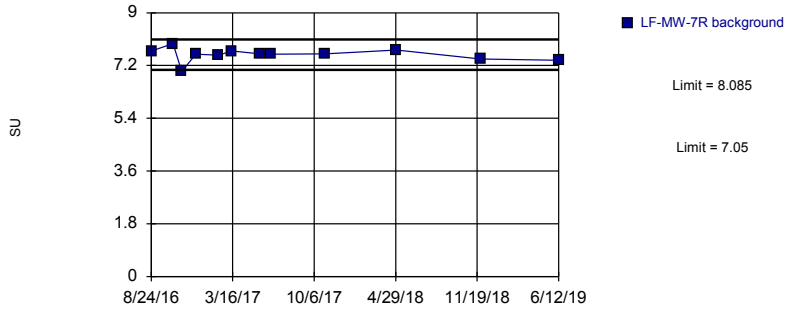
Constituent: pH, field Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



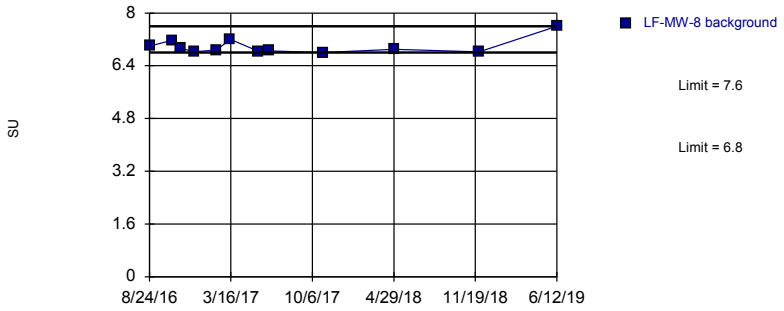
Background Data Summary: Mean=7.568, Std. Dev.=0.2316, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.896, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Non-parametric, LF-MW-8 (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 12 background values. Well-constituent pair annual alpha = 0.04286. Individual comparison alpha = 0.02155 (1 of 2). Assumes 1 future value.

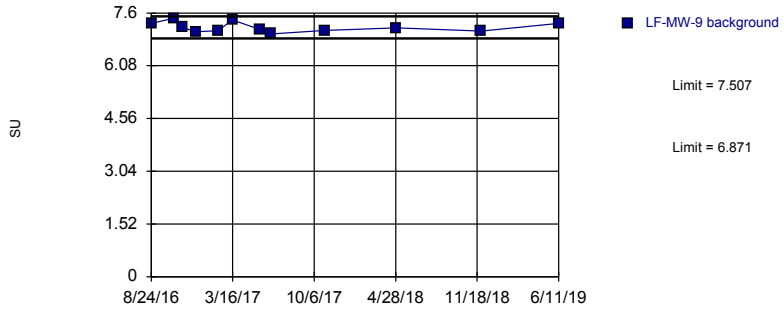
Constituent: pH, field Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



Background Data Summary: Mean=7.189, Std. Dev.=0.1424, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9234, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

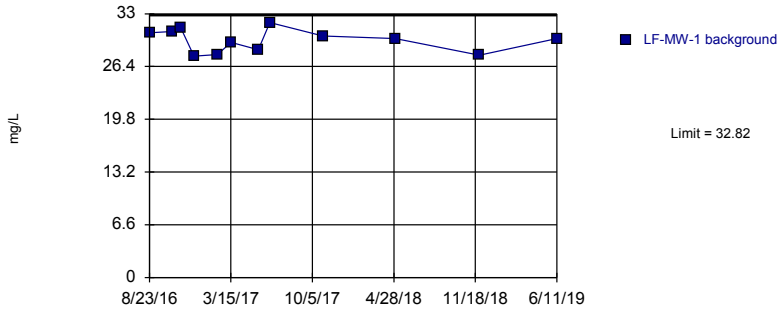
Constituent: pH, field Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-1



Background Data Summary: Mean=29.66, Std. Dev.=1.418, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9367, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

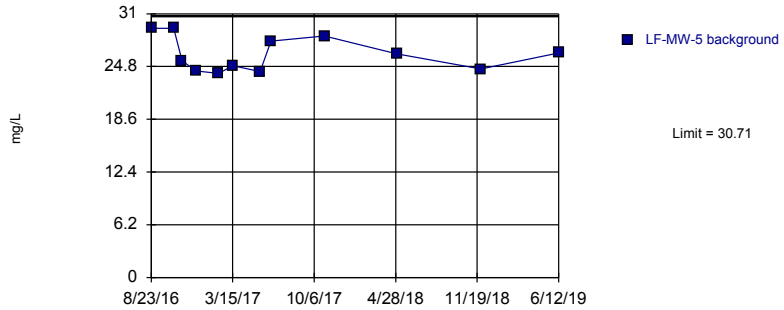
Constituent: Sulfate, total Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-5



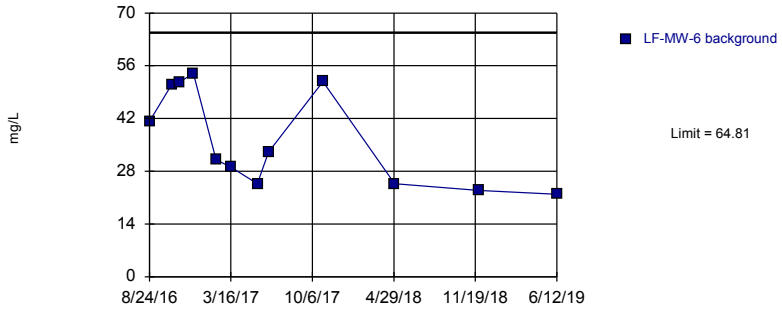
Background Data Summary: Mean=26.24, Std. Dev.=2.004, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8832, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/25/2019 9:10 AM View: Group 2

Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



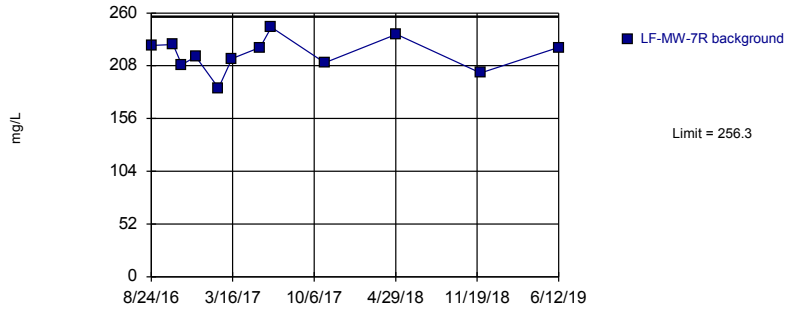
Background Data Summary: Mean=36.44, Std. Dev.=12.71, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8504, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



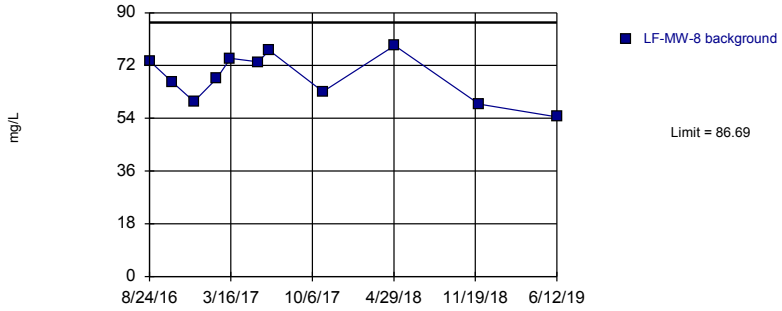
Background Data Summary: Mean=219.4, Std. Dev.=16.52, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9769, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



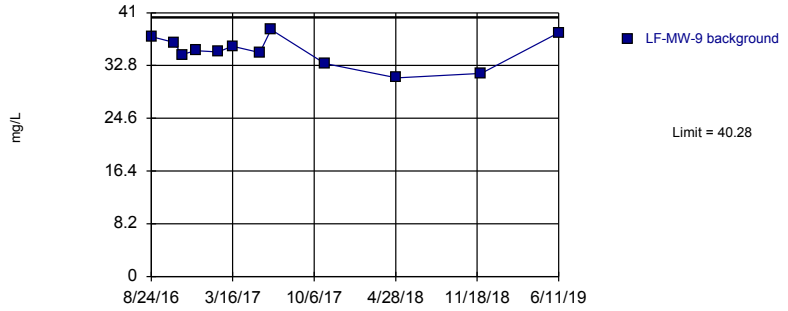
Background Data Summary: Mean=67.95, Std. Dev.=8.15, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9426, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)

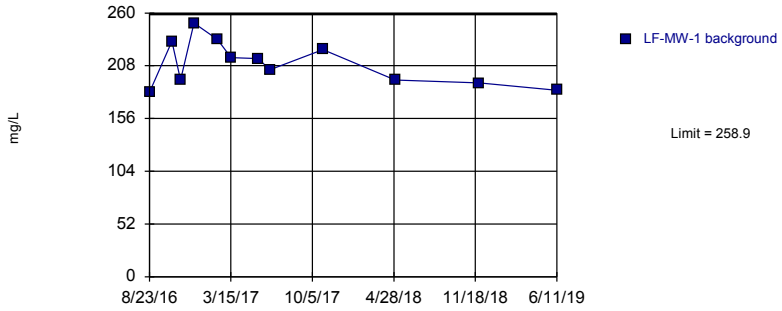


Background Data Summary: Mean=35.06, Std. Dev.=2.338, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9575, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-1

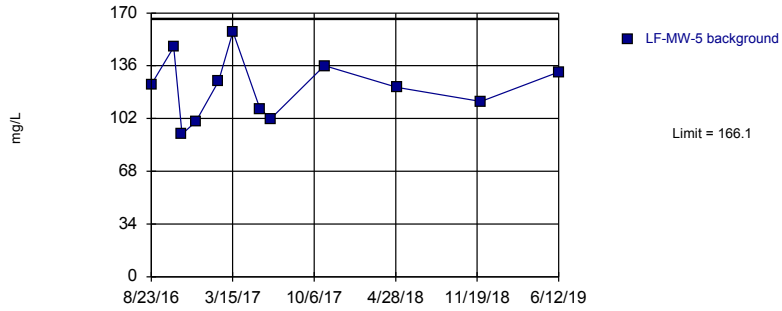


Background Data Summary: Mean=210, Std. Dev.=21.92, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9429, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-5

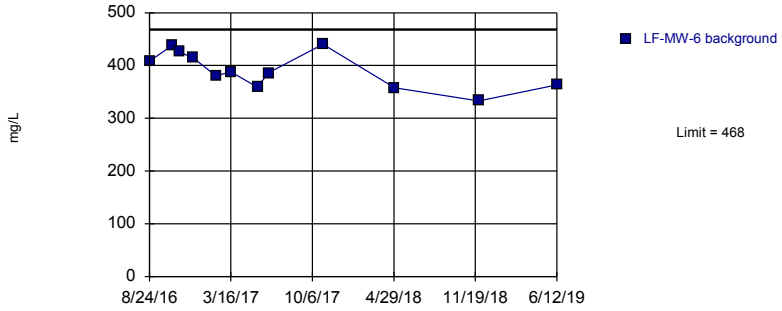


Background Data Summary: Mean=121.8, Std. Dev.=19.88, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9759, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)

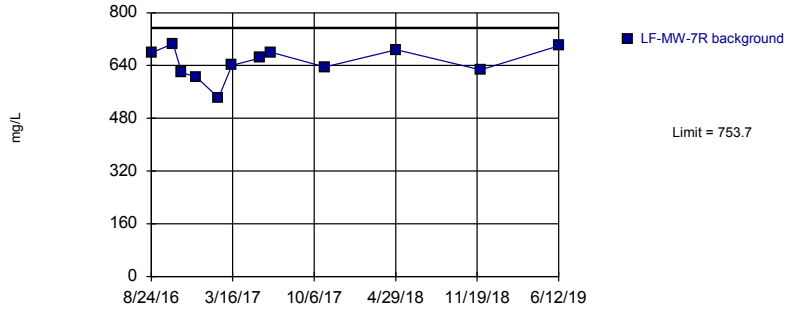


Background Data Summary: Mean=391.1, Std. Dev.=34.47, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9536, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/25/2019 9:10 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)

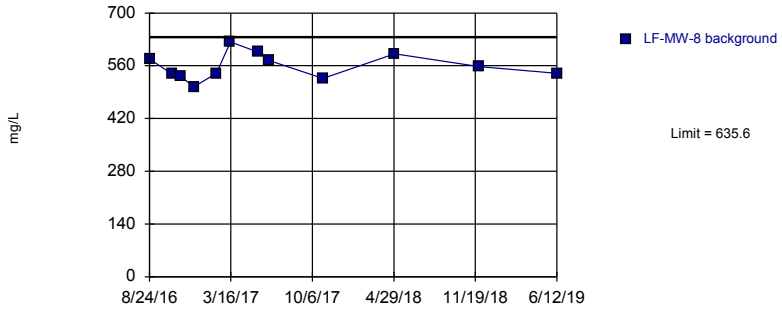


Background Data Summary: Mean=648.7, Std. Dev.=47.06, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9292, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/25/2019 9:11 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



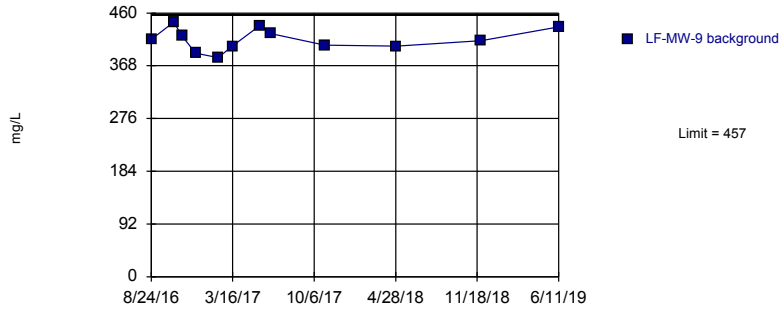
Background Data Summary: Mean=558.4, Std. Dev.=34.57, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9635, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/25/2019 9:11 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

Sanitas™ v.9.6.23 Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



Background Data Summary: Mean=414, Std. Dev.=19.28, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9681, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids [TDS] Analysis Run 10/25/2019 9:11 AM View: Group 2
Amos Landfill Client: Geosyntec Data: Amos Landfill

STATISTICAL ANALYSIS SUMMARY
Background Update Calculations
John E. Amos Plant
Landfill
Winfield, West Virginia

Submitted to

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane
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July 8, 2020

CHA8500

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LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Value
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LF	Landfill
LFB	Laboratory Fortified Blanks
LPL	Lower Prediction Limit
LRB	Laboratory Reagent Blanks
NELAP	National Environmental Laboratory Accreditation Program
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SWFPR	Site-Wide False Positive Rate
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR Subpart D, "CCR rule"), groundwater monitoring has been conducted at the lined landfill (LF), an existing CCR unit at the John E. Amos Power Plant located in Winfield, West Virginia.

The groundwater monitoring network was established, and eight monitoring events were completed prior to October 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. Two monitoring wells, MW-1 and MW-5, were removed from the groundwater monitoring network and replaced with wells MW-1801 and MW-1802 (Arcadis, 2020). Inrawell tests were used to evaluate the Appendix III parameter results at the LF. Background concentrations were developed for MW-1801 and MW-1802 using the data obtained in eight sampling events. Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The detection monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. The compliance data were reviewed for outliers, which were removed (when appropriate) prior to updating upper prediction limits (UPLs) for each Appendix III parameter to represent background values. Oversight on the use of statistical calculations was provided by Dr. Jim Loftis, senior advisor to Groundwater Stats Consulting, LLC. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

LANDFILL EVALUATION

2.1 Previous Background Calculations

Eight background monitoring events were completed from August 2016 through October 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule for the original groundwater monitoring network. The data were reviewed for outliers and trends prior to calculating UPLs for each Appendix III parameter. Lower prediction limits (LPLs) were also established for pH. Interwell prediction limits were initially selected for boron and fluoride, and intrawell prediction limits were initially selected for calcium, chloride, pH, sulfate, and TDS. Both the interwell and intrawell tests used a one-of-two resampling plan. The statistical analyses to establish background levels were previously documented in the January 2018 *Statistical Analysis Summary* report (Geosyntec, 2018a).

A review of groundwater geochemistry at the site identified two types of groundwater, which are referred to as Group 1 and Group 2. Group 1 groundwater is predominantly composed of sodium and bicarbonate, whereas Group 2 has higher concentrations of calcium and magnesium in addition to sodium and bicarbonate. Group 1 consists of upgradient well MW-10 and downgradient wells MW-2 and MW-4. Group 2 consists of upgradient wells MW-6, MW-7R, MW-8, and MW-9 and downgradient wells MW-1 and MW-5.

MW-2 and MW-4 had elevated boron concentrations relative to the upgradient wells prior to the placement of CCR at Amos LF. Fluoride data were not collected prior to CCR placement because it was not required by the state monitoring program. Because the two groups of groundwater have distinct geochemistries and because downgradient concentrations were elevated prior to CCR placement, the statistics for boron and fluoride were revised to an intrawell approach (Geosyntec, 2018b).

Four semiannual detection monitoring events were conducted at the LF between November 2017 and June 2019. These four detection monitoring events were evaluated for inclusion into the background dataset. Where appropriate, the background datasets were updated, and UPLs and LPLs were recalculated. Intrawell tests using a one-of-two retesting procedure were utilized for Appendix III parameters (Geosyntec, 2020).

Monitoring wells MW-1801 and MW-1802 were added to the groundwater network to replace MW-1 and MW-5 (Arcadis, 2020). Eight samples were collected from MW-1801 and MW-1802 between December 2018 and November 2019 to establish a background dataset for each well. Because MW-1 and MW-5 were removed from the groundwater network, results from those monitoring locations are not included in this statistical analysis. Groundwater at both MW-1801 and MW-1802 appear consistent with Group 2 concentrations at other locations, as shown in the Schoeller diagram provided in Figure 1.

2.2 Data Validation & QA/QC

A summary of data collected from MW-1801 and MW-1802 during the eight background monitoring events conducted between December 2018 and November 2019 may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.25a statistics software. The export was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.3 Statistical Analysis

The data used to conduct the statistical analyses described below are summarized in Table 1. Statistical analyses for the LF were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. The complete statistical analysis results are included in Attachment B.

Time series plots of Appendix III parameters are included in Attachment B and were used to evaluate concentrations over time and to provide an initial screening of suspected outliers and trends. Mann-Kendall analyses ($\alpha = 0.01$) were also conducted to evaluate trends in the background data for the Appendix III parameters at MW-1801 and MW-1802. No significant increasing or decreasing trends were observed. Box plots were also compiled to provide visual representation of variations between wells and within individual wells (Attachment B).

2.3.1 Outlier Evaluation

Potential outliers within the dataset were evaluated using Tukey's outlier test; i.e., data points were considered potential outliers if they met one of the following criteria:

$$x_i < \tilde{x}_{0.25} - 3 \times IQR \quad (1)$$

or

$$x_i > \tilde{x}_{0.75} + 3 \times IQR \quad (2)$$

where:

$x_i =$ individual data point
$\tilde{x}_{0.25} =$ first quartile
$\tilde{x}_{0.75} =$ third quartile
$IQR =$ the interquartile range $= \tilde{x}_{0.75} - \tilde{x}_{0.25}$

Only outliers within the MW-1801 and MW-1802 report are discussed here. The TDS value of 550 mg/L at MW-1801 on February 21, 2019, was flagged as an outlier by Tukey's test, but it was not removed from the dataset as it is similar to other measurements at the well and limited data is available at this time. Other outliers were not identified in the datasets for MW-1801 or MW-1802.

2.3.2 Updated Prediction Limits

As discussed in Section 2.1, two distinct types of groundwater (Group 1 and Group 2) were identified at the LF, and as a result, intrawell tests were selected to evaluate Appendix III parameter results. Now that MW-1 and MW-5 have been replaced with MW-1801 and MW-1802, Group 1 consists of upgradient well MW-10 and downgradient wells MW-2, MW-4, MW-1801, and MW-1802, and Group 2 consists of upgradient wells MW-6, MW-7R, MW-8, and MW-9. Because there is only one upgradient well in Group 1, spatial variation within Group 1 cannot be evaluated, further supporting the selection of intrawell tests for the LF.

A parametric or non-parametric analysis was selected for the MW-1801 and MW-1802 datasets based on the distribution of the data and the frequency of non-detect data. Estimated results less than the practical quantitation limit (PQL) – i.e., "J-flagged" data – were considered detections and the estimated results were used in the statistical analyses. Non-parametric analyses were selected for datasets with at least 50% non-detect data or datasets that could not be normalized. Parametric analyses were selected for datasets (either transformed or untransformed) that passed the Shapiro-Wilk / Shapiro-Francía test for normality. The Kaplan-Meier non-detect adjustment was applied to datasets with between 15% and 50% non-detect data. For datasets with fewer than 15% non-detect data, non-detect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or non-parametric) and transformation (where applicable) for each background dataset are shown in Attachment B.

Intrawell UPLs were developed for new compliance wells MW-1801 and MW-1802 using the eight sample results collected at each of these two wells between December 2018 and November 2019. Intrawell LPLs were also generated for pH. The updated prediction limits are summarized in Table 2. Because MW-1801 and MW-1802 replaced MW-1 and MW-5 in the groundwater monitoring network, the total number of wells within the network remained the same. As a result, the per-test false positive rate was not changed to maintain a site-wide false positive rate (SWFPR) below 10%, and the UPLs for existing downgradient wells MW-2 and MW-4 remain unchanged. UPLs for MW-2 and MW-4 are also included in Table 2.

The intrawell UPLs were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result does not exceed the UPL, a second sample will not be collected.

The retesting procedures allowed achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.4 Conclusions

Eight background monitoring events were completed in accordance with the CCR Rule for new monitoring wells MW-1801 and MW-1802. The laboratory and field data from these monitoring wells were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. Intrawell prediction limits were developed for MW-1801 and MW-1802. Because MW-1801 and MW-1802 replaced MW-1 and MW-5 in the groundwater monitoring network, the total number of wells within the network remained the same. As a result, the per-test false positive rate was not changed to maintain a SWFPR below 10%, and the UPLs for existing downgradient wells MW-2 and MW-4 remain unchanged. UPLs and LPLs were recalculated using intrawell prediction limits with a one-of-two retesting procedure for all Appendix III parameters.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – John E. Amos Plant. January 2017.

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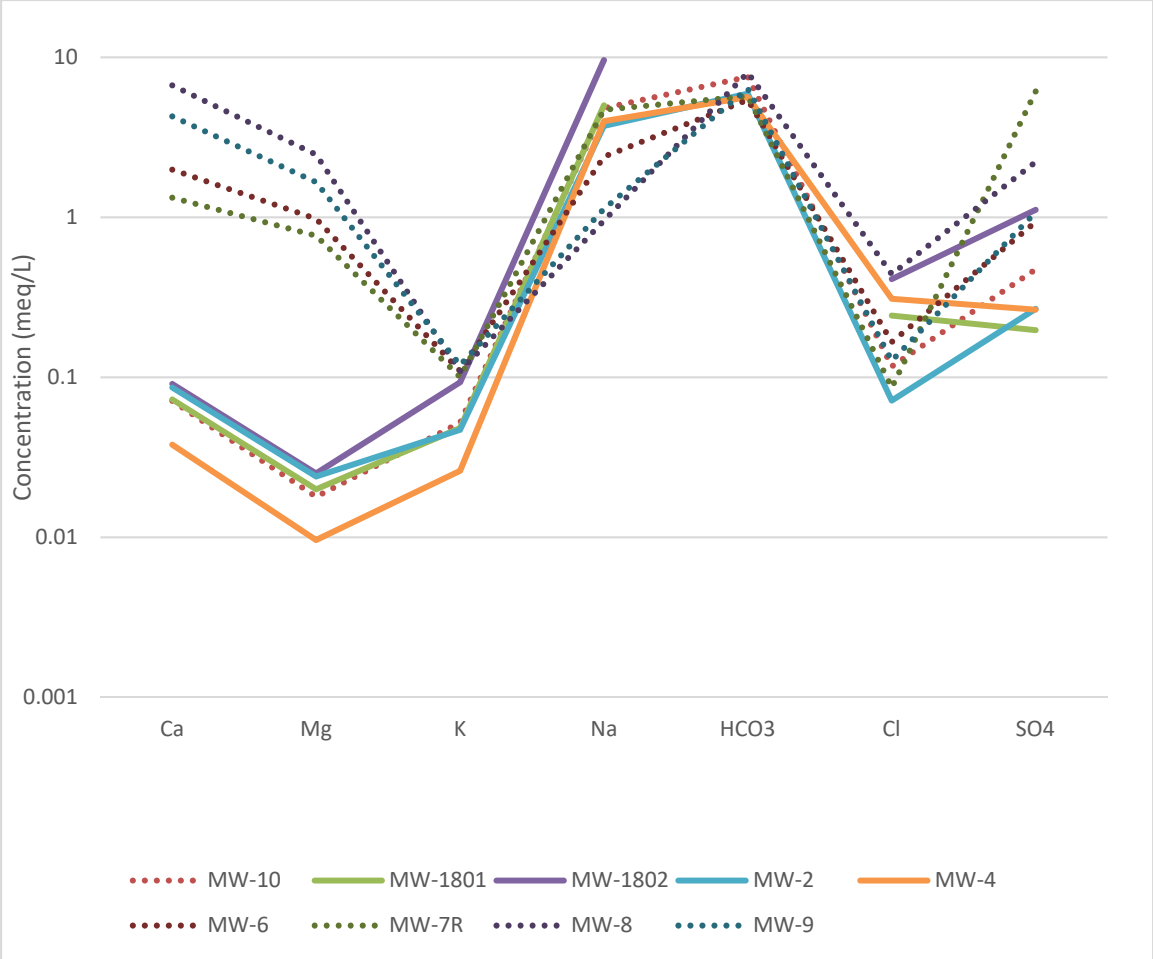
United States Environmental Protection Agency (USEPA). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March 2009.

FIGURES



Notes: Data is from the November 2019 sampling event at all locations. Dashed lines represent upgradient wells. Alkalinity data was not available at MW-1801 and MW-1802.

Groundwater Chemistry – Schoeller Diagram

Amos Landfill

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **1**

Columbus, Ohio

06-Jun-2020

TABLES

Table 1: Groundwater Data Summary - MW-1801 and MW-1802
Amos - Landfill

Geosyntec Consultants, Inc.

Component	Unit	MW-1801							
		12/18/2018	1/24/2019	2/21/2019	3/13/2019	4/23/2019	6/11/2019	7/23/2019	11/5/2019
		Background							
Boron	mg/L	0.273	0.247	0.219	0.251	0.246	0.26	0.246	0.255
Calcium	mg/L	1.76	1.59	1.38	1.55	1.50	1.45	1.41	1.46
Chloride	mg/L	10.4	10.8	11	11.1	11.3	10.4	10.8	11.7
Fluoride	mg/L	5.01	5.19	5.26	5.32	5.35	5.03	5.47	5.36
Total Dissolved Solids	mg/L	498	490	550	509	507	506	502	501
Sulfate	mg/L	8.1	7.2	6.8	6.6	8.2	6.5	7.2	7.0
pH	SU	8.9	8.9	9.0	9.0	9.1	9.4	8.8	8.7

Component	Unit	MW-1802							
		12/17/2018	1/25/2019	2/21/2019	3/13/2019	4/24/2019	6/12/2019	7/23/2019	11/5/2019
		Background							
Boron	mg/L	0.267	0.249	0.233	0.234	0.242	0.253	0.236	0.254
Calcium	mg/L	0.821	0.924	0.840	0.860	0.910	0.876	0.865	0.892
Chloride	mg/L	8.33	8.87	8.94	9.21	9.13	9.01	8.80	9.90
Fluoride	mg/L	4.79	4.82	4.87	4.75	5.04	4.54	5.16	4.84
Total Dissolved Solids	mg/L	482	451	532	477	478	476	476	460
Sulfate	mg/L	20.6	20.3	20.1	18.8	21.2	19.1	20.7	19.7
pH	SU	9.1	9.1	9.3	9.3	9.2	9.0	9.0	8.9

Notes:
mg/L: milligrams per liter
SU: standard unit

Table 2: Background Level Summary
Amos - Landfill

Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-2	MW-4	MW-1801	MW-1802
Boron	mg/L	Intrawell Background Value (UPL)	0.247	0.214	0.306	0.276
Calcium	mg/L	Intrawell Background Value (UPL)	2.10	0.912	1.83	0.978
Chloride	mg/L	Intrawell Background Value (UPL)	5.40	15.9	12.1	10.2
Fluoride	mg/L	Intrawell Background Value (UPL)	1.61	1.52	5.67	5.36
pH	SU	Intrawell Background Value (UPL)	9.0	10.1	9.5	9.5
		Intrawell Background Value (LPL)	8.2	8.3	8.5	8.7
Sulfate	mg/L	Intrawell Background Value (UPL)	12.9	12.2	8.88	22.4
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	394	422	550	522

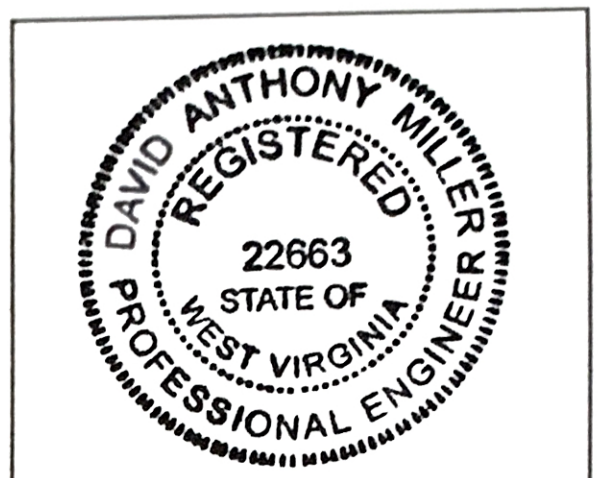
Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit

ATTACHMENT A

Certification by a Qualified Professional Engineer

Certification by a Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the John E. Amos Landfill CCR management area and that the requirements of 40 CFR 257.93(f) have been met.



DAVID ANTHONY MILLER
Printed Name of Licensed Professional Engineer

David Anthony Miller
Signature

22663
License Number

WEST VIRGINIA
Licensing State

07.08.2020
Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

June 1, 2020

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

RE: Amos Landfill Background Update

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the background update of the groundwater data through 2019 at American Electric Power's Amos Landfill. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at Amos Landfill for the CCR program in 2016 for all wells except wells MW-1801 and MW-1802 which were installed in 2018, and at least 8 background samples have been collected at each of the groundwater monitoring wells. The monitoring well network, as provided by Geosyntec Consultants, includes the following:

- **Upgradient well:** MF-MW-6, LF-MW-7R, LF-MW-8, LF-MW-9, and LF-MW-10
- **Downgradient wells:** LF-MW-2, LF-MW-4, MW-1801, and MW-1802

Data were sent electronically to Groundwater Stats Consulting, and the statistical analysis was reviewed by Dr. Jim Loftis, Civil & Environmental Engineering professor emeritus at Colorado State University and Senior Advisor to Groundwater Stats Consulting. The statistical analysis was performed according to the groundwater data screening that was performed in April 2018 by GSC and approved by Dr. Cameron, PhD Statistician with MacStat Consulting and primary author of the USEPA Unified Guidance.

The following constituents were evaluated during this background update:

- **Appendix III parameters** – boron, calcium, chloride, fluoride, pH, sulfate, and TDS

The following parameters were evaluated for existing wells during the initial background screening conducted in 2018:

- **Appendix IV parameters** – antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 & 228, fluoride, lead, lithium, mercury, molybdenum, selenium and thallium

Time series plots for Appendix III parameters at all wells are provided for the purpose of updating prediction limits at these wells (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells.

Data at existing wells were originally evaluated during the background screening conducted in March 2018 for Appendix III and IV parameters (summarized below) for the following: 1) outliers; 2) trends; 3) most appropriate statistical method for Appendix III parameters based on site characteristics of groundwater data upgradient of the facility; and 4) eligibility of downgradient wells when intrawell statistical methods are recommended. Power curves were provided with the previous screening to demonstrate that the selected statistical methods for Appendix III parameters comply with the USEPA Unified Guidance recommendations as discussed below.

Summary of Statistical Methods:

1) Intrawell prediction limits, combined with a 1-of-2 resample plan for boron, calcium, chloride, fluoride, pH, sulfate and TDS

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are nondetects, a nonparametric test is utilized. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits.

- No statistical analyses are required on wells and analytes containing 100% nondetects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% nondetects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for nondetects is the practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% nondetects, the Kaplan-Meier nondetect adjustment is applied to the background data. This technique adjusts the mean and standard deviation of the historical concentrations to account for concentrations below the reporting limit.
- Nonparametric prediction limits are used on data containing greater than 50% nondetects.

Summary of Original Background Screening – April 2018

Outlier Evaluation

Time series plots are used to identify suspected outliers, or extreme values that would result in limits that are not conservative from a regulatory perspective, in proposed background data. Suspected outliers at existing wells for Appendix III parameters were formally tested using Tukey's box plot method and, when identified, flagged in the computer database with "o" and deselected prior to construction of statistical limits.

Tukey's outlier test was also used to evaluated Appendix IV parameters, but no values were flagged as outliers for the wells in the current well network. A summary of these results was included in the previous screening.

No true seasonal patterns were observed on the time series plots for any of the detected data; therefore, no deseasonalizing adjustments were made to the data. When seasonal patterns are observed, data may be deseasonalized so that the resulting limits will correctly account for the seasonality as a predictable pattern rather than random variation or a release.

While trends may be visual, a quantification of the trend and its significance is needed. The Sen's Slope/Mann Kendall trend test was used to evaluate all data at each well to identify statistically significant increasing or decreasing trends. In the absence of suspected contamination, significant trending data are typically not included as part of the background data used for construction of prediction limits. This step serves to eliminate the trend and, thus, reduce variation in background. When statistically significant decreasing trends are present, earlier data are evaluated to determine whether

earlier concentration levels are significantly different than current reported concentrations and will be deselected as necessary. When the historical records of data are truncated for the reasons above, a summary report will be provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed Appendix III concentrations were stable over time with no statistically significant increasing or decreasing trends. A summary table of the trend test results accompanied the trend tests. Therefore, none of the data sets required any adjustments at that time.

Determination of Statistical Method - Appendix III Parameters

The Analysis of Variance (ANOVA) was used to statistically evaluate differences in average concentrations among upgradient wells, which assists in identifying the most appropriate statistical approach. When variation exists among upgradient wells, intrawell methods, which used historical data within a given well to establish a limit for comparison of future compliance data at the same well, are recommended as the most appropriate statistical method when groundwater downgradient of the facility is not affected by practices at the facility.

