Annual Groundwater Monitoring Report

Appalachian Power Company

John E. Amos Plant

Landfill CCR Management Unit

Winfield, West Virginia

January 2023

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APPALACHIAN POWER℠

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Abbreviations:
ASD – Alternate Source Demonstration
CCR – Coal Combustion Residual
GWPS – Groundwater Protection Standard
SSI – Statistically Significant Increase
SSL – Statistically Significant Level
AMLF – Amos Landfill

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 2022.
- The November 2021 detection monitoring event resulted in potential statistically significant increases (SSI) in which a verification sampling event confirmed the SSI's for calcium at MW-1802 and for chloride at MW-4 and MW-1801. Statistical analysis for this event was completed in April 2022. An alternative source demonstration (ASD) was successfully completed in July 2022. The AMLF continued in detection monitoring. The statistical analysis is included in **Appendix 2** and the ASD is included in **Appendix 3**.
- The May 2022 detection monitoring event resulted in potentially SSI's in which a verification sampling event confirmed the SSI's for calcium and chloride at MW-1802. The statistical analysis for this event was completed in August 2022. An ASD was successfully completed in November 2022. The AMLF continued in detection monitoring. The statistical analysis and alternate source demonstration are included in this report.
- The statistical background was updated in September 2022. The background update report is also included in **Appendix 2**.
- A detection monitoring event was conducted at the AMLF in November 2022. From the initial sampling, potential SSI's have been noted. Those are:
    - MW-4: Chloride
    - MW-1801: Chloride
    - MW-1802: Calcium and Chloride

  A re-sampling event will occur in the first quarter of 2022 for the above mentioned parameters and well locations in accordance with the statistical analysis plan. 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 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**).
- Statistical comparison of monitoring data to determine if there have been SSI(s) or SSL(s) (Attached as **Appendix 2**, where applicable);
- 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 | 2022/01/26

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\AEP-Amos_Landfill_Site_Layout_v2.mxd. ASoltero. 1/26/2022. CHA8423/04/08.

III. Monitoring Wells Installed or Decommissioned

No monitoring wells were installed or decommissioned in 2022.

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 2022. Static water elevation data from each monitoring event in 2022 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 2021 detection monitoring samples was completed in April 2022. An SSI in the Appendix III parameters of calcium at MW-1802 and chloride at MW-4 and MW-1801 was documented in the April 2022 *Evaluation of Detection Monitoring Data at Amos Plant's Landfill* memorandum (**Appendix 2**). An alternative source demonstration was undertaken for this parameter at these monitoring wells and it was successful. That demonstration is discussed in the next section of this report.

Statistical analysis of the May 2022 detection monitoring samples was completed in August 2022. An SSI in the Appendix III parameters of calcium and chloride at MW-1802 was documented in the August 2022 *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 2022 detection monitoring samples received indicate potential SSI's at the following:

- MW-4: Chloride
- MW-1801: Chloride
- MW-1802: Calcium and Chloride

The re-sampling event, in accordance with the statistical analysis plan, will be completed in the first quarter of 2022 and the final statistical analysis will follow. 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.

Additionally, the AMLF statistical background was updated in September 2022. The background update is included in **Appendix 2**.

VI. Alternative Source Demonstrations

An alternative source demonstration (ASD) relative to the Appendix III SSI's (calcium at MW-1802 and chloride at MW-1801 and MW-4) resulting from the November 2021 detection monitoring event was completed in July 2022. The demonstration concluded that the groundwater quality and Appendix III indicator parameter SSI's identified in the statistical evaluation is attributable to an alternative source. The successful ASD for this event is attached in **Appendix 3**.

An alternative source demonstration (ASD) relative to the Appendix III SSI's (MW-1802 calcium and chloride) resulting from the May 2022 detection monitoring event was completed in November 2022. The demonstration concluded that the groundwater quality and Appendix III indicator parameter SSI's 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 2023 pending the results of the aforementioned statistical analysis regarding the November 2022 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

As required by the CCR detection monitoring rules in 40 CFR 257.94, sampling all CCR wells for the Appendix III parameters was completed in 2022. All required information has been included in this annual groundwater monitoring report.

IX. Description of Any Problems Encountered in 2022 and Actions Taken

No significant problems were encountered. The low flow sampling effort went smoothly and the schedule was met to support the 2022 annual groundwater report preparation covering the groundwater monitoring activities in 2022.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2023 include:

- Complete the resampling event and statistical evaluation for the November 2022 detection monitoring potential SSI's.
- Perform an ASD, if necessary, for the November 2022 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 2023 annual groundwater report.

APPENDIX 1

Figures and Tables showing the groundwater monitoring network, data collected, and the rate and direction of groundwater flow.

Table 1 - Groundwater Data Summary: MW-1
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	0.044	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
MW-1 was removed from the groundwater monitoring network in 2020.

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
MW-1 was removed from the groundwater monitoring network in 2020.

Table 1 - Groundwater Data Summary: MW-2
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	0.201	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
5/4/2021	Detection	0.220	2.04	3.60	1.62	8.7	8.2	386
7/21/2021	Detection	--	--	--	1.41	8.4	--	--
11/2/2021	Detection	0.221	1.80	2.85	1.70	8.6	6.97	380
3/1/2022	Detection	--	--	--	0.09	6.3	--	--
5/24/2022	Detection	0.227	1.82	3.39	1.60	6.1	9.29	370 L1
7/27/2022	Detection	--	--	--	--	8.7	--	--
11/1/2022	Detection	0.215	1.89 M1	2.93	1.63	8.8	8.31	380

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 J1	6.57	51.8	0.129	0.14	1.3	1.02	0.904	1.34	1.24	0.009	< 0.002 U1	6.04	0.2 J1	0.03 J1
10/17/2016	Background	0.01 J1	3.94	25.7	0.040	0.005 J1	0.592	0.290	0.208	1.26	0.258	0.010	< 0.002 U1	3.70	0.09 J1	0.067
11/8/2016	Background	0.01 J1	3.54	23.7	0.02 J1	< 0.004 U1	0.295	0.107	0.8825	1.30	0.077	0.008	< 0.002 U1	3.84	0.05 J1	< 0.01 U1
12/13/2016	Background	0.01 J1	4.36	27.1	0.009 J1	< 0.004 U1	0.952	0.075	0.288	1.19	0.068	0.011	< 0.002 U1	6.11	0.05 J1	< 0.01 U1
2/8/2017	Background	< 0.01 U1	4.09	25.5	0.032	0.005 J1	0.571	0.287	1.109	1.33	0.279	0.009	< 0.002 U1	5.55	0.1	0.02 J1
3/14/2017	Background	0.02 J1	3.72	31.9	0.071	0.02	1.01	0.573	2.863	1.20	0.651	0.010	0.002 J1	3.46	0.2	0.02 J1
5/23/2017	Background	0.03 J1	3.59	27.2	0.043	0.009 J1	0.605	0.341	0.796	1.17	0.333	0.010	< 0.002 U1	3.70	0.1	< 0.01 U1
6/21/2017	Background	0.03 J1	3.80	27.7	0.028	0.01 J1	0.490	0.234	1.1188	1.19	0.229	0.004	0.003 J1	4.57	0.08 J1	0.03 J1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: MW-4
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	0.173	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
11/27/2018	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
1/5/2021	Detection	--	--	18.0	1.48	9.4	--	--
5/4/2021	Detection	0.168	0.695	19.7	1.50	9.2	8.8	410
7/21/2021	Detection	--	--	20.8	--	9.0	--	--
11/4/2021	Detection	0.167	0.7	21.8	1.40	9.1	7.86	390
3/1/2022	Detection	--	--	25.1	--	9.3	--	--
5/25/2022	Detection	0.171	0.95	24.2	1.34	8.3	9.79	400 L1
7/26/2022	Detection	--	0.89	--	--	9.2	--	--
11/1/2022	Detection	0.170	0.87	26.1	1.28	9.3	9.39	400

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 J1	9.61	24.1	0.020	0.11	0.9	0.158	0.444	1.49	0.371	0.008	< 0.002 U1	8.82	0.09 J1	< 0.01 U1
10/18/2016	Background	< 0.01 U1	8.81	20.2	< 0.005 U1	0.006 J1	0.064	0.014	0.152	1.33	0.021	0.002	< 0.002 U1	8.01	< 0.03 U1	0.03 J1
11/7/2016	Background	< 0.01 U1	9.07	21.5	< 0.005 U1	< 0.004 U1	1.68	0.029	1.56	1.44	0.007 J1	0.003	< 0.002 U1	8.14	< 0.03 U1	< 0.01 U1
12/13/2016	Background	< 0.01 U1	9.44	22.4	< 0.005 U1	< 0.004 U1	0.169	0.011	0.16	1.34	0.009 J1	0.007	< 0.002 U1	8.94	< 0.03 U1	0.02 J1
2/8/2017	Background	< 0.01 U1	8.78	19.2	0.006 J1	< 0.004 U1	0.122	0.043	0.567	1.40	0.064	0.006	< 0.002 U1	8.15	< 0.03 U1	0.03 J1
3/14/2017	Background	< 0.01 U1	10.1	20.4	0.005 J1	0.005 J1	0.523	0.041	1.456	1.46	0.114	0.006	< 0.002 U1	9.70	< 0.03 U1	< 0.01 U1
5/23/2017	Background	0.02 J1	8.96	21.1	< 0.004 U1	< 0.005 U1	0.104	0.008 J1	0.872	1.38	0.01 J1	0.012	< 0.002 U1	8.21	< 0.03 U1	< 0.01 U1
6/20/2017	Background	0.02 J1	9.15	21.8	0.004 J1	0.005 J1	0.157	0.037	0.905	1.36	0.039	0.005	< 0.002 U1	7.86	0.05 J1	< 0.01 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: MW-5
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	0.032	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
MW-5 was removed from the groundwater monitoring network in 2020.

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
MW-5 was removed from the groundwater monitoring network in 2020.

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 J1	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
5/4/2021	Detection	0.101	34.7	7.33	0.27	7.5	19.0	354
11/4/2021	Detection	0.093	35.1	7.51	0.25	7.4	22.1	360
5/26/2022	Detection	0.092	45.5	8.63	0.24	7.5	19.2	350 L1
11/2/2022	Detection	0.099	42.3	8.56	0.23	7.6	23.8	360

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 J1	6.03	245	0.036	0.03	0.5	0.183	2.318	0.26	0.461	0.015	< 0.002 U1	0.77	0.09 J1	0.138
10/19/2016	Background	0.02 J1	6.42	235	0.033	0.005 J1	0.413	0.148	0.697	0.23	0.381	0.015	< 0.002 U1	0.36	0.09 J1	0.02 J1
11/7/2016	Background	0.01 J1	6.64	250	0.009 J1	< 0.004 U1	0.160	0.023	2.70	0.25	0.053	0.011	< 0.002 U1	0.36	< 0.03 U1	< 0.01 U1
12/12/2016	Background	0.01 J1	7.36	246	0.006 J1	0.01 J1	0.104	0.020	1.878	0.20	0.039	0.023	< 0.002 U1	0.39	0.04 J1	0.03 J1
2/7/2017	Background	< 0.01 U1	5.47	199	0.02 J1	< 0.004 U1	0.207	0.073	1.151	0.23	0.160	0.013	< 0.002 U1	0.44	0.05 J1	0.01 J1
3/16/2017	Background	0.03 J1	4.44	224	< 0.005 U1	0.005 J1	0.498	0.028	1.844	0.24	0.048	0.009	0.003 J1	0.53	0.03 J1	< 0.01 U1
5/22/2017	Background	0.04 J1	4.58	218	0.02 J1	0.009 J1	0.175	0.063	2.40	0.23	0.117	0.019	< 0.002 U1	0.50	0.04 J1	0.01 J1
6/19/2017	Background	0.03 J1	4.86	233	0.01 J1	< 0.005 U1	0.274	0.051	1.617	0.21	0.136	0.011	< 0.002 U1	0.44	0.04 J1	< 0.01 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

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 J1	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
5/4/2021	Detection	0.096	33.0	3.86	0.37	7.6	220	708
11/4/2021	Detection	0.090	29.0	3.76	0.33	7.5	210	730
5/26/2022	Detection	0.092	38.5	3.87	0.33	7.5	219	690 L1
11/2/2022	Detection	0.087	38.8	3.89	0.31	7.6	249	720

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 J1	25.7	0.4	0.061
10/18/2016	Background	0.07	7.13	51.4	0.111	0.01 J1	0.760	0.279	0.959	0.32	0.961	0.012	0.002 J1	23.2	0.3	0.03 J1
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 U1	17.5	0.2	0.01 J1
12/14/2016	Background	0.09	7.33	44.3	0.028	0.01 J1	1.73	0.103	0.962	0.26	0.249	0.014	< 0.002 U1	24.6	0.2	0.02 J1
2/9/2017	Background	0.05	4.21	41.7	0.01 J1	0.01 J1	0.217	0.065	0.0996	0.22	0.156	0.012	< 0.002 U1	11.7	0.08 J1	0.02 J1
3/14/2017	Background	0.08	7.02	40.2	0.01 J1	0.01 J1	0.234	0.064	2.735	0.30	0.154	0.010	< 0.002 U1	24.6	0.1	0.02 J1
5/24/2017	Background	0.10	7.48	42.0	0.01 J1	0.01 J1	0.242	0.080	0.3888	0.29	0.171	0.016	< 0.002 U1	25.7	0.2	0.01 J1
6/21/2017	Background	0.08	6.69	39.1	0.006 J1	0.006 J1	0.154	0.043	1.497	0.26	0.064	0.010	< 0.002 U1	22.9	0.1	0.01 J1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1 - Groundwater Data Summary: MW-8
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	0.021	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 J1	126	13.2	0.17	6.8	58.8	558
6/12/2019	Detection	0.03 J1	125	8.58	0.20	7.6	54.5	540
11/6/2019	Detection	< 0.02 U1	134	21.2	0.16	6.8	78.6	613
5/7/2020	Detection	< 0.02 U1	115	15.3	0.15	7.0	98.4	590
11/4/2020	Detection	< 0.02 U1	112	9.87	0.20	6.8	87.3	549
5/4/2021	Detection	0.02 J1	94.1	6.32	0.20	7.1	73.8	472
11/3/2021	Detection	< 0.09 U1	111	60.9	0.18	7.0	64.9	570
5/26/2022	Detection	0.020 J1	102	63.8	0.17	7.4	76.3	560 L1
11/2/2022	Detection	0.023 J1	107	76.8	0.16	7.0	79.9	580

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 J1	0.41	221	0.021	0.04	0.4	0.270	0.776	0.16	0.393	0.013	< 0.002 U1	0.40	0.2	0.03 J1
10/19/2016	Background	0.03 J1	0.35	195	0.01 J1	0.04	0.158	0.140	0.746	0.15	0.279	0.006	< 0.002 U1	0.07 J1	0.2	0.02 J1
11/9/2016	Background	0.02 J1	0.25	209	0.008 J1	< 0.004 U1	0.164	0.082	1.113	0.07	0.028	0.004	< 0.002 U1	0.08 J1	0.2	0.02 J1
12/14/2016	Background	0.03 J1	0.32	212	0.008 J1	0.008 J1	0.097	0.083	1.582	0.13	0.062	0.013	< 0.002 U1	0.10	0.2	0.02 J1
2/8/2017	Background	0.03 J1	0.37	192	0.01 J1	0.007 J1	0.131	0.059	1.223	0.15	0.109	0.007	< 0.002 U1	0.47	0.1	0.136
3/15/2017	Background	0.05 J1	1.44	270	0.069	0.02 J1	2.39	1.02	3.405	0.16	1.43	0.011	0.003 J1	0.28	0.4	0.02 J1
5/24/2017	Background	0.07	0.47	201	0.02 J1	0.009 J1	0.354	0.201	1.257	0.14	0.260	0.016	< 0.002 U1	0.11	0.2	0.01 J1
6/20/2017	Background	0.03 J1	0.35	182	0.02 J1	0.007 J1	0.192	0.077	1.065	0.13	0.142	0.005	< 0.002 U1	0.07 J1	0.3	0.02 J1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

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 J1	78.8	6.08	0.21	7.1	31.6	412
6/11/2019	Detection	0.04 J1	97.6	6.03	0.20	7.3	37.9	436
11/7/2019	Detection	0.04 J1	85.8	6.11	0.19	7.3	38.2	442
5/6/2020	Detection	0.03 J1	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
5/4/2021	Detection	0.064	57.0	3.96	0.28	7.2	29.8	396
11/3/2021	Detection	0.054	72.7	4.47	0.23	7.2	28.2	410
5/26/2022	Detection	0.052	99.4	4.78	0.21	7.7	33.9	410 L1
11/3/2022	Detection	0.064	84.7 M1	4.77	0.22	7.2	31.1	420

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 U1	0.48	0.2	0.03 J1
10/19/2016	Background	0.04 J1	3.75	441	0.025	0.01 J1	0.625	0.372	3.035	0.18	0.478	0.010	< 0.002 U1	0.27	0.1	0.03 J1
11/9/2016	Background	0.05 J1	1.12	491	< 0.005 U1	0.02 J1	0.207	0.020	1.735	0.22	0.046	0.008	< 0.002 U1	0.41	0.1	0.03 J1
12/13/2016	Background	0.04 J1	1.23	497	< 0.005 U1	0.04	0.540	0.032	0.39	0.18	0.084	0.019	< 0.002 U1	0.56	0.2	< 0.01 U1
2/8/2017	Background	0.02 J1	1.78	388	< 0.005 U1	0.03	0.078	0.033	1.448	0.16	0.058	0.012	< 0.002 U1	0.27	0.1	0.02 J1
3/15/2017	Background	0.04 J1	4.40	603	0.074	0.04	1.43	1.51	2.365	0.22	1.81	0.009	0.002 J1	0.37	0.5	0.04 J1
5/23/2017	Background	0.07	0.96	425	< 0.004 U1	0.02 J1	0.117	0.021	2.173	0.18	0.063	0.021	< 0.002 U1	0.37	0.2	0.02 J1
6/20/2017	Background	0.05 J1	1.35	441	< 0.004 U1	0.03	0.094	0.066	1.992	0.15	0.038	0.014	< 0.002 U1	0.33	0.07 J1	0.02 J1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