Intrawell limits constructed from carefully screened background data from within each well serve to provide statistical limits that are conservative (i.e. lower) from a regulatory perspective, and that will rapidly identify a change in more recent compliance data from within a given well. This statistical method removes the element of variation from across wells and eliminates the chance of mistaking natural spatial variation for a release from the facility. Prior to performing intrawell prediction limits, several steps were required to reasonably demonstrate downgradient water quality does not have existing impacts from the practices of the facility.

Exploratory data analysis was used as a general comparison of concentrations in downgradient wells for all Appendix III parameters recommended for intrawell analyses to concentrations reported in upgradient wells. Upper tolerance limits were used in conjunction with confidence intervals to determine whether the estimated averages in downgradient wells are higher than observed levels upgradient of the facility. The upper tolerance limits were constructed to represent the extreme upper range of possible background levels at the site.

In cases where downgradient average concentrations are higher than observed concentrations upgradient for a given constituent, an independent study and hydrogeological investigation would be required to identify local geochemical conditions

and expected groundwater quality for the region to justify an intrawell approach. Such an assessment is beyond the scope of services provided by Groundwater Stats Consulting. When there is not an obvious explanation for observed concentration differences in downgradient wells relative to reported concentrations in upgradient wells, interwell prediction limits were initially be selected for the statistical method until further evidence shows that concentrations are due to natural variation rather than a result of the facility.

Parametric tolerance limits were constructed with a target of 99% confidence and 95% coverage using pooled upgradient well data for each of the Appendix III parameters. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. As more data are collected, the background population is better represented and the confidence and coverage levels increase.

Confidence intervals were constructed on downgradient wells for each of the Appendix III parameters, using the tolerance limits discussed above, to determine intrawell eligibility. When the entire confidence interval is above a background standard for a given parameter, interwell methods are initially recommended as the statistical method. Therefore, only parameters with confidence intervals which did not exceed background standards were eligible for intrawell prediction limits.

Confidence intervals for the majority of parameters were found to be within their respective background limits. Additionally, evidence provided by Geosyntec supported the use of intrawell analyses for all parameters at all wells based on additional studies conducted.

All available data through October 2017 at each well were used to establish intrawell background limits for each of the Appendix III parameters based on a 1-of-2 resample plan.

Background Update Summary

Prior to updating background data, samples were re-evaluated for all wells using Tukey's outlier test and visual screening on data collected through November 2019 (Figure C). While new wells MW-1801 and MW-1802 have data through November 2019, existing wells have data only through June/July 2019 for background. A few outliers were noted, and those values were flagged. The value identified of 550 mg/L for TDS identified as an outlier at well MW-1801 was similar to remaining measurements in this well and was not flagged at this time due to the limited data available.

While Tukey's test did not identify the following values as outliers, these values were flagged and deselected in the database as they are considerably lower than the majority of measurements within each well: pH well MW-4; and chloride and sulfate in well MW-8.

As mentioned above, flagged data are displayed in a lighter font and as a disconnected symbol on the time series reports, as well as in a lighter font on the accompanying data pages. An updated summary of Tukey's test results and flagged outliers follows this letter (Figure C).

The Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data for existing wells through October 2017 to the new compliance samples at each well through June/July 2019 to evaluate whether the groups are statistically similar at the 95% confidence level, in which case background data may be updated with compliance data (Figure D). Statistically significant differences were noted for boron in upgradient well LF-MW-7R and downgradient well LF-MW-2; and fluoride in upgradient well LF-MW-8. Because two of the three significant differences were noted in upgradient wells, and all more recent medians were similar to the majority of reported historical concentrations, all records were updated to include data through June/July 2019.

Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background are not updated to include the newer data but will be reconsidered in the future. A summary of these results follows this letter.

For newer wells MW-1801 and MW-1802, the Sen's Slope/Mann Kendall trend test was used to evaluate all data at each well to identify statistically significant increasing or decreasing trends (Figure E). In the absence of suspected contamination, significant trending data are typically not included as part of the background data used for construction of prediction limits. This step serves to eliminate the trend and, thus, reduce variation in background. When statistically significant decreasing trends are present, earlier data are evaluated to determine whether earlier concentration levels are significantly different than current reported concentrations and will be deselected as necessary. When the historical records of data are truncated for the reasons above, a summary report will be provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed that Appendix III concentrations are stable over time with no statistically significant increasing or decreasing trends. Therefore, none of the data sets required any adjustments at this time, The reported fluoride concentrations

are highest at the newer wells but are similar to or slightly higher than the established Maximum Concentration Level of 4 mg/L for fluoride. Concentrations for all other parameters are similar to or lower than those reported upgradient of the Landfill.

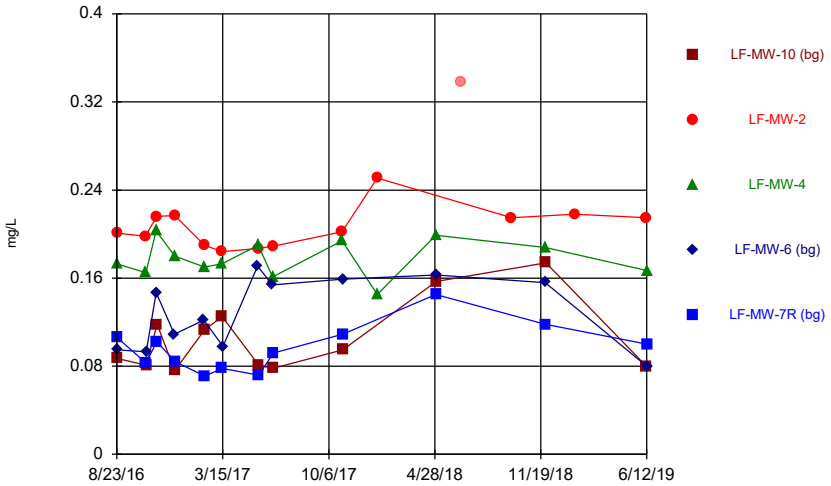
Intrawell prediction limits using all historical data through June/July 2019 for existing wells and through November 2019 for new wells, combined with a 1-of-2 resample plan, were constructed, and a summary of the updated limits follows this letter (Figure F). Future compliance observations at each well will be compared to these background limits during each subsequent semi-annual sampling event.

Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Amos Landfill. If you have any questions or comments, please feel free to contact us.

For Groundwater Stats Consulting,

Kristina L. Rayner
Groundwater Statistician

Time Series



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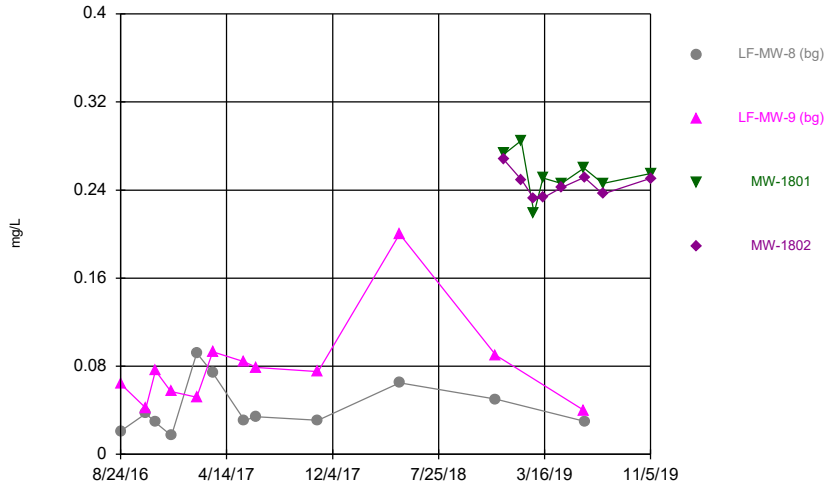
Time Series



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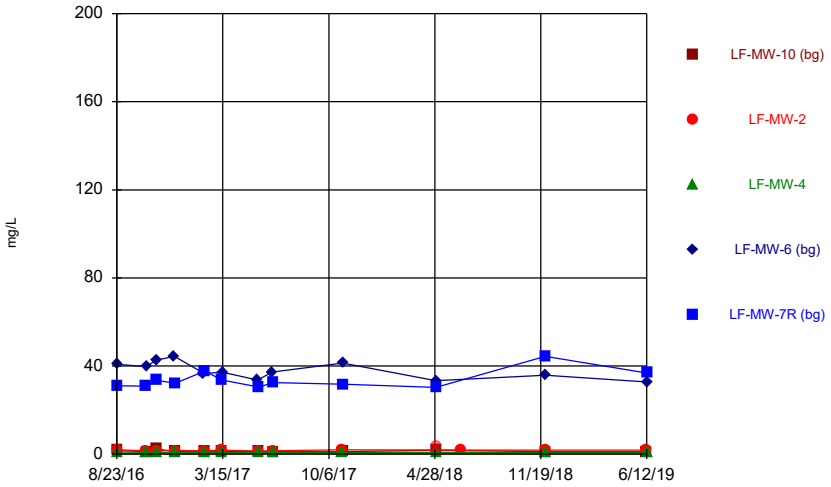

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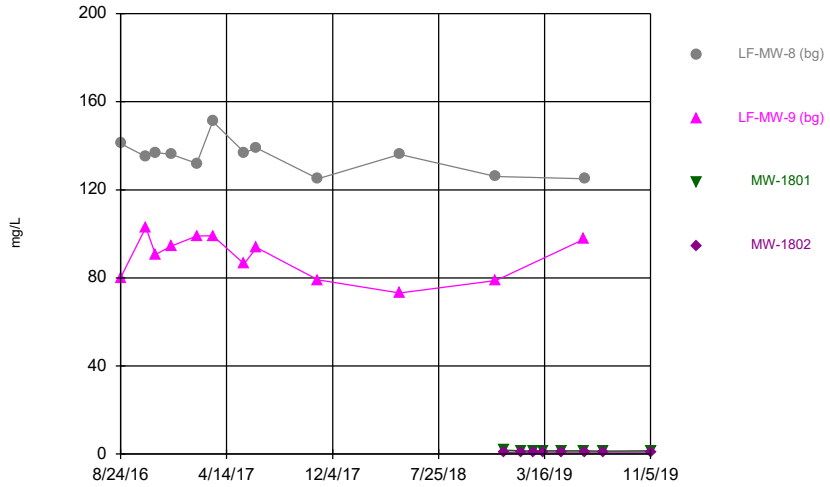

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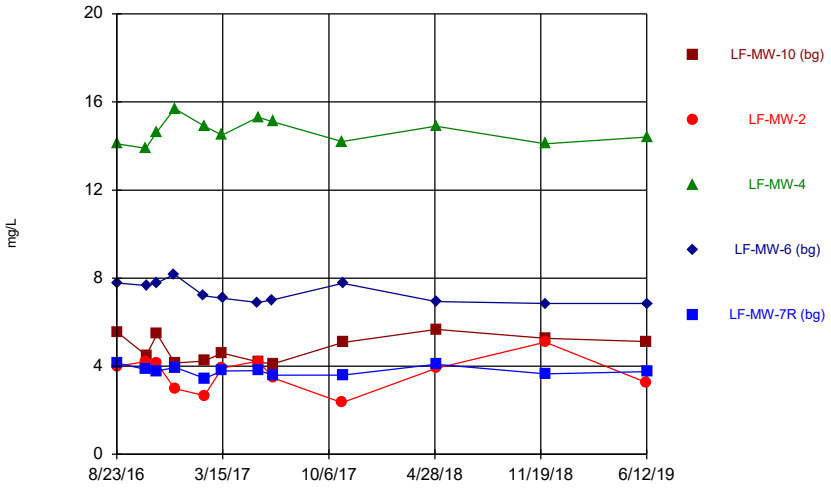

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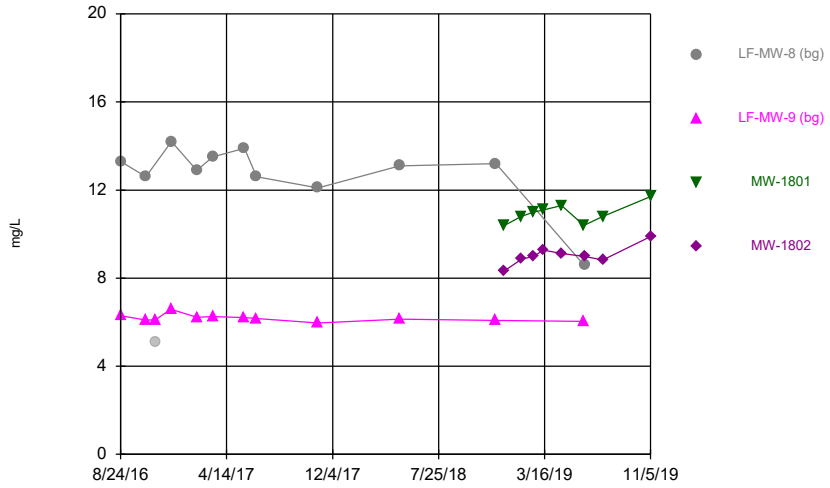

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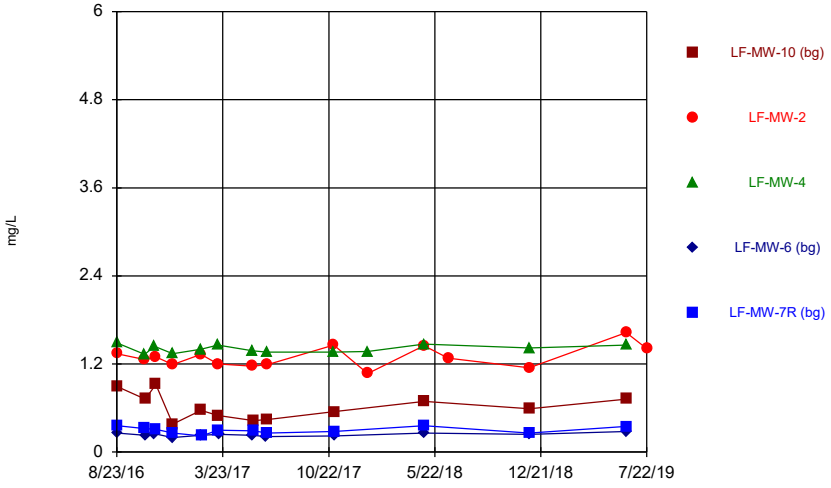

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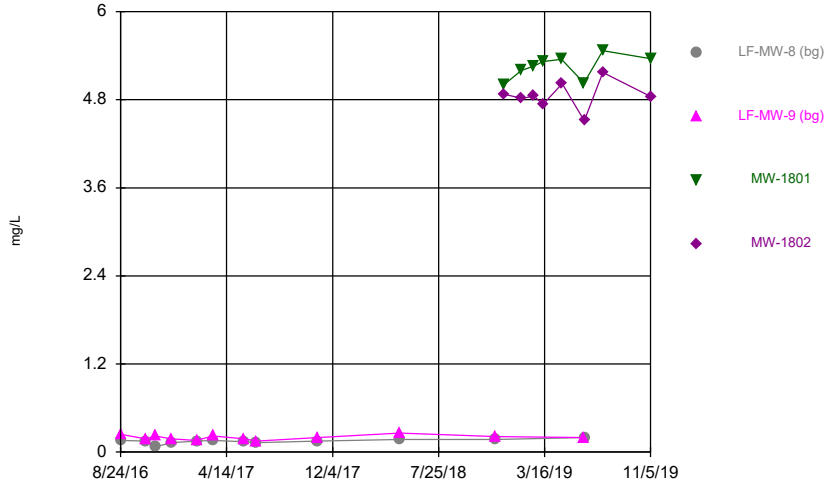

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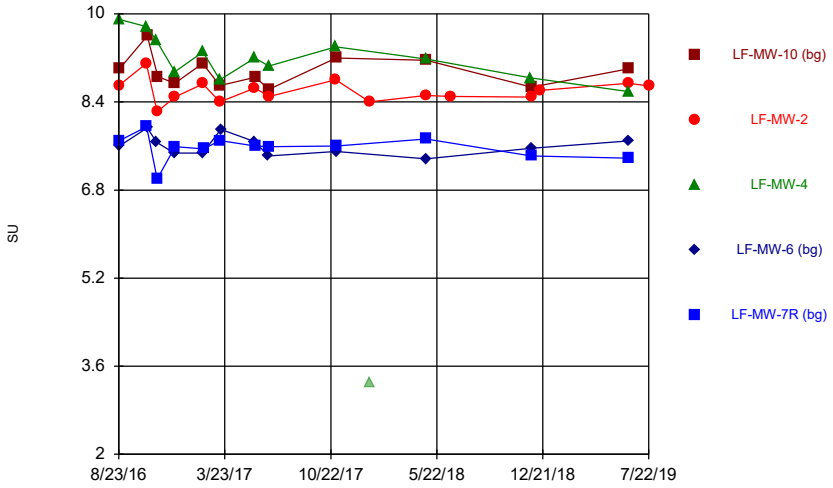
Time Series



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Amos Landfill Client: Geosyntec Data: Amos LF

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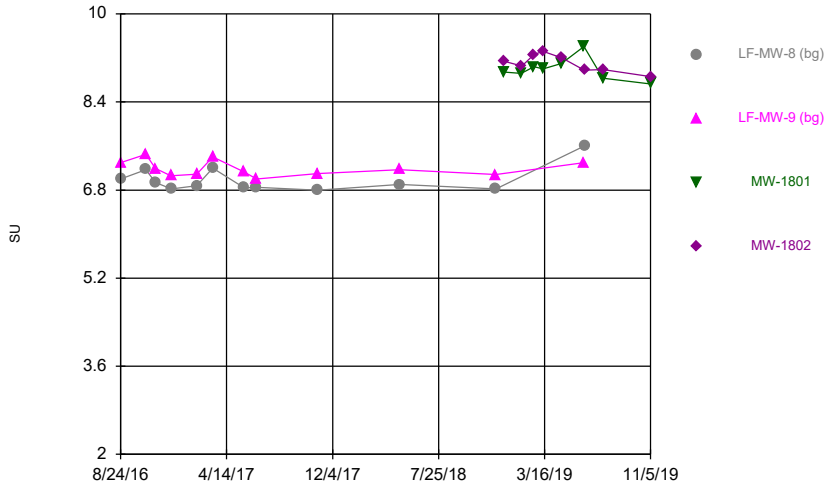
Time Series



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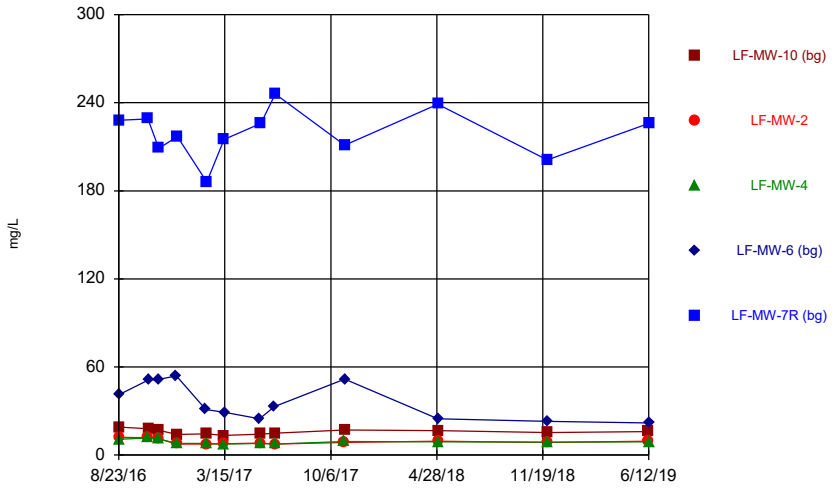
Time Series



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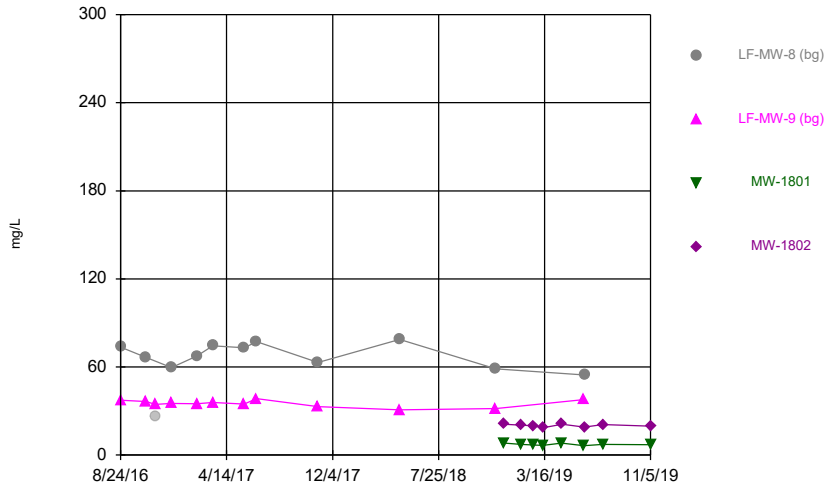
Time Series



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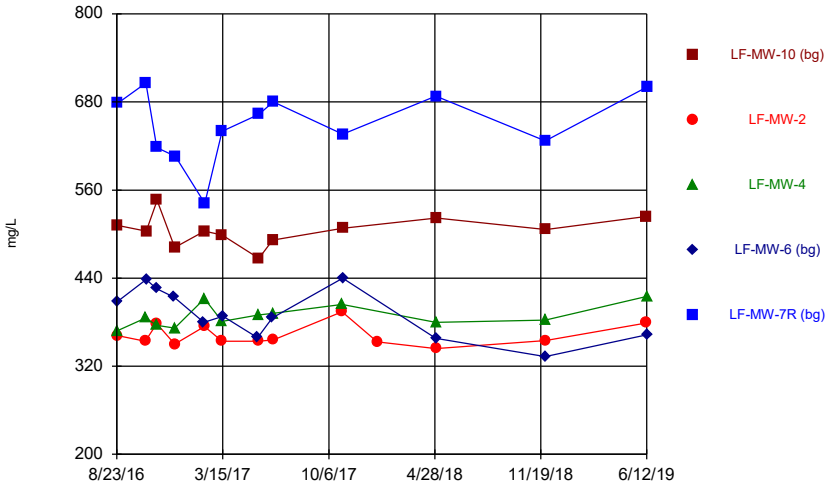

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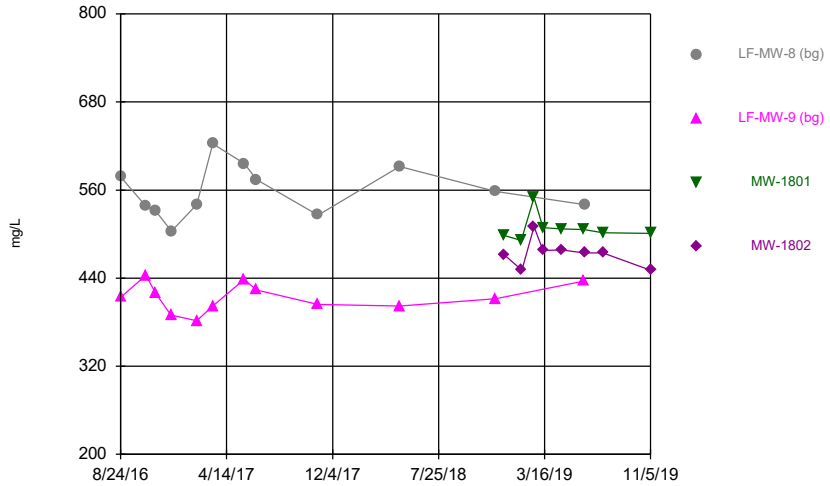
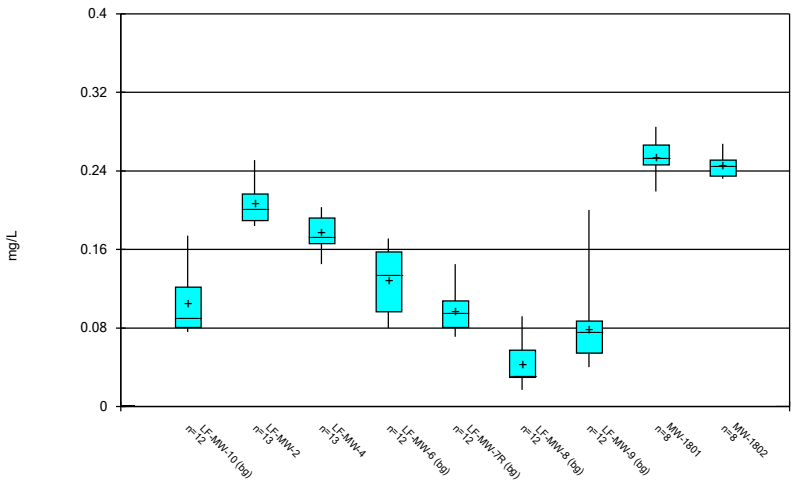
Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



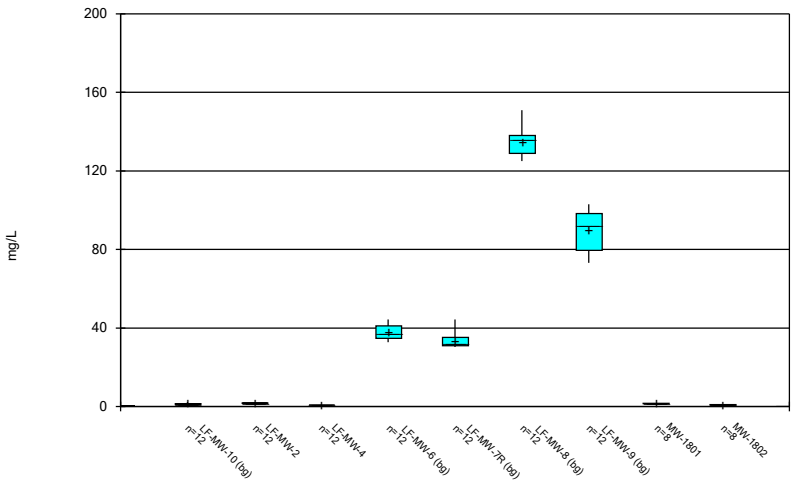
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:27 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Box & Whiskers Plot



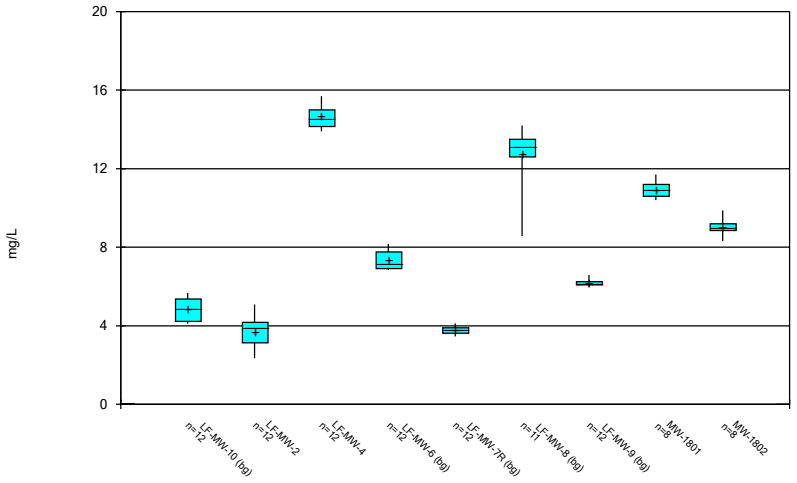
Constituent: Boron Analysis Run 5/30/2020 9:54 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Box & Whiskers Plot



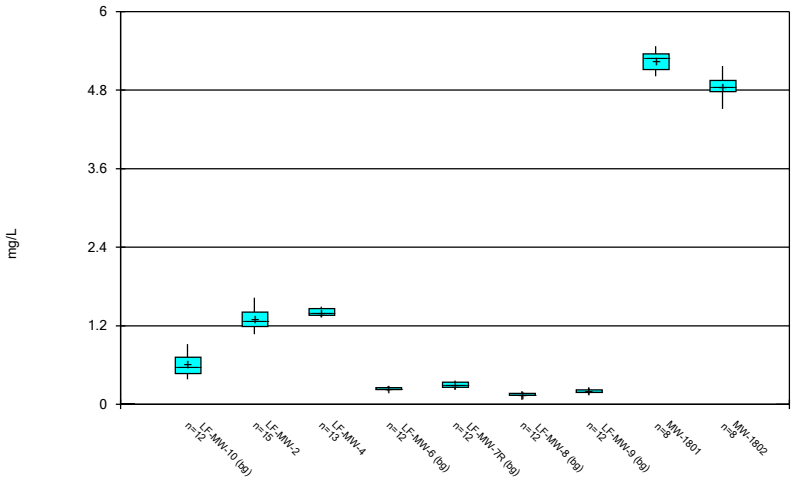
Constituent: Calcium Analysis Run 5/30/2020 9:54 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Box & Whiskers Plot



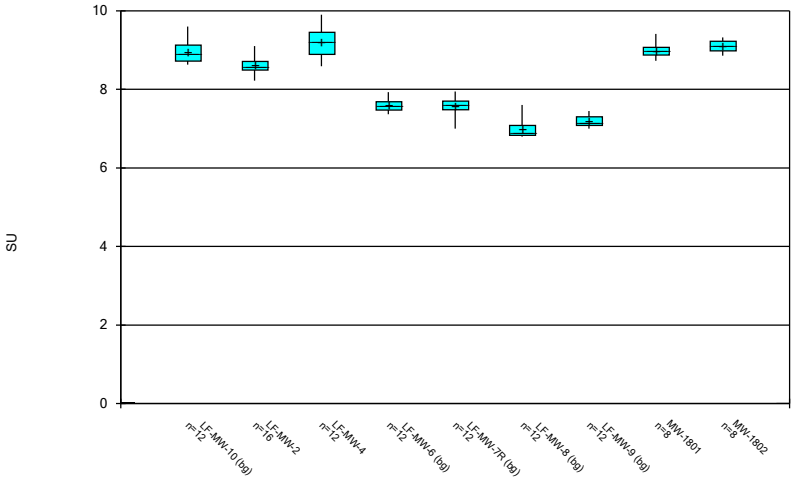
Constituent: Chloride Analysis Run 5/30/2020 9:54 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Box & Whiskers Plot



Constituent: Fluoride Analysis Run 5/30/2020 9:54 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

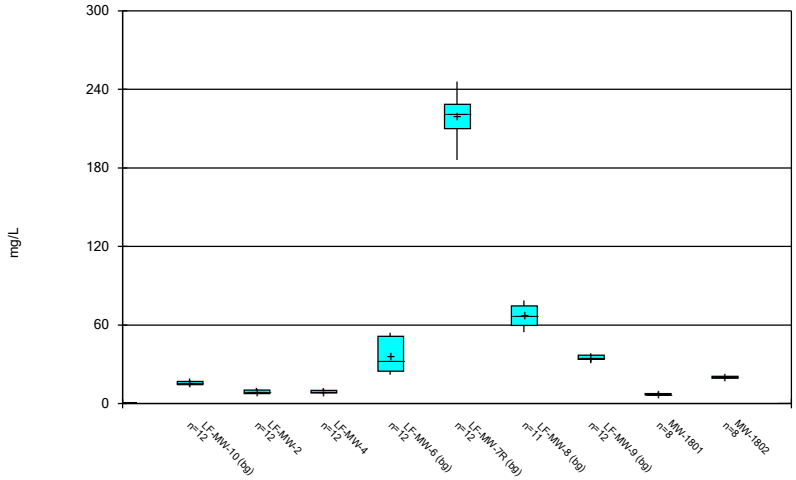
Box & Whiskers Plot



Constituent: pH, field Analysis Run 5/30/2020 9:54 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

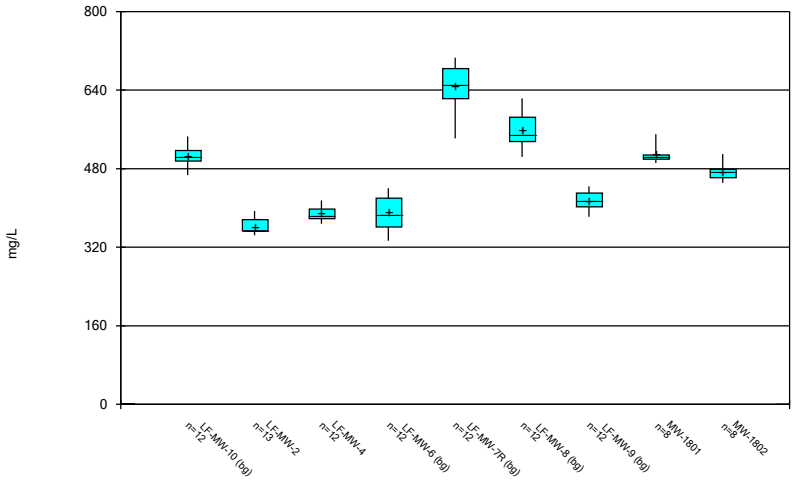
Box & Whiskers Plot



Constituent: Sulfate Analysis Run 5/30/2020 9:54 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:54 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Outlier Summary

Amos Landfill Client: Geosyntec Data: Amos LF Printed 5/30/2020, 10:52 AM

	LF-MW-2 Boron (mg/L)	LF-MW-2 Calcium (mg/L)	LF-MW-8 Chloride (mg/L)	LF-MW-4 pH, field (SU)	LF-MW-8 Sulfate (mg/L)
11/9/2016			5.12 (o)		26.1 (o)
1/8/2018				3.3 (o)	
5/1/2018		3.5 (o)			
6/19/2018	0.338 (o)				

Outlier Analysis - Significant Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 5/30/2020, 9:48 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (mg/L)	**LF-MW-2**	**Yes**	**0.338**	**6/19/2018**	**NP**	**14**	**0.2158**	**0.03935**	**ln(x)**	**ShapiroWilk**
Calcium (mg/L)	**LF-MW-2**	**Yes**	**3.5**	**5/1/2018**	**NP**	**13**	**1.83**	**0.5318**	**ln(x)**	**ShapiroWilk**
Total Dissolved Solids (mg/L)	**MW-1801**	**Yes**	**550**	**2/21/2019**	**NP**	**8**	**508.1**	**17.84**	**ln(x)**	**ShapiroWilk**

Outlier Analysis - All Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 5/30/2020, 9:48 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	12	0.1054	0.03285	ln(x)	ShapiroWilk
Boron (mg/L)	**LF-MW-2**	**Yes**	**0.338**	**6/19/2018**	**NP**	**14**	**0.2158**	**0.03935**	**ln(x)**	**ShapiroWilk**
Boron (mg/L)	LF-MW-4	No	n/a	n/a	NP	13	0.1775	0.01671	x^2	ShapiroWilk
Boron (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	12	0.1289	0.0327	normal	ShapiroWilk
Boron (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	12	0.09667	0.02144	ln(x)	ShapiroWilk
Boron (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	12	0.04258	0.02301	ln(x)	ShapiroWilk
Boron (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	12	0.07933	0.04192	ln(x)	ShapiroWilk
Boron (mg/L)	MW-1801	No	n/a	n/a	NP	8	0.2544	0.01971	x^2	ShapiroWilk
Boron (mg/L)	MW-1802	No	n/a	n/a	NP	8	0.2453	0.01187	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	12	1.333	0.3906	ln(x)	ShapiroWilk
Calcium (mg/L)	**LF-MW-2**	**Yes**	**3.5**	**5/1/2018**	**NP**	**13**	**1.83**	**0.5318**	**ln(x)**	**ShapiroWilk**
Calcium (mg/L)	LF-MW-4	No	n/a	n/a	NP	12	0.8141	0.04383	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	12	37.97	3.803	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	12	33.75	4.105	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	12	135	7.435	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	12	89.58	9.833	x^4	ShapiroWilk
Calcium (mg/L)	MW-1801	No	n/a	n/a	NP	8	1.511	0.1208	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-1802	No	n/a	n/a	NP	8	0.8776	0.03836	x^6	ShapiroWilk
Chloride (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	12	4.827	0.5919	x^2	ShapiroWilk
Chloride (mg/L)	LF-MW-2	No	n/a	n/a	NP	12	3.683	0.7693	normal	ShapiroWilk
Chloride (mg/L)	LF-MW-4	No	n/a	n/a	NP	12	14.64	0.5485	ln(x)	ShapiroWilk
Chloride (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	12	7.332	0.4657	ln(x)	ShapiroWilk
Chloride (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	12	3.786	0.2013	ln(x)	ShapiroWilk
Chloride (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	12	12.09	2.62	x^6	ShapiroWilk
Chloride (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	12	6.181	0.1603	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-1801	No	n/a	n/a	NP	8	10.94	0.4406	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-1802	No	n/a	n/a	NP	8	9.032	0.4442	ln(x)	ShapiroWilk
Fluoride (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	12	0.6167	0.1749	ln(x)	ShapiroWilk
Fluoride (mg/L)	LF-MW-2	No	n/a	n/a	NP	15	1.295	0.1463	ln(x)	ShapiroWilk
Fluoride (mg/L)	LF-MW-4	No	n/a	n/a	NP	13	1.406	0.05378	ln(x)	ShapiroWilk
Fluoride (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	12	0.2375	0.02261	ln(x)	ShapiroWilk
Fluoride (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	12	0.2975	0.04454	x^(1/3)	ShapiroWilk
Fluoride (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	12	0.1483	0.03129	x^2	ShapiroWilk
Fluoride (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	12	0.2	0.03219	x^(1/3)	ShapiroWilk
Fluoride (mg/L)	MW-1801	No	n/a	n/a	NP	8	5.25	0.1621	x^6	ShapiroWilk
Fluoride (mg/L)	MW-1802	No	n/a	n/a	NP	8	4.854	0.1921	x^2	ShapiroWilk
pH, field (SU)	LF-MW-10 (bg)	No	n/a	n/a	NP	12	8.959	0.2798	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-2	No	n/a	n/a	NP	16	8.596	0.2036	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-4	No	n/a	n/a	NP	13	8.754	1.682	x^6	ShapiroWilk
pH, field (SU)	LF-MW-6 (bg)	No	n/a	n/a	NP	12	7.605	0.178	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-7R (bg)	No	n/a	n/a	NP	12	7.568	0.2316	x^6	ShapiroWilk
pH, field (SU)	LF-MW-8 (bg)	No	n/a	n/a	NP	12	6.985	0.2349	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-9 (bg)	No	n/a	n/a	NP	12	7.189	0.1424	ln(x)	ShapiroWilk
pH, field (SU)	MW-1801	No	n/a	n/a	NP	8	8.996	0.204	ln(x)	ShapiroWilk
pH, field (SU)	MW-1802	No	n/a	n/a	NP	8	9.1	0.1568	x^2	ShapiroWilk
Sulfate (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	12	15.83	1.748	ln(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-2	No	n/a	n/a	NP	12	9.1	1.714	ln(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-4	No	n/a	n/a	NP	12	9.042	1.428	ln(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	12	36.44	12.71	ln(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	12	219.4	16.52	x^3	ShapiroWilk
Sulfate (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	12	64.46	14.36	x^4	ShapiroWilk
Sulfate (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	12	35.06	2.338	x^4	ShapiroWilk
Sulfate (mg/L)	MW-1801	No	n/a	n/a	NP	8	7.206	0.6394	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-1802	No	n/a	n/a	NP	8	20.07	0.9008	x^6	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	12	505.5	20.38	sqrt(x)	ShapiroWilk

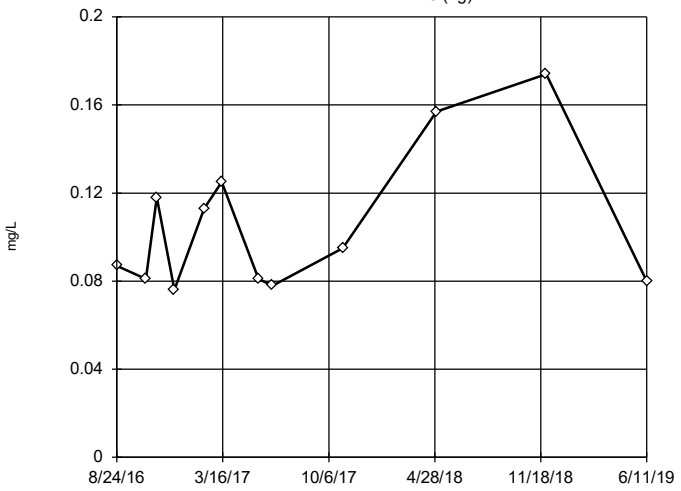
Outlier Analysis - All Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 5/30/2020, 9:48 AM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	N	Mean	Std. Dev.	Distribution	Normality Test
Total Dissolved Solids (mg/L)	LF-MW-2	No	n/a	n/a	NP	13	362.1	14.55	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-4	No	n/a	n/a	NP	12	388.3	15.14	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	12	391.1	34.47	x^(1/3)	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	12	648.7	47.06	x^6	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	12	558.4	34.57	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	12	414	19.28	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	**MW-1801**	**Yes**	**550**	**2/21/2019**	**NP**	**8**	**508.1**	**17.84**	**ln(x)**	**ShapiroWilk**
Total Dissolved Solids (mg/L)	MW-1802	No	n/a	n/a	NP	8	473.7	18.49	ln(x)	ShapiroWilk

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.4171, low cutoff = 0.02344, based on IQR multiplier of 3.

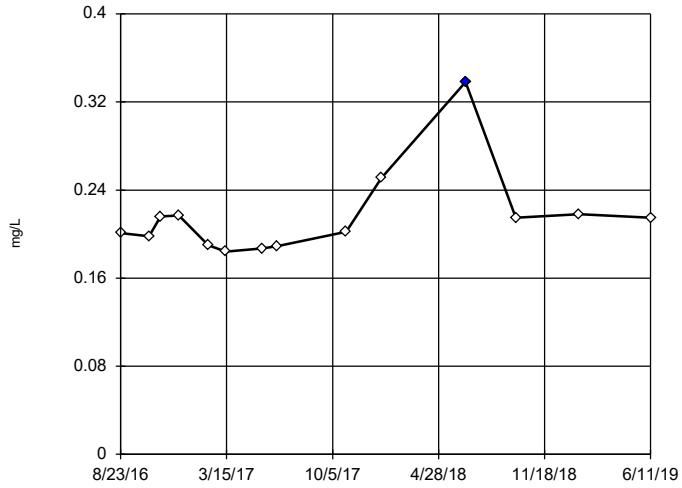
Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 14

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3289, low cutoff = 0.1253, based on IQR multiplier of 3.

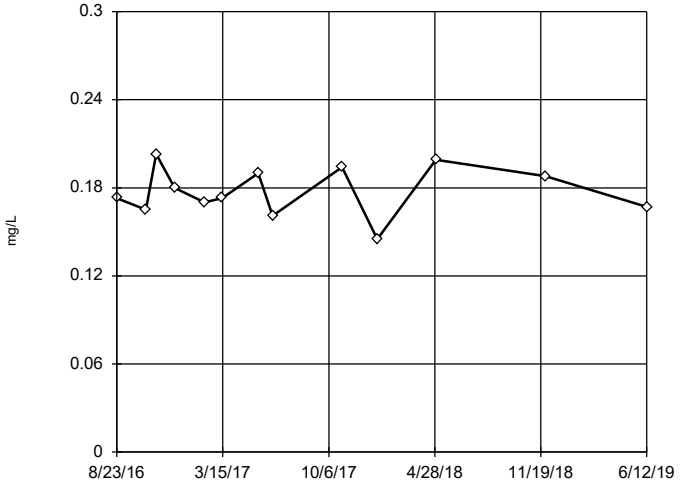
Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 13

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2546, low cutoff = -0.01939, based on IQR multiplier of 3.

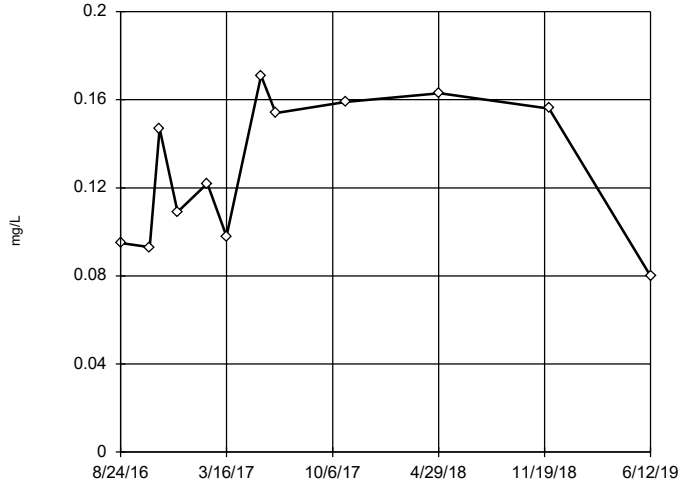
Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

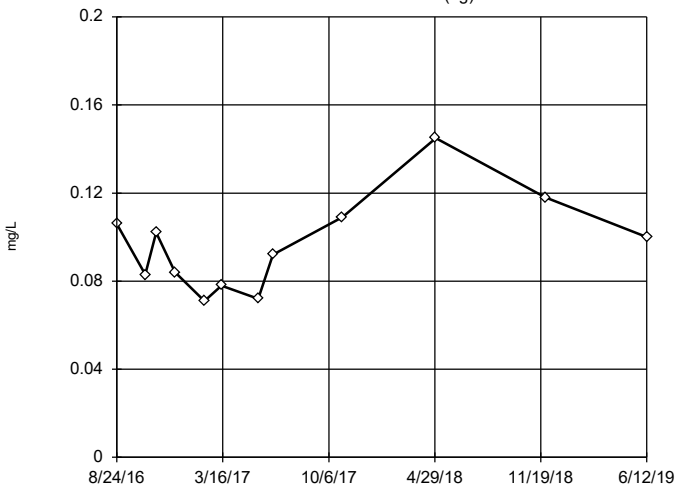
High cutoff = 0.3405, low cutoff = -0.0865, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2563, low cutoff = 0.03375, based on IQR multiplier of 3.

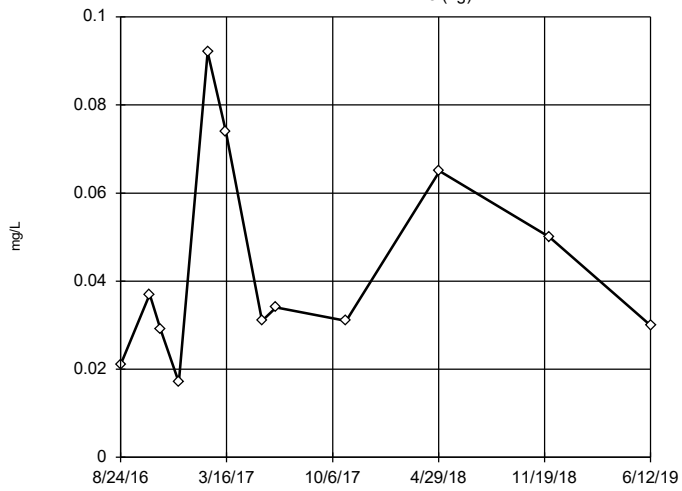
Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.4116, low cutoff = 0.004085, based on IQR multiplier of 3.

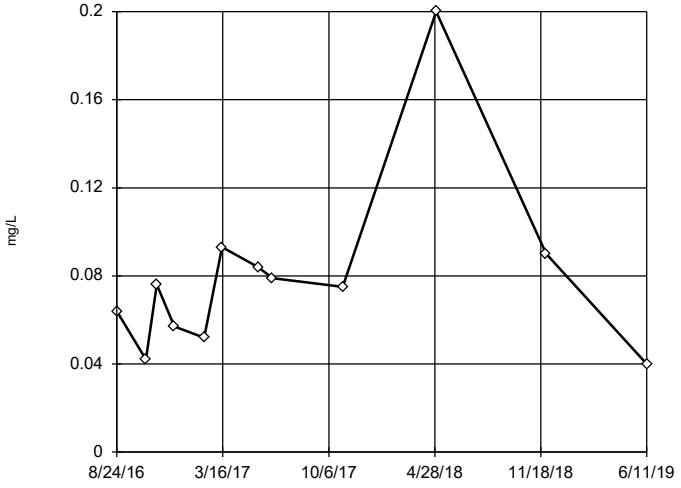
Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3542, low cutoff = 0.01337, based on IQR multiplier of 3.

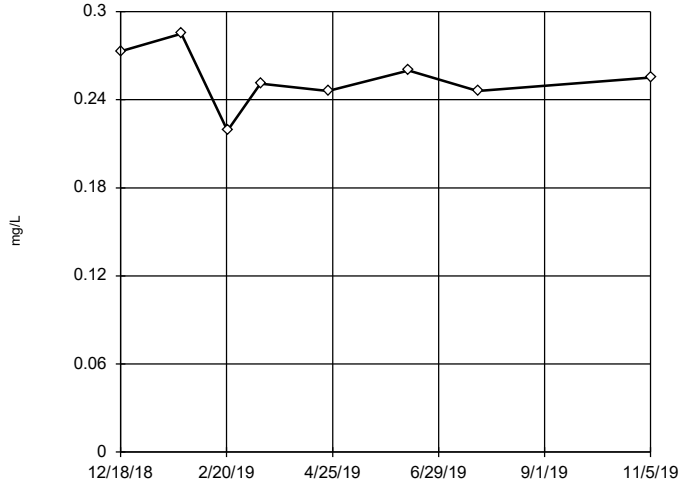
Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



n = 8

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

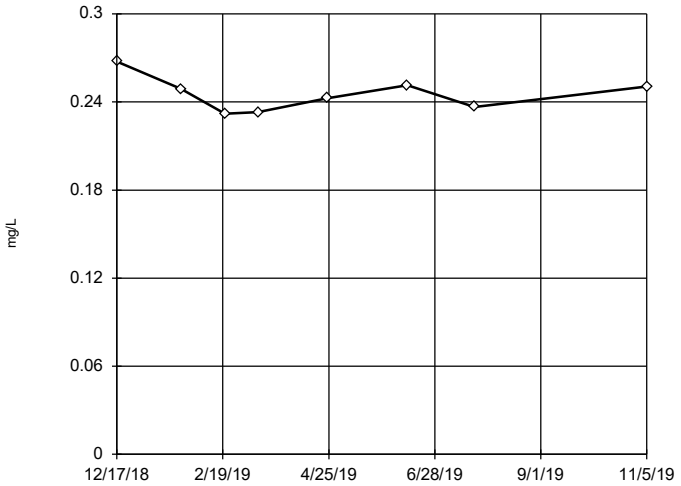
High cutoff = 0.3205, low cutoff = 0.1699, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1802



n = 8

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3068, low cutoff = 0.192, based on IQR multiplier of 3.

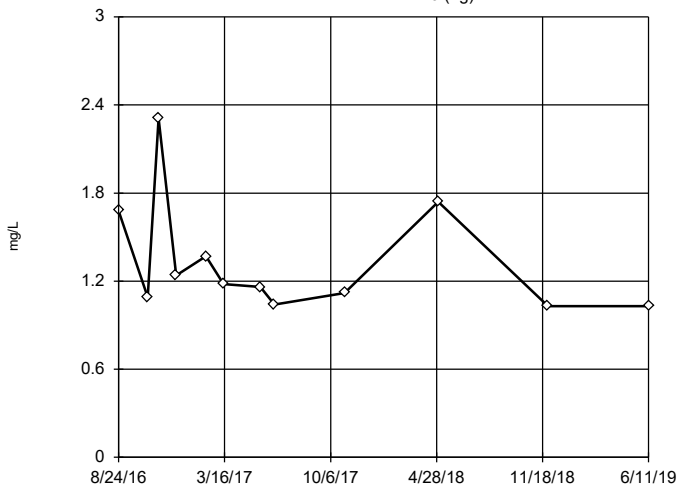
Constituent: Boron Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 4.389, low cutoff = 0.368, based on IQR multiplier of 3.

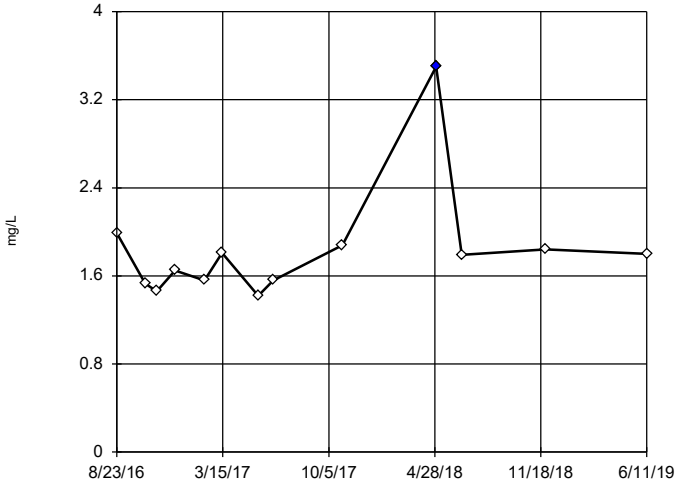
Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 13

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 3.245, low cutoff = 0.8855, based on IQR multiplier of 3.

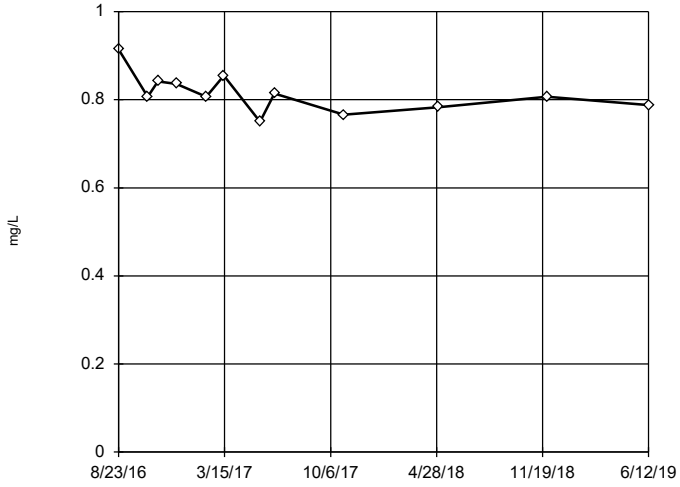
Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

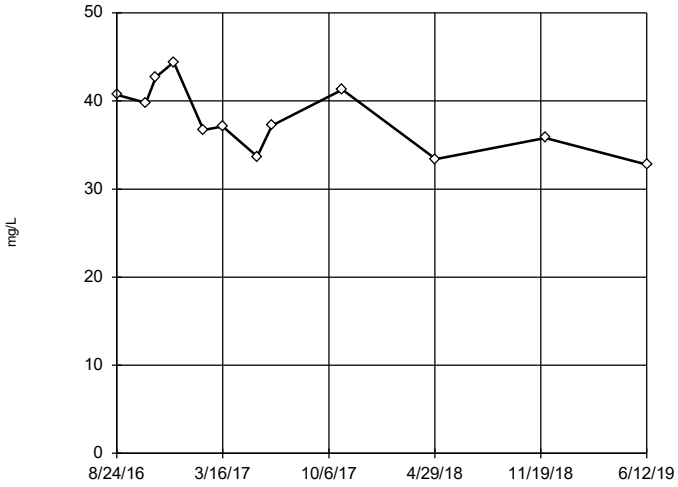
High cutoff = 1.022, low cutoff = 0.6446, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 67.42, low cutoff = 21.12, based on IQR multiplier of 3.

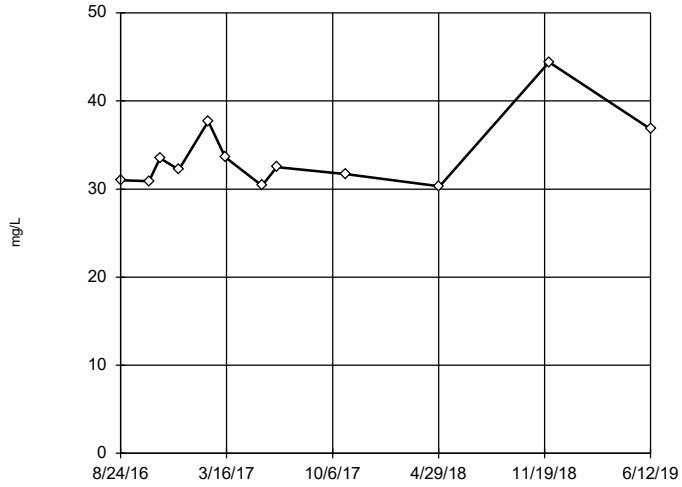
Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 51.57, low cutoff = 21.1, based on IQR multiplier of 3.

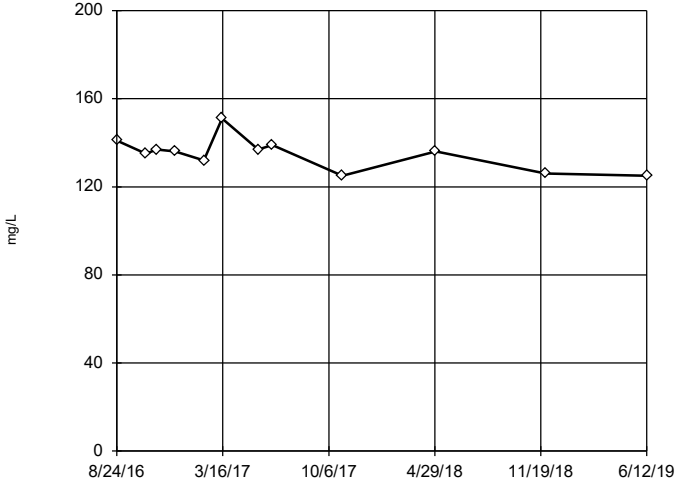
Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 169.1, low cutoff = 105.3, based on IQR multiplier of 3.

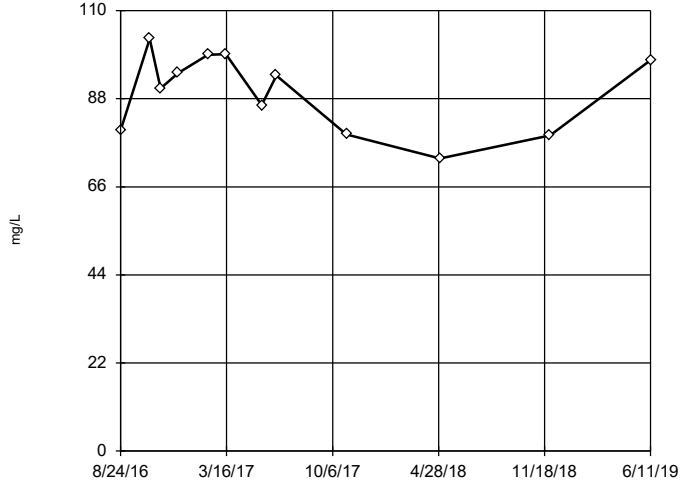
Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

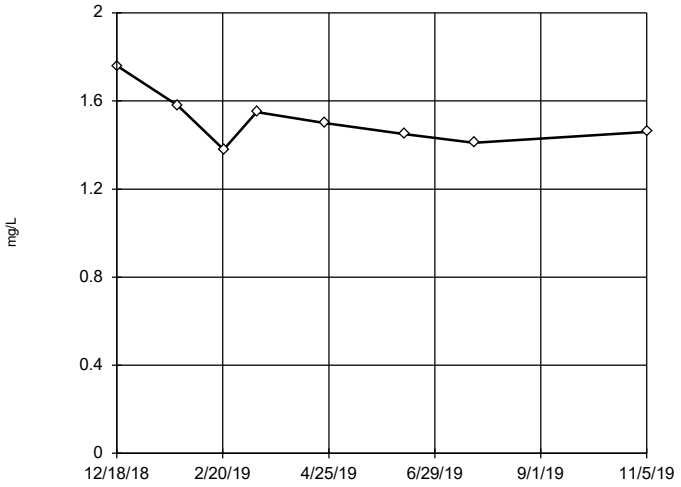
High cutoff = 126.1, low cutoff = -104.6, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1801



n = 8

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2.052, low cutoff = 1.091, based on IQR multiplier of 3.

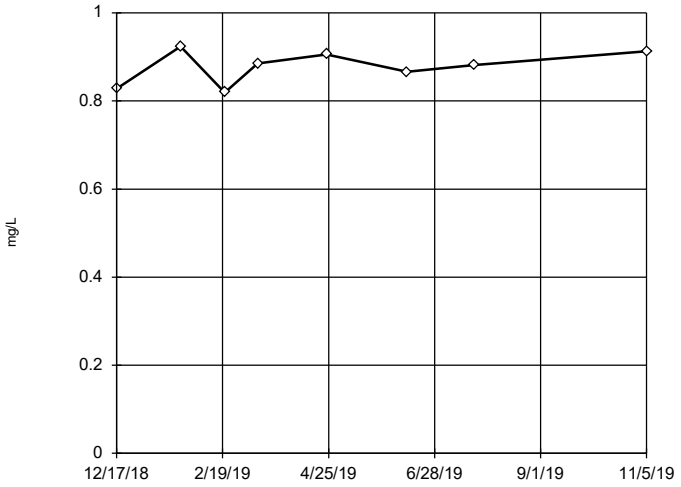
Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



n = 8

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1.022, low cutoff = -0.7691, based on IQR multiplier of 3.

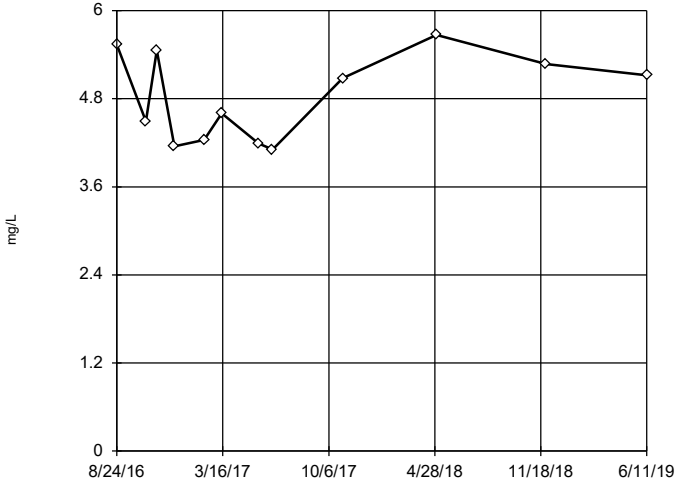
Constituent: Calcium Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.866, low cutoff = -3.913, based on IQR multiplier of 3.

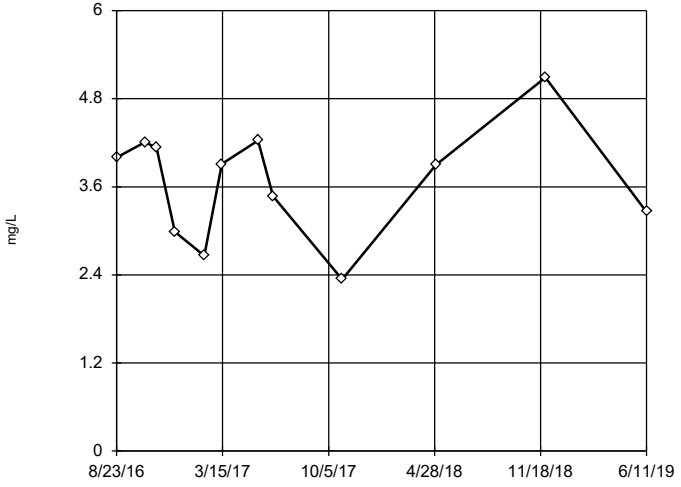
Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 12

No outliers found. Tukey's method selected by user.

Ladder of Powers transformations did not improve normality; analysis run on raw data.

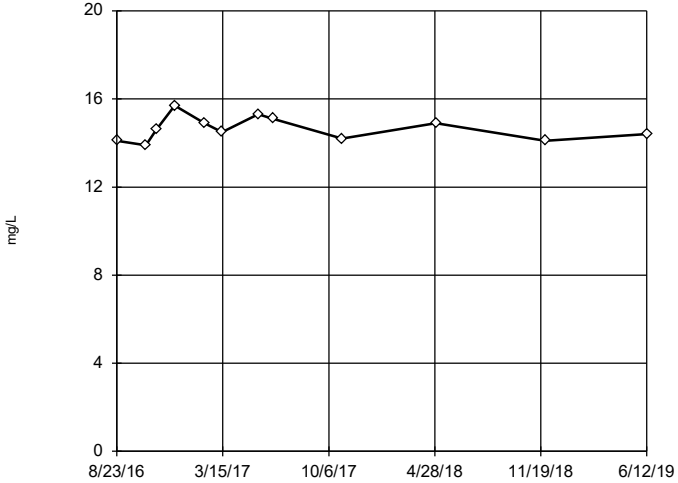
High cutoff = 7.305, low cutoff = -0.01, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 17.87, low cutoff = 11.88, based on IQR multiplier of 3.

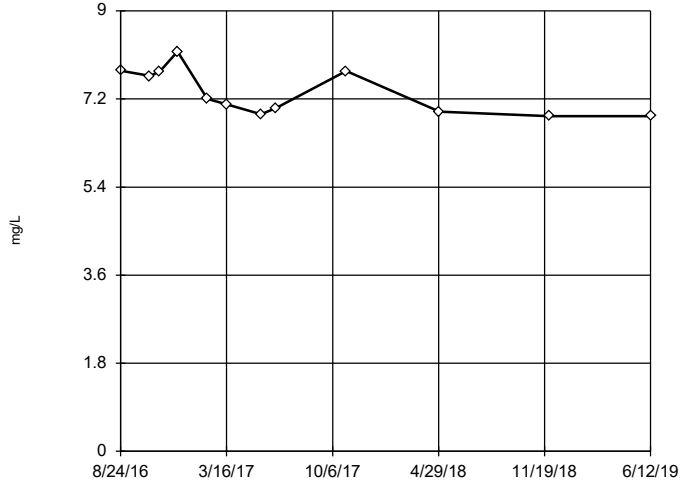
Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 11, low cutoff = 4.884, based on IQR multiplier of 3.

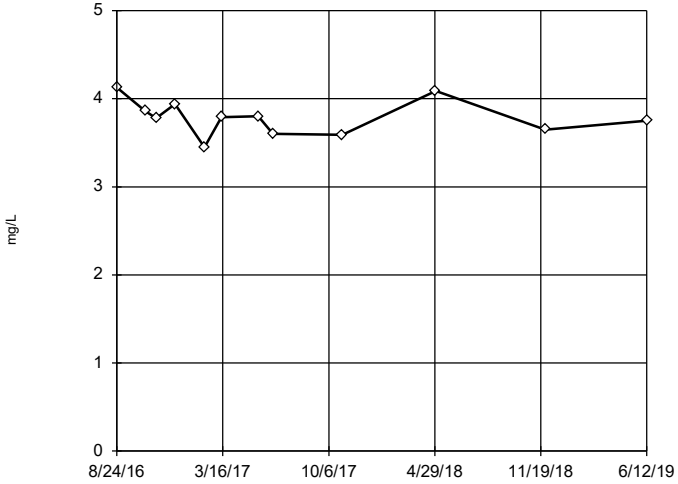
Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 4.856, low cutoff = 2.911, based on IQR multiplier of 3.

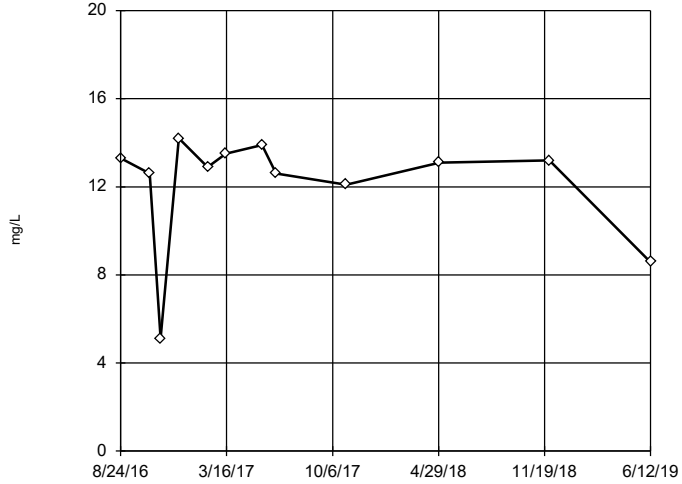
Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

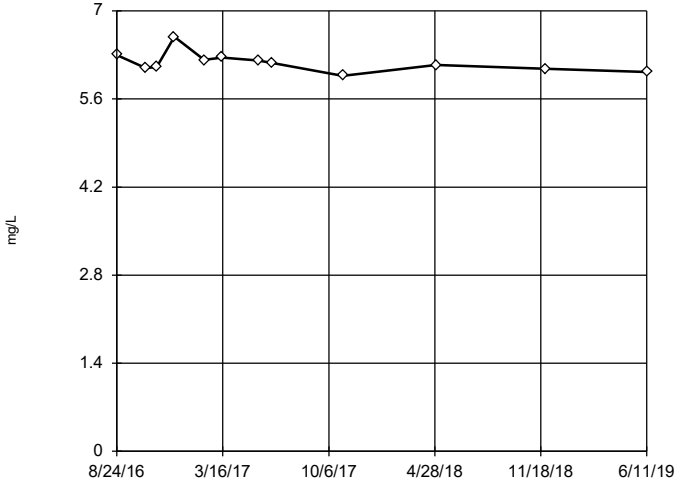
High cutoff = 15.23, low cutoff = -12.08, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 6.729, low cutoff = 5.643, based on IQR multiplier of 3.