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 J1	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	4.9	0.60	8.6	13.0	526
11/4/2020	Detection	0.071	1.18	5.77	0.73	8.9	16.5	523
5/4/2021	Detection	0.081	0.916	5.48	0.73	9.0	14.7	519
11/5/2021	Detection	0.257	0.9	16.4	4.88	8.8	17.8	490
5/26/2022	Detection	0.083	1.44	4.10	0.51	6.0	14.1	510 L1
11/3/2022	Detection	0.088	1.68	5.60	0.65	7.5	14.4	520

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 J1	3.08	0.5	0.01 J1
10/19/2016	Background	0.26	19.4	62.4	0.02 J1	0.01 J1	0.373	0.102	0.0283	0.72	0.357	0.008	< 0.002 U1	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 J1	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 U1	2.79	0.7	< 0.01 U1
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 J1	2.76	1.9	0.071
3/14/2017	Background	0.32	21.2	69.0	0.039	0.01 J1	0.965	0.280	2.089	0.50	0.635	0.010	0.003 J1	3.38	2.3	0.02 J1
5/24/2017	Background	0.23	9.07	55.6	0.022	0.02 J1	0.500	0.151	1.06	0.43	0.469	0.011	< 0.002 U1	3.52	0.5	0.01 J1
6/20/2017	Background	0.30	17.7	61.7	0.025	0.01 J1	0.577	0.170	0.1376	0.44	0.448	0.004	< 0.002 U1	2.40	1.0	0.01 J1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

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
1/5/2021	Detection	--	--	11.7	--	9.0	--	--
5/5/2021	Detection	0.250	1.65	13.1	5.24	8.8	9.1	542
7/21/2021	Detection	--	--	13.1	--	8.6	7.63	--
11/4/2021	Detection	0.245	1.5	13.5	5.13	8.7	6.31	530
2/28/2022	Detection	--	--	13.2	--	8.8	--	--
5/25/2022	Detection	0.265	1.78	14.4	5.22	8.4	5.42	510 L1
7/27/2022	Detection	--	--	14.0	--	8.8	--	--
11/1/2022	Detection	0.253	1.57	15.0	5.38	8.9	5.66	520

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

Table 1 - Groundwater Data Summary: MW-1801
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
12/18/2018	Background	0.30	13.5	39.3	0.113	0.07	3.30	0.876	0.816	5.01	0.966	< 0.009 U1	< 0.002 U1	58.4	0.3	< 0.1 U1
1/24/2019	Background	0.14	11.8	34.6	0.08 J1	< 0.01 U1	2.56	0.436	0.983	5.19	0.544	0.032	< 0.002 U1	64.5	0.2 J1	< 0.1 U1
2/21/2019	Background	0.14	10.4	28.7	0.02 J1	< 0.01 U1	0.585	0.162	0.175	5.26	0.272	< 0.009 U1	< 0.002 U1	66.3	0.1 J1	< 0.1 U1
3/13/2019	Background	0.1 J1	9.02	26.6	< 0.02 U1	< 0.01 U1	0.463	0.143	0.58	5.32	0.116	< 0.009 U1	< 0.002 U1	60.8	0.05 J1	< 0.1 U1
4/23/2019	Background	0.14	9.95	30.9	0.02 J1	< 0.01 U1	0.722	0.180	0.751	5.35	0.240	< 0.009 U1	< 0.002 U1	69.4	0.06 J1	< 0.1 U1
6/11/2019	Background	0.1 J1	7.80	25.4	< 0.02 U1	< 0.01 U1	0.336	0.120	0.208	5.03	0.09 J1	< 0.009 U1	< 0.002 U1	61.6	0.05 J1	< 0.1 U1
7/23/2019	Background	0.06 J1	7.95	26.2	< 0.02 U1	< 0.01 U1	0.229	0.092	0.569	5.47	0.07 J1	< 0.02 U1	< 0.002 U1	62.7	< 0.03 U1	< 0.1 U1
11/5/2019	Background	0.04 J1	7.74	25.9	< 0.02 U1	< 0.01 U1	0.483	0.073	0.29	5.36	0.07 J1	0.00829	< 0.002 U1	62.8	< 0.03 U1	< 0.1 U1

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

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
11/4/2020	Detection	0.223	0.974	10.7	4.89	9.2	19.0	494
1/5/2021	Detection	--	--	10.7	--	9.3	--	--
5/5/2021	Detection	0.258	0.800	11.5	4.88	9.1	17.9	508
7/21/2021	Detection	--	--	13.5	--	8.8	--	--
11/4/2021	Detection	0.082	1.0	5.47	0.73	9.0	13.2	510
3/1/2022	Detection	--	1.0	--	--	9.1	--	--
5/25/2022	Detection	0.273	1.14	17.0	4.71	6.1	19.0	520 L1
7/27/2022	Detection	--	1.16	14.9	--	9.1	--	--
11/4/2022	Detection	0.261	1.13	17.0	4.86	9.2	18.2	510

Notes:
mg/L: milligrams per liter
SU: standard unit
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag.
In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.
M1: The associated matrix spike (MS) or matrix spike duplicate (MSD) was above acceptance limits.
L1: The associated laboratory control sample (LSC) or laboratory control sample duplicate (LCSD) recovery was outside acceptance limits.

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 J1	6.08	15.5	< 0.02 U1	< 0.01 U1	0.296	0.081	0.445	4.79	0.1 J1	< 0.009 U1	< 0.002 U1	22.7	0.04 J1	< 0.1 U1
1/25/2019	Background	0.05 J1	6.00	17.1	0.03 J1	< 0.01 U1	0.497	0.219	0.522	4.82	0.214	0.03 J1	< 0.002 U1	23.1	0.05 J1	< 0.1 U1
2/21/2019	Background	0.03 J1	6.42	16.1	< 0.02 U1	< 0.01 U1	0.232	0.083	0.1739	4.87	0.08 J1	< 0.009 U1	< 0.002 U1	24.9	< 0.03 U1	< 0.1 U1
3/13/2019	Background	0.04 J1	6.28	15.2	< 0.02 U1	< 0.01 U1	0.269	0.074	0.0735	4.75	0.1 J1	< 0.009 U1	< 0.002 U1	23.9	< 0.03 U1	< 0.1 U1
4/24/2019	Background	0.08 J1	6.24	17.0	< 0.02 U1	< 0.01 U1	0.300	0.099	0.281	5.04	0.142	< 0.009 U1	< 0.002 U1	28.0	0.06 J1	< 0.1 U1
6/12/2019	Background	0.02 J1	5.66	13.6	< 0.02 U1	< 0.01 U1	0.08 J1	0.03 J1	0.418	4.54	0.04 J1	< 0.009 U1	< 0.002 U1	23.3	< 0.03 U1	< 0.1 U1
7/23/2019	Background	0.04 J1	6.43	15.5	< 0.02 U1	< 0.01 U1	0.281	0.071	0.0519	5.16	0.1 J1	< 0.02 U1	< 0.002 U1	26.9	0.05 J1	< 0.1 U1
11/5/2019	Background	0.04 J1	6.37	14.6	< 0.02 U1	< 0.01 U1	0.273	0.04 J1	0.2057	4.84	0.06 J1	0.00714	< 0.002 U1	26.8	0.05 J1	< 0.1 U1

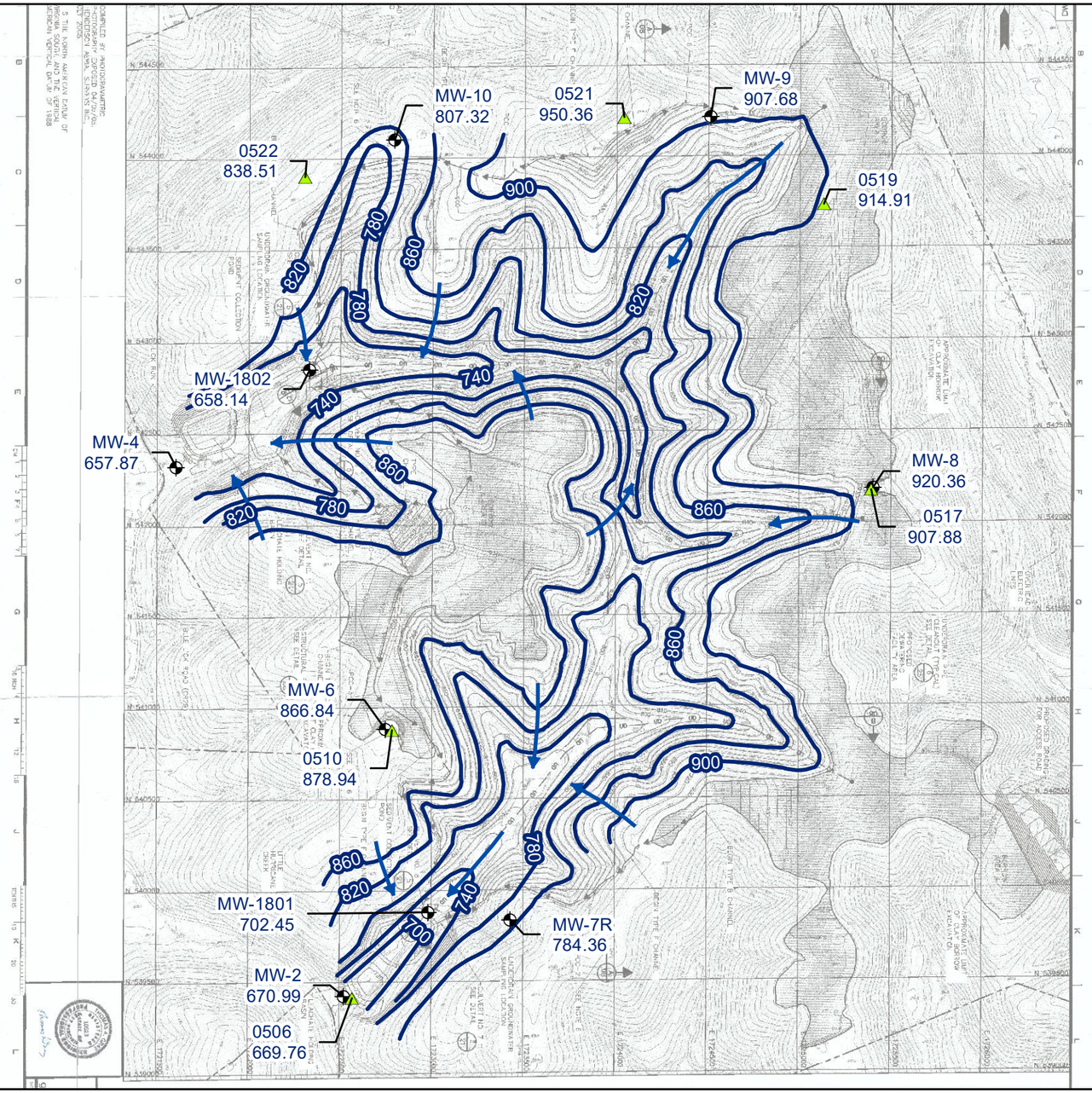
Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
<: Non-detect value. Analytes which were not detected are shown as less than the method detection limit (MDL) followed by a 'U1' flag. In analytical data prior to 5/18/2021, U1 flags were reported as U in the analytical report.
- -: Not analyzed
J1: Concentration estimated. Analyte was detected between the method detection limit and the reporting limit. In analytical data prior to 5/18/2021, J1 flags were reported as J in the analytical report.

Table 1: Residence Time Calculation Summary
Amos Landfill

Geosyntec Consultants, Inc.

			2022-01[3]		2022-05		2022-07[3]		2022-10	
CCR Management Unit	Monitoring Well	Well Diameter (inches)	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-2 [2]	2.0	3.0	21	3.0	20	3.4	18	2.9	21
	MW-4 [2]	2.0	2.0	30	2.0	31	2.0	30	2.0	31
	MW-6 [1]	2.0	NC	NC	0.5	115	NC	NC	0.7	82
	MW-7R [1]	2.0	NC	NC	2.3	27	NC	NC	4.1	15
	MW-8 [1]	2.0	NC	NC	0.7	84	NC	NC	0.7	93
	MW-9 [1]	2.0	NC	NC	1.0	63	NC	NC	0.9	70
	MW-10 [1]	2.0	NC	NC	1.2	50	NC	NC	0.7	85
	MW-1801 [2]	2.0	NC	NC	2.5	25	2.4	25	2.4	25
	MW-1802 [2]	2.0	2.7	22	2.8	21	3.3	18	3.7	17

Notes:
[1] - Background Well
[2] - Downgradient Well
[3] - Two-of-two verification sampling
NC - Not calculated



Legend

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

Notes

- Monitoring well coordinates and water level data (collected on May 16 and 17, 2022) 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 2022

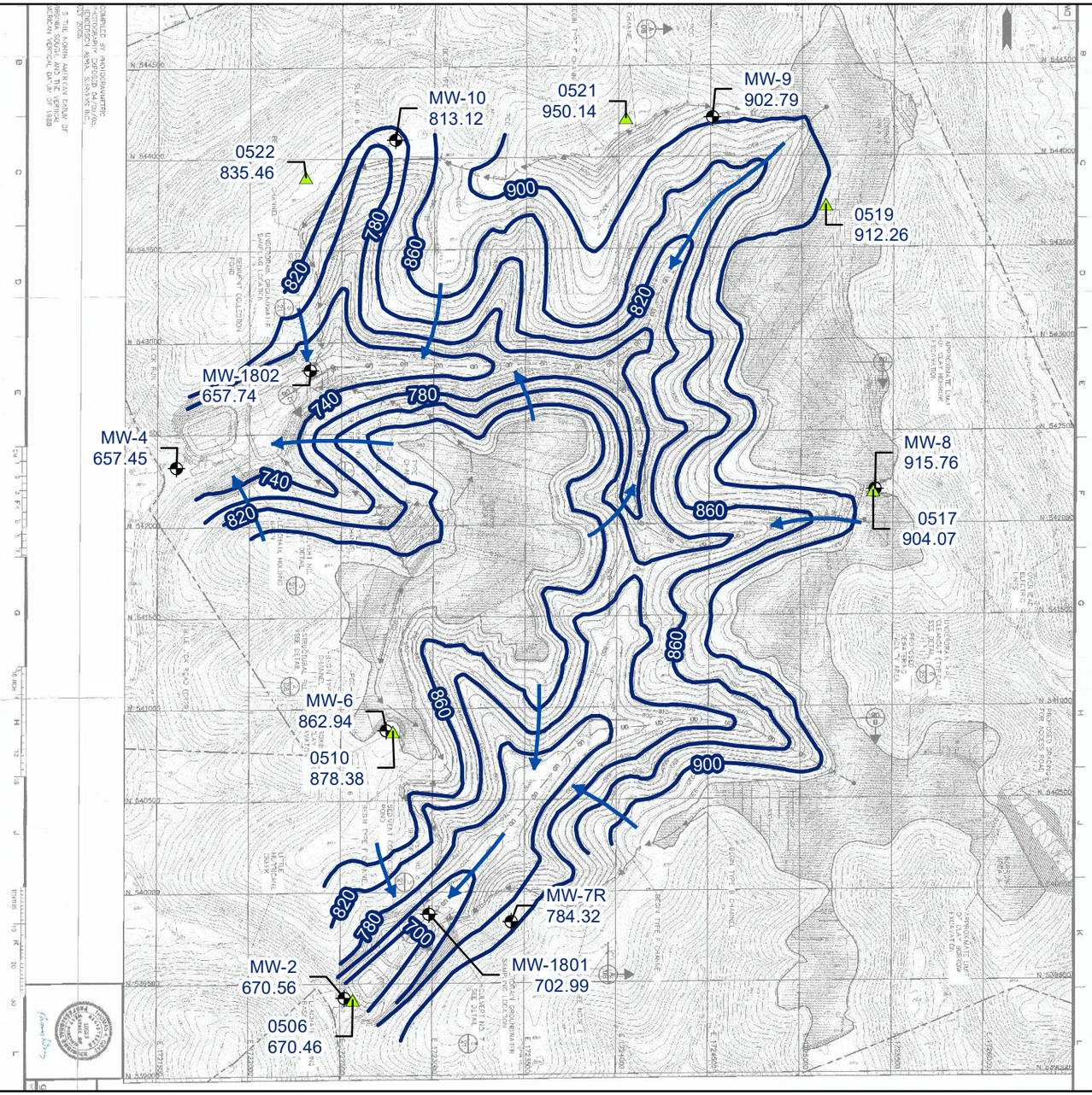
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2022/08/15

Figure **1**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2022\AEP-Amos_Landfill_GW_2022-05.mxd. ASoltero. 8/15/2022. CHA8423/04/08.



Legend

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

Notes

- Monitoring well coordinates and water level data (collected on October 24, 2022) 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
October 2022

AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | 2022/12/21

Figure **2**

W:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2022\AEP-Amos_Landfill_GW_2022-10.mxd. ASoltero. 12/21/2022. CHA8423/04/08.

APPENDIX 2

The statistical analysis reports completed in 2022 follow.

Geosyntec consultants

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Memorandum

Date:	April 4, 2022
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 of 2021 at the Landfill (LF), an existing CCR unit at the Amos Power Plant located in Winfield, West Virginia was completed on November 2-4, 2021. Based on the results, verification sampling was completed on February 28-March 1, 2022.

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 0.978 mg/L in both the initial (1.0 mg/L) and second (1.0 mg/L) samples collected at MW-1802. Thus, an SSI over background is concluded for calcium at MW-1802.

- Chloride concentrations exceeded the intrawell UPL of 15.9 mg/L in both the initial (21.8 mg/L) and second (25.1 mg/L) samples collected at MW-4. Chloride concentrations exceeded the intrawell UPL of 12.1 mg/L in both the initial (13.5 mg/L) and second (13.2 mg/L) samples collected at MW-1801. Thus, SSIs over background are concluded for chloride at MW-4 and MW-1801.

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 and chloride 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 Comparison
Amos - Landfill

Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-2		MW-4		MW-1801		MW-1802	
			11/2/2021	3/1/2022	11/4/2021	3/1/2022	11/4/2021	2/28/2022	11/4/2021	3/1/2022
Boron	mg/L	Intrawell Background Value (UPL)	0.247		0.214		0.306		0.276	
		Analytical Result	0.221	--	0.167	--	0.245	--	0.082	--
Calcium	mg/L	Intrawell Background Value (UPL)	2.10		0.912		1.83		0.978	
		Analytical Result	1.8	--	0.7	--	1.5	--	**1.0**	**1.0**
Chloride	mg/L	Intrawell Background Value (UPL)	5.40		15.9		12.1		10.2	
		Analytical Result	2.85	--	**21.8**	**25.1**	**13.5**	**13.2**	5.47	--
Fluoride	mg/L	Intrawell Background Value (UPL)	1.61		1.52		5.67		5.36	
		Analytical Result	**1.70**	0.09	1.40	--	5.13	--	0.73	--
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	
		Analytical Result	8.6	--	9.1	--	8.7	--	9.0	--
Sulfate	mg/L	Intrawell Background Value (UPL)	12.9		12.2		8.88		22.4	
		Analytical Result	6.97	--	7.86	--	6.31	--	13.2	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	394		422		550		522	
		Analytical Result	380	--	390	--	530	--	510	--

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.

ATTACHMENT A

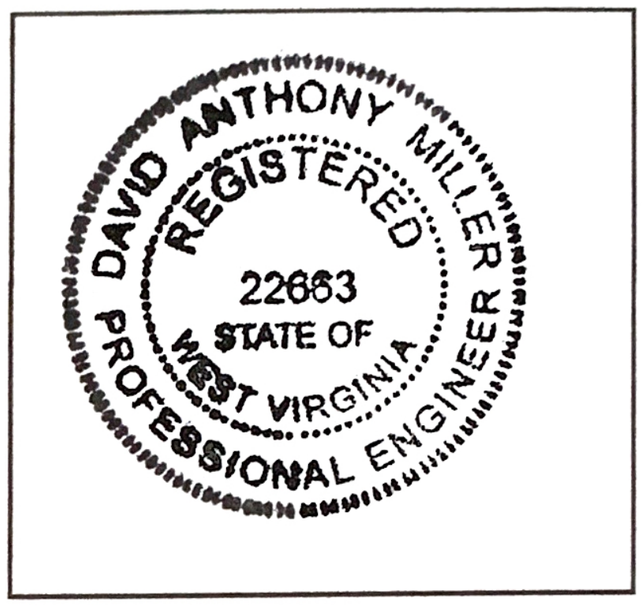
Certification by a Qualified Professional Engineer

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	04.04.22
License Number	Licensing State	Date

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Memorandum

Date:	August 26, 2022
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 of 2022 at the Landfill (LF), an existing CCR unit at the Amos Power Plant located in Winfield, West Virginia was completed on May 24-25, 2022. Based on the results, verification sampling was completed on July 26-27, 2022.

Background values for the LF were previously calculated in January 2018. 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, upper prediction limits (UPLs) and lower prediction limits (LPLs) were calculated for MW-1801 and MW-1802. 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 for all wells in the groundwater monitoring network. Revised UPLs were calculated for each Appendix III parameter to represent background values. LPLs were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec's *Statistical Analysis Summary – Background Update Calculations* report, dated August 26, 2022.

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 1.05 mg/L in both the initial (1.14 mg/L) and second (1.16 mg/L) samples collected at MW-1802. Thus, an SSI over background is concluded for calcium at MW-1802.

- Chloride concentrations exceeded the intrawell UPL of 13.4 mg/L in both the initial (17.0 mg/L) and second (14.9 mg/L) samples collected at MW-1802. Thus, an SSI over background is concluded for chloride at MW-1802.

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 and chloride 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 Comparison
Amos - Landfill

Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-2		MW-4		MW-1801		MW-1802	
			5/24/2022	7/27/2022	5/25/2022	7/26/2022	5/25/2022	7/27/2022	5/25/2022	7/27/2022
Boron	mg/L	Intrawell Background Value (UPL)	0.243		0.206		0.293		0.282	
		Analytical Result	0.227	--	0.171	--	0.265	--	0.273	--
Calcium	mg/L	Intrawell Background Value (UPL)	3.50		0.904		1.78		1.05	
		Analytical Result	1.82	--	**0.95**	0.89	1.78	--	**1.14**	**1.16**
Chloride	mg/L	Intrawell Background Value (UPL)	5.32		25.1		14.0		13.4	
		Analytical Result	3.39	--	24.2	--	**14.4**	14.0	**17.0**	**14.9**
Fluoride	mg/L	Intrawell Background Value (UPL)	1.74		1.55		5.58		5.32	
		Analytical Result	1.60	--	1.34	--	5.22	--	4.71	--
pH	SU	Intrawell Background Value (UPL)	8.9		9.8		9.3		9.4	
		Intrawell Background Value (LPL)	8.2		8.6		8.5		8.7	
		Analytical Result	**6.1**	8.7	**8.3**	9.2	**8.4**	8.8	**6.1**	9.1
Sulfate	mg/L	Intrawell Background Value (UPL)	12.1		11.5		9.05		24.2	
		Analytical Result	9.29	--	9.79	--	5.42	--	19.0	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	396		419		563		527	
		Analytical Result	370	--	400	--	510	--	520	--

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.
--: Not sampled

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 August 26, 2022 *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	09.15.22
License Number	Licensing State	Date

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

Submitted to

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August 26, 2022
CHA8500B

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LIST OF ACRONYMS AND ABBREVIATIONS

CCR	Coal Combustion Residuals
CCV	Continuing Calibration Value
CFR	Code of Federal Regulations
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
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. Recent groundwater monitoring results were incorporated into the LF background dataset as appropriate and the site-specific background values were re-established for use in future detection monitoring events.

Eight monitoring events were completed prior to October 2017 to establish background concentrations for Appendix III and Appendix IV parameters under the CCR rule. Prediction limits for Appendix III parameters were previously updated in February 2020 using data until July 2019 (Geosyntec, 2020a). 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). Background concentrations were established for MW-1801 and MW-1802 in July 2020 (Geosyntec, 2020b). Since the last background reassessment for wells originally in the monitoring well network, five semiannual detection monitoring events were conducted between July 2019 and March 2022. Since background concentrations were established for MW-1801 and MW-1802, four semiannual detection monitoring events were conducted between May 2020 and March 2022. Data from these semiannual 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, which were removed (when appropriate) prior to updating upper prediction limits (UPLs) for each Appendix III parameter to represent background values.

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 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 UPLs for each Appendix III parameter. Lower prediction limits (LPLs) were also established for pH. Initial statistical analyses recommended intrawell prediction limits for calcium, chloride, pH, sulfate and total dissolved solids (TDS) with a one-of-two resampling procedure and interwell prediction limits for boron and fluoride 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, 2018a).

A subsequent review of groundwater chemistry 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 of boron and fluoride were revised to an intrawell approach (Geosyntec, 2018b).

Monitoring wells MW-1801 and MW-1802 were added to the groundwater monitoring network to replace MW-1 and MW-5 (Arcadis, 2020). Eight samples were collected from MW-1801 and MW-1801 from December 2018 through November 2019 to establish background concentrations for all parameters under the CCR rule (Geosyntec, 2020b). As recommended in the USEPA *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* (Unified Guidance), background values should be updated every four to eight measurements assuming no confirmed statistically significant increase (SSI) was identified (USEPA, 2009). Prediction limits for Appendix III parameters were previously updated in February 2020 using data until July 2019 for wells originally included in the monitoring well network (Geosyntec, 2020b). The established background concentrations for MW-1801 and MW-1802 have not been updated since they were initially established (Geosyntec, 2020b).

2.2 Data Validation & QA/QC

Five semiannual detection monitoring events have been conducted between November 2019 and March 2022 at the LF since the previous background reassessment (which used data through June 2019) for wells in the original groundwater monitoring network (i.e., MW-2, MW-4, MW-6, MW-7R, MW-8, MW-9, and MW-10). Four semiannual detection monitoring events have been

completed between May 2020 and March 2022 since background was established for monitoring wells MW-1801 and MW-1802. If the initial results for each detection monitoring event identified possible exceedances, verification sampling was completed on an individual well/parameter basis. Thus, a minimum of four samples have been collected from each compliance well since the previous background updates. A summary of data collected during these detection monitoring events is provided 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.9.6.33 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 October 2020 *Statistical Analysis Plan* (Geosyntec, 2020c). 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. Box plots were also compiled to provide visual representation of variations between wells and within individual wells (Attachment B).

2.3.1 Background 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 collected during the detection monitoring period that were evaluated as potential outliers are summarized in Attachment B. Tukey's outlier test indicated five potential outliers for the data of interest. Three values were retained in the dataset, as they were the most recently reported values and may indicate naturally changing groundwater quality. The results for the November 2021 sampling event for fluoride at upgradient well MW-10 and the March 2022 sampling event for pH at downgradient well MW-2 were excluded from the background dataset to construct limits that are conservative from a regulatory perspective.

Flagged data and outliers will be reevaluated as new data are collected.

2.3.2 Establishment of Updated Background Dataset

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 – July 2019 for wells originally in the network; December 2018 – November 2019 for MW-1801 and MW-1802) to the new compliance samples (November 2019 – March 2022 for wells originally in the network; May 2020 – March 2020 for MW-1801 and MW-1802). 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. Statistically significant differences were found between the two groups for the following upgradient well/parameter pairs:

- A decrease was found for calcium at MW-8; and,
- A decrease was found for chloride at MW-9.

The background datasets for all upgradient wells were updated to include all available data because the majority of recent measurements were similar or lower than historic measurements; therefore, these data represent naturally occurring groundwater quality not impacted by a release.

Statistically significant differences were found between the two groups for the following downgradient well/parameter pairs:

- Increases were found for chloride at MW-4 and MW-1801.

The background datasets for all downgradient wells were updated to include all available data because the majority of recent measurements were similar or lower than historic measurements; therefore, these data represent naturally occurring groundwater quality not impacted by a release. For chloride at MW-1801, the recent concentrations are relatively low and similar to at least one upgradient well. For chloride in downgradient well MW-4, the recent concentrations are slightly higher than historical measurements but are relatively low and similar to at least one upgradient well. Additionally, an ASD was prepared which attributed chloride concentrations at MW-4 to natural variability in the aquifer (Geosyntec, 2022).

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 March 2022 to represent background values. Intrawell LPLs were also generated for pH. The updated prediction limits are summarized in Table 2. The intrawell UPLs and LPLs 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 and the pH result was greater than or equal to the LPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result did not exceed the UPL and the pH result was greater than or equal to the LPL, a second sample will not be collected. The retesting procedures allow achieving an

acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.4 Conclusions

Four to five 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 selected for all Appendix III parameters.

SECTION 3

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TABLES

Table 1: Groundwater Data Summary
Amos - Landfill

Component	Unit	MW-2								
		11/6/2019	2/11/2020	5/5/2020	7/7/2020	11/3/2020	5/4/2021	7/21/2021	11/2/2021	3/1/2022
Boron	mg/L	0.203	--	0.174	--	0.179	0.220	--	0.221	--
Calcium	mg/L	1.73	--	2.76	2.74	1.69	2.04	--	1.8	--
Chloride	mg/L	3.44	--	5.08	--	4.31	3.60	--	2.85	--
Fluoride	mg/L	1.66	1.37	1.37	--	1.45	1.62	1.41	1.70	0.09
Total Dissolved Solids	mg/L	9.5	--	7.8	--	9.0	8.2	--	6.97	--
Sulfate	mg/L	379	--	368	--	378	386	--	380	--
pH	SU	8.6	8.5	8.6	8.5	8.8	8.7	8.4	8.6	6.3

Component	Unit	MW-4								MW-6				
		11/6/2019	5/5/2020	11/3/2020	1/5/2021	5/4/2021	7/21/2021	11/4/2021	3/1/2022	11/6/2019	5/7/2020	11/4/2020	5/4/2021	11/4/2021
Boron	mg/L	0.173	0.150	0.157	--	0.168	--	0.167	--	0.100	0.092	0.088	0.101	0.093
Calcium	mg/L	0.761	0.790	0.783	--	0.695	--	0.7	--	39.8	37.0	38.4	34.7	35.1
Chloride	mg/L	14.9	15.2	17.1	18.0	19.7	20.8	21.8	25.1	8.00	6.61	7.63	7.33	7.51
Fluoride	mg/L	1.49	1.37	1.53	1.48	1.50	--	1.40	--	0.24	0.21	0.28	0.27	0.25
Total Dissolved Solids	mg/L	9.4	8.4	9.7	--	8.8	--	7.86	--	33.2	14.9	32.5	19.0	22.1
Sulfate	mg/L	382	397	397	--	410	--	390	--	390	349	375	354	360
pH	SU	9.2	9.2	9.4	9.4	9.2	9.0	9.1	9.3	7.4	7.6	7.7	7.5	7.4

Component	Unit	MW-7R					MW-8					MW-9				
		11/6/2019	5/6/2020	11/3/2020	5/4/2021	11/4/2021	11/6/2019	5/7/2020	11/4/2020	5/4/2021	11/3/2021	11/7/2019	5/6/2020	11/4/2020	5/4/2021	11/3/2021
Boron	mg/L	0.099	0.079	0.077	0.096	0.090	0.05 U	0.05 U	0.05 U	0.02 J	0.5 U	0.04 J	0.03 J	0.056	0.064	0.054
Calcium	mg/L	26.6	41.7	37.9	33.0	29.0	134	115	112	94.1	111	85.8	80.3	61.5	57.0	72.7
Chloride	mg/L	4.15	3.68	3.93	3.86	3.76	21.2	15.3	9.87	6.32	60.9	6.11	2.53	2.73	3.96	4.47
Fluoride	mg/L	0.34	0.28	0.35	0.37	0.33	0.16	0.15	0.20	0.20	0.18	0.19	0.22	0.30	0.28	0.23
Total Dissolved Solids	mg/L	217	208	247	220	210	78.6	98.4	87.3	73.8	64.9	38.2	22.4	28.4	29.8	28.2
Sulfate	mg/L	655	629	731	708	730	613	590	549	472	570	442	333	362	396	410
pH	SU	7.5	7.5	7.6	7.6	7.5	6.8	7.0	6.8	7.1	7.0	7.3	7.2	7.1	7.2	7.2

Component	Unit	MW-10					MW-1801						
		11/6/2019	5/6/2020	11/4/2020	5/4/2021	11/5/2021	5/7/2020	11/4/2020	1/5/2021	5/5/2021	7/21/2021	11/4/2021	2/28/2022
Boron	mg/L	0.076	0.074	0.071	0.081	0.257	0.252	0.215	--	0.250	--	0.245	--
Calcium	mg/L	1.43	1.25	1.18	0.916	0.9	1.65	1.52	--	1.65	--	1.5	--
Chloride	mg/L	5.62	4.90	5.77	5.48	16.4	11.6	12.5	11.7	13.1	13.1	13.5	13.2
Fluoride	mg/L	0.52	0.60	0.73	0.73	4.88	4.98	5.34	--	5.24	--	5.13	--
Total Dissolved Solids	mg/L	16.8	13.0	16.5	14.7	17.8	6.8	7.5	--	9.1	7.63	6.31	--
Sulfate	mg/L	490	526	523	519	490	541	535	--	542	--	530	--
pH	SU	8.7	8.6	8.9	9.0	8.8	8.9	9.0	9.0	8.8	8.6	8.7	8.8

Component	Unit	MW-1802						
		5/7/2020	11/4/2020	1/5/2021	5/5/2021	7/21/2021	11/4/2021	3/1/2022
Boron	mg/L	0.258	0.223	--	0.258	--	0.082	--
Calcium	mg/L	0.963	0.974	--	0.800	--	1.0	1
Chloride	mg/L	9.12	10.7	10.7	11.5	13.5	5.47	--
Fluoride	mg/L	4.91	4.89	--	4.88	--	0.73	--
Total Dissolved Solids	mg/L	15.2	19.0	--	17.9	--	13.2	--
Sulfate	mg/L	490	494	--	508	--	510	--
pH	SU	8.8	9.2	9.3	9.1	8.8	9.0	9.1

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

Table 2: Background Level Summary
Amos - Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	Description	MW-2	MW-4	MW-1801	MW-1802
Boron	mg/L	Intrawell Background Value (UPL)	0.243	0.206	0.293	0.282
Calcium	mg/L	Intrawell Background Value (UPL)	3.50	0.904	1.78	1.05
Chloride	mg/L	Intrawell Background Value (UPL)	5.32	25.1	14.0	13.4
Fluoride	mg/L	Intrawell Background Value (UPL)	1.74	1.55	5.58	5.32
pH	SU	Intrawell Background Value (UPL)	8.9	9.8	9.3	9.4
		Intrawell Background Value (LPL)	8.2	8.6	8.5	8.7
Sulfate	mg/L	Intrawell Background Value (UPL)	12.1	11.5	9.1	24.2
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	396	419	563	527

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

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

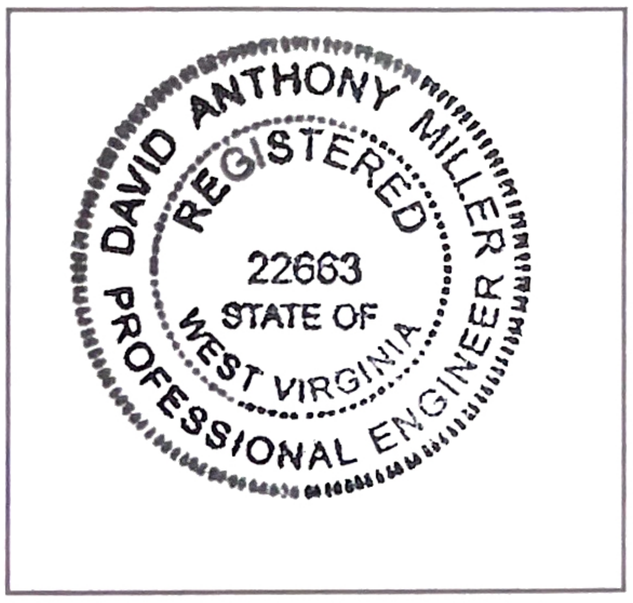
I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the John E. Amos Landfill CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



22663	WEST VIRGINIA	09.15.22
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

July 19, 2022

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

RE: Amos Landfill Background Update - 2022

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 2022 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:** LF-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 Kristina Rayner, Senior Statistician and Founder of 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

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 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:

- 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. 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 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 – March 2022

Data sets were previously evaluated in June 2020 for updating background limits at existing wells, and all records for these wells were updated using data through June/July 2019. Proposed background data through November 2019 were screened at new wells MW-1801 and MW-1802 and prediction limits were constructed using all available data. A summary of those findings was submitted at that time.