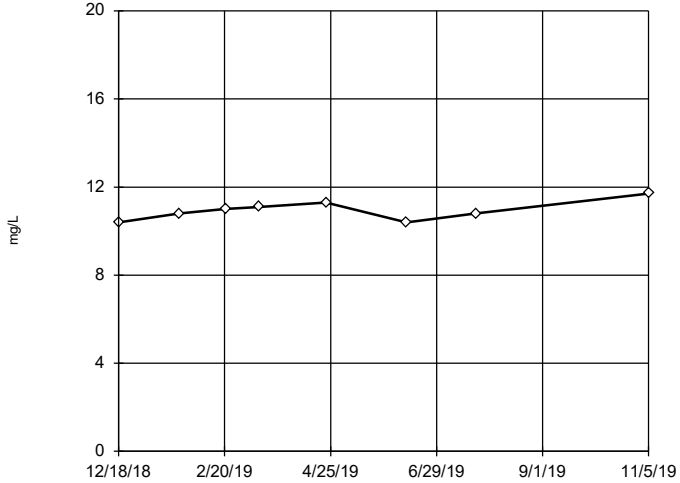
Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



n = 8

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 13.22, low cutoff = 8.981, based on IQR multiplier of 3.

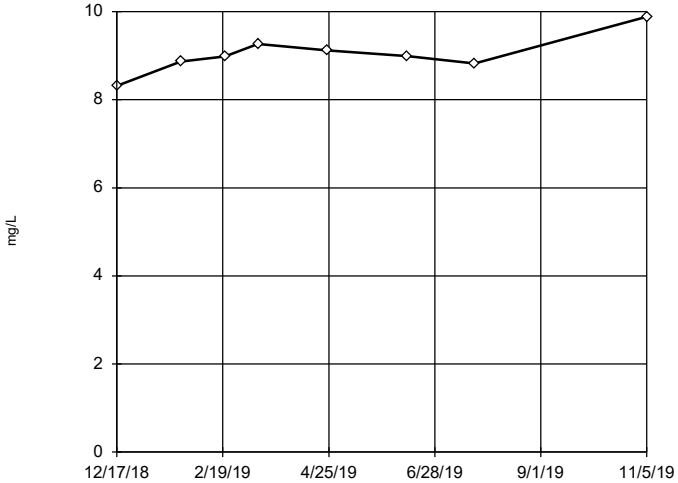
Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



n = 8

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 10.33, low cutoff = 7.874, based on IQR multiplier of 3.

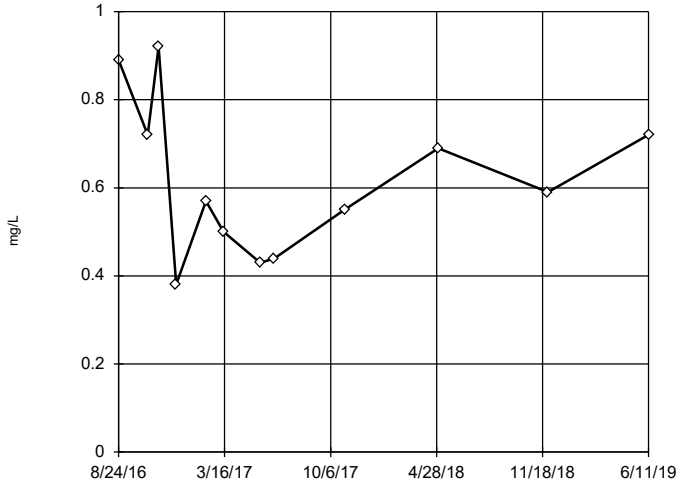
Constituent: Chloride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

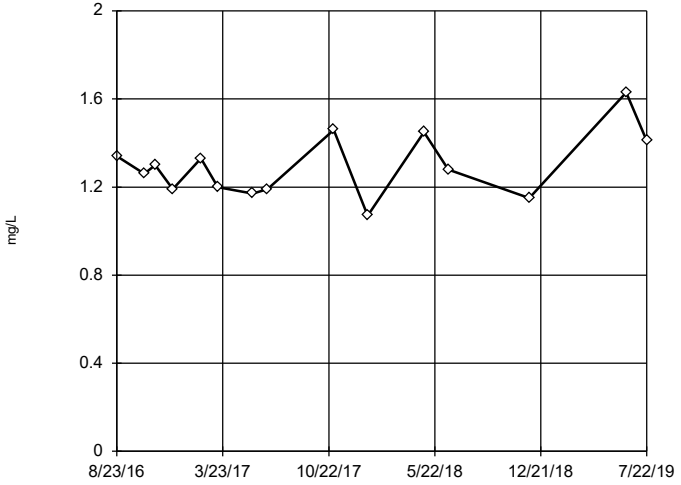
High cutoff = 2.604, low cutoff = 0.1297, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-2



n = 15

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2.346, low cutoff = 0.7154, based on IQR multiplier of 3.

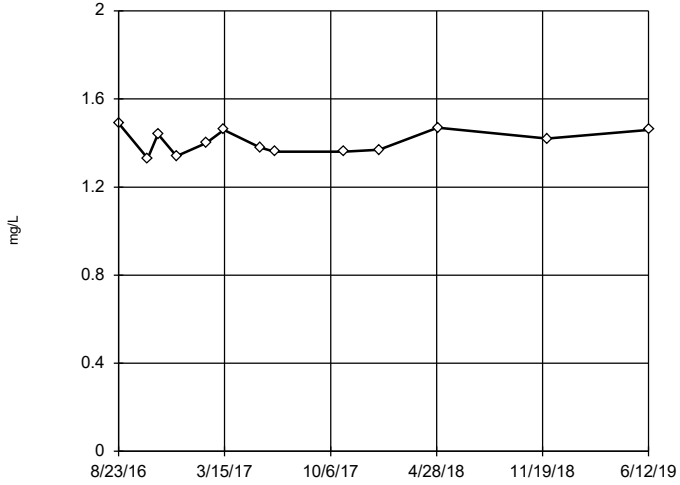
Constituent: Fluoride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 13

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 1.806, low cutoff = 1.099, based on IQR multiplier of 3.

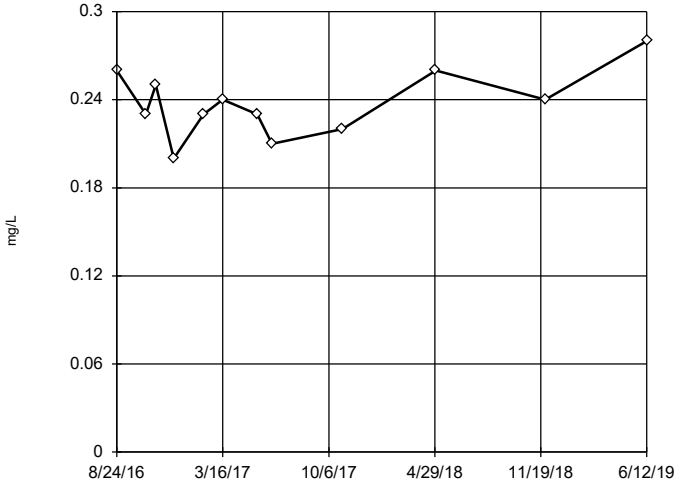
Constituent: Fluoride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3712, low cutoff = 0.1545, based on IQR multiplier of 3.

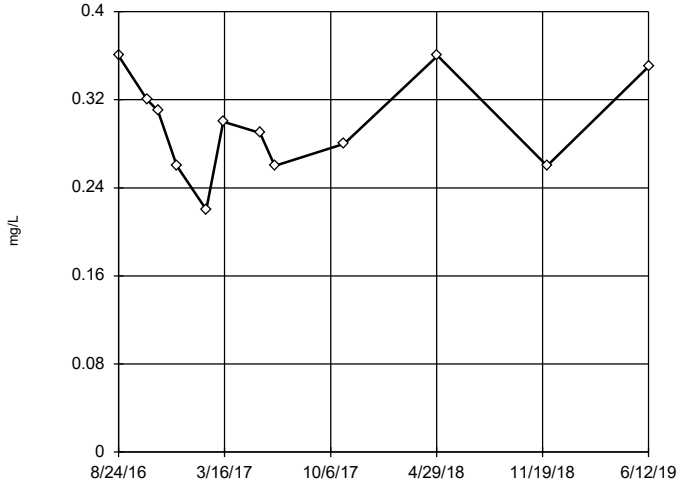
Constituent: Fluoride Analysis Run 5/30/2020 9:42 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

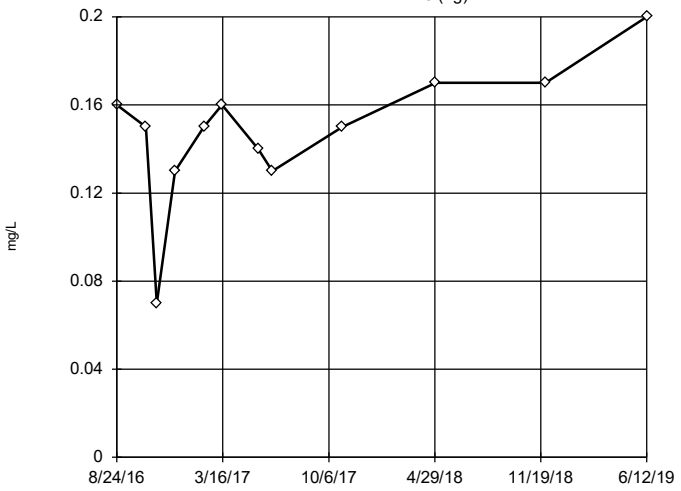
High cutoff = 0.642, low cutoff = 0.1038, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.2329, low cutoff = -0.09354, based on IQR multiplier of 3.

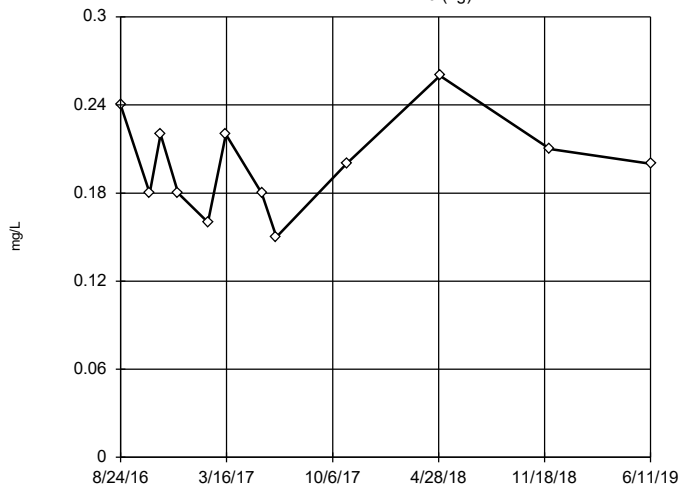
Constituent: Fluoride Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.3746, low cutoff = 0.08958, based on IQR multiplier of 3.

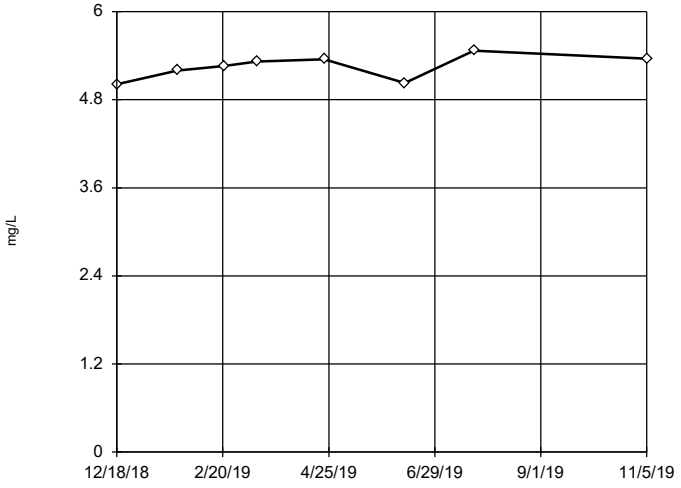
Constituent: Fluoride Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



n = 8

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 5.857, low cutoff = 3.255, based on IQR multiplier of 3.

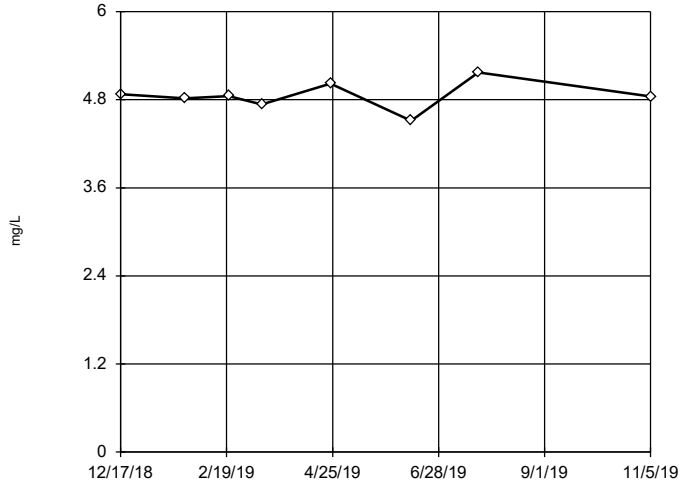
Constituent: Fluoride Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



n = 8

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

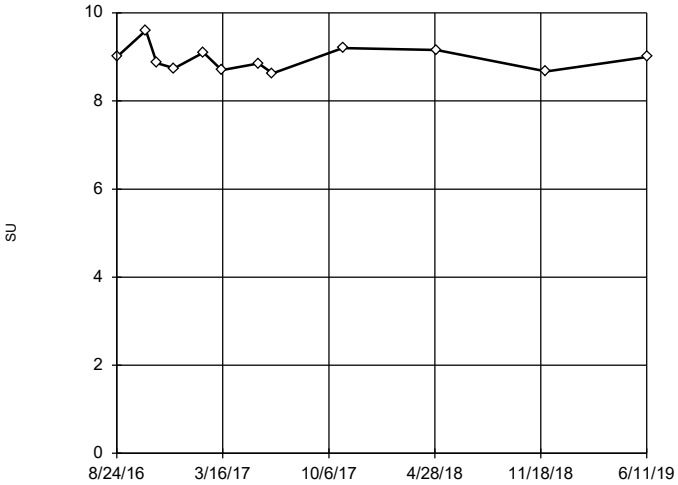
High cutoff = 5.427, low cutoff = 4.226, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

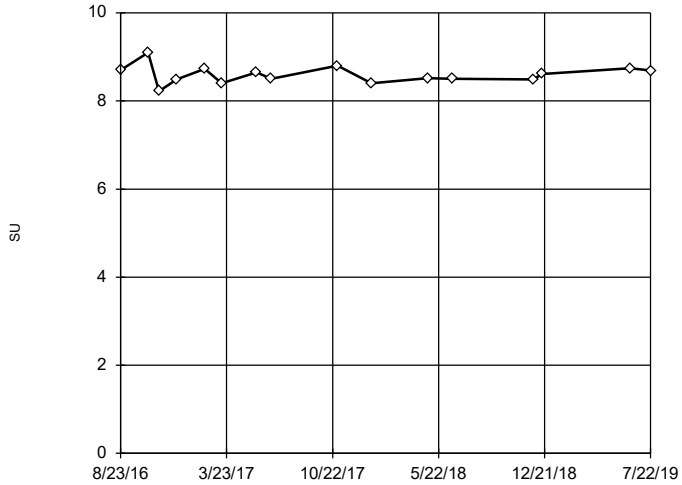
High cutoff = 10.48, low cutoff = 7.597, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 16

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

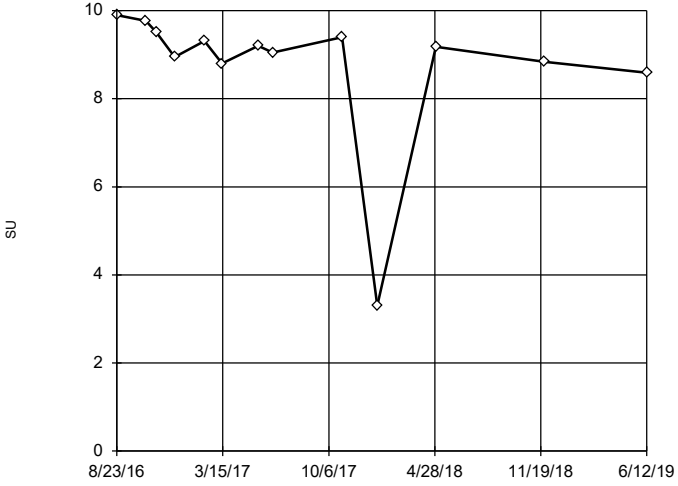
High cutoff = 9.426, low cutoff = 7.849, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 13

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

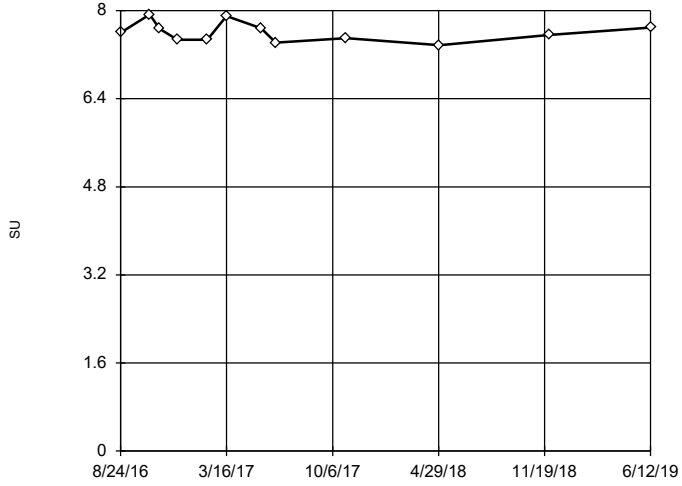
High cutoff = 10.63, low cutoff = -7.995, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

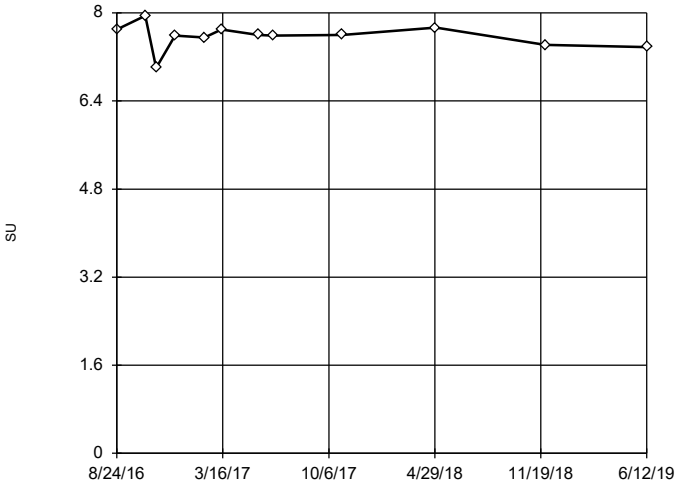
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 8.368, low cutoff = 6.86, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive
Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 8.207, low cutoff = 6.55, based on IQR multiplier of 3.

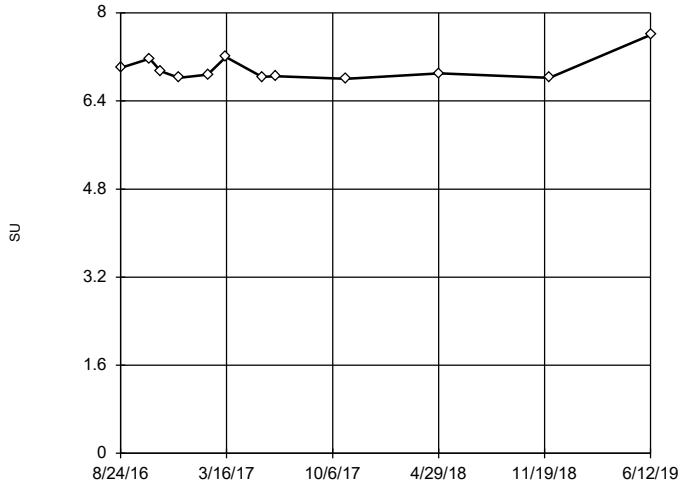
Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.906, low cutoff = 6.12, based on IQR multiplier of 3.

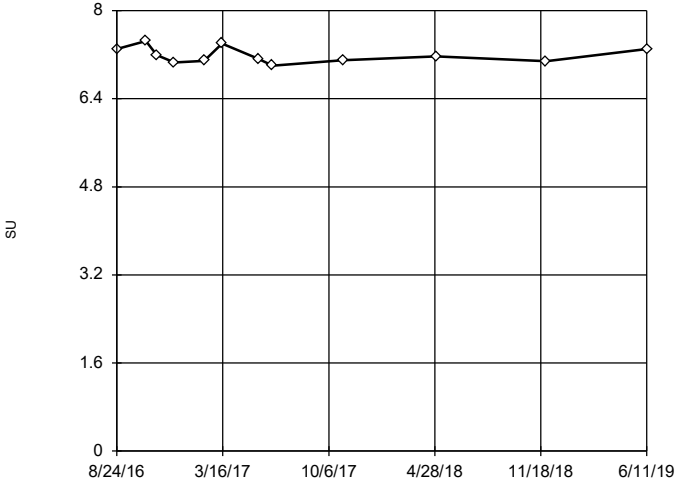
Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 7.985, low cutoff = 6.477, based on IQR multiplier of 3.

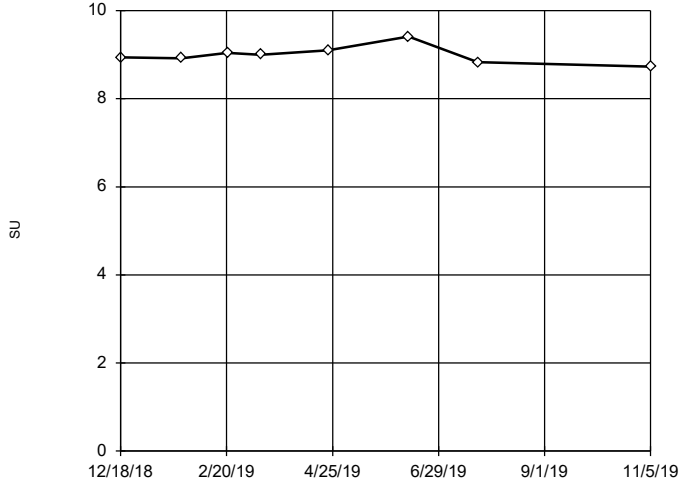
Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



n = 8

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

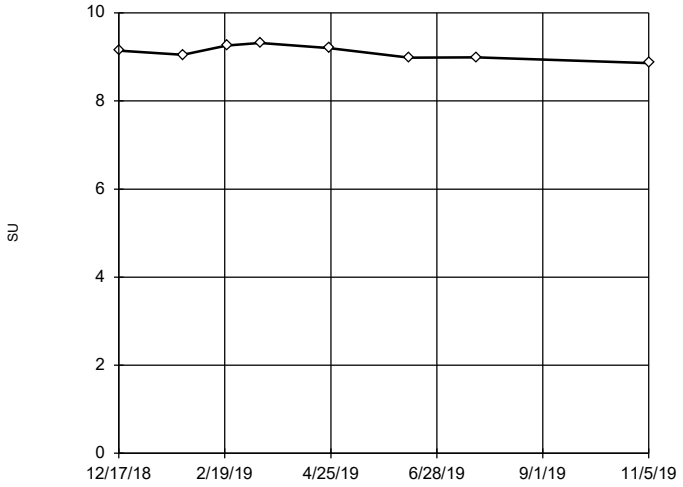
High cutoff = 9.681, low cutoff = 8.315, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1802



n = 8

No outliers found. Tukey's method selected by user.

Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 9.929, low cutoff = 8.206, based on IQR multiplier of 3.

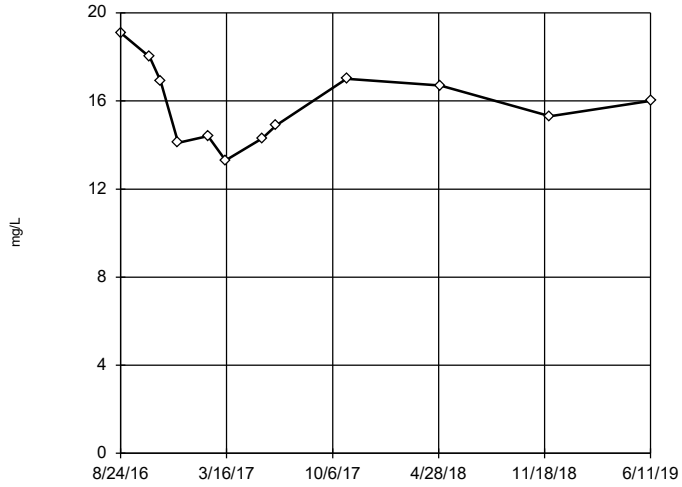
Constituent: pH, field Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 27.93, low cutoff = 8.708, based on IQR multiplier of 3.

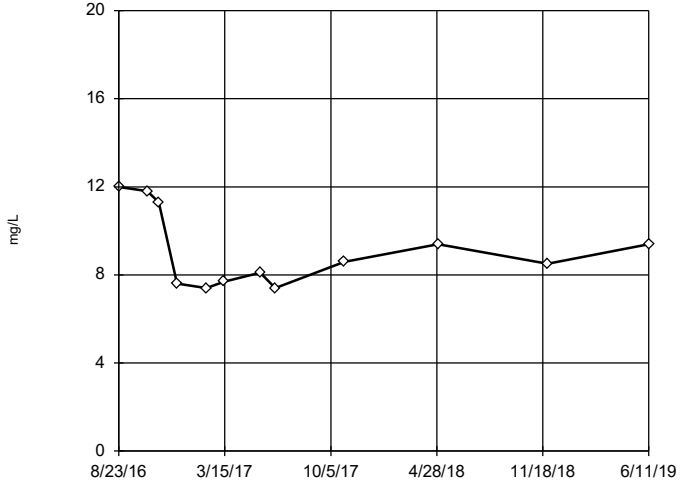
Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 25.2, low cutoff = 3.128, based on IQR multiplier of 3.

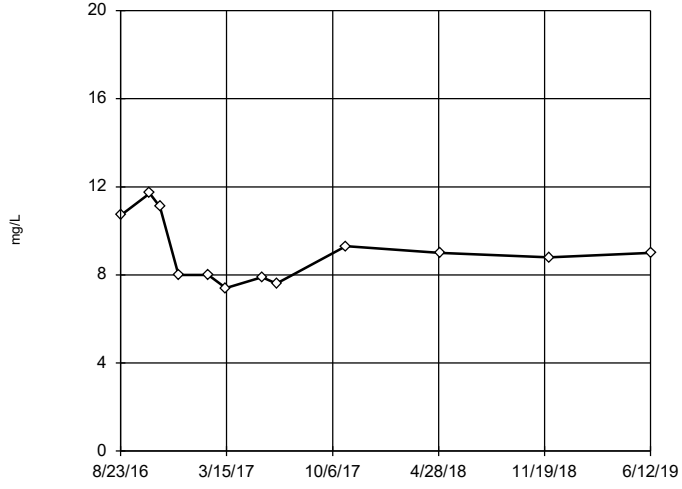
Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

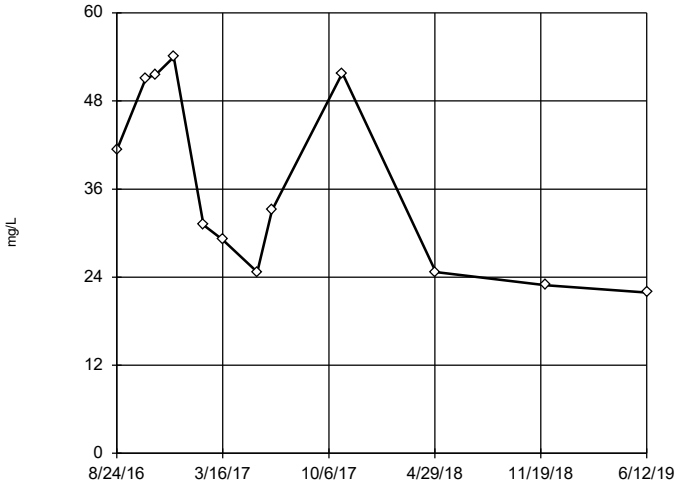
High cutoff = 19.71, low cutoff = 4.024, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 461.4, low cutoff = 2.749, based on IQR multiplier of 3.

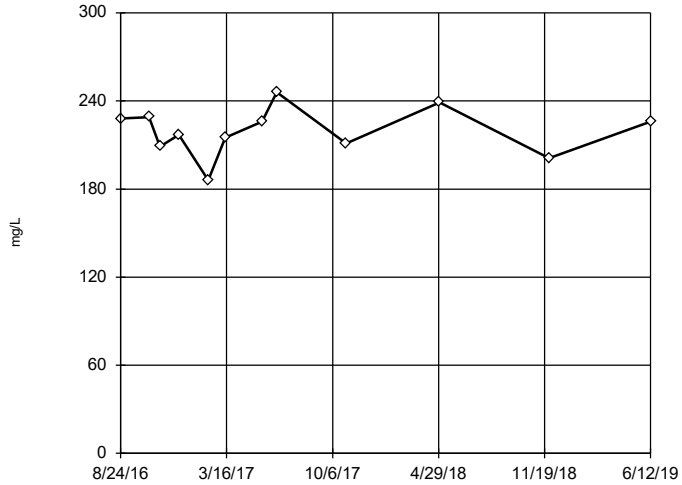
Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube transformed to achieve best W statistic (graph shown in original units).

High cutoff = 271.2, low cutoff = 107.9, based on IQR multiplier of 3.

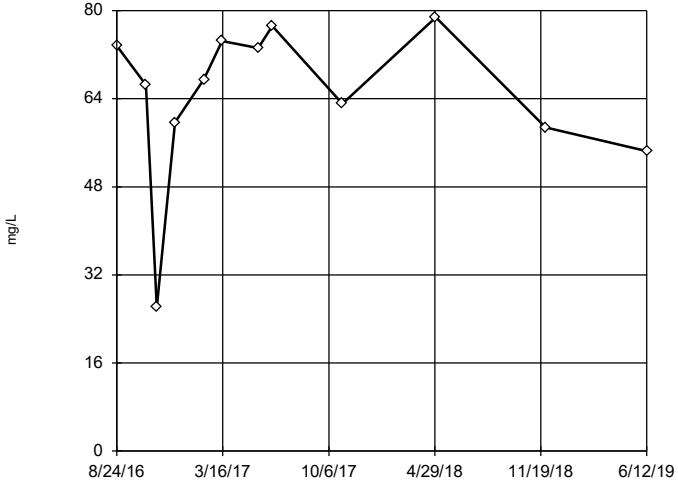
Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 95.54, low cutoff = -79.98, based on IQR multiplier of 3.

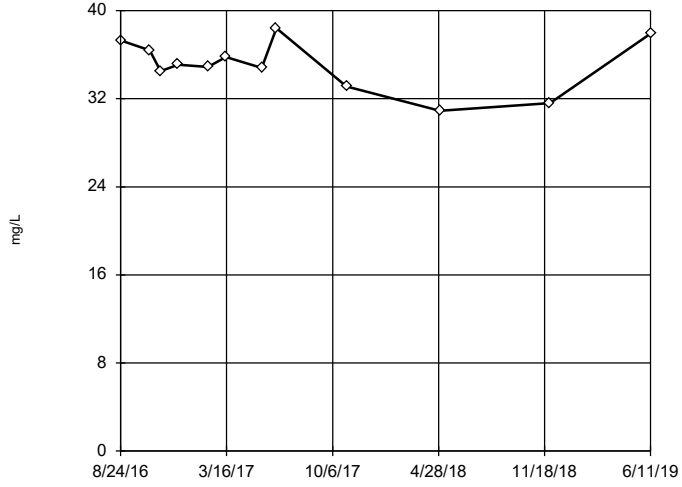
Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^4 transformed to achieve best W statistic (graph shown in original units).

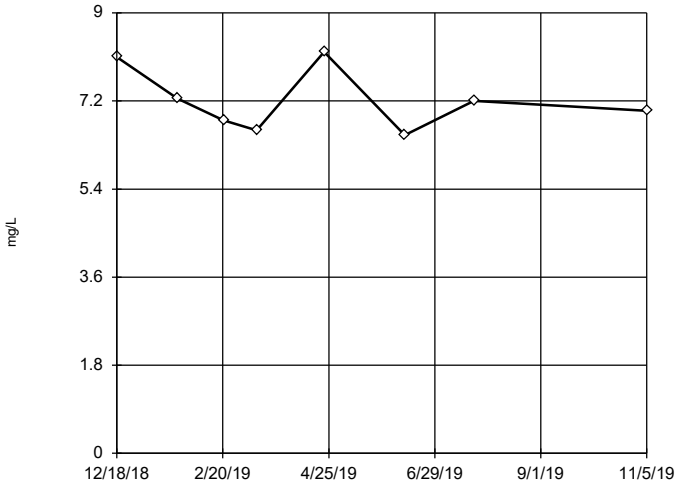
High cutoff = 43.12, low cutoff = -23.46, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1801



n = 8

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 11.47, low cutoff = 4.476, based on IQR multiplier of 3.

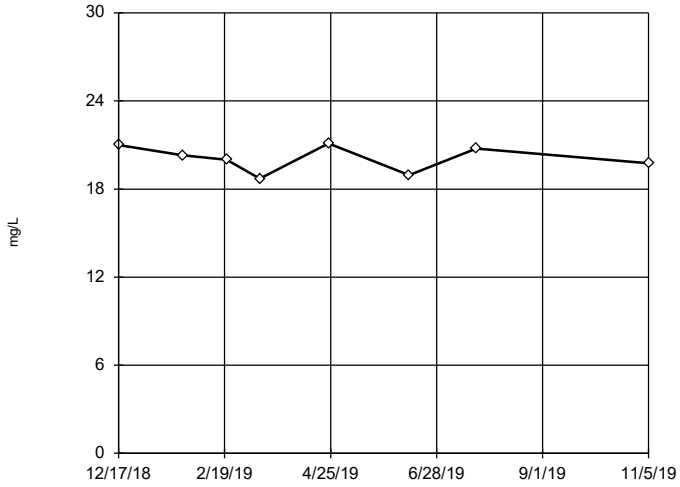
Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



n = 8

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 23.6, low cutoff = -18.26, based on IQR multiplier of 3.