Prior to updating background data during this analysis, samples were re-evaluated for all wells using Tukey's outlier test and visual screening on data collected through November 2021 (Figure C). Some records had data available through March 2022 which were included in the background update.

Tukey's test identified several values as outliers. The majority of these values were the most recent reported measurement, which may indicate naturally changing groundwater quality in upgradient and downgradient wells. Therefore, these values were not flagged as outliers as this time. Exceptions to this include the highest measurement of fluoride in upgradient well LF-MW-10 which was reported above the Groundwater Protection Standard of 4.0 mg/L with remaining measurements reported below 1.0 mg/L; and the

most recent measurement of pH in downgradient well LF-MW-2, which was considerably lower than all measurements within this record. Additionally, Tukey's test confirmed the values of boron in well LF-MW-2 and pH in well LF-MW-4 that were flagged as outliers during the original screening; therefore, these values remain flagged in the database.

Previously flagged values of calcium in well LF-MW-2, as well as chloride and sulfate in well LF-MW-8 were unflagged as Tukey's test did not identify these values as outliers during this background update.

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).

Mann-Whitney Test

The Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data for existing wells through June 2019 and for new wells (MW-1801 and MW-1802) through November 2019 to the new compliance samples at each existing well through March 2022 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).

Statistically significant differences were found between the two groups for a few well/constituent pairs. Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background is not updated to include the newer data but will be reconsidered in the future unless it can be reasonably determined that the newer measurements are representative of naturally changing groundwater quality rather than a result of practices at the site.

For cases where the Mann-Whitney test identified statistically significant differences, while the medians of the two groups were different, the majority of the recently reported measurements were similar to or lower than those reported historically. In the case of chloride at well LF-MW-4, the more recent concentrations are slightly higher than those reported in background but are relatively low in this well (ranging from 14.1 mg/L to 25.1 mg/L) and similar to recent reported concentrations in at least one upgradient well. Furthermore, geochemistry studies conducted by Geosyntec Consultants also indicate changing concentrations at this site are due to natural variation in groundwater quality. Therefore, all records were updated with available data through March 2022. A summary of these results follows this letter.

Prediction Limits

Intrawell prediction limits using all historical data through March 2022, 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,

Tristan Clark

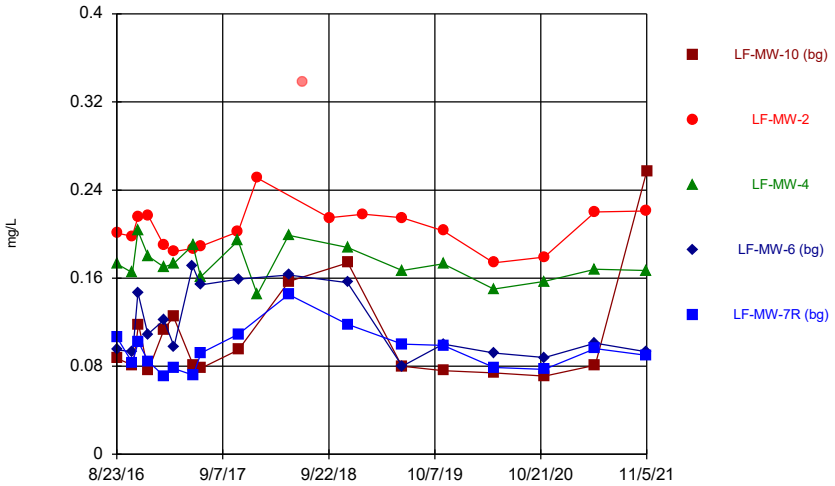
Kristina Rayner

Tristan Clark
Groundwater Analyst

Kristina Rayner
Senior Statistician

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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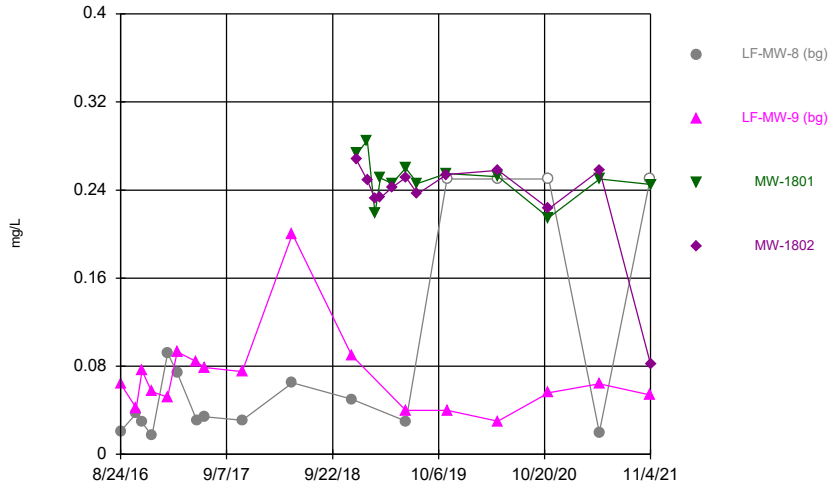
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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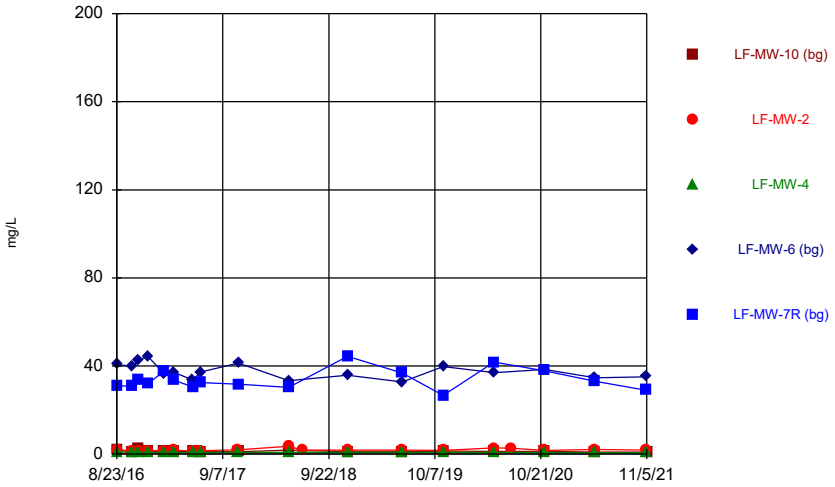
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

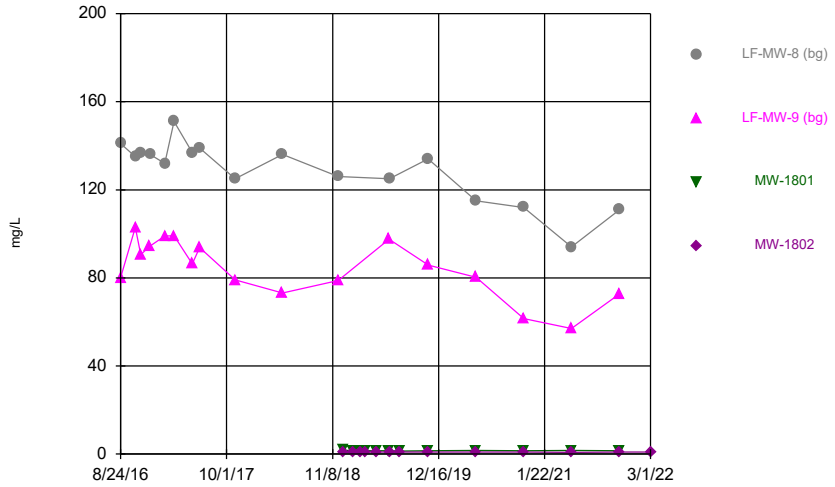
Time Series



Constituent: Calcium Analysis Run 7/18/2022 3:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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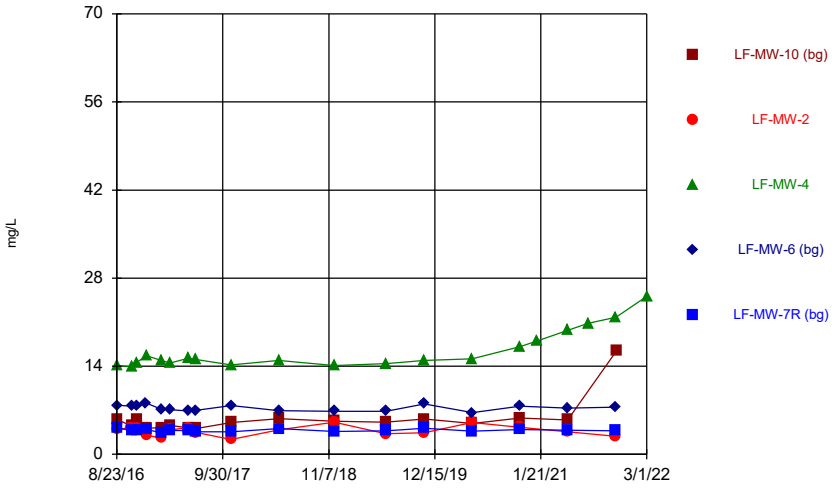
Amos Landfill Client: Geosyntec Data: Amos LF

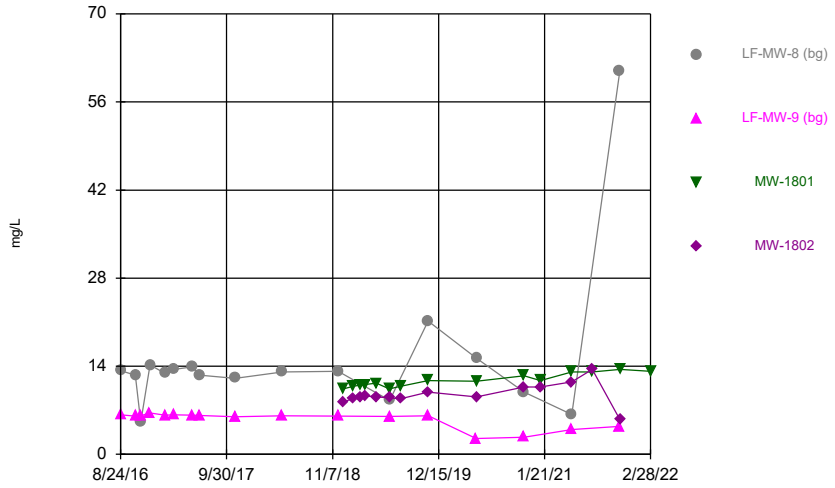
Time Series



Constituent: Chloride Analysis Run 7/18/2022 3:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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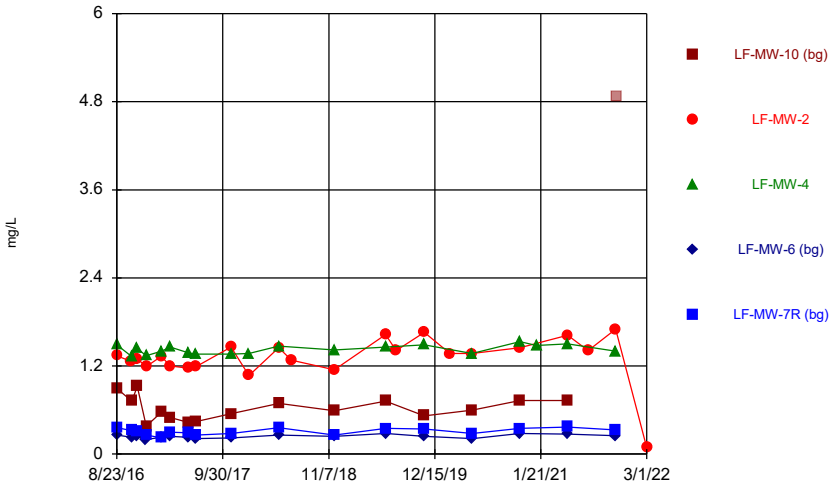
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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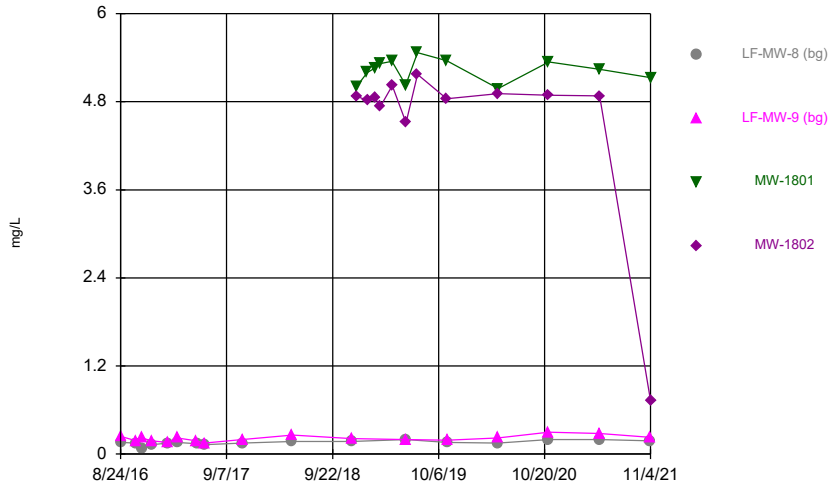
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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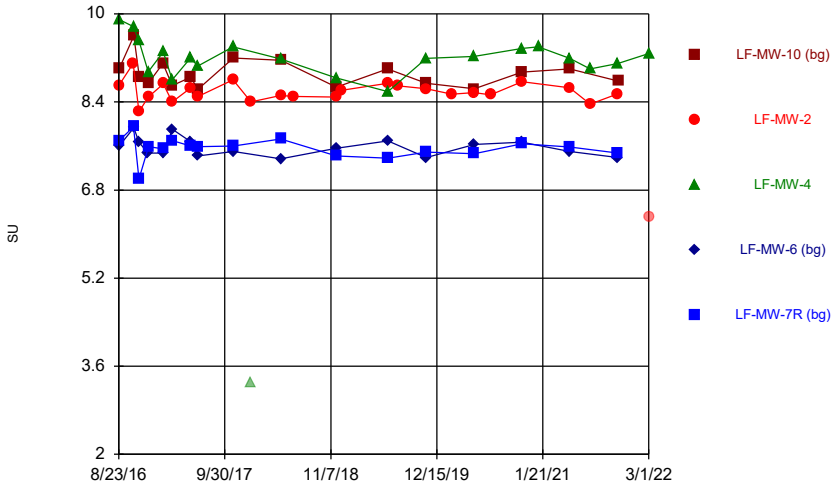
Amos Landfill Client: Geosyntec Data: Amos LF

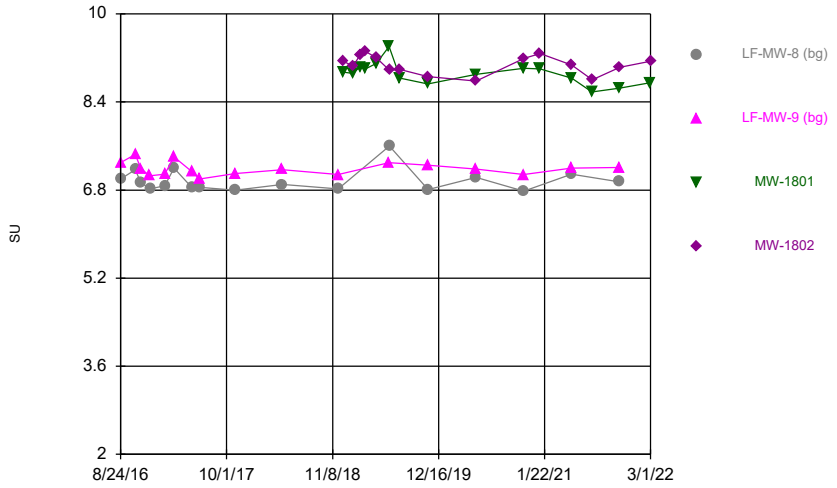
Time Series



Constituent: pH, field Analysis Run 7/18/2022 3:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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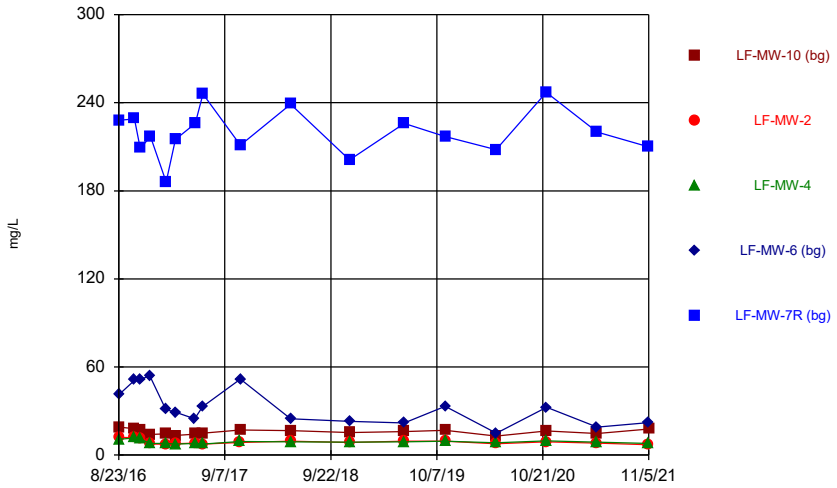
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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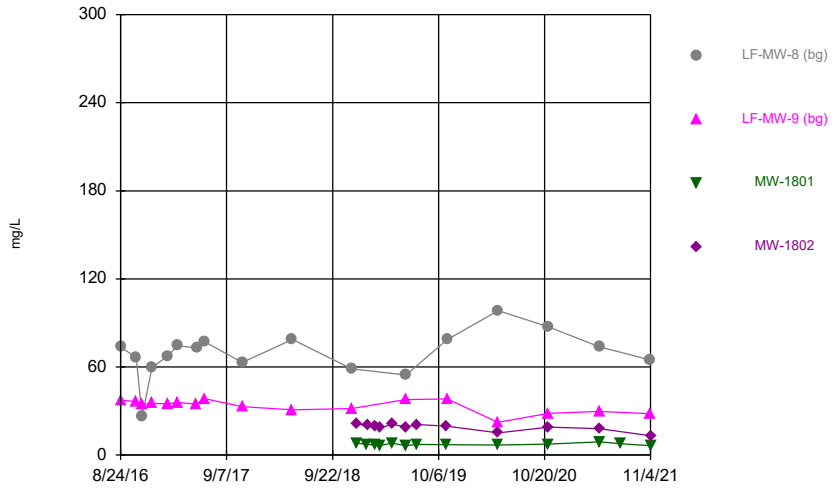
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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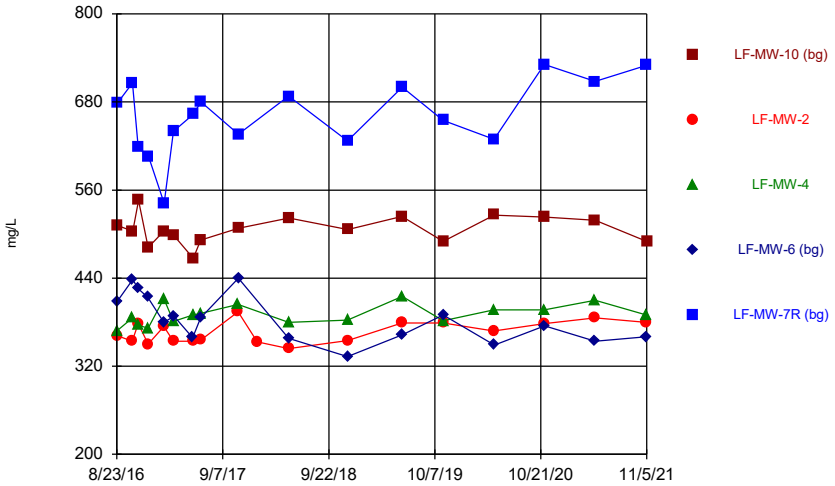
Amos Landfill Client: Geosyntec Data: Amos LF

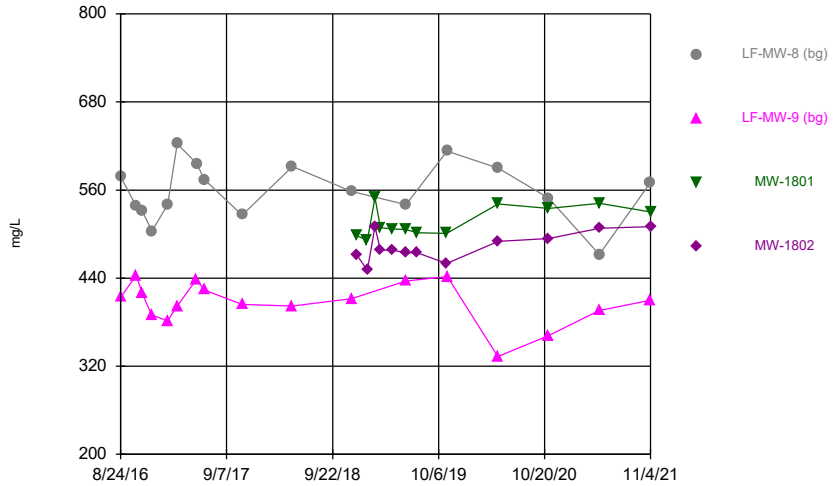
Time Series



Constituent: Total Dissolved Solids Analysis Run 7/18/2022 3:20 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

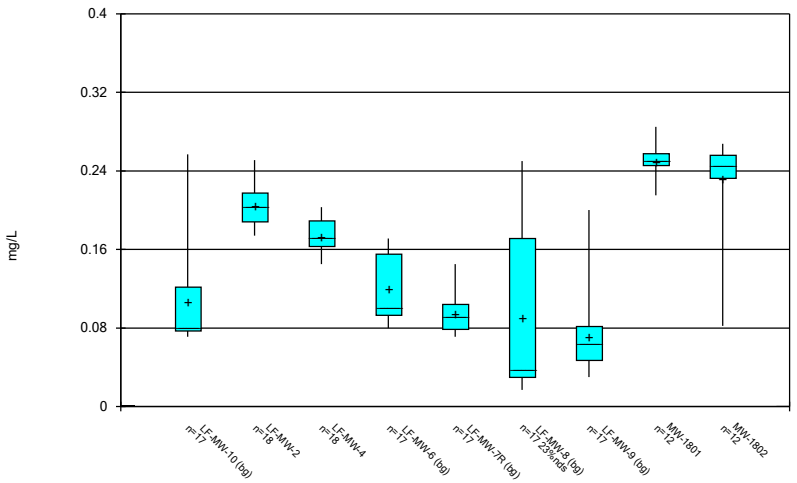
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Total Dissolved Solids Analysis Run 7/18/2022 3:20 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

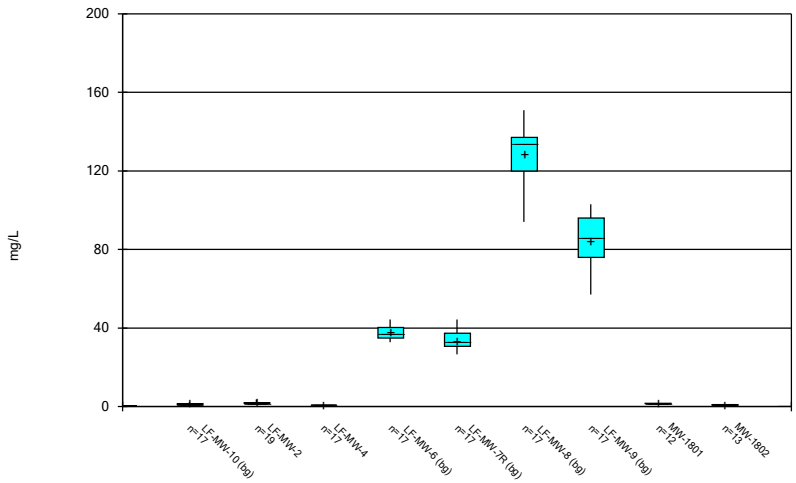
Box & Whiskers Plot



Constituent: Boron Analysis Run 7/18/2022 3:21 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

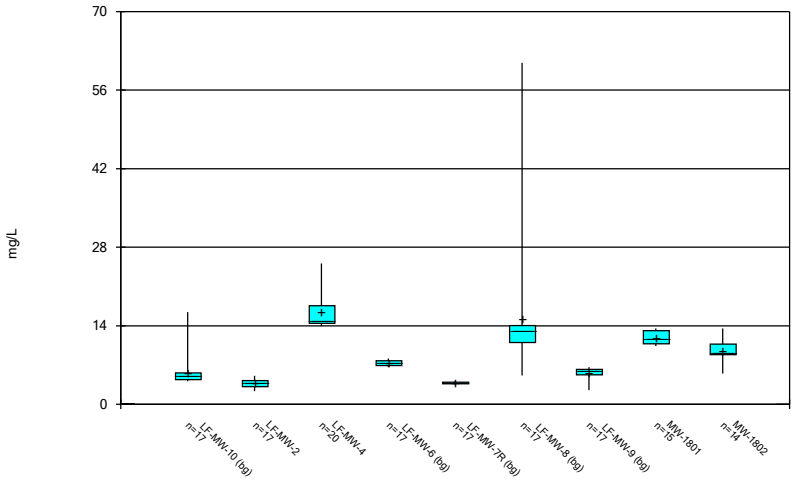
Box & Whiskers Plot



Constituent: Calcium Analysis Run 7/18/2022 3:21 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

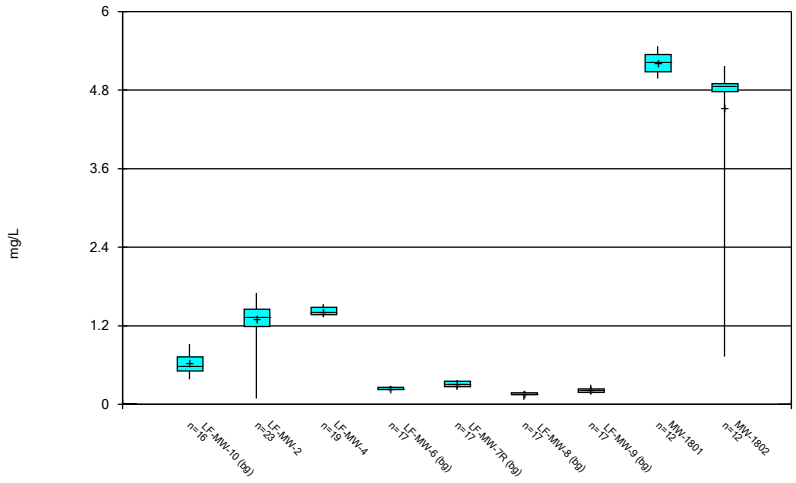
Box & Whiskers Plot



Constituent: Chloride Analysis Run 7/18/2022 3:21 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

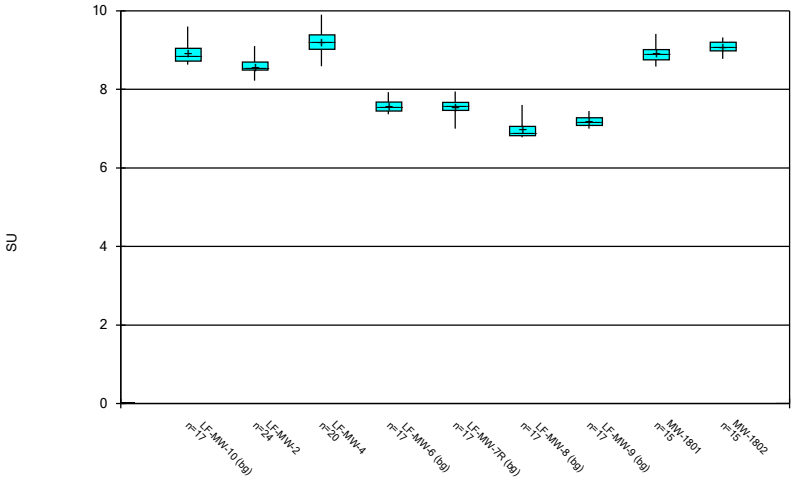
Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Fluoride Analysis Run 7/18/2022 3:21 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

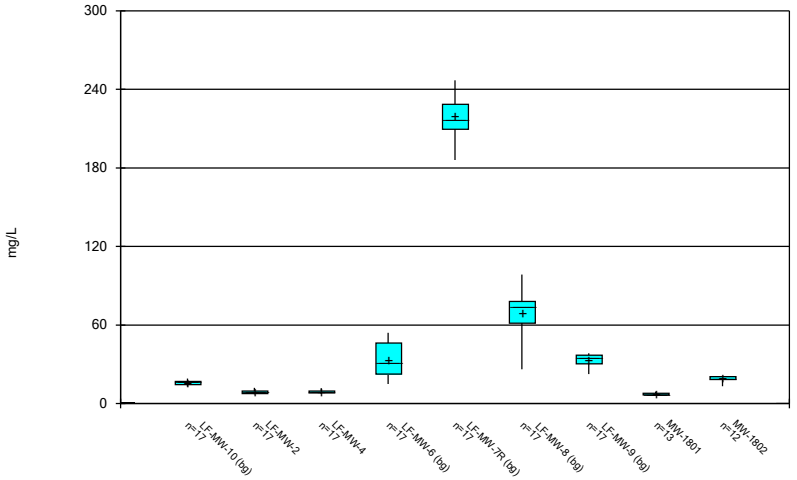
Box & Whiskers Plot



Constituent: pH, field Analysis Run 7/18/2022 3:21 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

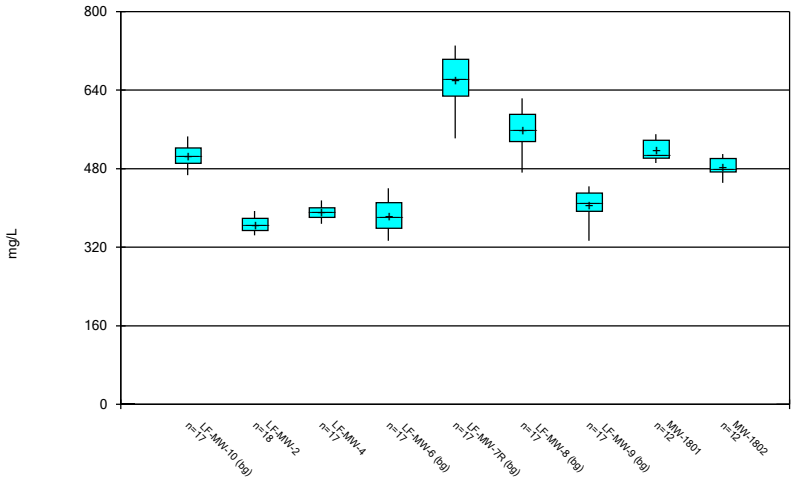
Box & Whiskers Plot



Constituent: Sulfate Analysis Run 7/18/2022 3:21 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 7/18/2022 3:21 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Outlier Summary

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/18/2022, 3:22 PM

	LF-MW-2 Boron (mg/L)	LF-MW-10 Fluoride (mg/L)	LF-MW-2 pH, field (SU)	LF-MW-4 pH, field (SU)
1/8/2018				3.3 (o)
6/19/2018	0.338 (o)			
11/5/2021		4.88 (o)		
3/1/2022			6.31 (o)	

Outlier Analysis - Significant Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/14/2022, 3:44 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (mg/L)	**LF-MW-2**	**Yes**	**0.338**	**6/19/2018**	**NP**	**NaN**	**19**	**0.2115**	**0.03581**	**ln(x)**	**ShapiroWilk**
Chloride (mg/L)	**LF-MW-10 (bg)**	**Yes**	**16.4**	**11/5/2021**	**NP**	**NaN**	**17**	**5.652**	**2.83**	**ln(x)**	**ShapiroWilk**
Chloride (mg/L)	**LF-MW-8 (bg)**	**Yes**	**5.12,60.9**	**11/9/2016,11/3/2021**	**NP**	**NaN**	**17**	**15.22**	**12.31**	**ln(x)**	**ShapiroWilk**
Fluoride (mg/L)	**LF-MW-10 (bg)**	**Yes**	**4.88**	**11/5/2021**	**NP**	**NaN**	**17**	**0.8741**	**1.043**	**ln(x)**	**ShapiroWilk**
Fluoride (mg/L)	**MW-1802**	**Yes**	**0.73**	**11/4/2021**	**NP**	**NaN**	**12**	**4.52**	**1.203**	**x^6**	**ShapiroWilk**
pH, field (SU)	**LF-MW-2**	**Yes**	**6.31**	**3/1/2022**	**NP**	**NaN**	**25**	**8.499**	**0.4879**	**x^6**	**ShapiroWilk**
pH, field (SU)	**LF-MW-4**	**Yes**	**3.3**	**1/8/2018**	**NP**	**NaN**	**21**	**8.931**	**1.325**	**x^6**	**ShapiroWilk**