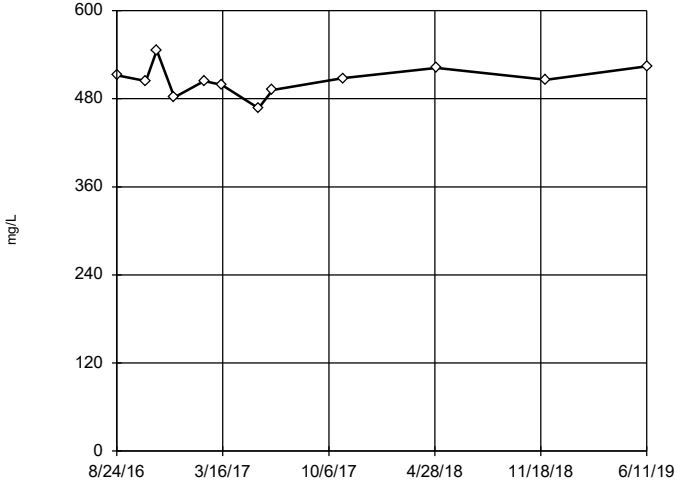
Constituent: Sulfate Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were square root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 584.2, low cutoff = 433.7, based on IQR multiplier of 3.

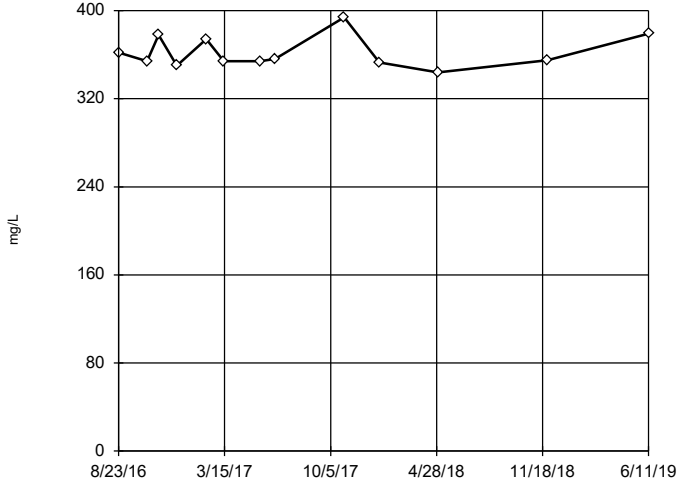
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 13

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

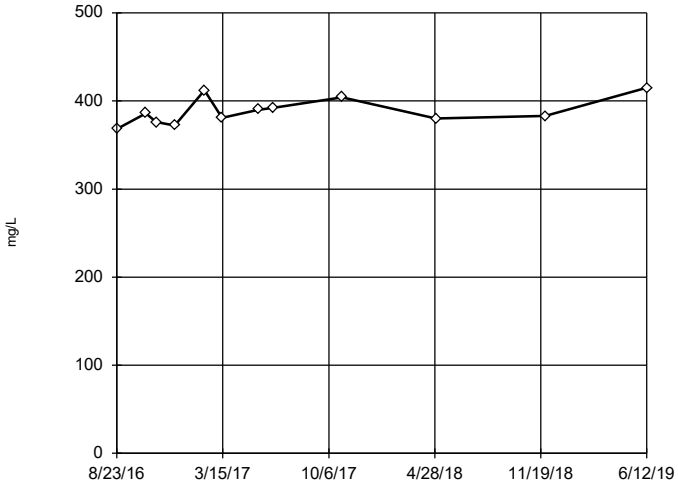
High cutoff = 452.4, low cutoff = 293.8, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-4



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 464.4, low cutoff = 323.9, based on IQR multiplier of 3.

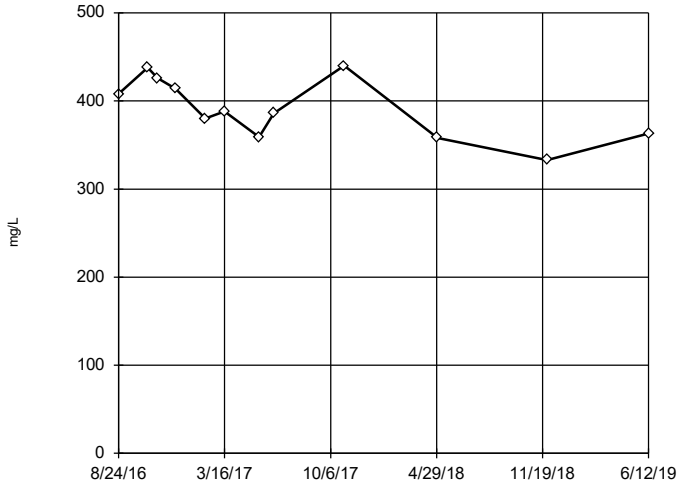
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 634.7, low cutoff = 217.7, based on IQR multiplier of 3.

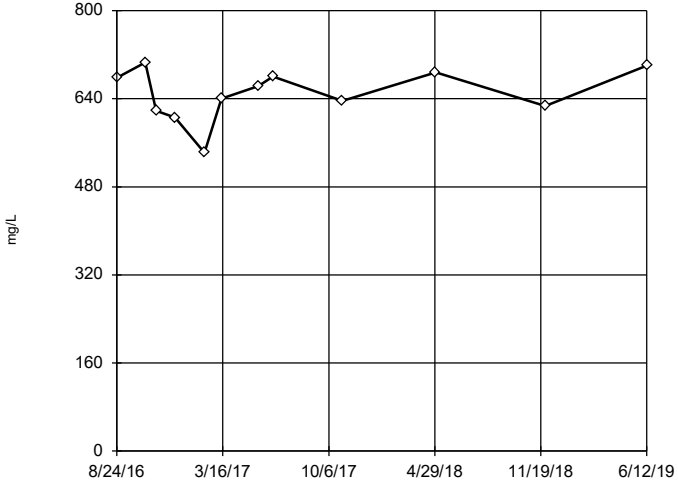
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were x^6 transformed to achieve best W statistic (graph shown in original units).

High cutoff = 785.6, low cutoff = -648.6, based on IQR multiplier of 3.

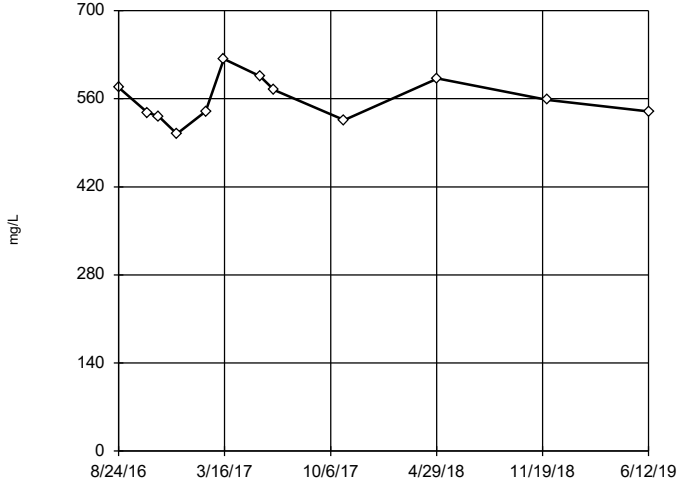
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

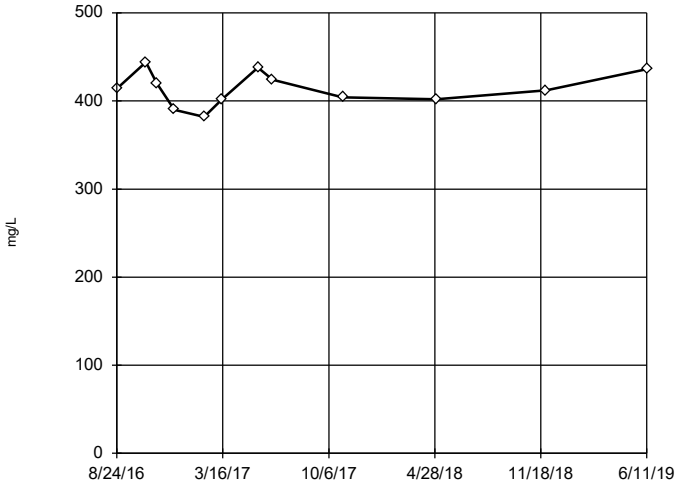
High cutoff = 764.6, low cutoff = 409.3, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 12

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 526, low cutoff = 328.6, based on IQR multiplier of 3.

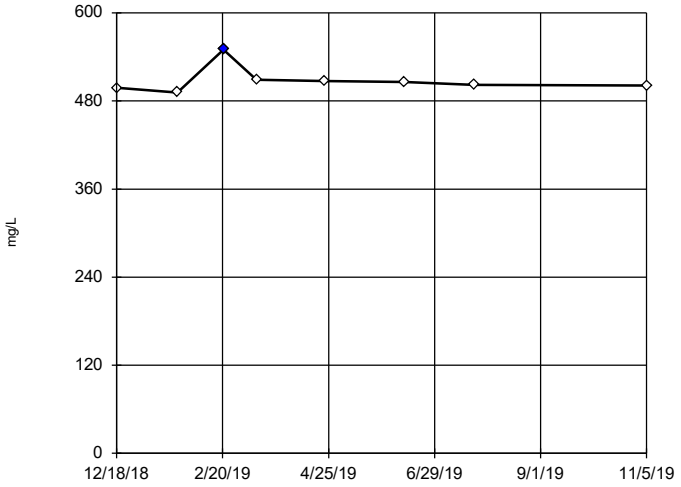
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



n = 8

Outlier is drawn as solid. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 534.4, low cutoff = 474.8, based on IQR multiplier of 3.

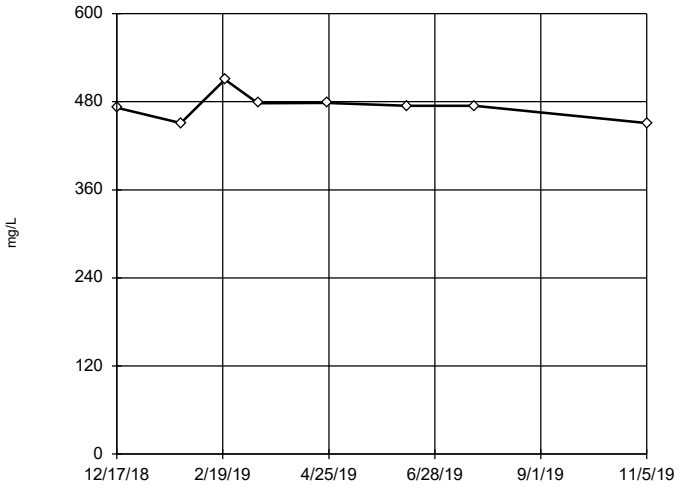
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



n = 8

No outliers found. Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 532.6, low cutoff = 414.3, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:43 AM View: Descriptive

Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney - Significant Results

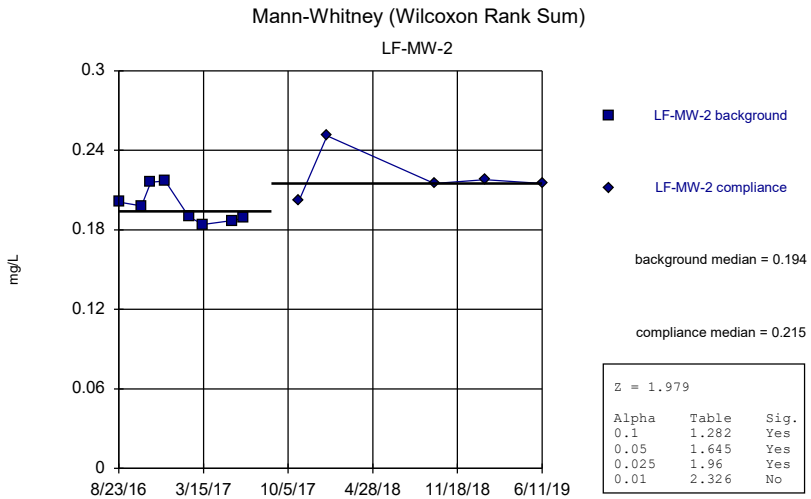
Amos Landfill Client: Geosyntec Data: Amos LF Printed 6/1/2020, 10:11 AM

Constituent	Well	Calc.	0.05	Sig.	Method
Boron (mg/L)	**LF-MW-2**	**1.979**	**Yes**	**Yes**	**Mann-W**
Boron (mg/L)	**LF-MW-7R (bg)**	**2.293**	**Yes**	**Yes**	**Mann-W**
Fluoride (mg/L)	**LF-MW-8 (bg)**	**2.149**	**Yes**	**Yes**	**Mann-W**

Mann-Whitney - All Results

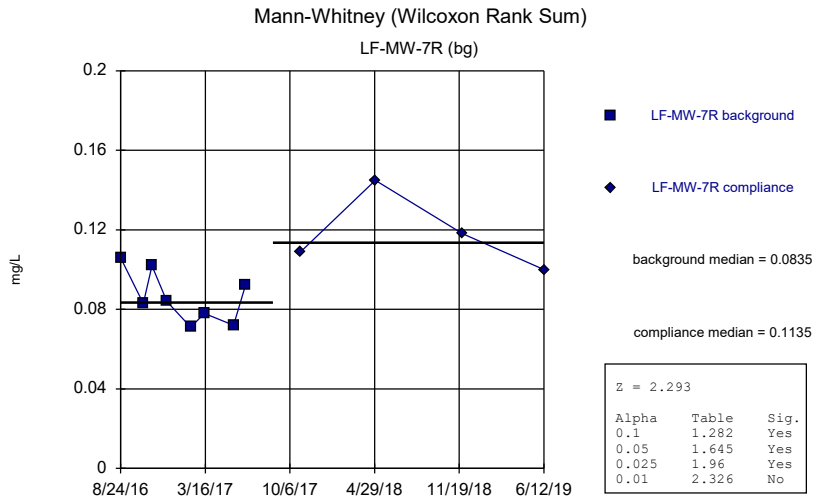
Amos Landfill Client: Geosyntec Data: Amos LF Printed 6/1/2020, 10:11 AM

Constituent	Well	Calc.	0.05	Sig.	Method
Boron (mg/L)	LF-MW-10 (bg)	1.106	No	No	Mann-W
Boron (mg/L)	**LF-MW-2**	**1.979**	**Yes**	**Yes**	**Mann-W**
Boron (mg/L)	LF-MW-4	0.2199	No	No	Mann-W
Boron (mg/L)	LF-MW-6 (bg)	0.7643	No	No	Mann-W
Boron (mg/L)	**LF-MW-7R (bg)**	**2.293**	**Yes**	**Yes**	**Mann-W**
Boron (mg/L)	LF-MW-8 (bg)	0.3403	No	No	Mann-W
Boron (mg/L)	LF-MW-9 (bg)	0.4246	No	No	Mann-W
Calcium (mg/L)	LF-MW-10 (bg)	-1.276	No	No	Mann-W
Calcium (mg/L)	LF-MW-2	1.616	No	No	Mann-W
Calcium (mg/L)	LF-MW-4	-1.967	No	No	Mann-W
Calcium (mg/L)	LF-MW-6 (bg)	-1.613	No	No	Mann-W
Calcium (mg/L)	LF-MW-7R (bg)	0.2548	No	No	Mann-W
Calcium (mg/L)	LF-MW-8 (bg)	-2.39	No	No	Mann-W
Calcium (mg/L)	LF-MW-9 (bg)	-1.953	No	No	Mann-W
Chloride (mg/L)	LF-MW-10 (bg)	1.613	No	No	Mann-W
Chloride (mg/L)	LF-MW-2	-0.5944	No	No	Mann-W
Chloride (mg/L)	LF-MW-4	-1.108	No	No	Mann-W
Chloride (mg/L)	LF-MW-6 (bg)	-1.616	No	No	Mann-W
Chloride (mg/L)	LF-MW-7R (bg)	-0.7643	No	No	Mann-W
Chloride (mg/L)	LF-MW-8 (bg)	-1.61	No	No	Mann-W
Chloride (mg/L)	LF-MW-9 (bg)	-2.463	No	No	Mann-W
Fluoride (mg/L)	LF-MW-10 (bg)	0.5104	No	No	Mann-W
Fluoride (mg/L)	LF-MW-2	0.9846	No	No	Mann-W
Fluoride (mg/L)	LF-MW-4	0.5138	No	No	Mann-W
Fluoride (mg/L)	LF-MW-6 (bg)	1.116	No	No	Mann-W
Fluoride (mg/L)	LF-MW-7R (bg)	0.514	No	No	Mann-W
Fluoride (mg/L)	**LF-MW-8 (bg)**	**2.149**	**Yes**	**Yes**	**Mann-W**
Fluoride (mg/L)	LF-MW-9 (bg)	1.116	No	No	Mann-W
pH, field (SU)	LF-MW-10 (bg)	0.6806	No	No	Mann-W
pH, field (SU)	LF-MW-2	0.2105	No	No	Mann-W
pH, field (SU)	LF-MW-4	-1.274	No	No	Mann-W
pH, field (SU)	LF-MW-6 (bg)	-0.7656	No	No	Mann-W
pH, field (SU)	LF-MW-7R (bg)	-0.5122	No	No	Mann-W
pH, field (SU)	LF-MW-8 (bg)	-0.6806	No	No	Mann-W
pH, field (SU)	LF-MW-9 (bg)	-0.3403	No	No	Mann-W
Sulfate (mg/L)	LF-MW-10 (bg)	0.7643	No	No	Mann-W
Sulfate (mg/L)	LF-MW-2	0.5965	No	No	Mann-W
Sulfate (mg/L)	LF-MW-4	0.5965	No	No	Mann-W
Sulfate (mg/L)	LF-MW-6 (bg)	-1.531	No	No	Mann-W
Sulfate (mg/L)	LF-MW-7R (bg)	-0.3403	No	No	Mann-W
Sulfate (mg/L)	LF-MW-8 (bg)	-1.228	No	No	Mann-W
Sulfate (mg/L)	LF-MW-9 (bg)	-1.613	No	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-10 (bg)	1.616	No	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-2	0.0736	No	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-4	0.9341	No	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-6 (bg)	-1.274	No	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-7R (bg)	0.5944	No	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-8 (bg)	-0.3403	No	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-9 (bg)	-0.3403	No	No	Mann-W



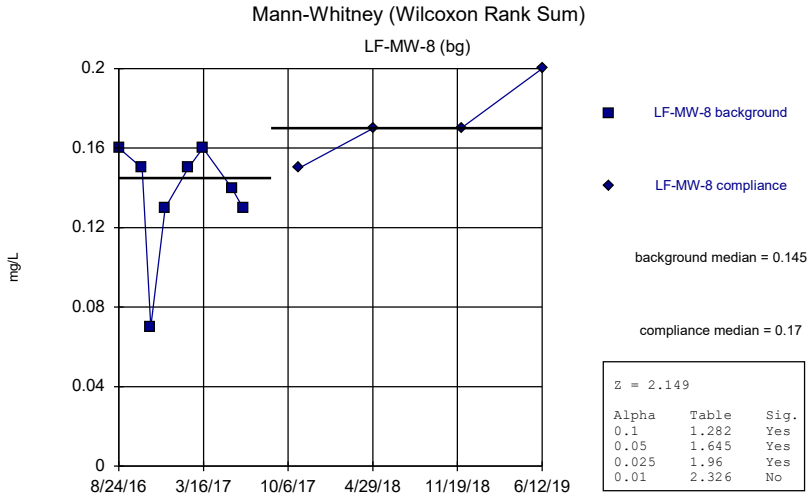
Constituent: Boron Analysis Run 6/1/2020 10:08 AM View: Mann Whitney
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: Boron Analysis Run 6/1/2020 10:08 AM View: Mann Whitney
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: Fluoride Analysis Run 6/1/2020 10:08 AM View: Mann Whitney
Amos Landfill Client: Geosyntec Data: Amos LF

Trend Test Summary - All Results (No Significant)

Amos Landfill Client: Geosyntec Data: Amos LF Printed 5/30/2020, 9:40 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron (mg/L)	MW-1801	-0.01711	-5	-21	No	8	0	n/a	n/a	0.01	NP
Boron (mg/L)	MW-1802	-0.0002861	0	21	No	8	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-1801	-0.3443	-14	-21	No	8	0	n/a	n/a	0.01	NP
Calcium (mg/L)	MW-1802	0.0849	6	21	No	8	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-1801	1.313	12	21	No	8	0	n/a	n/a	0.01	NP
Chloride (mg/L)	MW-1802	1.152	12	21	No	8	0	n/a	n/a	0.01	NP
Fluoride (mg/L)	MW-1801	0.4928	18	21	No	8	0	n/a	n/a	0.01	NP
Fluoride (mg/L)	MW-1802	0.01251	0	21	No	8	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-1801	-0.1838	-2	-21	No	8	0	n/a	n/a	0.01	NP
pH, field (SU)	MW-1802	-0.3232	-12	-21	No	8	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	MW-1801	-0.8453	-8	-21	No	8	0	n/a	n/a	0.01	NP
Sulfate (mg/L)	MW-1802	-1.06	-6	-21	No	8	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-1801	-9.311	-4	-21	No	8	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-1802	-11.86	-4	-21	No	8	0	n/a	n/a	0.01	NP

Intrawell Prediction Limits

Amos Landfill Client: Geosyntec Data: Amos LF Printed 5/30/2020, 10:02 AM

Constituent	Well	Upper Lim.	Lower Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	LF-MW-10	0.1787	n/a	12	0.1054	0.03285	0	None	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-2	0.2466	n/a	13	0.2064	0.01836	0	None	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-4	0.2142	n/a	13	0.1775	0.01671	0	None	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-6	0.2019	n/a	12	0.1289	0.0327	0	None	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-7R	0.1445	n/a	12	0.09667	0.02144	0	None	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-8	0.09394	n/a	12	0.04258	0.02301	0	None	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-9	0.1756	n/a	12	0.2748	0.06465	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Boron (mg/L)	MW-1801	0.3059	n/a	8	0.2544	0.01971	0	None	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	MW-1802	0.2764	n/a	8	0.2453	0.01187	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-10	2.234	n/a	12	1.145	0.1569	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-2	2.101	n/a	12	1.691	0.1839	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-4	0.9119	n/a	12	0.8141	0.04383	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-6	46.46	n/a	12	37.97	3.803	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-7R	43.01	n/a	12	5.8	0.3395	0	None	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-8	151.6	n/a	12	135	7.435	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-9	111.5	n/a	12	89.58	9.833	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	MW-1801	1.827	n/a	8	1.511	0.1208	0	None	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	MW-1802	0.978	n/a	8	0.8776	0.03836	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-10	6.148	n/a	12	4.827	0.5919	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-2	5.4	n/a	12	3.683	0.7693	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-4	15.87	n/a	12	14.64	0.5485	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-6	8.371	n/a	12	7.332	0.4657	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-7R	4.235	n/a	12	3.786	0.2013	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-8	15.55	n/a	11	164	33.87	0	None	x^2	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-9	6.539	n/a	12	6.181	0.1603	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	MW-1801	12.09	n/a	8	10.94	0.4406	0	None	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	MW-1802	10.19	n/a	8	9.032	0.4442	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-10	1.007	n/a	12	0.6167	0.1749	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-2	1.605	n/a	15	1.295	0.1463	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-4	1.524	n/a	13	1.406	0.05378	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-6	0.288	n/a	12	0.2375	0.02261	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-7R	0.3969	n/a	12	0.2975	0.04454	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-8	0.2182	n/a	12	0.1483	0.03129	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-9	0.2719	n/a	12	0.2	0.03219	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	MW-1801	5.674	n/a	8	5.25	0.1621	0	None	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	MW-1802	5.356	n/a	8	4.854	0.1921	0	None	No	0.00188	Param Intra 1 of 2
pH, field (SU)	LF-MW-10	9.584	8.335	12	8.959	0.2798	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-2	9.019	8.174	16	8.596	0.2036	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-4	10.09	8.328	12	9.208	0.3942	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-6	8.002	7.208	12	7.605	0.178	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-7R	8.085	7.05	12	7.568	0.2316	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-8	7.6	6.8	12	n/a	n/a	0	n/a	n/a	0.02155	NP Intra (normality) 1 of 2
pH, field (SU)	LF-MW-9	7.507	6.871	12	7.189	0.1424	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	MW-1801	9.53	8.463	8	8.996	0.204	0	None	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	MW-1802	9.51	8.69	8	9.1	0.1568	0	None	No	0.0009398	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-10	19.74	n/a	12	15.83	1.748	0	None	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-2	12.93	n/a	12	9.1	1.714	0	None	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-4	12.23	n/a	12	9.042	1.428	0	None	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-6	64.81	n/a	12	36.44	12.71	0	None	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-7R	256.3	n/a	12	219.4	16.52	0	None	No	0.00188	Param Intra 1 of 2

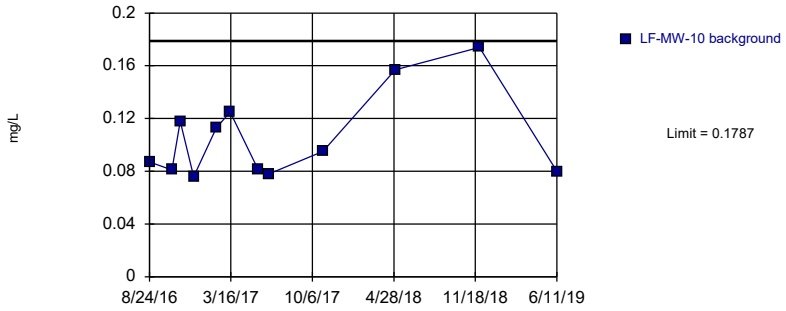
Intrawell Prediction Limits

Amos Landfill Client: Geosyntec Data: Amos LF Printed 5/30/2020, 10:02 AM

Constituent	Well	Upper Lim.	Lower Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Sulfate (mg/L)	LF-MW-8	86.69	n/a	11	67.95	8.15	0	None	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-9	40.28	n/a	12	35.06	2.338	0	None	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	MW-1801	8.879	n/a	8	7.206	0.6394	0	None	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	MW-1802	22.43	n/a	8	20.07	0.9008	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-10	551	n/a	12	505.5	20.38	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-2	394	n/a	13	362.1	14.55	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-4	422	n/a	12	388.3	15.14	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-6	468	n/a	12	391.1	34.47	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-7R	753.7	n/a	12	648.7	47.06	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-8	635.6	n/a	12	558.4	34.57	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-9	457	n/a	12	414	19.28	0	None	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-1801	550	n/a	8	n/a	n/a	0	n/a	n/a	0.02144	NP Intra (normality) 1 of 2
Total Dissolved Solids (mg/L)	MW-1802	522.1	n/a	8	473.7	18.49	0	None	No	0.00188	Param Intra 1 of 2

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=0.1054, Std. Dev.=0.03285, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.835, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

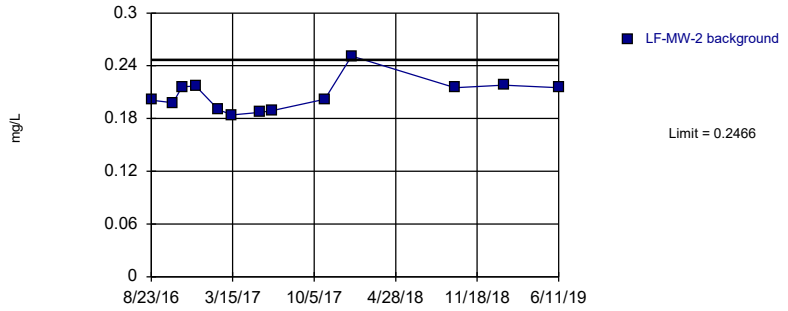
Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



Background Data Summary: Mean=0.2064, Std. Dev.=0.01836, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8908, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

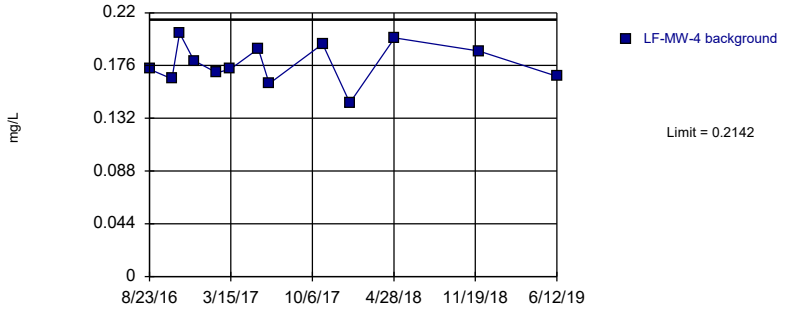
Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



Background Data Summary: Mean=0.1775, Std. Dev.=0.01671, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9699, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

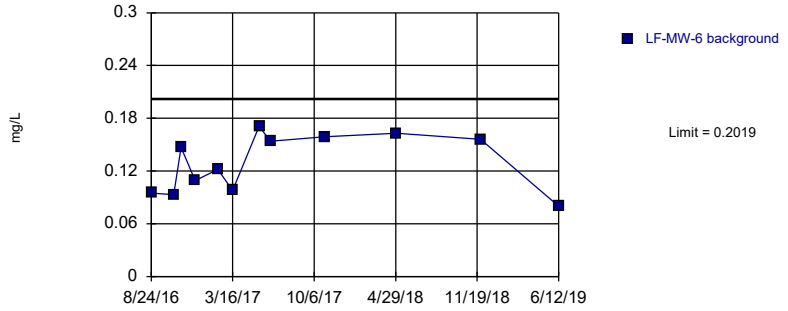
Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



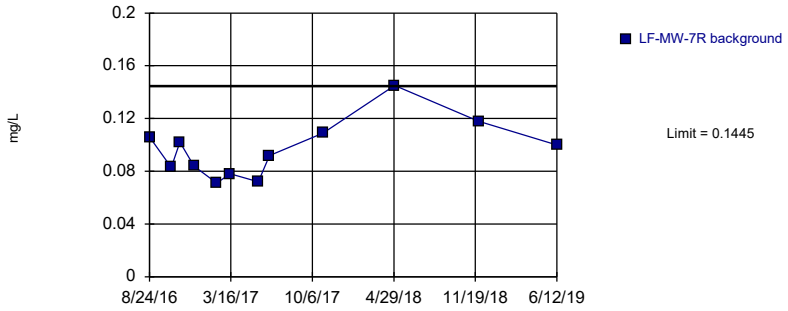
Background Data Summary: Mean=0.1289, Std. Dev.=0.0327, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8885, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



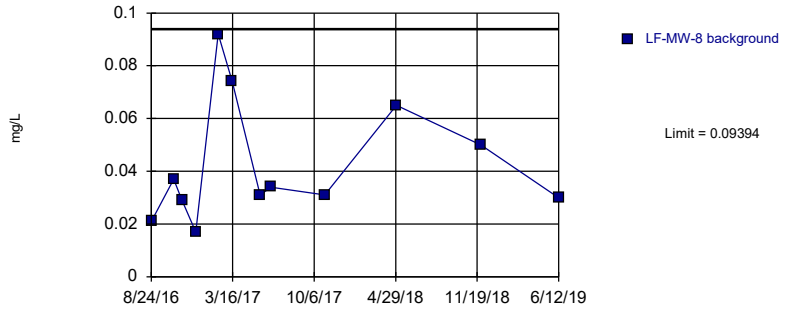
Background Data Summary: Mean=0.09667, Std. Dev.=0.02144, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.932, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



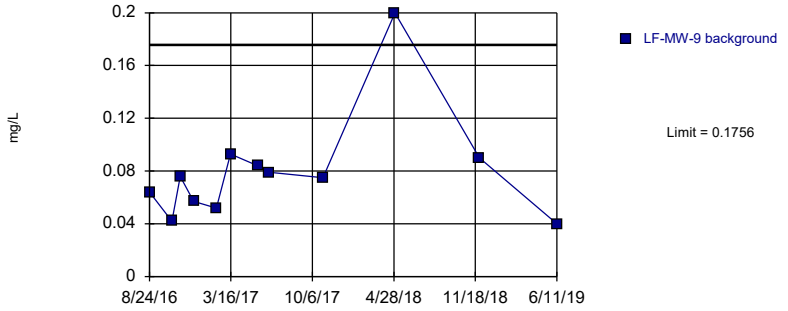
Background Data Summary: Mean=0.04258, Std. Dev.=0.02301, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8645, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



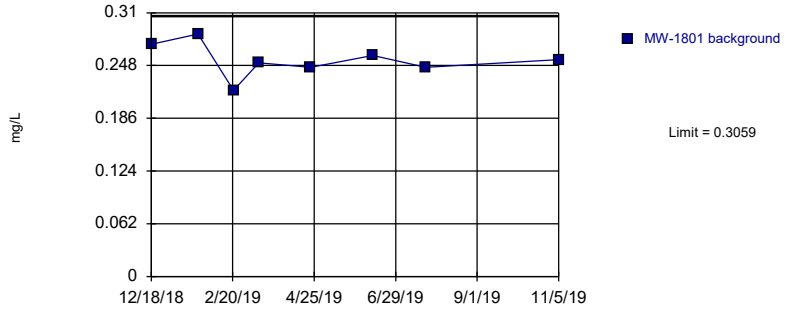
Background Data Summary (based on square root transformation): Mean=0.2748, Std. Dev.=0.06465, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8376, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1801

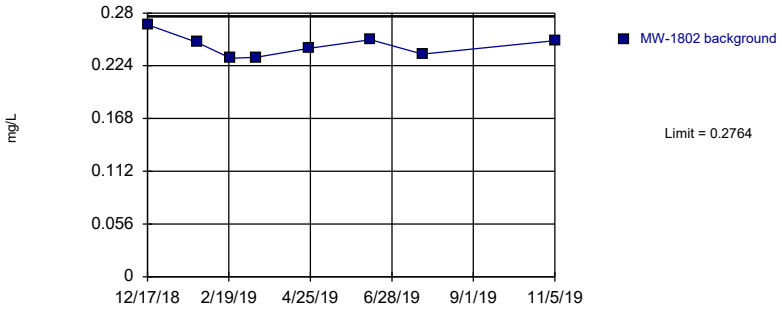


Background Data Summary: Mean=0.2544, Std. Dev.=0.01971, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.962, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=0.2453, Std. Dev.=0.01187, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.922, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

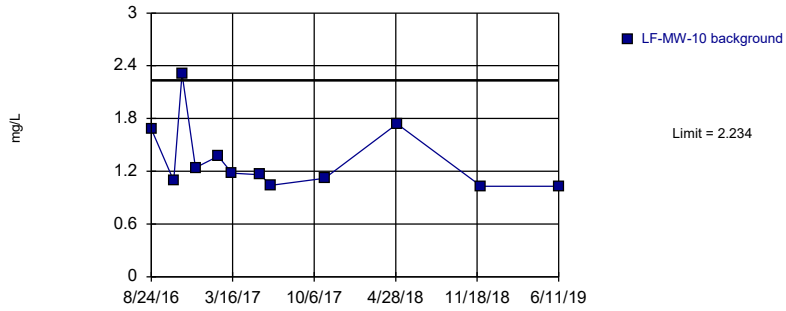
Constituent: Boron Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary (based on square root transformation): Mean=1.145, Std. Dev.=0.1569, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.809, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

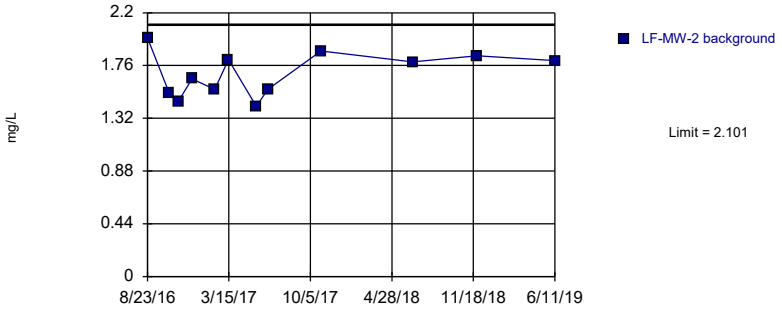
Constituent: Calcium Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



Background Data Summary: Mean=1.691, Std. Dev.=0.1839, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9376, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

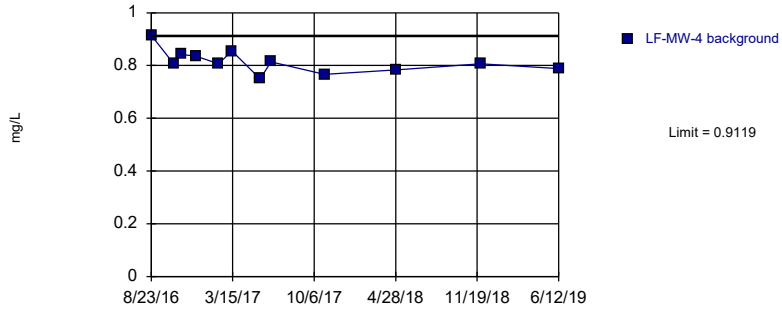
Constituent: Calcium Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



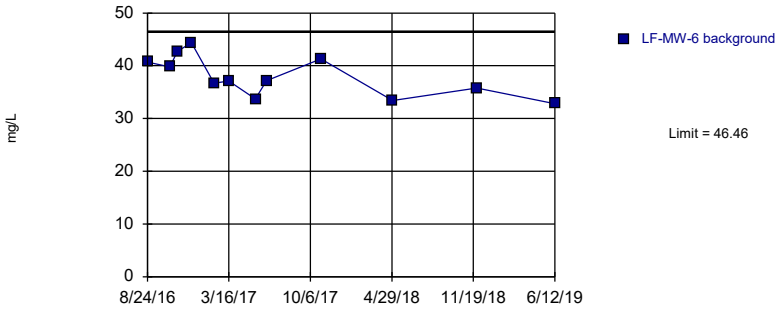
Background Data Summary: Mean=0.8141, Std. Dev.=0.04383, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9473, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



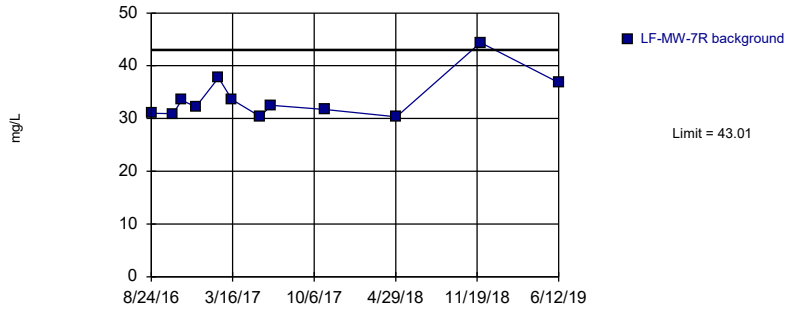
Background Data Summary: Mean=37.97, Std. Dev.=3.803, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9497, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



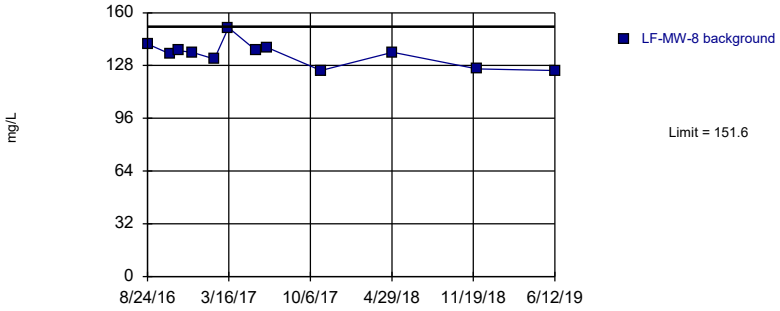
Background Data Summary (based on square root transformation): Mean=5.8, Std. Dev.=0.3395, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8101, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 5/30/2020 9:55 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



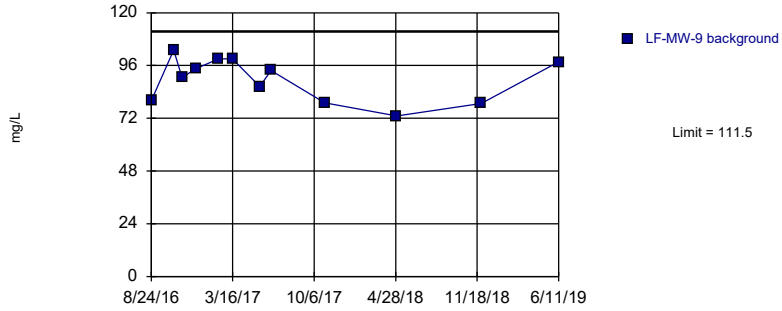
Background Data Summary: Mean=135, Std. Dev.=7.435, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9148, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



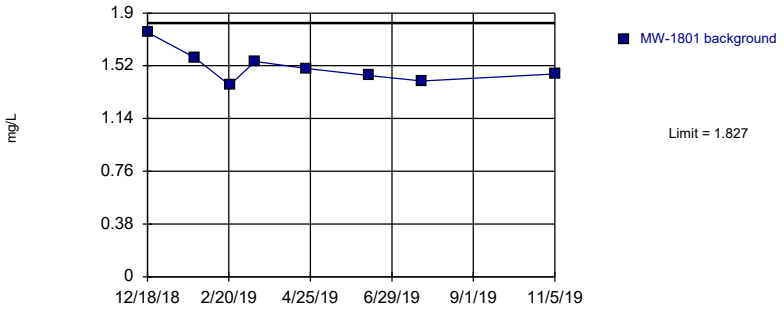
Background Data Summary: Mean=89.58, Std. Dev.=9.833, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9271, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1801



Background Data Summary: Mean=1.511, Std. Dev.=0.1208, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9019, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

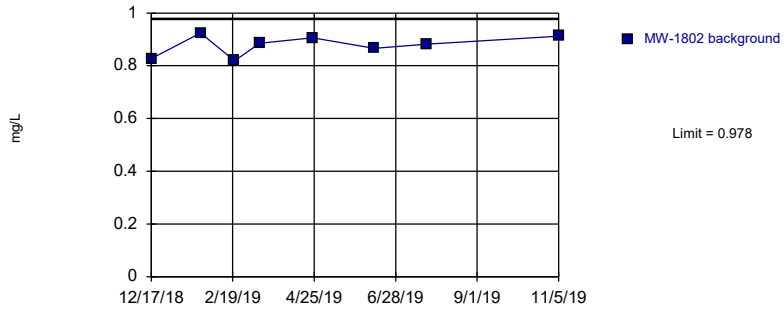
Constituent: Calcium Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=0.8776, Std. Dev.=0.03836, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9235, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

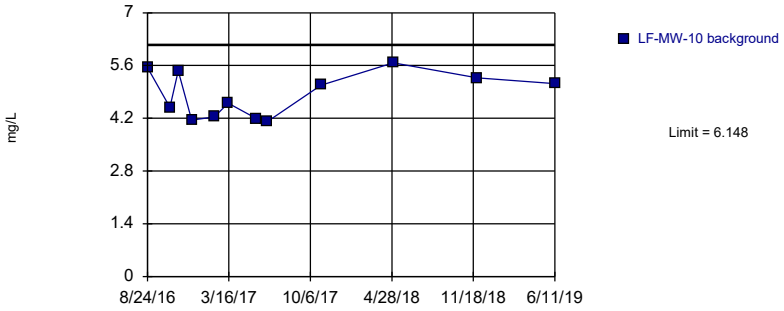
Constituent: Calcium Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=4.827, Std. Dev.=0.5919, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8884, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

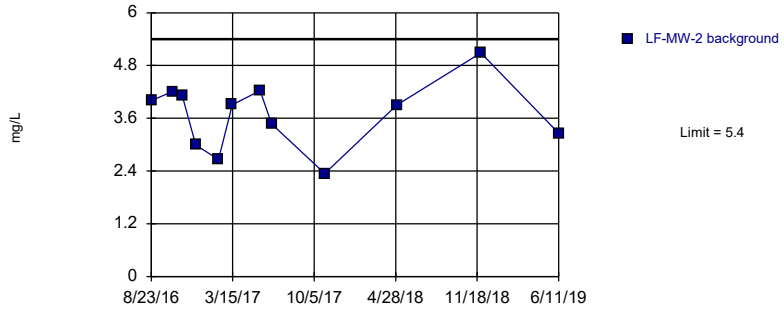
Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



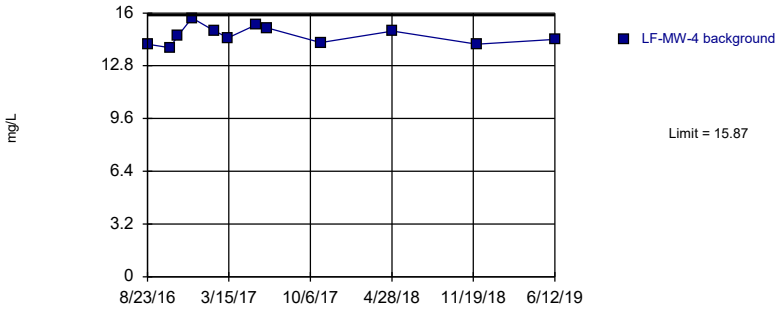
Background Data Summary: Mean=3.683, Std. Dev.=0.7693, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9609, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-4



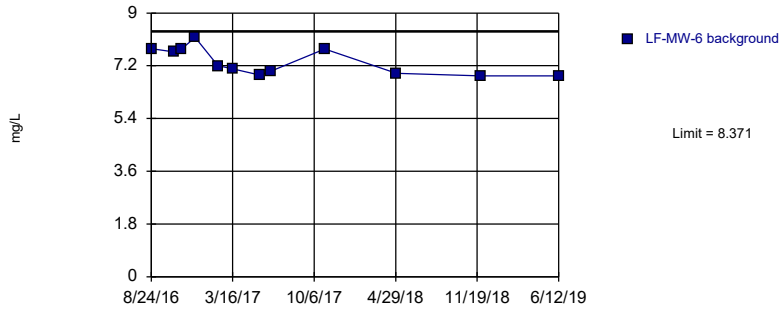
Background Data Summary: Mean=14.64, Std. Dev.=0.5485, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9568, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



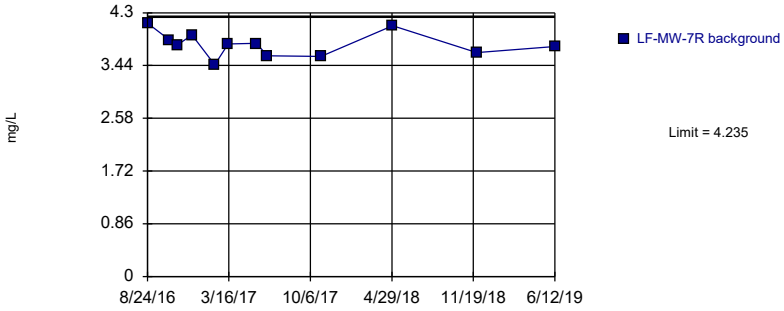
Background Data Summary: Mean=7.332, Std. Dev.=0.4657, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8604, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



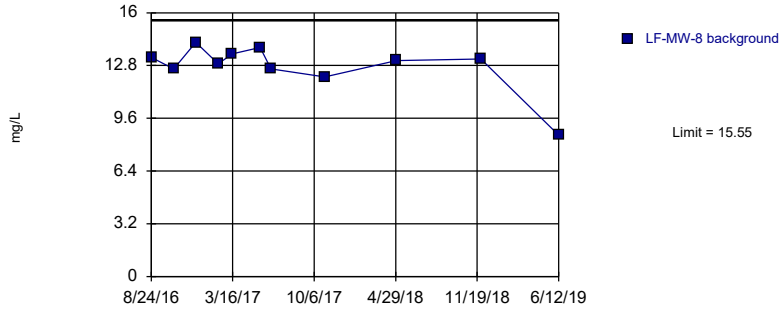
Background Data Summary: Mean=3.786, Std. Dev.=0.2013, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9668, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)

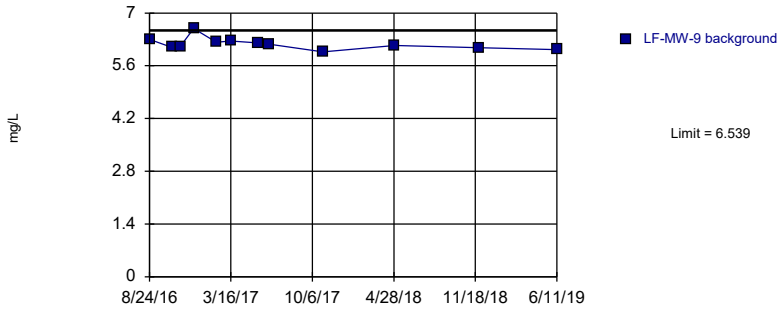


Background Data Summary (based on square transformation): Mean=164, Std. Dev.=33.87, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7978, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



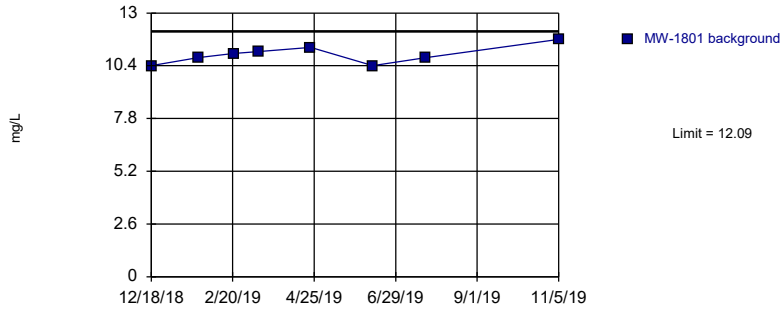
Background Data Summary: Mean=6.181, Std. Dev.=0.1603, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8922, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1801



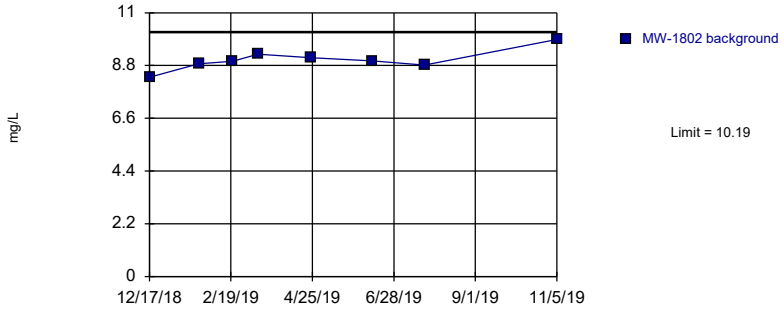
Background Data Summary: Mean=10.94, Std. Dev.=0.4406, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9481, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



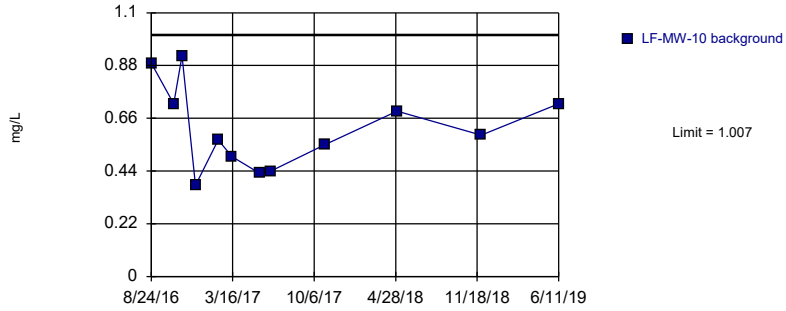
Background Data Summary: Mean=9.032, Std. Dev.=0.4442, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.935, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)

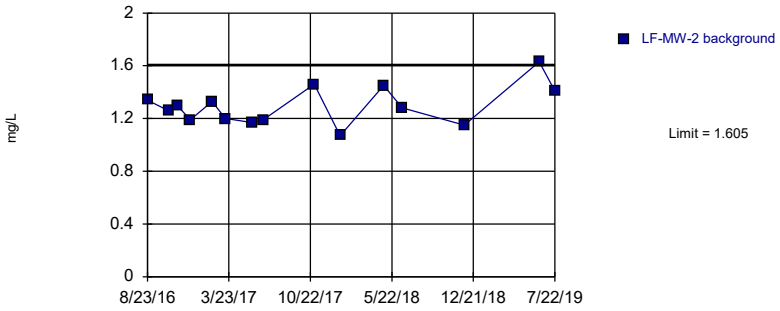


Background Data Summary: Mean=0.6167, Std. Dev.=0.1749, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9411, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-2



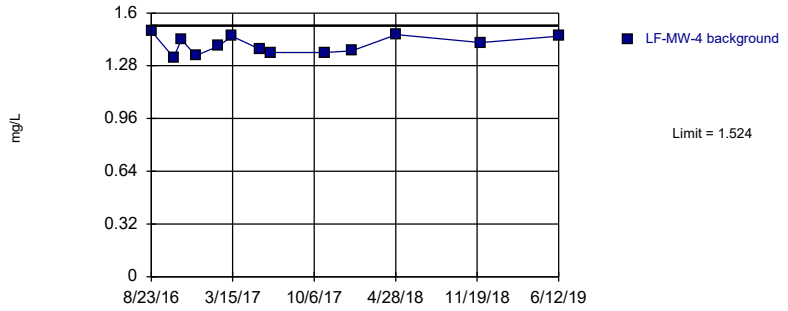
Background Data Summary: Mean=1.295, Std. Dev.=0.1463, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9567, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



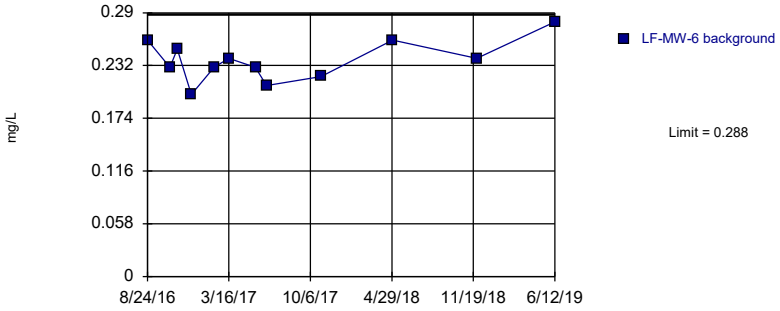
Background Data Summary: Mean=1.406, Std. Dev.=0.05378, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9336, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



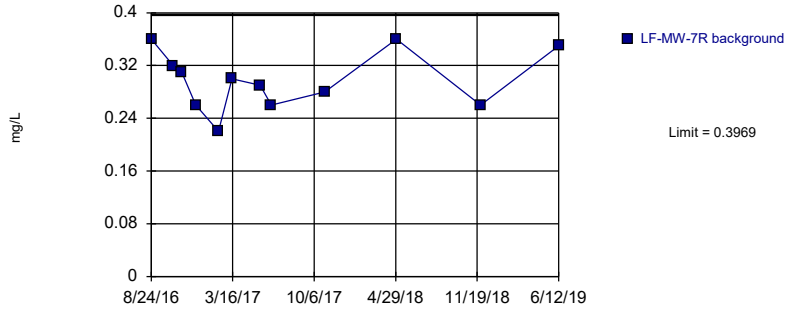
Background Data Summary: Mean=0.2375, Std. Dev.=0.02261, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.979, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)

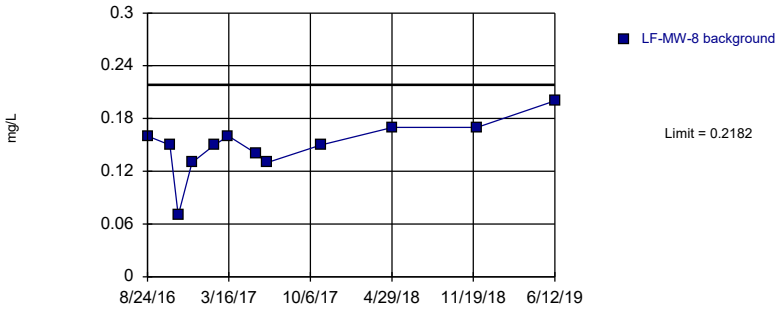


Background Data Summary: Mean=0.2975, Std. Dev.=0.04454, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9449, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



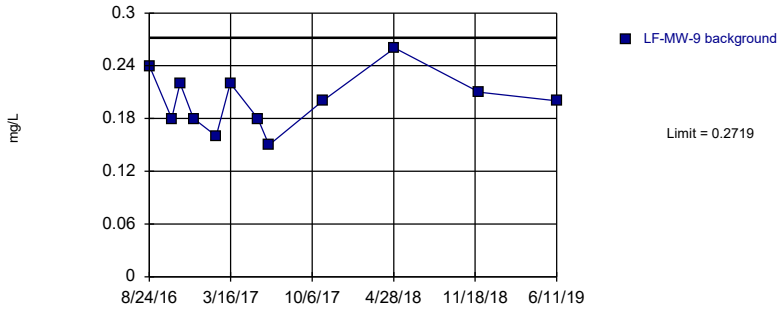
Background Data Summary: Mean=0.1483, Std. Dev.=0.03129, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8912, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



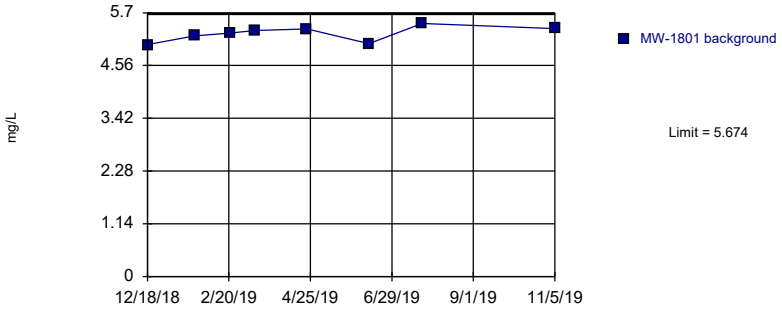
Background Data Summary: Mean=0.2, Std. Dev.=0.03219, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9731, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1801



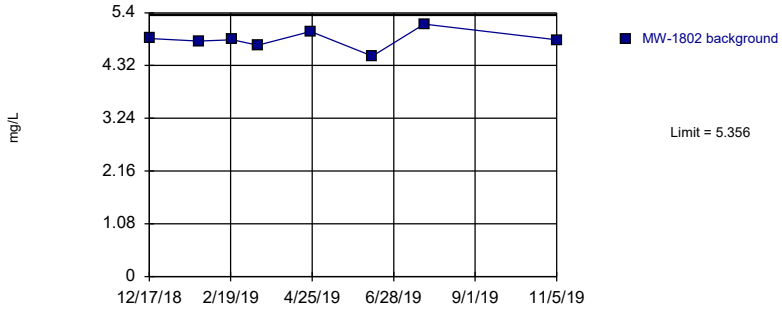
Background Data Summary: Mean=5.25, Std. Dev.=0.1621, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9239, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802

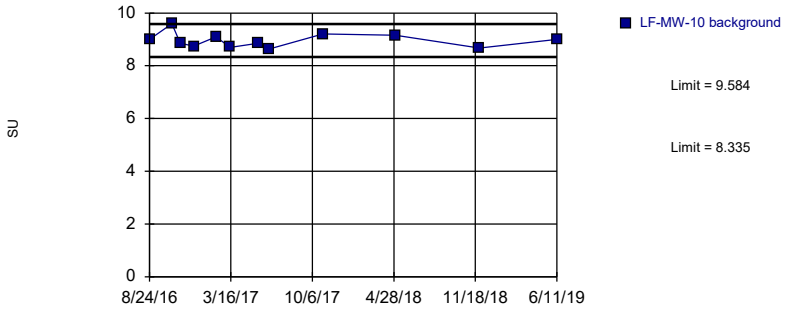


Background Data Summary: Mean=4.854, Std. Dev.=0.1921, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9546, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



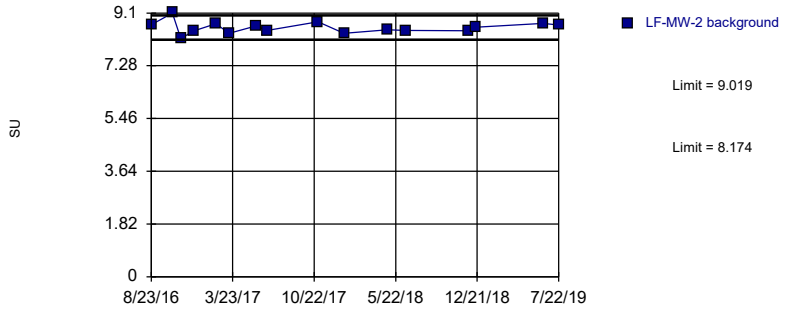
Background Data Summary: Mean=8.959, Std. Dev.=0.2798, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9208, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



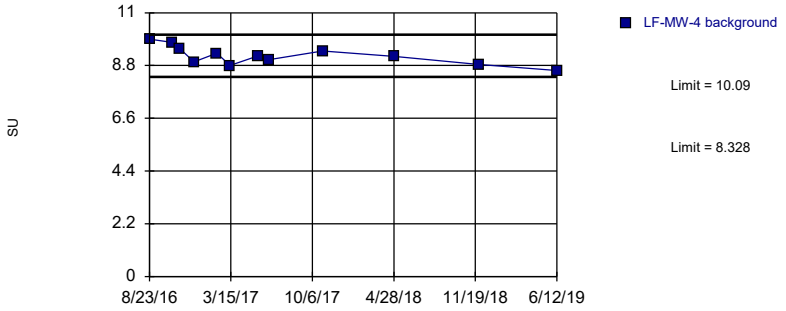
Background Data Summary: Mean=8.596, Std. Dev.=0.2036, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9506, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



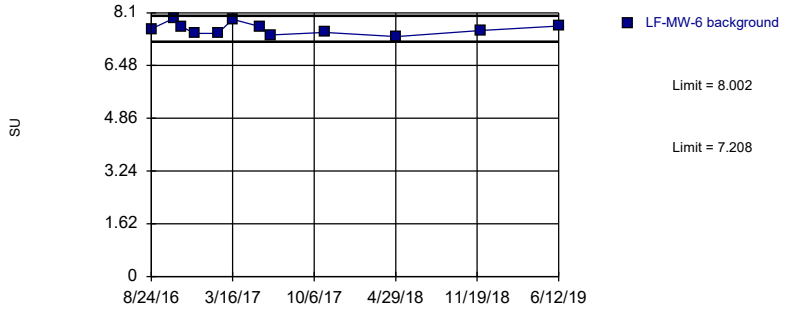
Background Data Summary: Mean=9.208, Std. Dev.=0.3942, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.978, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)

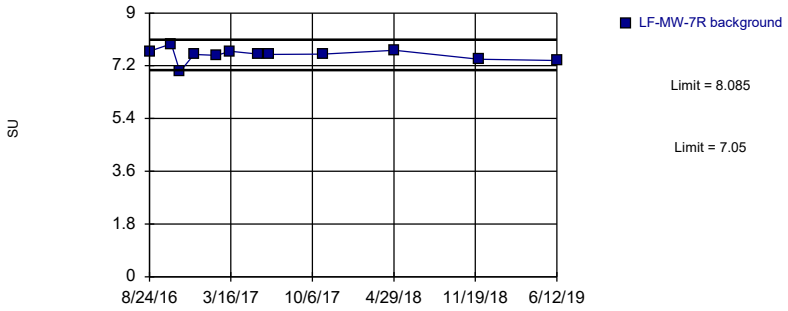


Background Data Summary: Mean=7.605, Std. Dev.=0.178, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9253, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



Background Data Summary: Mean=7.568, Std. Dev.=0.2316, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.896, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

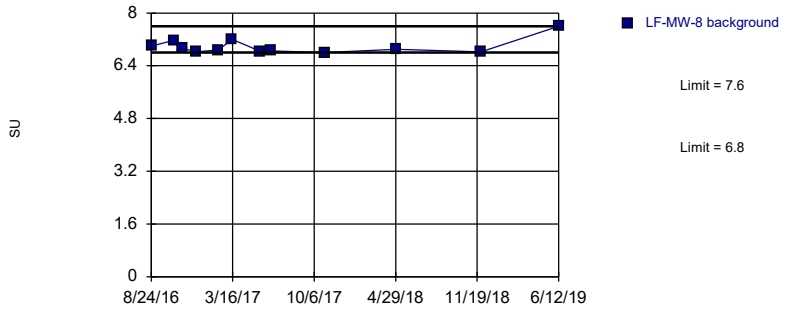
Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, LF-MW-8 (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 12 background values. Well-constituent pair annual alpha = 0.04286. Individual comparison alpha = 0.02155 (1 of 2). Assumes 1 future value.