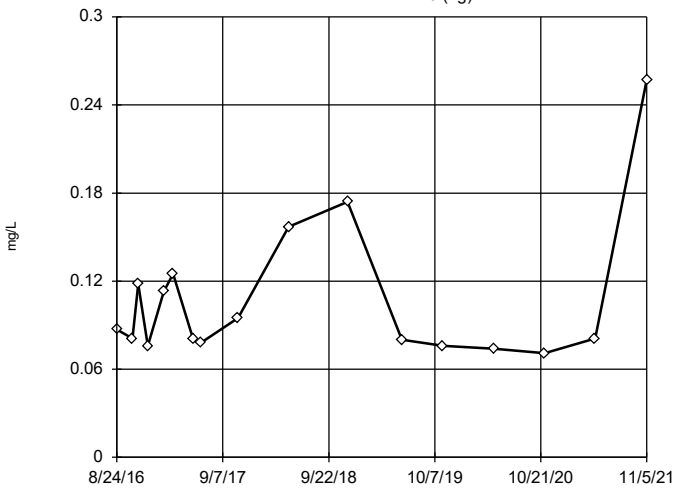
Outlier Analysis - All Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/14/2022, 3:44 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	17	0.1073	0.049	ln(x)	ShapiroWilk
Boron (mg/L)	**LF-MW-2**	**Yes**	**0.338**	**6/19/2018**	**NP**	**NaN**	**19**	**0.2115**	**0.03581**	**ln(x)**	**ShapiroWilk**
Boron (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	18	0.1735	0.01619	ln(x)	ShapiroWilk
Boron (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	17	0.1189	0.03161	ln(x)	ShapiroWilk
Boron (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	17	0.09418	0.01887	ln(x)	ShapiroWilk
Boron (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	17	0.09006	0.09358	ln(x)	ShapiroWilk
Boron (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	17	0.07035	0.03821	ln(x)	ShapiroWilk
Boron (mg/L)	MW-1801	No	n/a	n/a	NP	NaN	12	0.2498	0.01937	x^2	ShapiroWilk
Boron (mg/L)	MW-1802	No	n/a	n/a	NP	NaN	12	0.2323	0.04906	x^6	ShapiroWilk
Calcium (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	17	1.274	0.3554	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	19	1.924	0.5267	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	17	0.794	0.05352	normal	ShapiroWilk
Calcium (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	17	37.68	3.365	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	17	33.72	4.61	ln(x)	ShapiroWilk
Calcium (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	17	128.6	13.9	x^4	ShapiroWilk
Calcium (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	17	84.25	13.27	x^3	ShapiroWilk
Calcium (mg/L)	MW-1801	No	n/a	n/a	NP	NaN	12	1.534	0.1106	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-1802	No	n/a	n/a	NP	NaN	13	0.9029	0.0668	ln(x)	ShapiroWilk
Chloride (mg/L)	**LF-MW-10 (bg)**	**Yes**	**16.4**	**11/5/2021**	**NP**	**NaN**	**17**	**5.652**	**2.83**	**ln(x)**	**ShapiroWilk**
Chloride (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	17	3.734	0.7734	sqrt(x)	ShapiroWilk
Chloride (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	20	16.42	3.097	ln(x)	ShapiroWilk
Chloride (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	17	7.356	0.4653	ln(x)	ShapiroWilk
Chloride (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	17	3.812	0.1944	ln(x)	ShapiroWilk
Chloride (mg/L)	**LF-MW-8 (bg)**	**Yes**	**5.12,60.9**	**11/9/2016,11/3/2021**	**NP**	**NaN**	**17**	**15.22**	**12.31**	**ln(x)**	**ShapiroWilk**
Chloride (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	17	5.528	1.278	x^6	ShapiroWilk
Chloride (mg/L)	MW-1801	No	n/a	n/a	NP	NaN	15	11.75	1.07	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-1802	No	n/a	n/a	NP	NaN	14	9.519	1.806	normal	ShapiroWilk
Fluoride (mg/L)	**LF-MW-10 (bg)**	**Yes**	**4.88**	**11/5/2021**	**NP**	**NaN**	**17**	**0.8741**	**1.043**	**ln(x)**	**ShapiroWilk**
Fluoride (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	23	1.309	0.3161	x^3	ShapiroWilk
Fluoride (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	19	1.424	0.06094	x^(1/3)	ShapiroWilk
Fluoride (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	17	0.2412	0.02395	x^(1/3)	ShapiroWilk
Fluoride (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	17	0.3082	0.04405	x^2	ShapiroWilk
Fluoride (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	17	0.1571	0.03158	x^2	ShapiroWilk
Fluoride (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	17	0.2129	0.04058	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-1801	No	n/a	n/a	NP	NaN	12	5.224	0.1571	x^6	ShapiroWilk
Fluoride (mg/L)	**MW-1802**	**Yes**	**0.73**	**11/4/2021**	**NP**	**NaN**	**12**	**4.52**	**1.203**	**x^6**	**ShapiroWilk**
pH, field (SU)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	17	8.918	0.2521	ln(x)	ShapiroWilk
pH, field (SU)	**LF-MW-2**	**Yes**	**6.31**	**3/1/2022**	**NP**	**NaN**	**25**	**8.499**	**0.4879**	**x^6**	**ShapiroWilk**
pH, field (SU)	**LF-MW-4**	**Yes**	**3.3**	**1/8/2018**	**NP**	**NaN**	**21**	**8.931**	**1.325**	**x^6**	**ShapiroWilk**
pH, field (SU)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	17	7.579	0.1668	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	17	7.556	0.1969	x^6	ShapiroWilk
pH, field (SU)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	17	6.969	0.2076	ln(x)	ShapiroWilk
pH, field (SU)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	17	7.188	0.1223	ln(x)	ShapiroWilk
pH, field (SU)	MW-1801	No	n/a	n/a	NP	NaN	15	8.913	0.2031	ln(x)	ShapiroWilk
pH, field (SU)	MW-1802	No	n/a	n/a	NP	NaN	15	9.073	0.1693	x^6	ShapiroWilk
Sulfate (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	17	15.81	1.735	sqrt(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	17	8.863	1.553	ln(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	17	8.98	1.245	ln(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	17	32.88	12.65	ln(x)	ShapiroWilk
Sulfate (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	17	219.7	15.79	normal	ShapiroWilk
Sulfate (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	17	69.21	15.51	x^2	ShapiroWilk
Sulfate (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	17	33.39	4.346	x^4	ShapiroWilk
Sulfate (mg/L)	MW-1801	No	n/a	n/a	NP	NaN	13	7.307	0.7932	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-1802	No	n/a	n/a	NP	NaN	12	18.82	2.405	x^6	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-10 (bg)	No	n/a	n/a	NP	NaN	17	506.7	19.25	normal	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-2	No	n/a	n/a	NP	NaN	18	366.6	14.65	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-4	No	n/a	n/a	NP	NaN	17	390.3	13.96	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-6 (bg)	No	n/a	n/a	NP	NaN	17	383.6	32.1	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-7R (bg)	No	n/a	n/a	NP	NaN	17	661	49.44	x^4	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-8 (bg)	No	n/a	n/a	NP	NaN	17	558.5	39.38	x^3	ShapiroWilk
Total Dissolved Solids (mg/L)	LF-MW-9 (bg)	No	n/a	n/a	NP	NaN	17	406.5	29.08	x^6	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-1801	No	n/a	n/a	NP	NaN	12	517.7	20.35	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-1802	No	n/a	n/a	NP	NaN	12	483.4	19.34	ln(x)	ShapiroWilk

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 17

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 = 0.4767, low cutoff = 0.01962, based on IQR multiplier of 3.

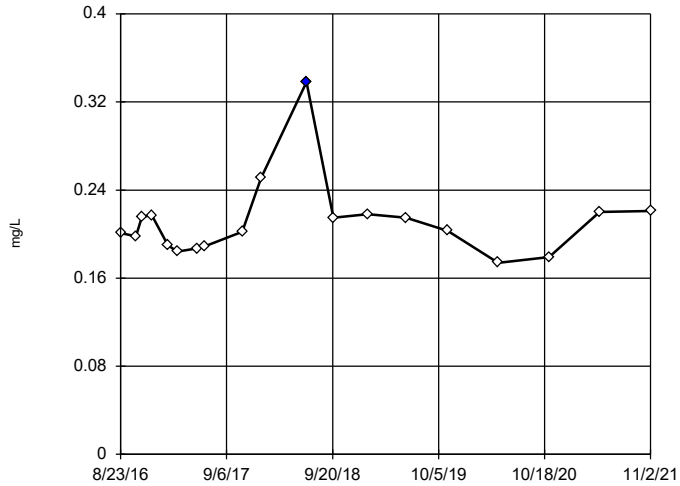
Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 19

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 = 0.3345, low cutoff = 0.1232, based on IQR multiplier of 3.

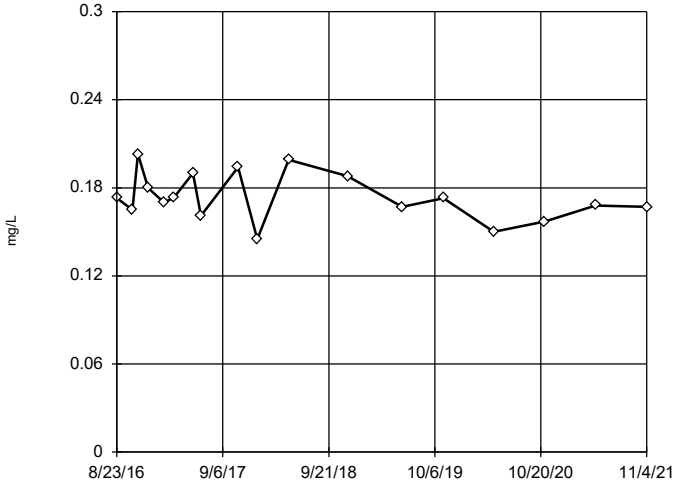
Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 18

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 = 0.2947, low cutoff = 0.1045, based on IQR multiplier of 3.

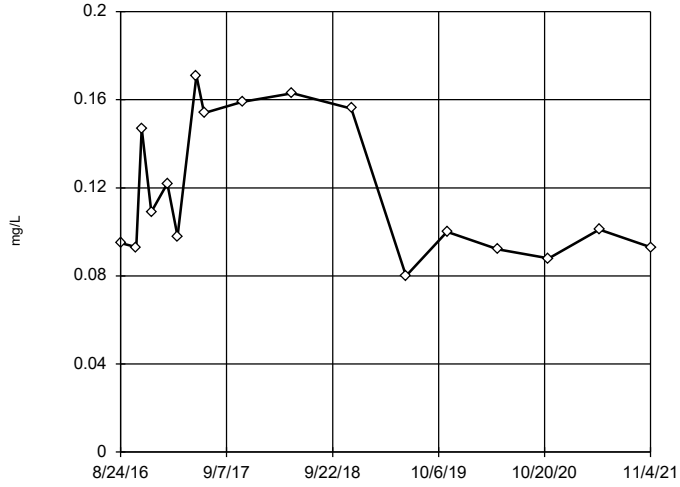
Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 17

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

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

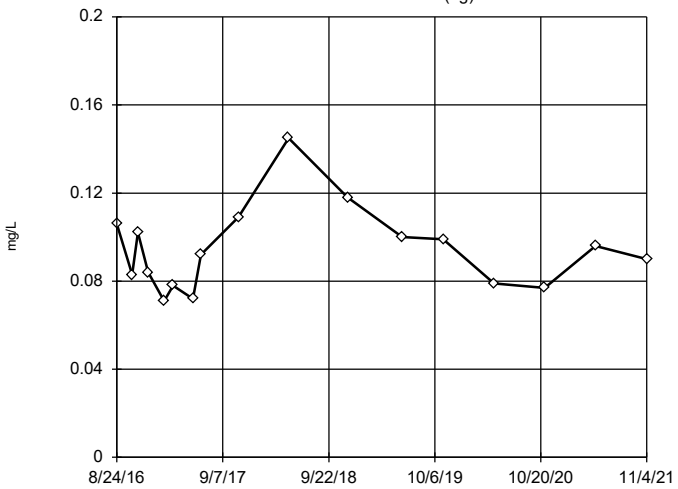
High cutoff = 0.7175, low cutoff = 0.02009, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 17

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 = 0.2417, low cutoff = 0.03377, based on IQR multiplier of 3.

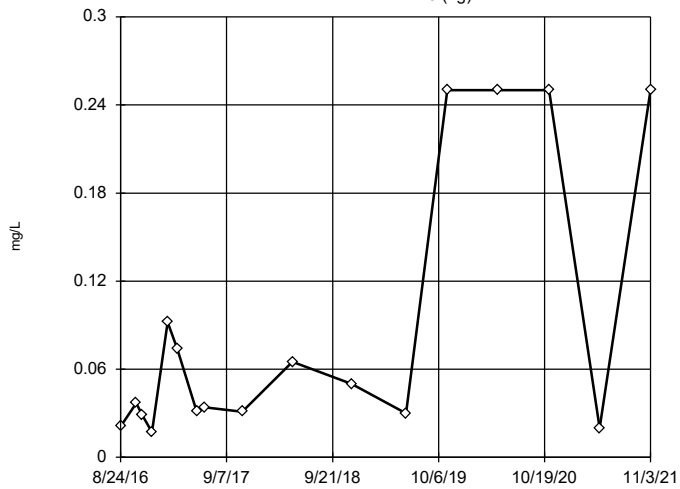
Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 17

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 = 20.61, low cutoff = 0.000217, based on IQR multiplier of 3.

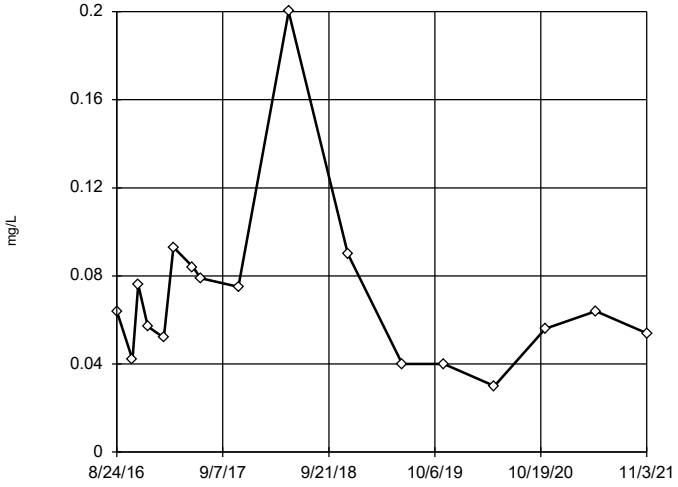
Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 17

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 = 0.4315, low cutoff = 0.008824, based on IQR multiplier of 3.

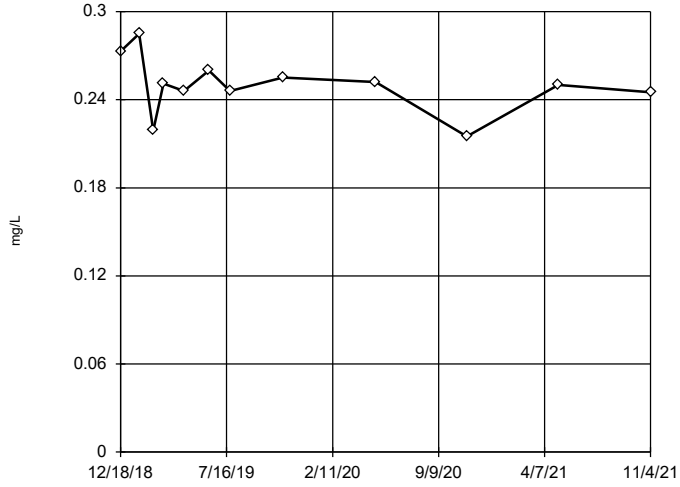
Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



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).

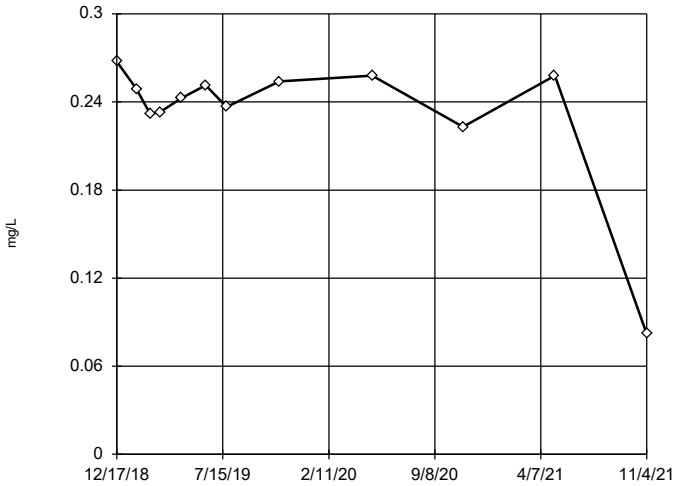
High cutoff = 0.2906, low cutoff = 0.2053, based on IQR multiplier of 3.

Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1802



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 = 0.2945, low cutoff = -0.2444, based on IQR multiplier of 3.

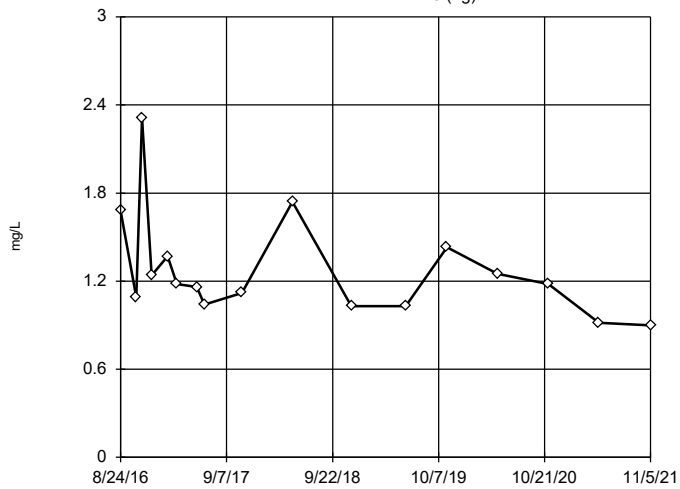
Constituent: Boron Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 17

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 = 3.462, low cutoff = 0.4185, based on IQR multiplier of 3.

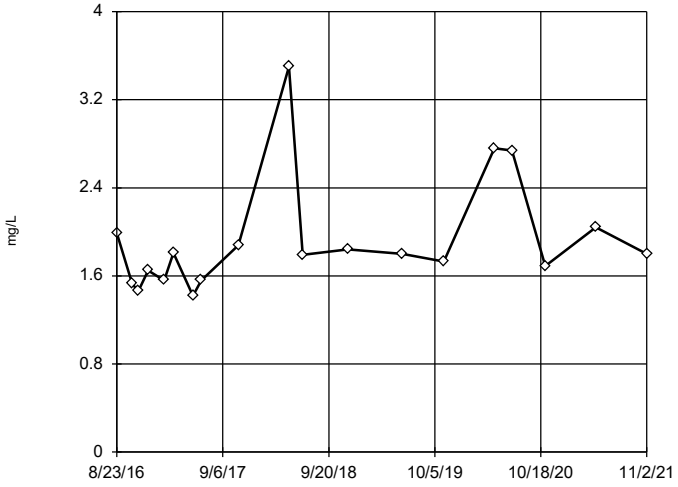
Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 19

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 = 4.131, low cutoff = 0.7515, based on IQR multiplier of 3.