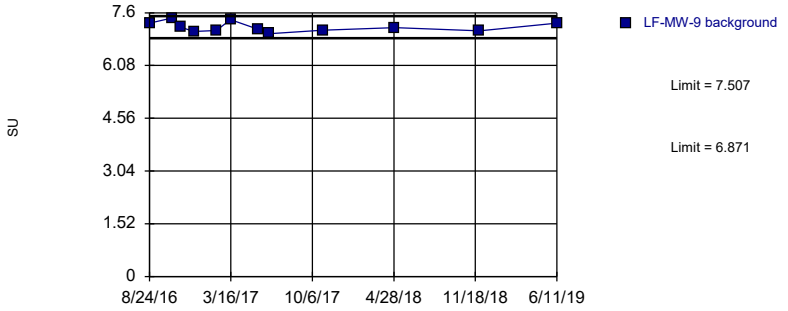
Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



Background Data Summary: Mean=7.189, Std. Dev.=0.1424, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9234, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

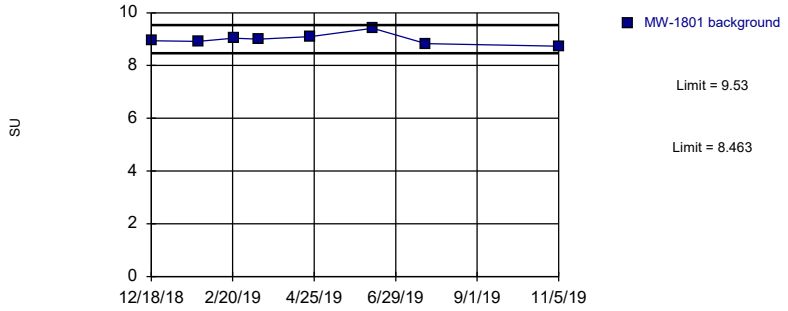
Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1801



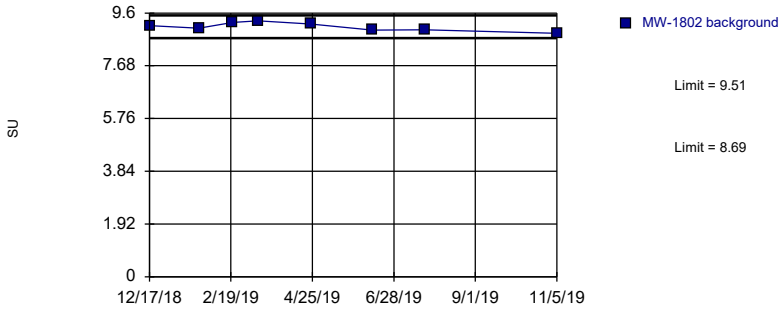
Background Data Summary: Mean=8.996, Std. Dev.=0.204, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9324, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=9.1, Std. Dev.=0.1568, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9697, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

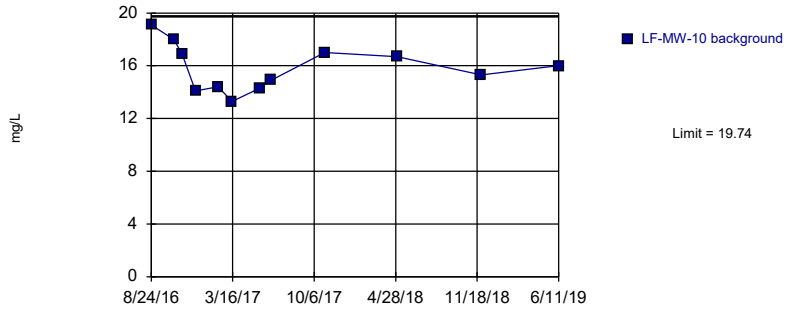
Constituent: pH, field Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=15.83, Std. Dev.=1.748, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9627, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

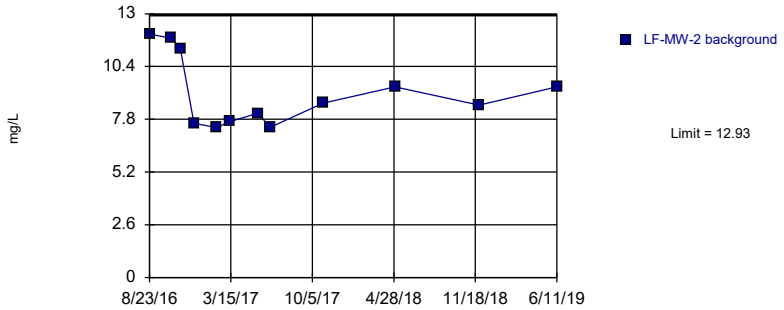
Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



Background Data Summary: Mean=9.1, Std. Dev.=1.714, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8503, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

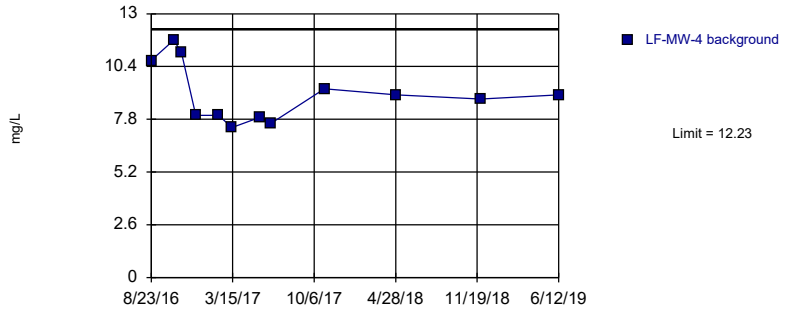
Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



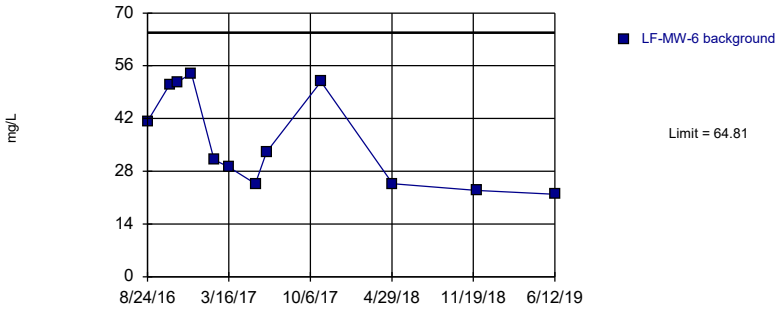
Background Data Summary: Mean=9.042, Std. Dev.=1.428, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8947, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



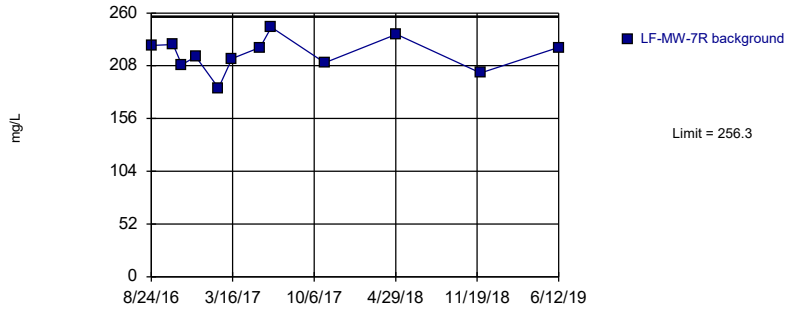
Background Data Summary: Mean=36.44, Std. Dev.=12.71, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8504, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



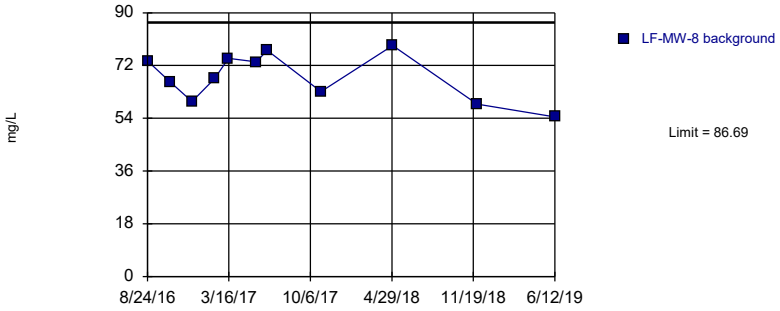
Background Data Summary: Mean=219.4, Std. Dev.=16.52, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9769, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



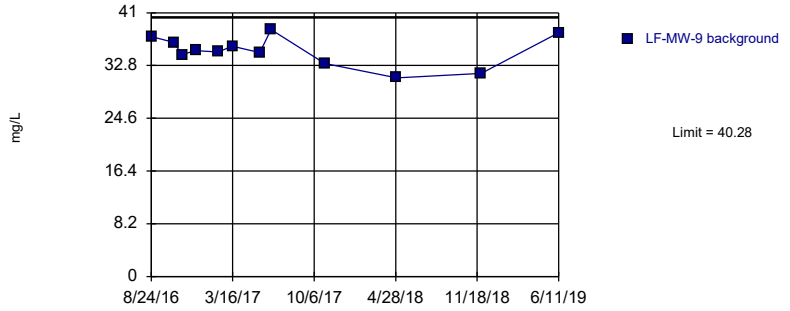
Background Data Summary: Mean=67.95, Std. Dev.=8.15, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9426, critical = 0.792. Kappa = 2.3 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



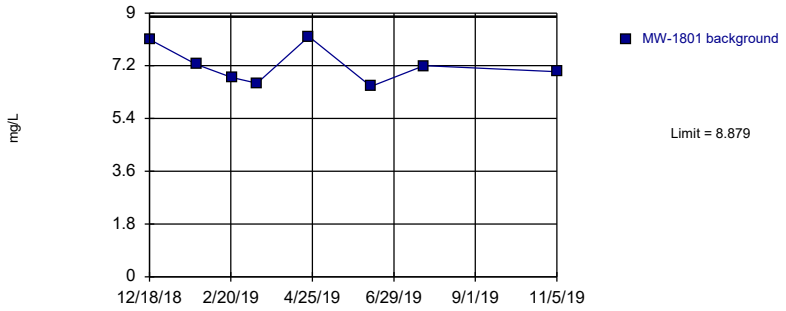
Background Data Summary: Mean=35.06, Std. Dev.=2.338, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9575, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1801



Background Data Summary: Mean=7.206, Std. Dev.=0.6394, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8867, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

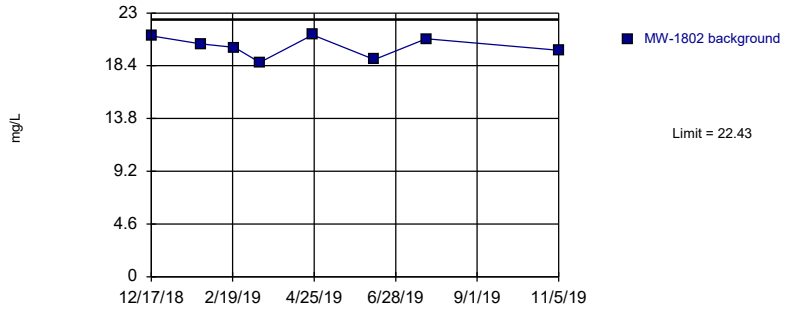
Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=20.07, Std. Dev.=0.9008, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9251, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

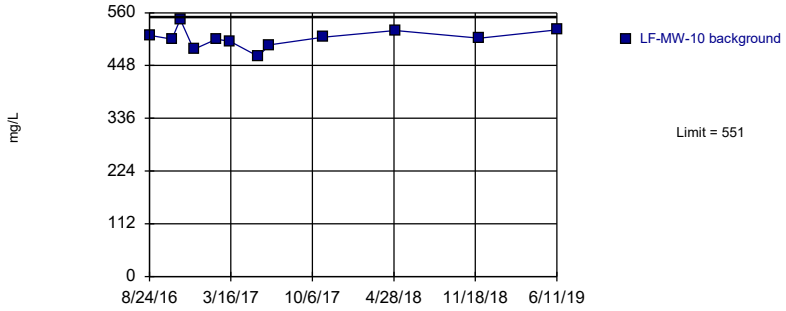
Constituent: Sulfate Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=505.5, Std. Dev.=20.38, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9756, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

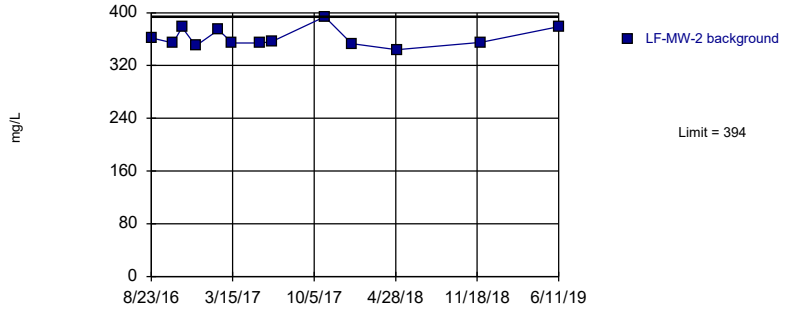
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



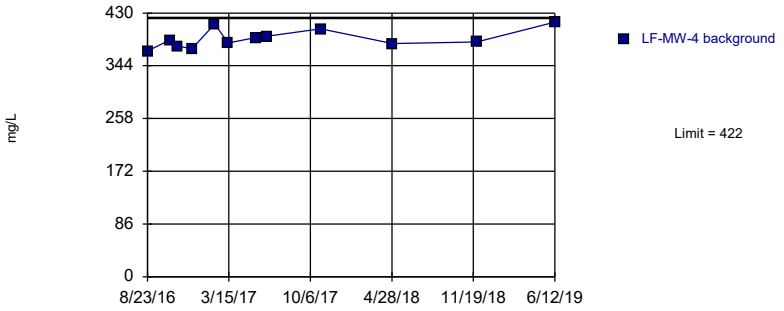
Background Data Summary: Mean=362.1, Std. Dev.=14.55, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8652, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-4



Background Data Summary: Mean=388.3, Std. Dev.=15.14, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9298, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

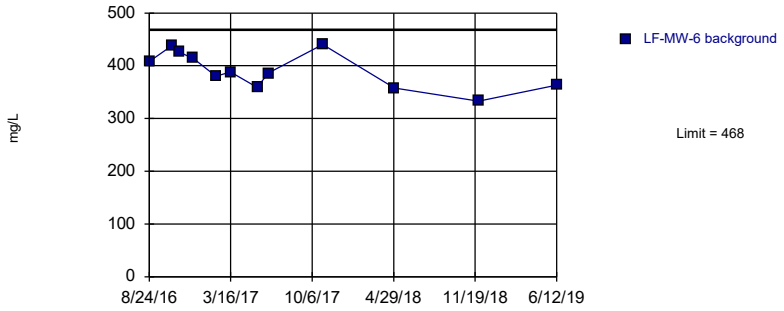
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



Background Data Summary: Mean=391.1, Std. Dev.=34.47, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9536, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

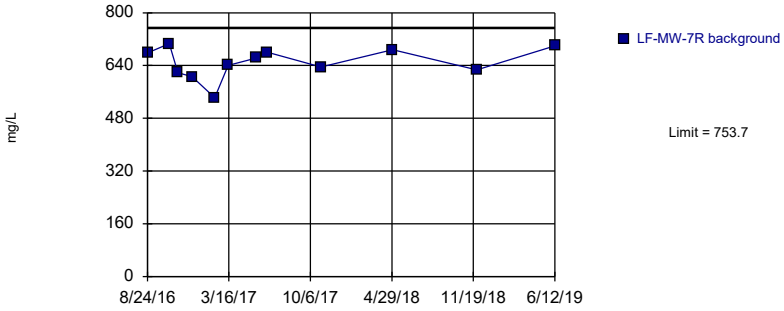
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-7R (bg)



Background Data Summary: Mean=648.7, Std. Dev.=47.06, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9292, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

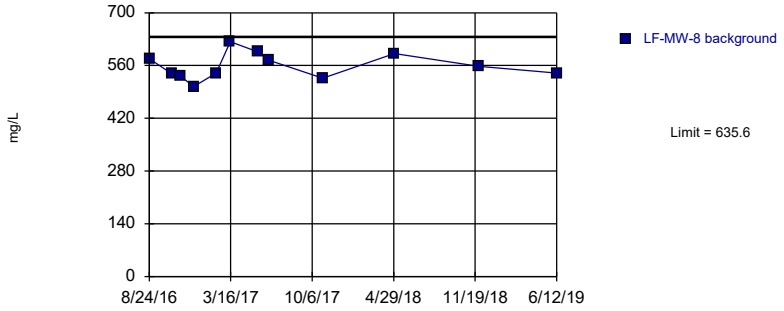
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



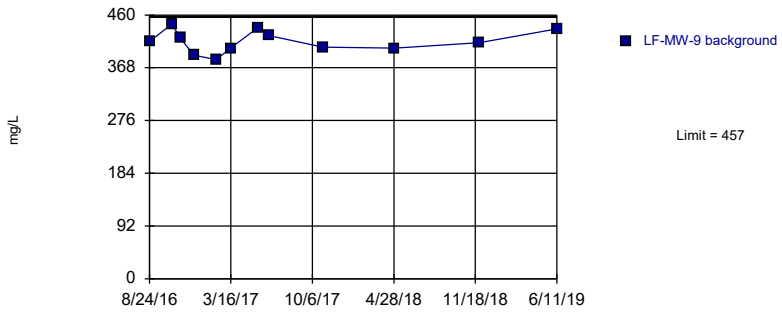
Background Data Summary: Mean=558.4, Std. Dev.=34.57, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9635, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



Background Data Summary: Mean=414, Std. Dev.=19.28, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9681, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

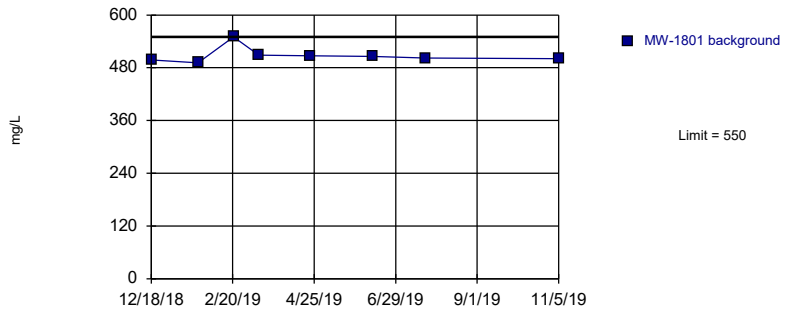
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, MW-1801



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 8 background values. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2). Assumes 1 future value.

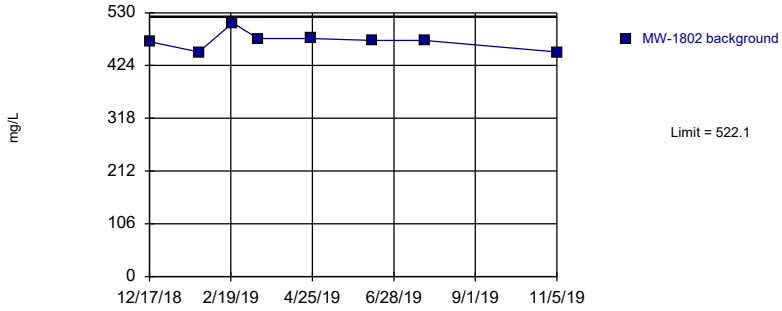
Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.25a Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=473.7, Std. Dev.=18.49, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.863, critical = 0.749. Kappa = 2.616 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 5/30/2020 9:56 AM View: PLs

Amos Landfill Client: Geosyntec Data: Amos LF

Geosyntec consultants

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Columbus, Ohio 43212
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	April 3, 2020
To:	David Miller (AEP)
Copies to:	Benjamin Kepchar (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Amos Plant's Landfill (LF)

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the second semi-annual detection monitoring event at the Landfill (LF), an existing CCR unit at the Amos Power Plant located in Winfield, West Virginia was completed on November 5-6, 2019. Based on the results, verification sampling was completed on February 11, 2020.

Background values for the LF were previously calculated in January 2018. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the dataset was updated as appropriate. Revised upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec's *Statistical Analysis Summary* report, dated February 27, 2020.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is concluded only if both samples in a series of two exceed the UPL (or are below the LPL for pH). In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are compared in Table 1 and noted exceedances are described in the list below.

- Calcium concentrations exceeded the intrawell UPL of 18.1 mg/L in both the initial (18.3 mg/L) and second (18.5 mg/L) samples collected at MW-5. While the results of the duplicate sample collected during the second event (17.1 mg/L) were below the UPL, an SSI over background is concluded for calcium at MW-5 based on the results of the parent sample.

In response to the exceedance noted above, the Amos LF CCR unit will either transition to assessment monitoring or an alternative source demonstration (ASD) for calcium will be conducted in accordance with 40 CFR 257.94(e)(2). If the ASD is successful, the Amos LF will remain in detection monitoring.

The statistical analysis was conducted within 90 days of completion of sampling and analysis in accordance with 40 CFR 257.93(h)(2). A certification of these statistics by a qualified professional engineer is provided in Attachment A.

Table 1: Detection Monitoring Data Evaluation
Amos Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	Description	MW-1	MW-2		MW-4	MW-5	MW-5
			11/6/2019	11/6/2019	2/11/2020	11/6/2019	11/5/2019	2/11/2020
Boron	mg/L	Intrawell Background Value (UPL)	0.162	0.247		0.214	0.135	
		Detection Monitoring Result	0.0400	0.203	--	0.173	0.0300	--
Calcium	mg/L	Intrawell Background Value (UPL)	31.7	2.10		0.912	18.1	
		Detection Monitoring Result	30.1	1.73	--	0.761	**18.3**	**18.5***
Chloride	mg/L	Intrawell Background Value (UPL)	3.60	5.40		15.9	5.37	
		Detection Monitoring Result	3.20	3.44	--	14.9	5.21	--
Fluoride	mg/L	Intrawell Background Value (UPL)	0.124	1.61		1.52	0.148	
		Detection Monitoring Result	0.100	**1.66**	1.37	1.49	0.100	--
pH	SU	Intrawell Background Value (UPL)	7.3	9.0		10.1	8.2	
		Intrawell Background Value (LPL)	5.8	8.2		8.3	6.0	
		Detection Monitoring Result	6.2	8.6	--	9.2	6.0	--
Sulfate	mg/L	Intrawell Background Value (UPL)	32.8	12.9		12.2	30.7	
		Detection Monitoring Result	29.4	9.50	--	9.40	28.3	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	259	394		422	166	
		Detection Monitoring Result	193	379	--	382	131	--

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.
*Duplicate sample result was 17.1 mg/L, which is below the UPL.

ATTACHMENT A
Certification by Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the February 27, 2020 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Amos LF CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

22663	WEST VIRGINIA	04.06.2020
License Number	Licensing State	Date

Geosyntec consultants

941 Chatham Lane, Suite 103
Columbus, Ohio 43212
PH 614.468.0415
FAX 614.468.0416
www.geosyntec.com

Memorandum

Date:	July 29, 2020
To:	David Miller (AEP)
Copies to:	Benjamin Kepchar (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Amos Plant's Landfill (LF)

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the first semi-annual detection monitoring event at the Landfill (LF), an existing CCR unit at the Amos Power Plant located in Winfield, West Virginia, was completed on May 5-7, 2020. Based on the results, verification sampling was completed on July 7, 2020.

Background values for the LF were previously calculated in January 2018. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the dataset was updated as appropriate. Revised upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec's *Statistical Analysis Summary* report, dated February 27, 2020. In May 2020, monitoring wells MW-1 and MW-5 were removed from the groundwater monitoring network and replaced with wells MW-1801 and MW-1802. Following completion of eight background monitoring events, UPLs and LPLs were calculated for MW-1801 and MW-1802, as described in Geosyntec's *Statistical Analysis Summary – Background Update Calculations* report, dated July 8, 2020.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is concluded only if both samples in a series of two exceed the UPL (or are below the LPL for pH). In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are compared in Table 1 and noted exceedances are described in the list below.

- Calcium concentrations exceeded the intrawell UPL of 2.10 mg/L in both the initial (2.76 mg/L) and second (2.74 mg/L) samples collected at MW-2. Thus, an SSI over background is concluded for calcium at MW-2.

In response to the exceedance noted above, the Amos LF CCR unit will either transition to assessment monitoring or an alternative source demonstration (ASD) for calcium will be conducted in accordance with 40 CFR 257.94(e)(2). If the ASD is successful, the Amos LF will remain in detection monitoring.

The statistical analysis was conducted within 90 days of completion of sampling and analysis in accordance with 40 CFR 257.93(h)(2). A certification of these statistics by a qualified professional engineer is provided in Attachment A.

Table 1: Detection Monitoring Data Evalation
Amos Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	Description	MW-2		MW-4	MW-1801	MW-1802
			5/5/2020	7/7/2020	5/5/2020	5/7/2020	5/7/2020
Boron	mg/L	Intrawell Background Value (UPL)	0.247		0.214	0.306	0.276
		Detection Monitoring Result	0.174	--	0.150	0.252	0.258
Calcium	mg/L	Intrawell Background Value (UPL)	2.10		0.912	1.83	0.978
		Detection Monitoring Result	**2.76**	**2.74**	0.790	1.65	0.963
Chloride	mg/L	Intrawell Background Value (UPL)	5.40		15.9	12.1	10.2
		Detection Monitoring Result	5.08	--	15.2	11.6	9.12
Fluoride	mg/L	Intrawell Background Value (UPL)	1.61		1.52	5.67	5.36
		Detection Monitoring Result	1.37	--	1.37	4.98	4.91
pH	SU	Intrawell Background Value (UPL)	9.0		10.1	9.5	9.5
		Intrawell Background Value (LPL)	8.2		8.3	8.5	8.7
		Detection Monitoring Result	8.6	--	9.2	8.9	8.8
Total Dissolved Solids (TDS)	mg/L	Intrawell Background Value (UPL)	394		422	550	522
		Detection Monitoring Result	368	--	397	541	490
Sulfate	mg/L	Intrawell Background Value (UPL)	12.9		12.2	8.88	22.4
		Detection Monitoring Result	7.8	--	8.4	6.8	15.2

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

ATTACHMENT A

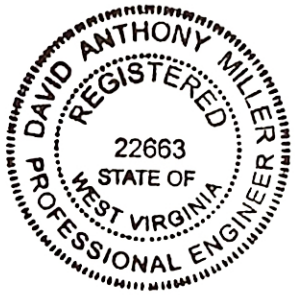
Certification by a Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the July 8, 2020 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Amos LF CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer



David Anthony Miller

Signature

22663	WEST VIRGINIA	08.03.2020
License Number	Licensing State	Date

APPENDIX 3

The alternative source demonstrations follow.

ALTERNATIVE SOURCE DEMONSTRATION REPORT FEDERAL CCR RULE

Amos Plant Landfill
Winfield, West Virginia

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane, Suite 103
Columbus, Ohio 43221

June 25, 2020

CHA8495

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
bgs	Below ground surface
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LPL	Lower Prediction Limit
mg/L	Milligram per liter
QC	Quality Control
SSI	Statistically Significant Increase
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

INTRODUCTION AND SUMMARY

1.1 Introduction

This Alternative Source Demonstration (ASD) report has been prepared to address a statistically significant increase (SSI) for calcium at the Amos Plant Landfill (Landfill) following the second semi-annual detection monitoring event of 2019.

Following completion of four detection monitoring events, the previously calculated upper prediction limits (UPLs) for the Landfill were recalculated for each Appendix III parameter to represent background values (Geosyntec, 2020). A lower prediction limit (LPL) was also recalculated for pH. The revised prediction limits were calculated based on a one-of-two retesting procedure in accordance with the Unified Guidance (USEPA, 2009) and the statistical analysis plan developed for the site (AEP, 2017). With this procedure, a statistically significant increase (SSI) is concluded only if both samples in a series of two exceed the UPL, or in the case of pH are below the LPL.

The second semi-annual detection monitoring event of 2019 was performed in November 2019 (initial sampling event) and February 2020 (verification sampling event) and the results were compared to the recalculated prediction limits. During this detection monitoring event, an SSI was identified for calcium at MW-5 based on an intrawell comparison. A summary of the detection monitoring analytical results for all constituents listed in 40 CFR Part 257 Appendix III and the calculated prediction limits to which they were compared is provided in **Table 1**.

1.2 CCR Rule Requirements

In accordance with the United States Environmental Protection Agency (USEPA) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments, Rule 40 CFR 257.94(e)(2) states the following:

> *The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report.*

The second semi-annual detection monitoring event for 2019 was completed in November 2019 and February 2020 to identify SSIs over background limits. Pursuant to 40 CFR 257.94(e)(2), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report to identify whether the SSL identified for calcium at MW-5 is from a source other than the Landfill.

1.3 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which identified SSIs could be attributed. Alternative sources were identified amongst five types:

- ASD Type I: Sampling Causes;
- ASD Type II: Laboratory Causes;
- ASD Type III: Statistical Evaluation Causes;
- ASD Type IV: Natural Variation; and
- ASD Type V: Alternative Sources.

A demonstration was conducted to assess whether the increase in calcium at MW-5 was based on a Type IV cause (Natural Variation) and not by a release from the Amos Plant Landfill.

SECTION 2

ALTERNATIVE SOURCE DEMONSTRATION

A brief description of the site geology, ASD evaluation methodology, and the proposed alternative source are described below.

2.1 Site Geology Summary

The Amos Plant Landfill site consists of a northern valley and southern valley, both of which are surrounded on all sides by bedrock ridges (**Figure 1**). A topographic high point separates the two valleys (Arcadis, 2016), as shown in **Figure 2**. MW-5 is a downgradient well for the northern valley, which is hydrologically separate from the southern valley. MW-5 is screened from 5 to 10 feet below ground surface within a perched aquifer consisting of shallow alluvium (**Figure 3**).

Bedrock beneath MW-5 consists of a combination of gray siltstone, silty shale, and red claystone. These lithologies make up part of the Pennsylvanian Monongahela and Conemaugh Formations. Groundwater flows through these formations primarily in stress relief fractures that are associated with erosion (Arcadis, 2016).

2.2 Examination of Alternative Sources

Initial review of site geochemistry, site historical data, and laboratory QA/QC did not identify an ASD due to Type I (sampling) or Type II (laboratory) causes. A review of the statistical methods used did not identify any Type III (statistical) causes. As described below, the SSI was attributed to natural variation, which is a Type IV cause.

Calcium concentrations at upgradient wells MW-8 and MW-9, both of which are also located on the northern side of the topographic divide, have consistently been above those observed at MW-5 (**Figure 4**). The high calcium concentrations as MW-8 and MW-9 also indicate that the native geologic material (which is predominantly claystone and sandstone) contains calcium that may be released into solution at higher concentrations than typically found at MW-5. Because MW-5 is set within a perched zone, it is particularly likely to be influenced by seasonal variations in groundwater migration and surface water intrusion through material that is not typically saturated. For these reasons, MW-5 was removed from the groundwater monitoring network and replaced with a well screened within the continuous upper aquifer (Arcadis, 2020).

A duplicate sample was collected at MW-5 during the verification sampling event in February 2020. The reported calcium concentration for the duplicate sample was 17.1 milligrams per liter (mg/L), which is below the calcium UPL of 18.1 mg/L (**Table 1**). The analytical results for the verification sampling event are provided in **Attachment A**. The results of this duplicate sample provide an additional line of evidence that the reported increase in calcium during the semiannual detection monitoring event is affected by variability instead of a release from the LF.

2.3 Sampling Requirements

The conclusions of this ASD support the determination that the identified SSI is from natural variation and not due to a release from the Landfill. Therefore, the unit will remain in the detection monitoring program. Groundwater at the unit will be sampled for Appendix III parameters on a semiannual basis.

SECTION 3

CONCLUSIONS AND RECOMMENDATIONS

The preceding information serves as the ASD prepared in accordance with 40 CFR 257.94(e)(2) and supports the conclusion that the SSI for calcium at MW-5 is attributed to natural variation. Based on the results of the duplicate sample collected during verification monitoring, and the calcium concentrations in MW-8 and -9, the SSI for calcium should not be attributed to a release from the Landfill. Therefore, no further action is warranted, and the Amos Plant Landfill will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment B**.

SECTION 4

REFERENCES

AEP, 2017. Statistical Analysis Plan – John E. Amos Plant. January.

Arcadis, 2016. FGD Landfill – CCR Groundwater Monitoring Network Evaluation. October.

Arcadis, 2020. FGD Landfill – CCR Revised Groundwater Monitoring Well Network Evaluation. May.

Geosyntec Consultants, 2020. Statistical Analysis Summary – Background Update Calculations. John E. Amos Plant Landfill. Winfield, West Virginia. February.

USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March

USEPA, 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (Final Rule). Fed. Reg. 80 FR 21301, pp. 21301-21501, 40 CFR Parts 257 and 261, April.

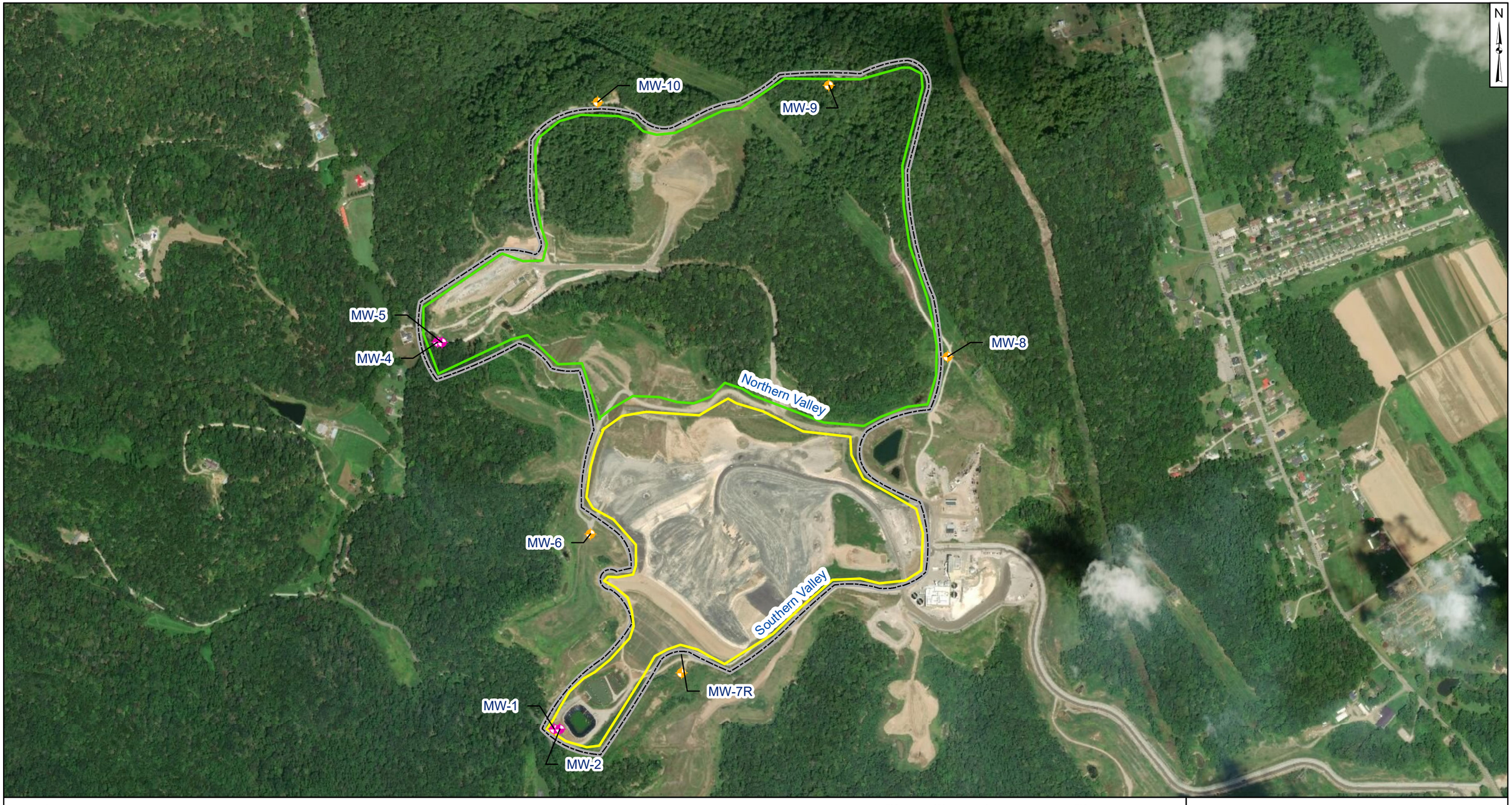
TABLES

Table 1: Detection Monitoring Data Evaluation
Amos Plant - Landfill

Parameter	Unit	Description	MW-1	MW-2		MW-4	MW-5	MW-5
			11/6/2019	11/6/2019	2/11/2020	11/6/2019	11/5/2019	2/11/2020
Boron	mg/L	Intrawell Background Value (UPL)	0.162	0.247		0.214	0.135	
		Detection Monitoring Result	0.0400	0.203	--	0.173	0.0300	--
Calcium	mg/L	Intrawell Background Value (UPL)	31.7	2.10		0.912	18.1	
		Detection Monitoring Result	30.1	1.73	--	0.761	**18.3**	**18.5***
Chloride	mg/L	Intrawell Background Value (UPL)	3.60	5.40		15.9	5.37	
		Detection Monitoring Result	3.20	3.44	--	14.9	5.21	--
Fluoride	mg/L	Intrawell Background Value (UPL)	0.124	1.61		1.52	0.148	
		Detection Monitoring Result	0.100	**1.66**	1.37	1.49	0.100	--
pH	SU	Intrawell Background Value (UPL)	7.3	9.0		10.1	8.2	
		Intrawell Background Value (LPL)	5.8	8.2		8.3	6.0	
		Detection Monitoring Result	6.2	8.6	--	9.2	6.0	--
Sulfate	mg/L	Intrawell Background Value (UPL)	32.8	12.9		12.2	30.7	
		Detection Monitoring Result	29.4	9.50	--	9.40	28.3	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	259	394		422	166	
		Detection Monitoring Result	193	379	--	382	131	--

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.
*Duplicate sample result was 17.1 mg/L, which is below the UPL.

FIGURES



Legend

- Upgradient Sampling Location
- Downgradient Sampling Location

Name

- Northern Valley
- Southern Valley
- FGD Landfill Permitted Limits

Notes

- Monitoring well coordinates provided by AEP.
- Aerial imagery provided by DigitalGlobe and dated 8/302/2016.

700 350 0 700 Feet

Site Layout
FGD Landfill

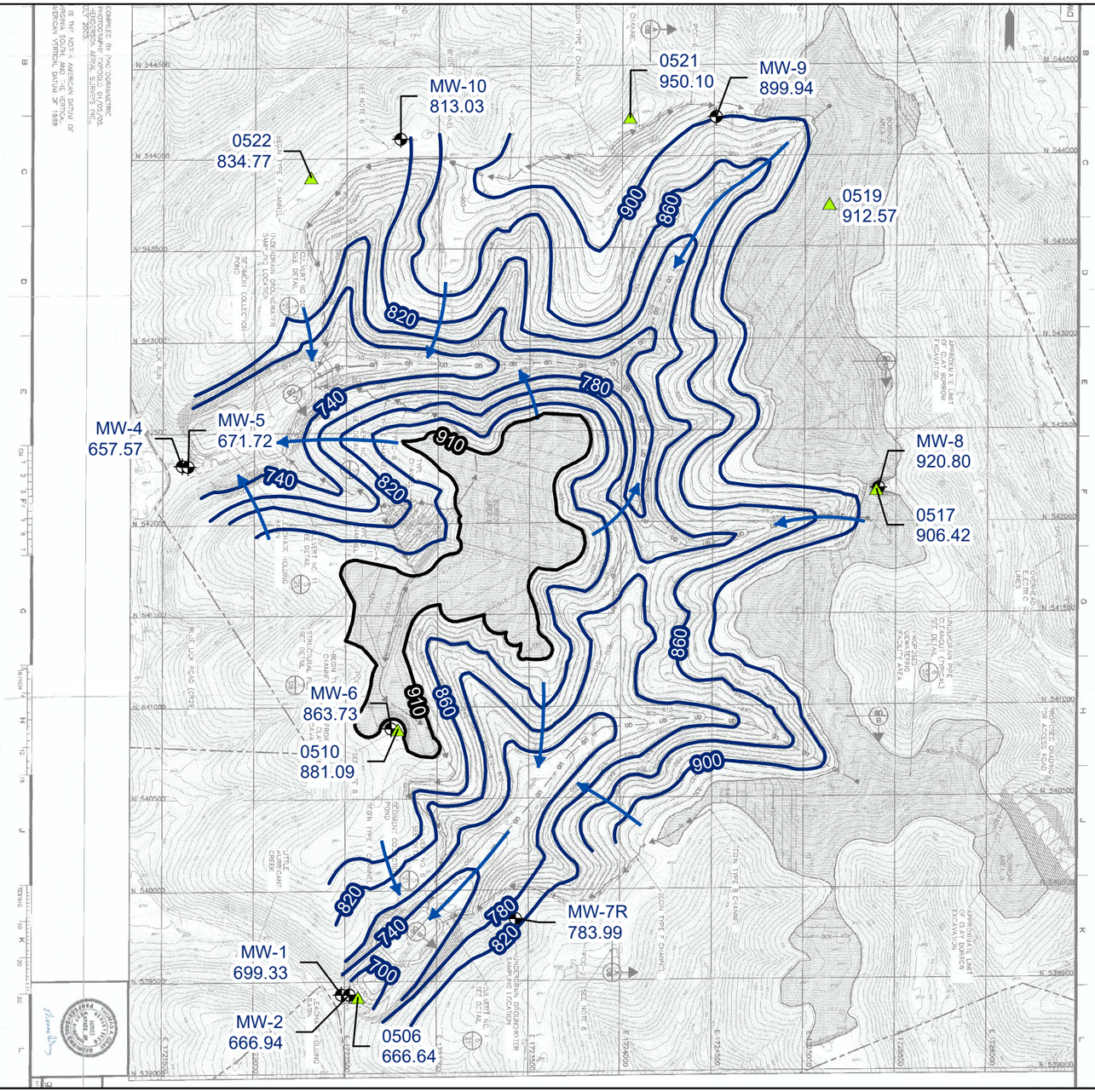
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2020/06/01

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\AEP-Amos_Landfill_Site_Layout_GW Flow_2018-04_April.mxd. BAres. 9/28/2018. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Piezometer
- Ridge Contour
- Groundwater Flow Direction
- Groundwater Elevation Contour

Notes

- Monitoring well coordinates and water level data (collected on November 4, 2019) provided by AEP.
- Potentiometric surface contour interval is 40 feet.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.

700 350 0 700 Feet

Potentiometric Surface Map - Uppermost Aquifer
November 2019

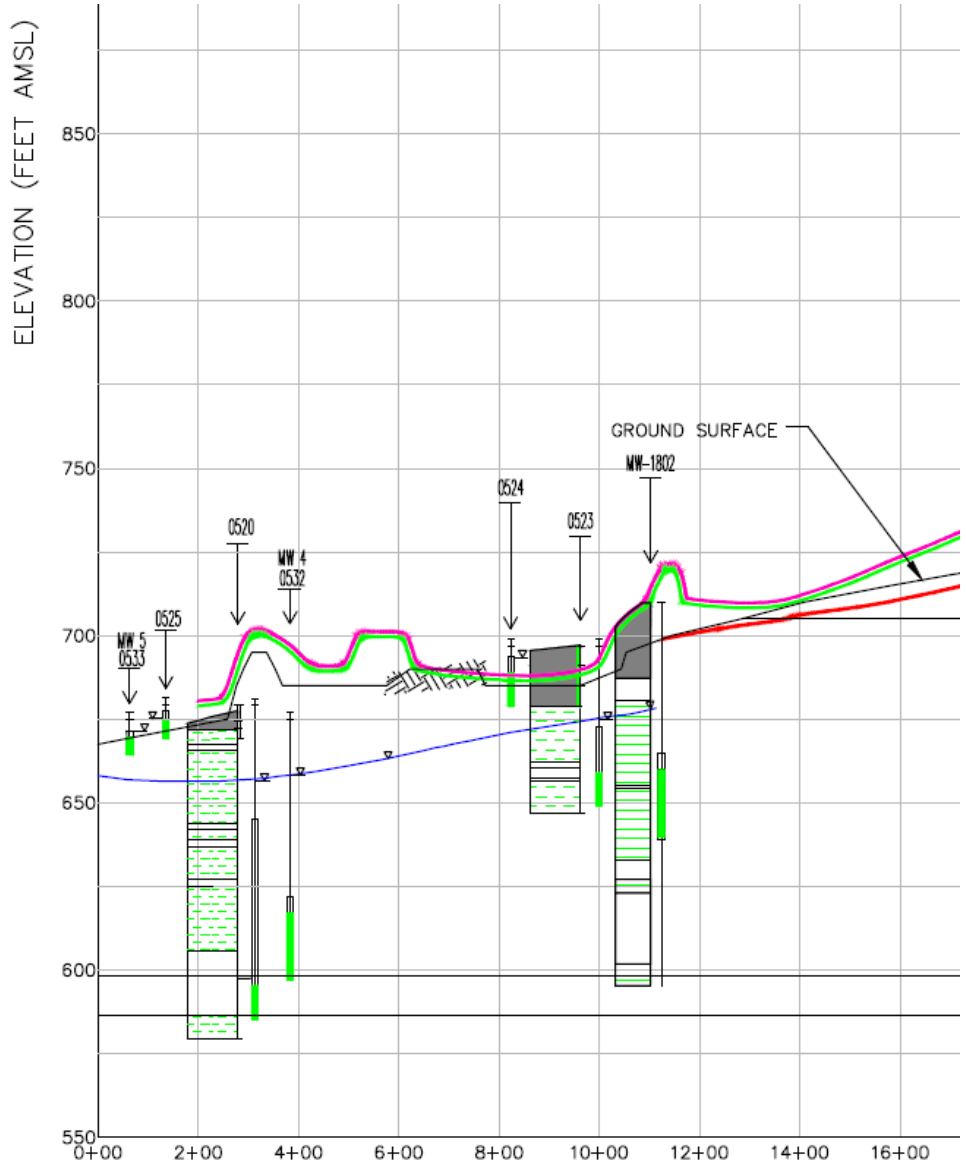
AEP Amos Generating Plant
Winfield, West Virginia

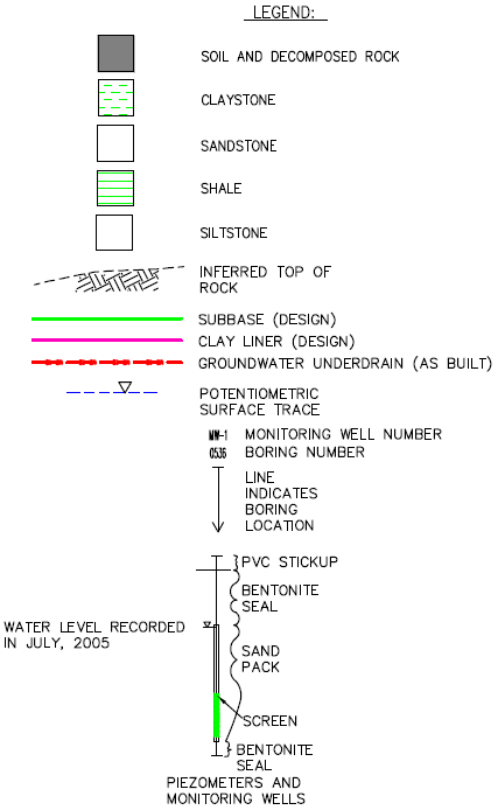
Geosyntec consultants

Columbus, Ohio | 2020/06/05

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2019\AEP-Amos_Landfill_GW_2019-11.mxd. BAres. 1/29/2020. CHA8423/04/08.





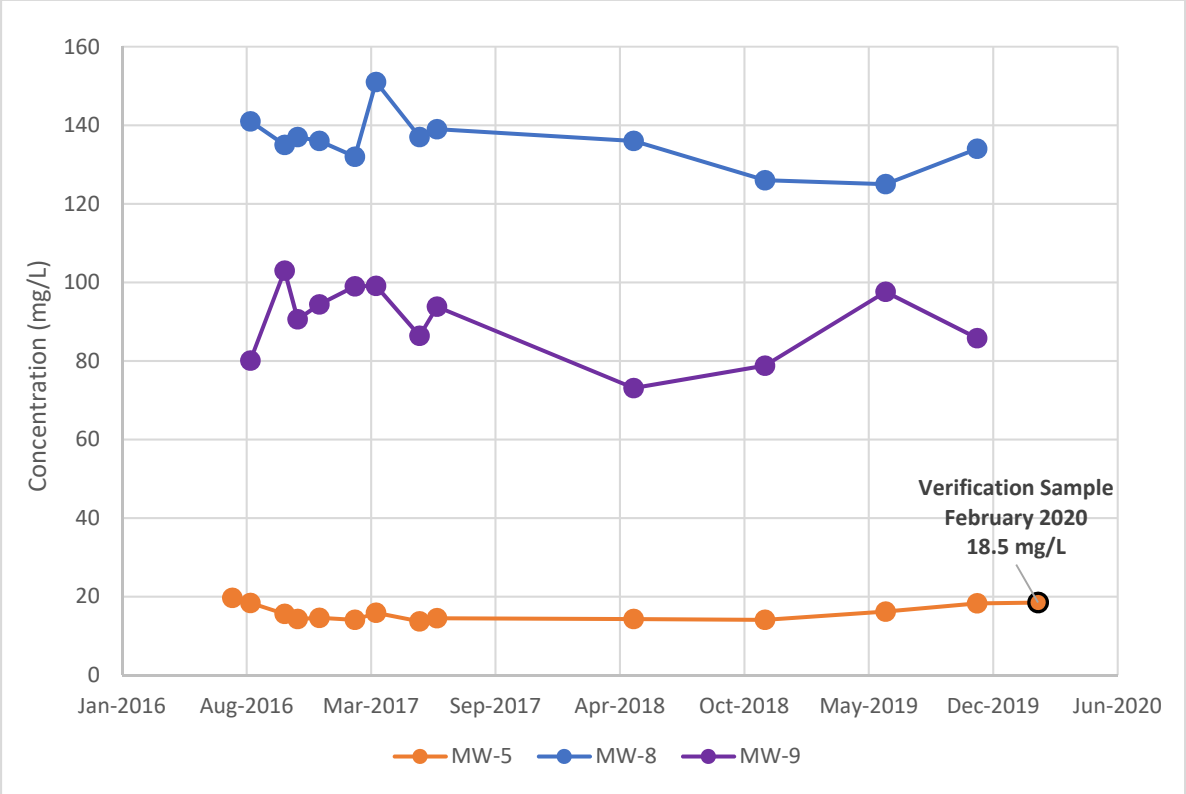
Notes:
MW-5 is located in a perched aquifer on the left side of the cross-section segment. The topographic high is located beyond the extend of the figure to the NE (right side). Source figure provided by Arcadis (Figure 6B, Groundwater Monitoring Well Network Evaluation, May 2020).

Northern Valley Cross Section Segment
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2020/06/01

Figure **3**



Notes: MW-8 and MW-9 are upgradient monitoring locations. Calcium data were collected under the federal CCR rule and represent total calcium in groundwater. A duplicate sample collected at the same time as the MW-5 verification sample had a reported calcium concentration of 17.1 milligrams per liter (mg/L).

Calcium Comparison to Upgradient Wells

AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **4**

Columbus, Ohio

2020/06/05

internal info: path, date revised, author

ATTACHMENT A

February 2020 Verification Sampling Analytical Laboratory Report

Form REP-703
Rev. 1, 11/2013

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Amos Plant ***Report Date: 2/19/2020***

CCR LF MW-2

Sample Number: 200457-001 **Date Collected: 02/11/2020 12:15** **Date Received: 2/12/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Fluoride, F	1.37	mg/L		0.2	0.04	CRJ	02/12/2020 16:03	EPA 300.1-1997, Rev. 1.0

CCR LF MW-5

Sample Number: 200457-002 **Date Collected: 02/11/2020 09:55** **Date Received: 2/12/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Calcium, Ca	18.5	mg/L		0.3	0.1	DAM	02/14/2020 16:11	EPA 200.7-1994, Rev. 4.4

Dup-1

Sample Number: 200457-003 **Date Collected: 02/11/2020** **Date Received: 2/12/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Calcium, Ca	17.1	mg/L		0.3	0.1	DAM	02/14/2020 16:15	EPA 200.7-1994, Rev. 4.4

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit
J: Analyte was positively identified, though the quantitation was below Reporting Limit.

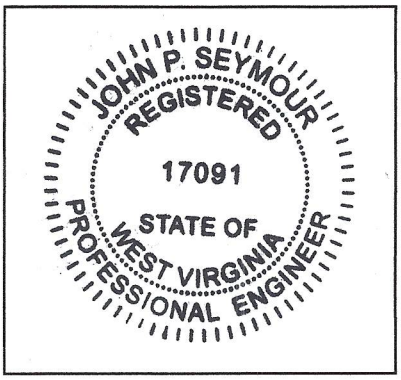
Michael Ohlinger, Chemist
Email msohlinger@aep.com *Tel.*
Fax 614-836-4168 *Audinet 8-210-*

ATTACHMENT B

Certification by a Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Amos Plant Landfill CCR management area and that the requirements of 40 CFR 257.94(e)(2) have been met.



John Seymour
Printed Name of Licensed Professional Engineer

Signature

017091 — License Number

West Virginia — Licensing State

6/25/2020 — Date

ALTERNATIVE SOURCE DEMONSTRATION REPORT FEDERAL CCR RULE

Amos Plant Landfill
Winfield, West Virginia

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane, Suite 103
Columbus, Ohio 43221

October 26, 2020

CHA8495

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
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CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
LPL	Lower Prediction Limit
mg/L	Milligram per liter
QC	Quality Control
SSI	Statistically Significant Increase
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

INTRODUCTION AND SUMMARY

1.1 Introduction

This Alternative Source Demonstration (ASD) report has been prepared to address a statistically significant increase (SSI) for calcium at the Amos Plant Landfill (Landfill) following the first semi-annual detection monitoring event of 2020.

Following completion of four detection monitoring events, the previously calculated upper prediction limits (UPLs) for the Landfill were recalculated for each Appendix III parameter to represent background values (Geosyntec, 2020). A lower prediction limit (LPL) was also recalculated for pH. The revised prediction limits were calculated based on a one-of-two retesting procedure in accordance with the Unified Guidance (USEPA, 2009) and the statistical analysis plan developed for the site (AEP, 2017). With this procedure, a statistically significant increase (SSI) is concluded only if both samples in a series of two exceed the UPL, or in the case of pH are below the LPL.

The first semi-annual detection monitoring event of 2020 was performed in May 2020 (initial sampling event) and July 2020 (verification sampling event) and the results were compared to the recalculated prediction limits. During this detection monitoring event, an SSI was identified for calcium at MW-2 based on an intrawell comparison. A summary of the detection monitoring analytical results for all constituents listed in 40 CFR Part 257 Appendix III and the calculated prediction limits to which they were compared is provided in **Table 1**.

1.2 CCR Rule Requirements

In accordance with the United States Environmental Protection Agency (USEPA) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments, Rule 40 CFR 257.94(e)(2) states the following:

> *The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report.*

The first semi-annual detection monitoring event for 2020 was completed in May 2020 and July 2020 to identify SSIs over background limits. Pursuant to 40 CFR 257.94(e)(2), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report to identify whether the SSI identified for calcium at MW-2 is from a source other than the Landfill.

1.3 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which identified SSIs could be attributed. Alternative sources were identified amongst five types:

- ASD Type I: Sampling Causes;
- ASD Type II: Laboratory Causes;
- ASD Type III: Statistical Evaluation Causes;
- ASD Type IV: Natural Variation; and
- ASD Type V: Alternative Sources.

A demonstration was conducted to assess whether the increase in calcium at MW-2 was based on a Type IV cause (Natural Variation) and not by a release from the Amos Plant Landfill.

SECTION 2

ALTERNATIVE SOURCE DEMONSTRATION

A brief description of the site geology, ASD evaluation methodology, and the proposed alternative source are described below.

2.1 Site Geology Summary

The Amos Plant Landfill site consists of a northern valley and southern valley, both of which are surrounded on all sides by bedrock ridges (**Figure 1**). A topographic high point separates the two valleys (Arcadis, 2020), as shown in **Figure 2**. MW-2 is a downgradient well for the southern valley, which is hydrologically separate from the northern valley. Bedrock in the vicinity of MW-2 consists of a combination of gray siltstone, silty shale, and red claystone. These lithologies make up part of the Pennsylvanian Monongahela and Conemaugh Formations. These formations contain a system of stress relief fractures that are associated with a decline in stress and erosion (Arcadis, 2020). Groundwater flows through these formations primarily in these stress fractures. Bedrock groundwater flow generally follows surface topography, flowing downslope of ridges towards valley floors (Arcadis, 2020).

2.2 Examination of Alternative Sources

Initial review of site geochemistry, site historical data, and laboratory QA/QC did not identify an ASD due to Type I (sampling) or Type II (laboratory) causes. A review of the statistical methods used did not identify any Type III (statistical) causes. Therefore, natural variation, which is a Type IV cause, was examined as a potential cause of the SSI.

Calcium concentrations at upgradient wells MW-6 and MW-7R, both of which are also located on the southern side of the topographic divide, have consistently been above those observed at MW-2 (**Figure 3**). The high calcium concentrations at MW-6 and MW-7R indicate that the native geologic material (which is predominantly claystone and sandstone) contains calcium that may be released into solution at higher concentrations than those typically found at MW-2. Thus, the changes in calcium concentration at MW-2 are attributable to natural variation.

2.3 Sampling Requirements

The conclusions of this ASD support the determination that the identified SSI is from natural variation and not due to a release from the Landfill. Therefore, the unit will remain in the detection monitoring program. Groundwater at the unit will be sampled for Appendix III parameters on a semiannual basis.

SECTION 3

CONCLUSIONS AND RECOMMENDATIONS

The preceding information serves as the ASD prepared in accordance with 40 CFR 257.94(e)(2) and supports the conclusion that the SSI for calcium at MW-2 is attributed to natural variation. Therefore, no further action is warranted, and the Amos Plant Landfill will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment A**.

SECTION 4

REFERENCES

AEP, 2017. Statistical Analysis Plan – John E. Amos Plant. January.

Arcadis, 2020. FGD Landfill – CCR Revised Groundwater Monitoring Well Network Evaluation. May.

Geosyntec Consultants, 2020. Statistical Analysis Summary – Background Update Calculations. John E. Amos Plant Landfill. Winfield, West Virginia. February.

USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March

USEPA, 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (Final Rule). Fed. Reg. 80 FR 21301, pp. 21301-21501, 40 CFR Parts 257 and 261, April.

TABLES

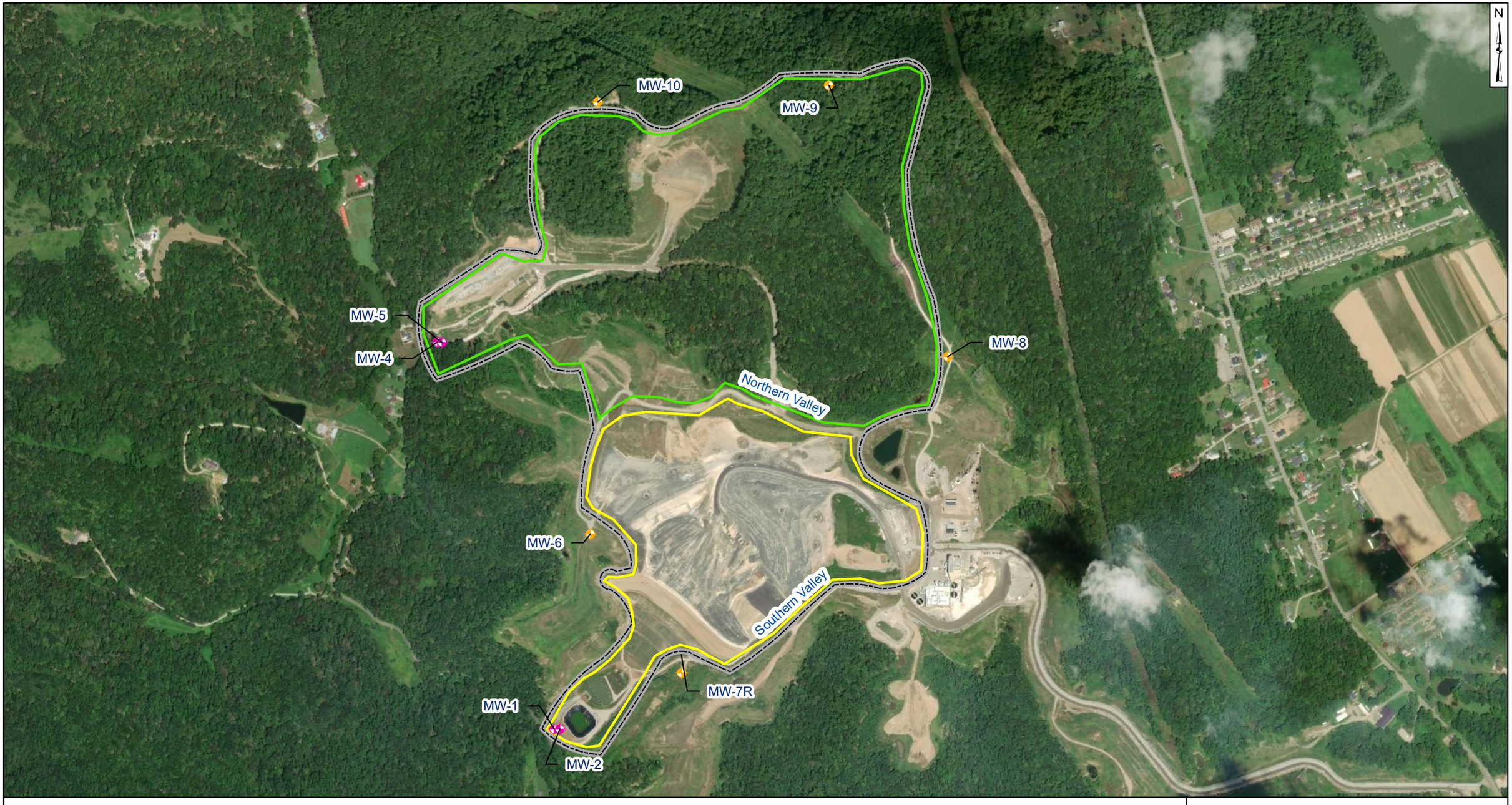
Table 1: Detection Monitoring Data Evalation
Amos Plant - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	Description	MW-2		MW-4	MW-1801	MW-1802
			5/5/2020	7/7/2020	5/5/2020	5/7/2020	5/7/2020
Boron	mg/L	Intrawell Background Value (UPL)	0.247		0.214	0.306	0.276
		Detection Monitoring Result	0.174	--	0.150	0.252	0.258
Calcium	mg/L	Intrawell Background Value (UPL)	2.10		0.912	1.83	0.978
		Detection Monitoring Result	**2.76**	**2.74**	0.790	1.65	0.963
Chloride	mg/L	Intrawell Background Value (UPL)	5.40		15.9	12.1	10.2
		Detection Monitoring Result	5.08	--	15.2	11.6	9.12
Fluoride	mg/L	Intrawell Background Value (UPL)	1.61		1.52	5.67	5.36
		Detection Monitoring Result	1.37	--	1.37	4.98	4.91
pH	SU	Intrawell Background Value (UPL)	9.0		10.1	9.5	9.5
		Intrawell Background Value (LPL)	8.2		8.3	8.5	8.7
		Detection Monitoring Result	8.6	--	9.2	8.9	8.8
Total Dissolved Solids (TDS)	mg/L	Intrawell Background Value (UPL)	394		422	550	522
		Detection Monitoring Result	368	--	397	541	490
Sulfate	mg/L	Intrawell Background Value (UPL)	12.9		12.2	8.88	22.4
		Detection Monitoring Result	7.8	--	8.4	6.8	15.2

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

FIGURES



Legend

- Upgradient Sampling Location
- Downgradient Sampling Location

Name

- Northern Valley
- Southern Valley
- FGD Landfill Permitted Limits

Notes

- Monitoring well coordinates provided by AEP.
- Aerial imagery provided by DigitalGlobe and dated 8/30/2016.

700 350 0 700 Feet

Site Layout
FGD Landfill

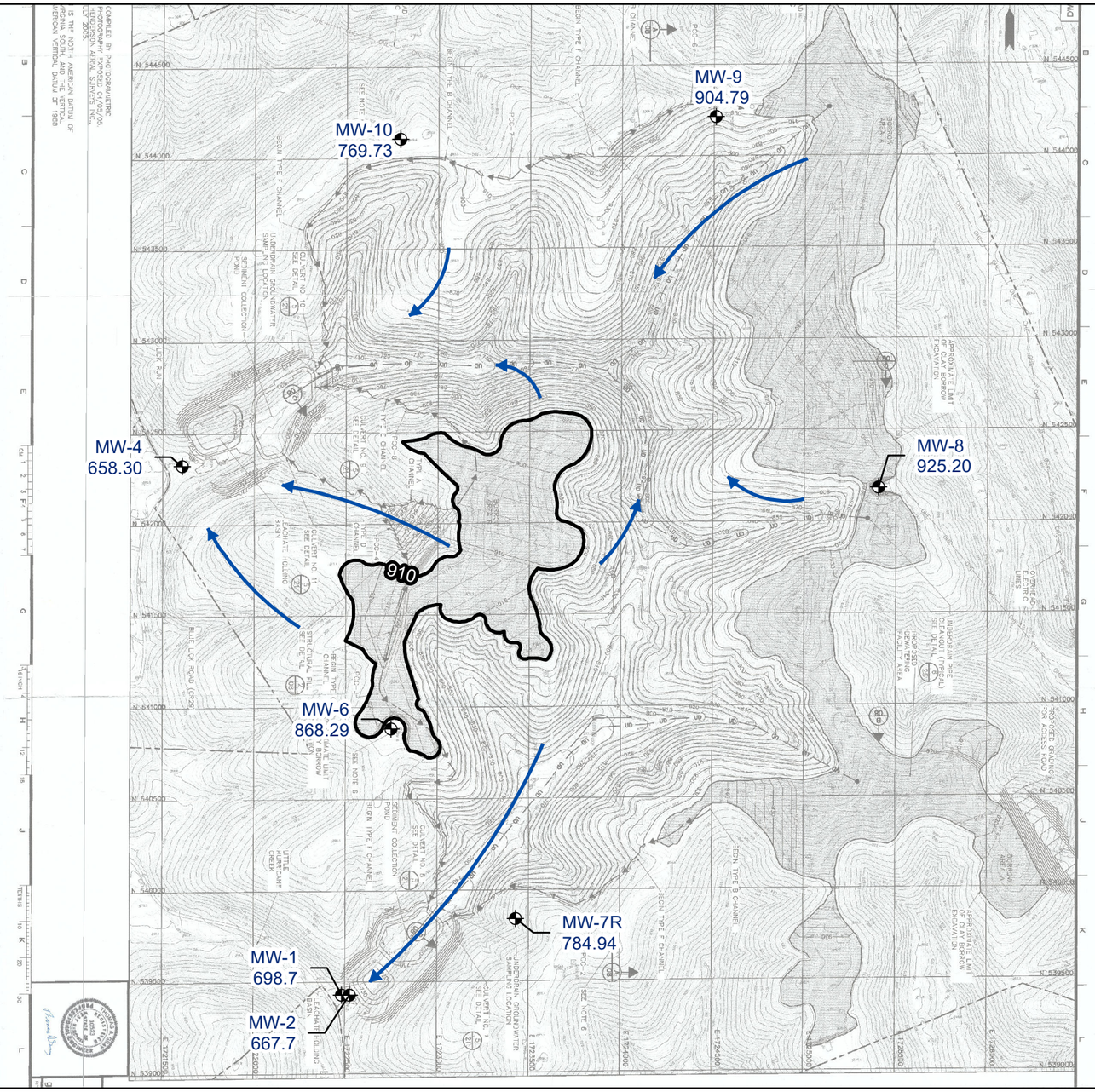
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2020/09/17

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\AEP-Amos_Landfill_Site_Layout_GW Flow_2018-04_April.mxd. BAres. 9/28/2018. CHA8423/04/08.



Legend

- Groundwater Monitoring Well
- Flow Direction
- Ridge Peak Contour - Drainage Divide

Notes

- Monitoring well coordinates and water level data (collected on May 4, 2020) provided by AEP.
- Topography and drainage system basemap from AEP Drawing No. 13-30500-05-A (topographic contour interval: 10 feet).
- Groundwater elevation units are feet above mean sea level.
- The black line indicates the maximum elevation of the central ridge.

700 350 0 700 Feet

Groundwater Flow Direction Map Uppermost Aquifer - May 2020

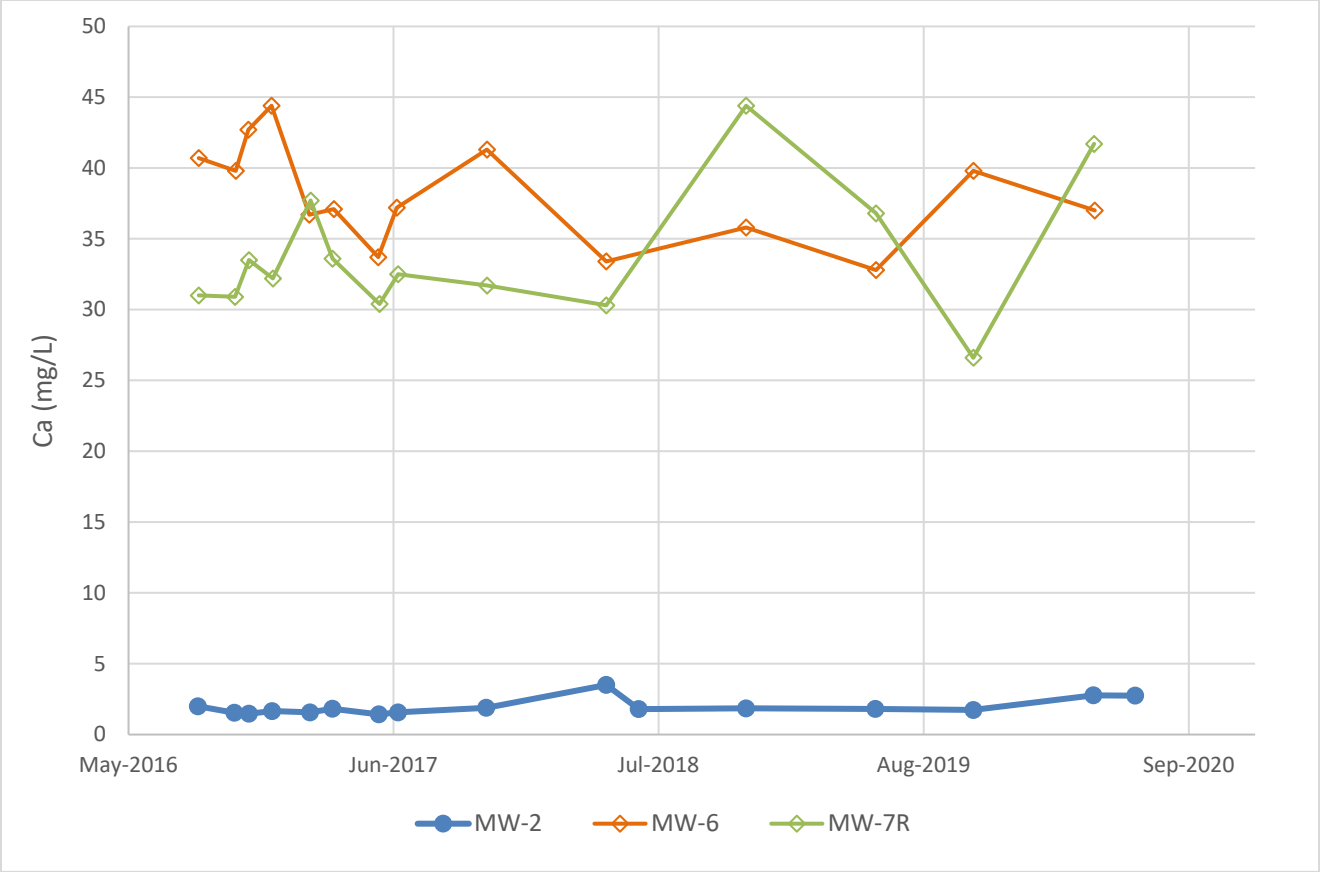
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2020/10/26

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2020\No Contour ASD_edit_AEP-Amos_Landfill_GW_2020-05.mxd. BAres. 10/26/2020. CHA8423/04/08.



Notes: MW-6 and MW-7R are upgradient monitoring locations. Calcium data were collected under the federal CCR rule and represent total calcium in groundwater. All three wells are screened in the Pennsylvanian Monongahela and Conemaugh Formations.

Calcium Comparison to Upgradient Wells
Mitchell Landfill

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **3**

Columbus, Ohio

17-September-2020

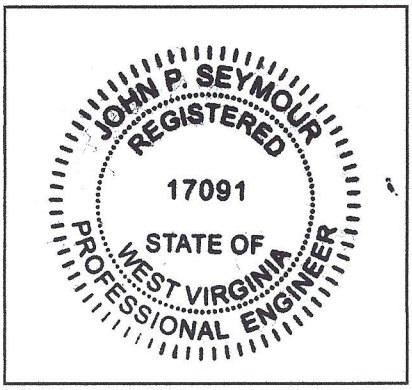
internal info: path, date revised, author

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Amos Plant Landfill CCR management area and that the requirements of 40 CFR 257.94(e)(2) have been met.



John Seymour
Printed Name of Licensed Professional Engineer

Signature

017091	West Virginia	October 29, 2020
License Number	Licensing State	Date

APPENDIX 4

Not applicable.

APPENDIX 5

Not applicable.