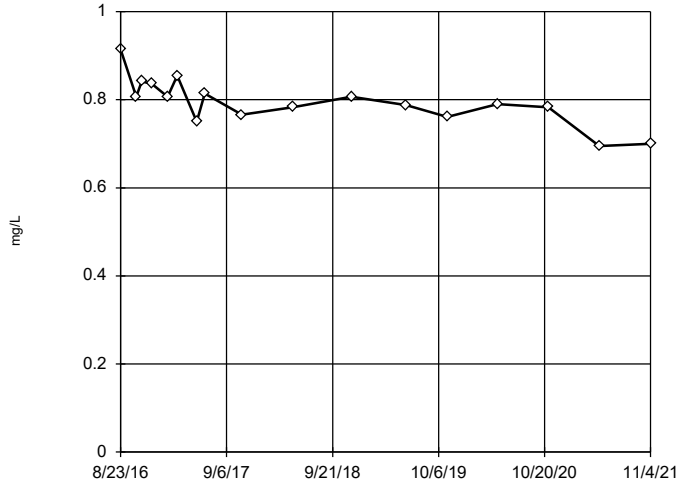
Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 17

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

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

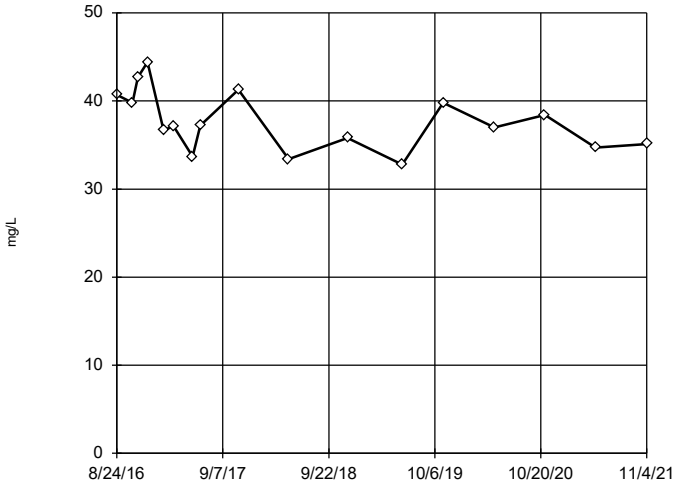
High cutoff = 1.01, low cutoff = 0.579, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 17

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 = 61.73, low cutoff = 22.75, based on IQR multiplier of 3.

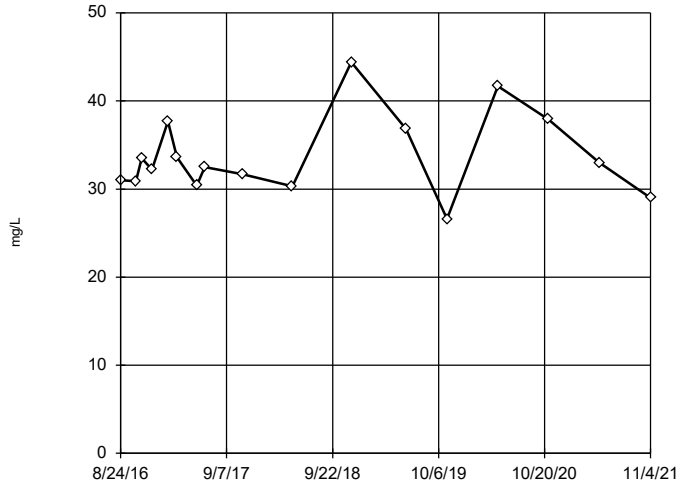
Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 17

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 = 66.85, low cutoff = 17.08, based on IQR multiplier of 3.

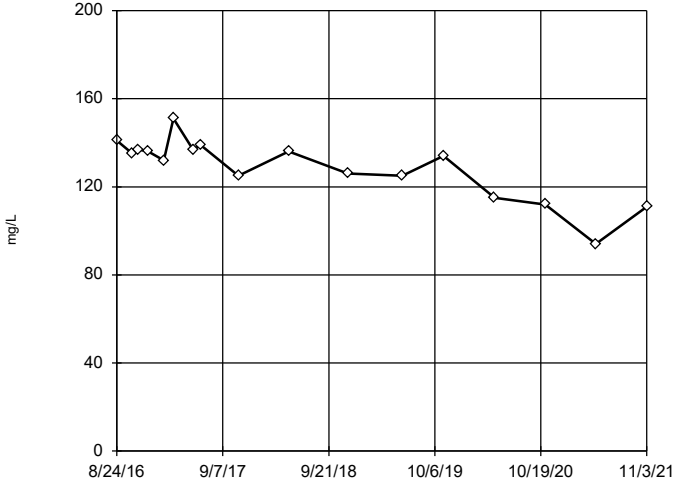
Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 17

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 = 167.1, low cutoff = -121.6, based on IQR multiplier of 3.

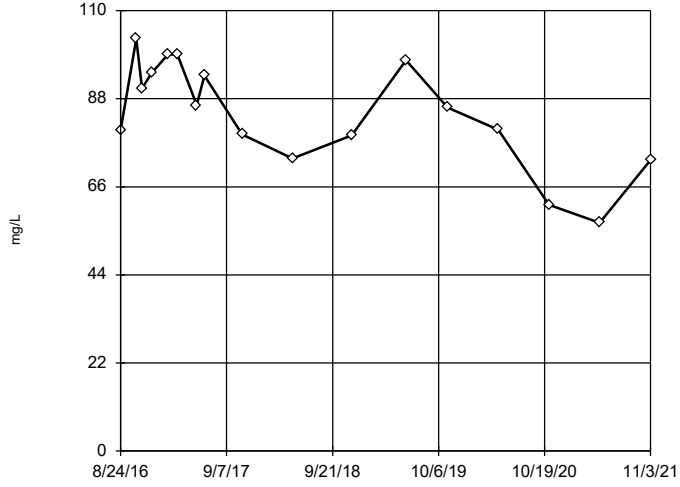
Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 17

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

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

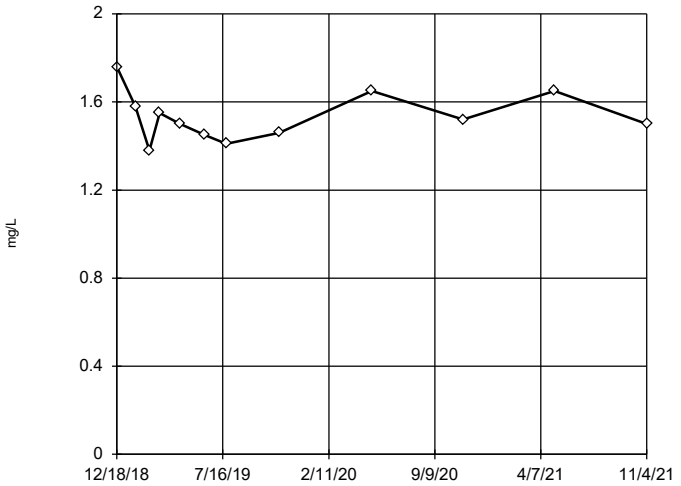
High cutoff = 130.5, low cutoff = -96.43, based on IQR multiplier of 3.

Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1801



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 = 2.206, low cutoff = 1.065, based on IQR multiplier of 3.

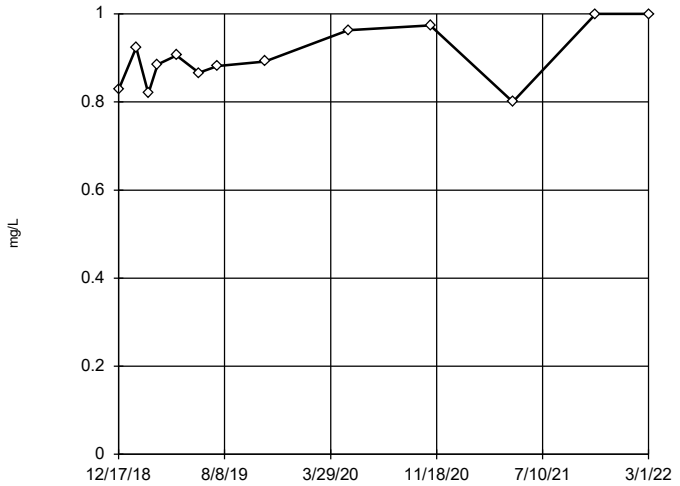
Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



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 = 1.45, low cutoff = 0.5653, based on IQR multiplier of 3.

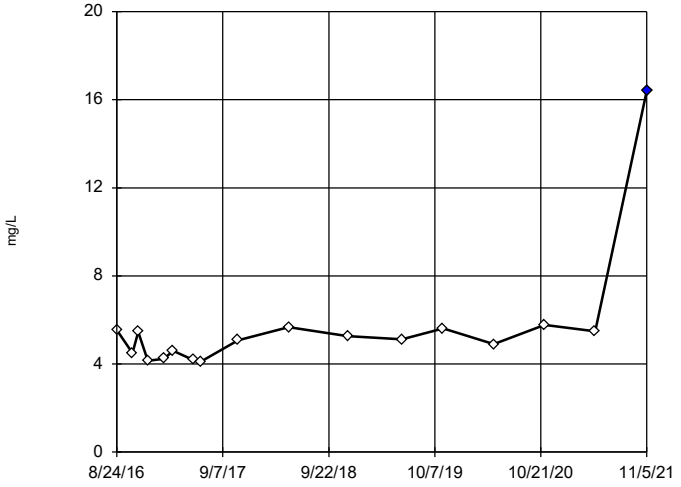
Constituent: Calcium Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 17

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 = 11.67, low cutoff = 2.086, based on IQR multiplier of 3.

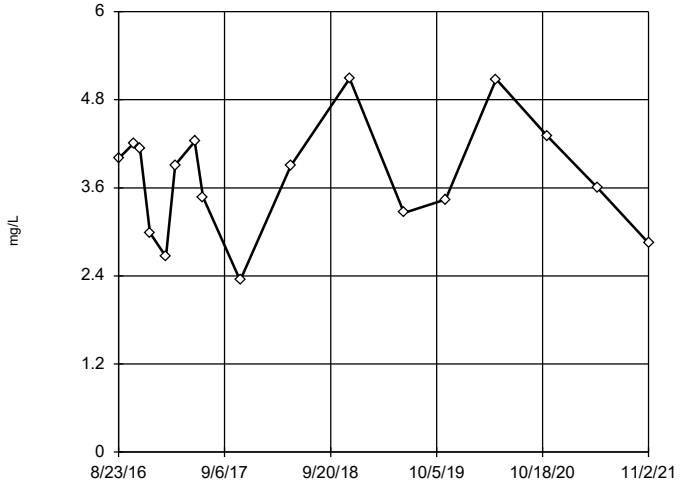
Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 17

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

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

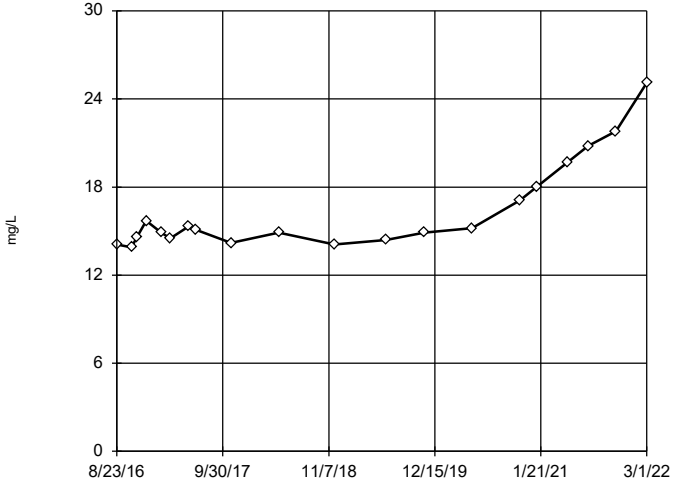
High cutoff = 8.497, low cutoff = 0.822, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-4



n = 20

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 = 31.4, low cutoff = 8.073, based on IQR multiplier of 3.

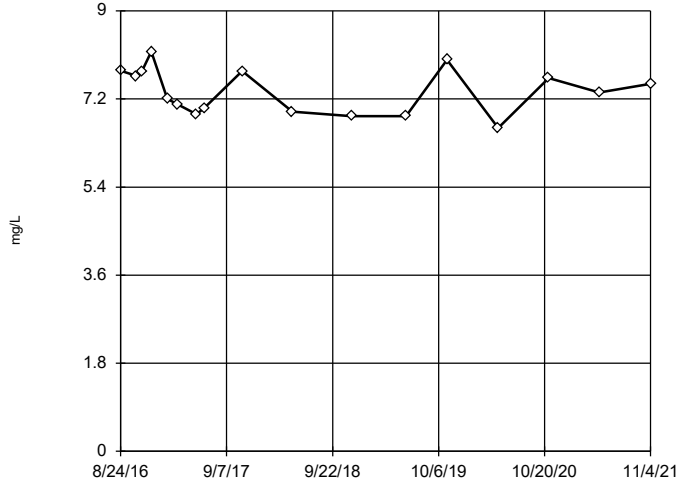
Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 17

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.

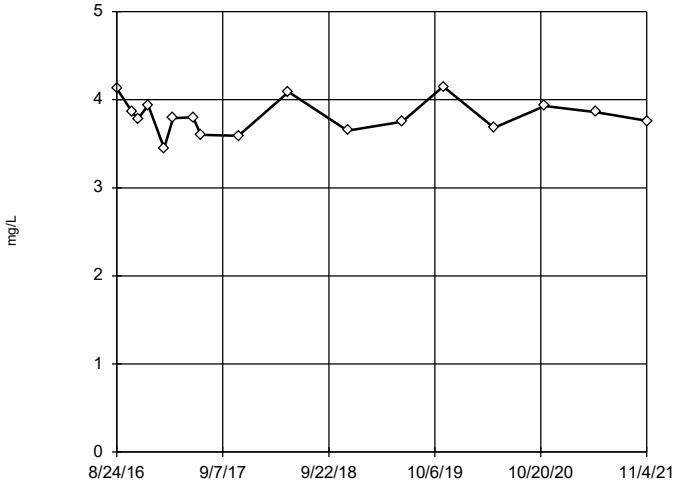
Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 17

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 = 4.87, low cutoff = 2.961, based on IQR multiplier of 3.

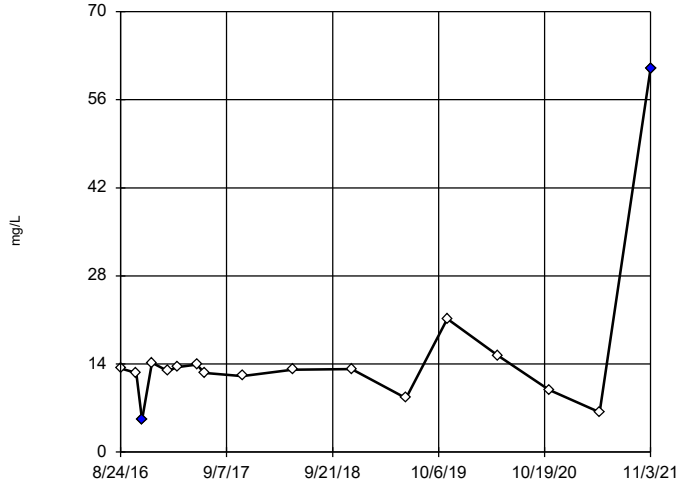
Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 17

Outliers are drawn as solid.
Tukey's method selected by user.

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

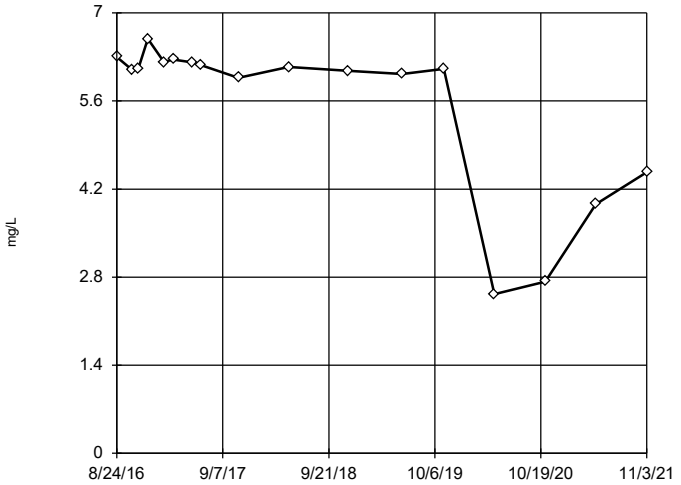
High cutoff = 29.85, low cutoff = 5.143, based on IQR multiplier of 3.

Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 17

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 = 7.294, low cutoff = -6.363, based on IQR multiplier of 3.

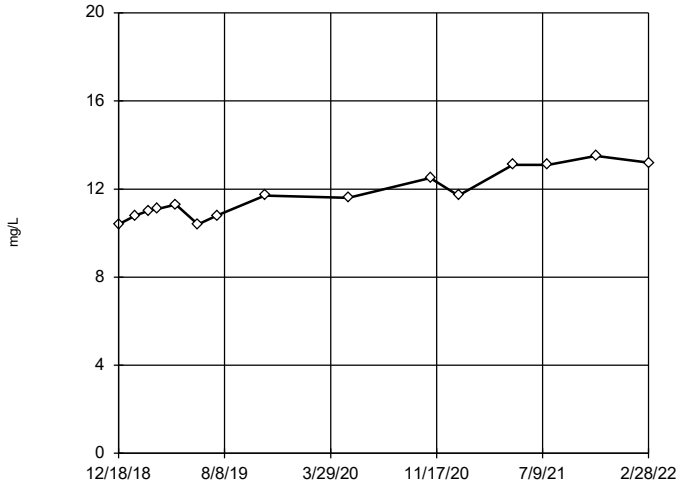
Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



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 = 23.38, low cutoff = 6.052, based on IQR multiplier of 3.

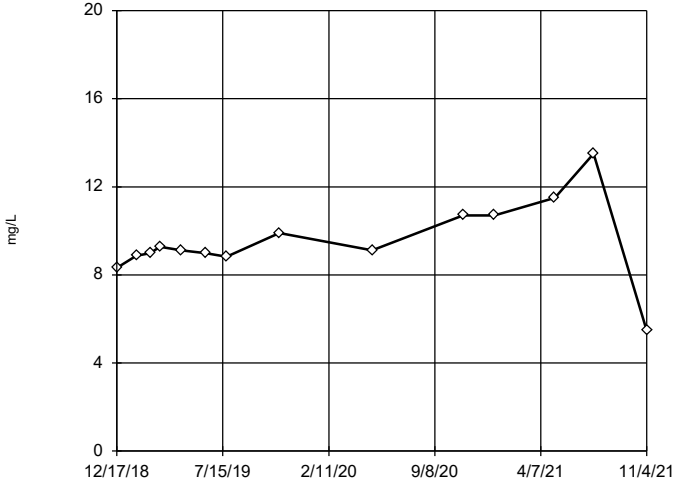
Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



n = 14

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

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

High cutoff = 16.27, low cutoff = 3.28, based on IQR multiplier of 3.

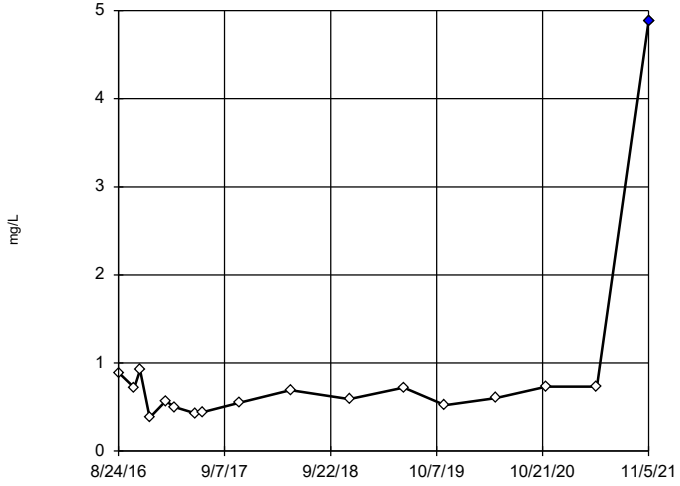
Constituent: Chloride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 17

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).

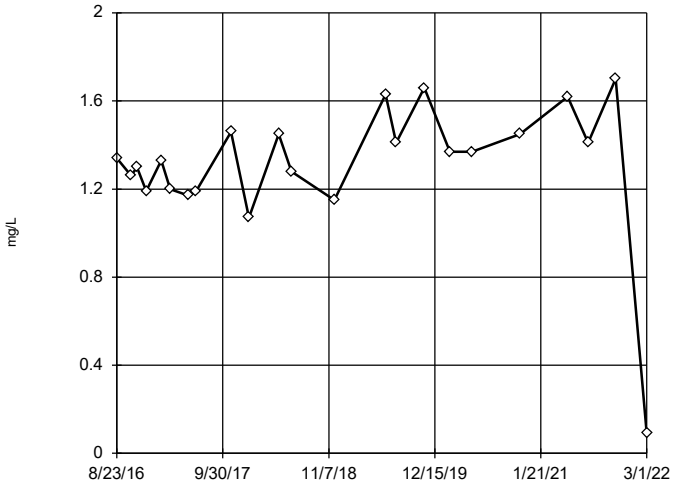
High cutoff = 2.142, low cutoff = 0.1738, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-2



n = 23

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 = 1.926, low cutoff = -1.34, based on IQR multiplier of 3.

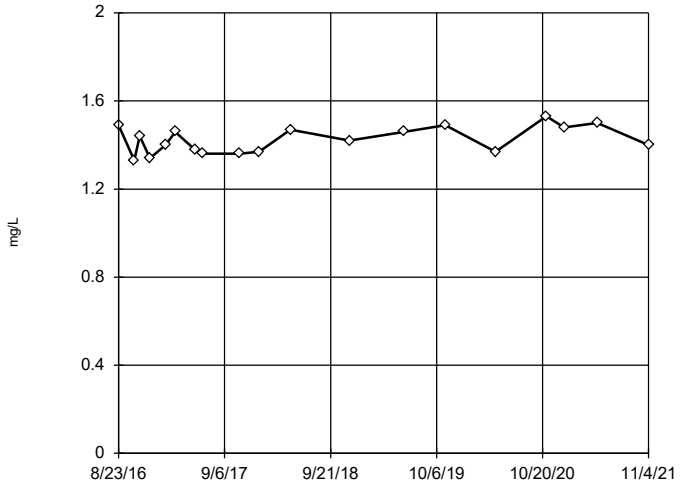
Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 19

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 = 1.845, low cutoff = 1.073, based on IQR multiplier of 3.

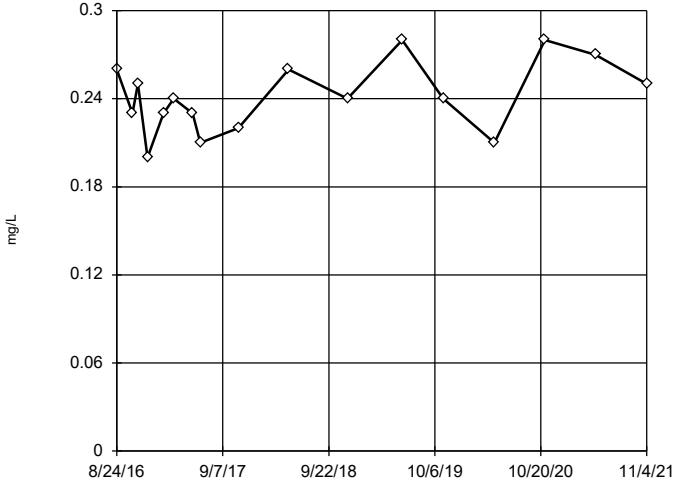
Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 17

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 = 0.3865, low cutoff = 0.139, based on IQR multiplier of 3.

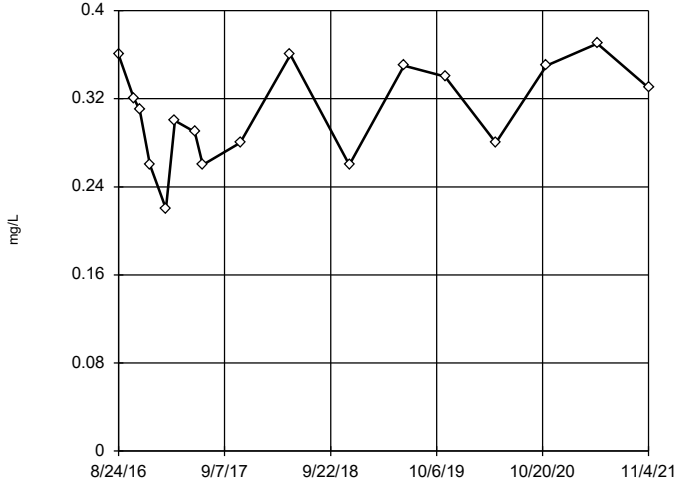
Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 17

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

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

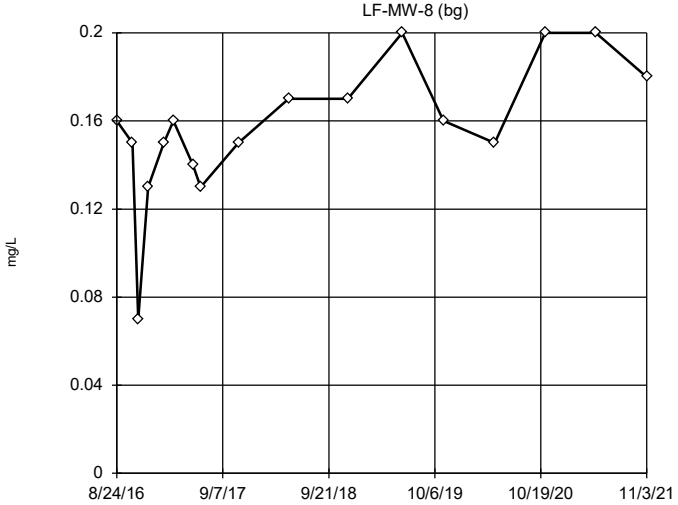
High cutoff = 0.5206, low cutoff = -0.2748, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 17

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 = 0.2438, low cutoff = -0.08803, based on IQR multiplier of 3.

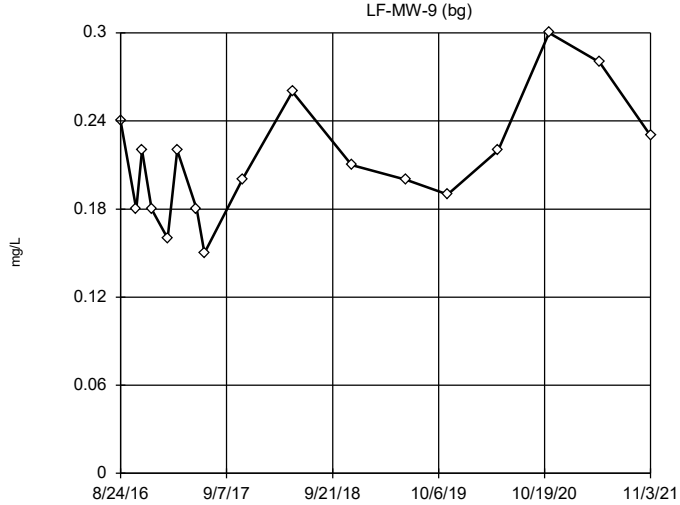
Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 17

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 = 0.5225, low cutoff = 0.08094, based on IQR multiplier of 3.

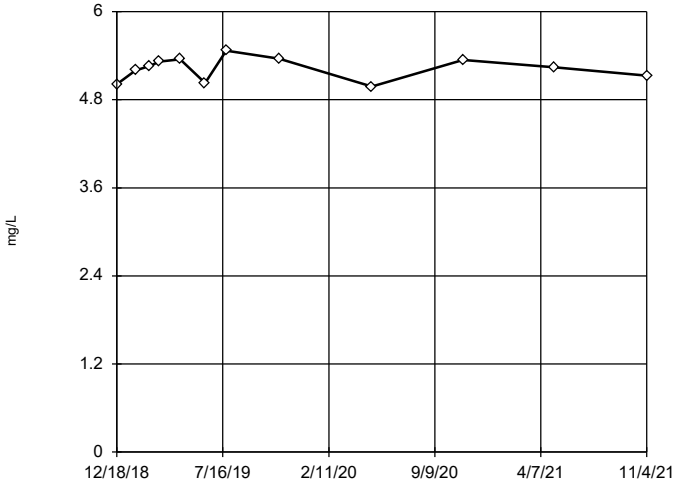
Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



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 = 5.887, low cutoff = -3.217, based on IQR multiplier of 3.

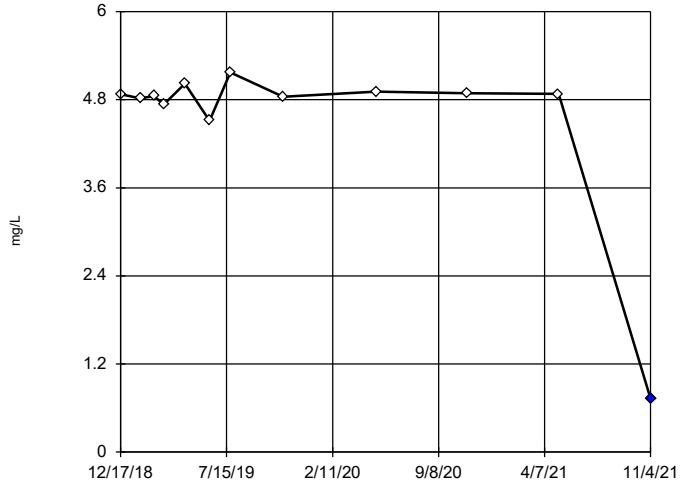
Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



n = 12

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

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

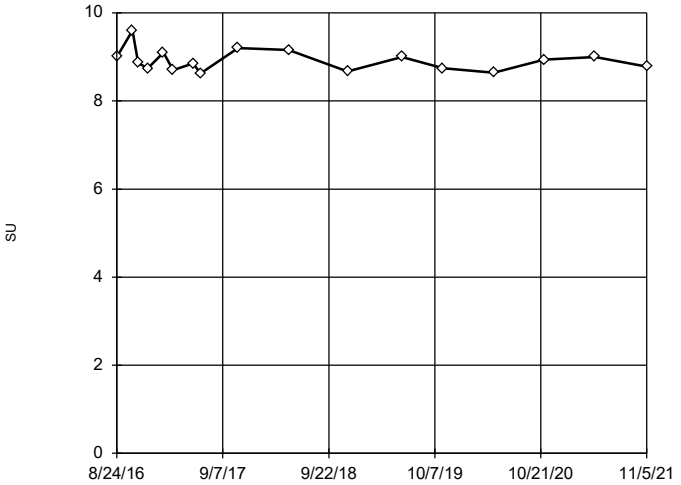
High cutoff = 5.195, low cutoff = 4.274, based on IQR multiplier of 3.

Constituent: Fluoride Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 17

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 = 10.12, low cutoff = 7.801, based on IQR multiplier of 3.

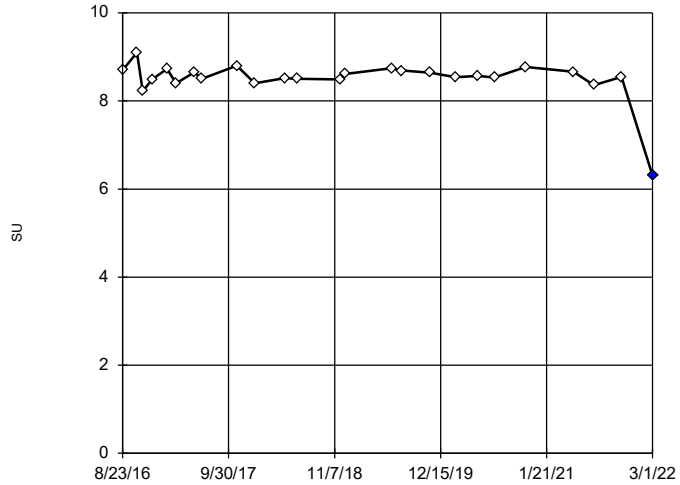
Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 25

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

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

High cutoff = 9.197, low cutoff = 7.657, based on IQR multiplier of 3.

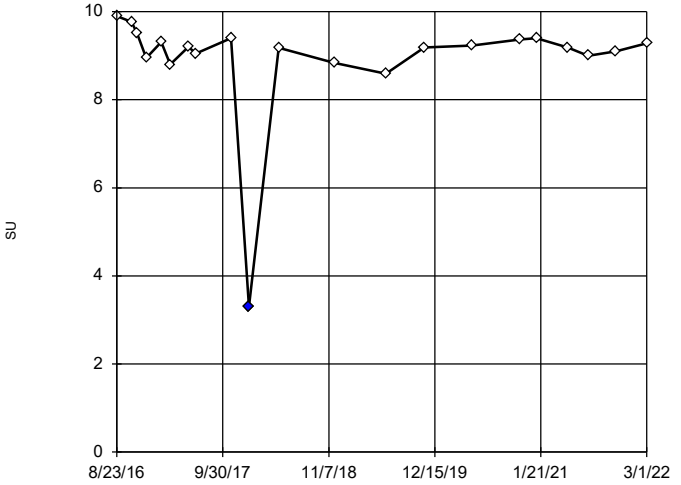
Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 21

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

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

High cutoff = 10.26, low cutoff = 5.869, based on IQR multiplier of 3.

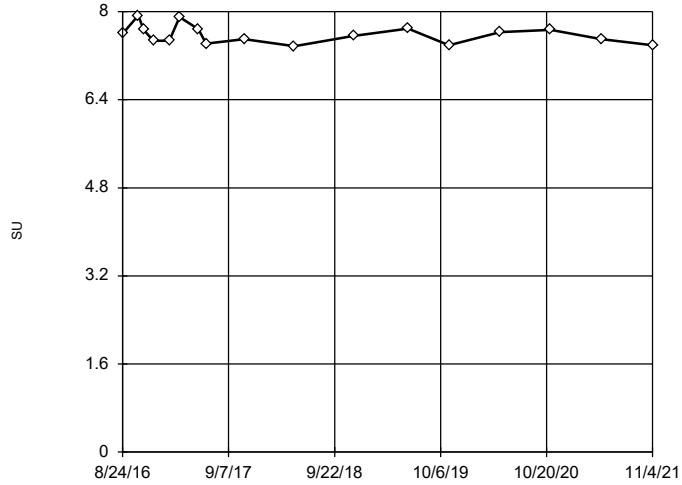
Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 17

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

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

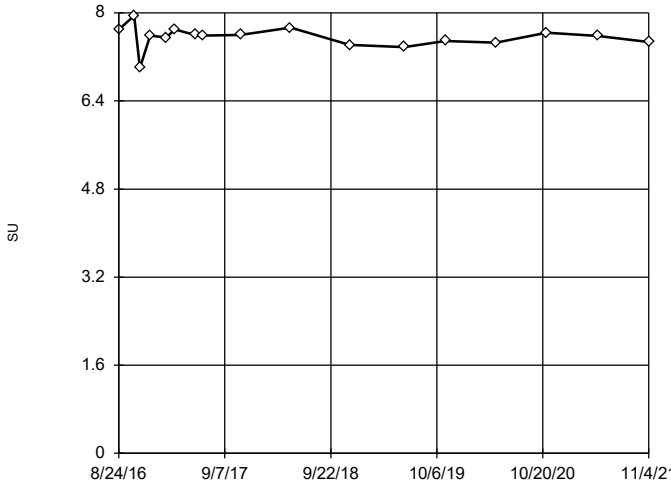
High cutoff = 8.409, low cutoff = 6.795, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 17

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 = 8.161, low cutoff = 6.582, based on IQR multiplier of 3.

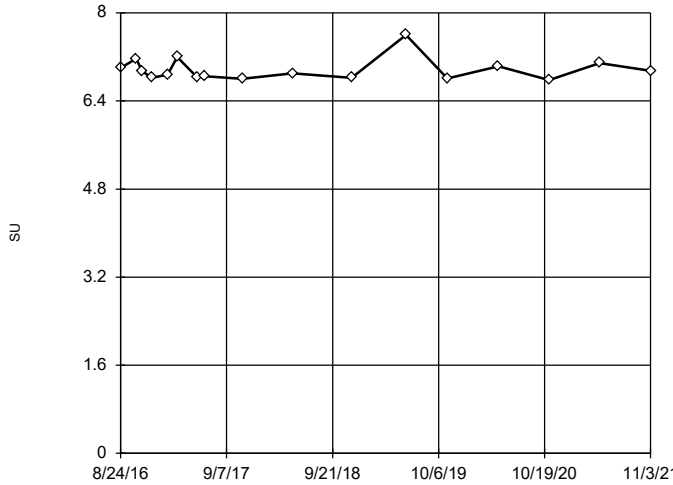
Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 17

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 = 7.832, low cutoff = 6.148, based on IQR multiplier of 3.

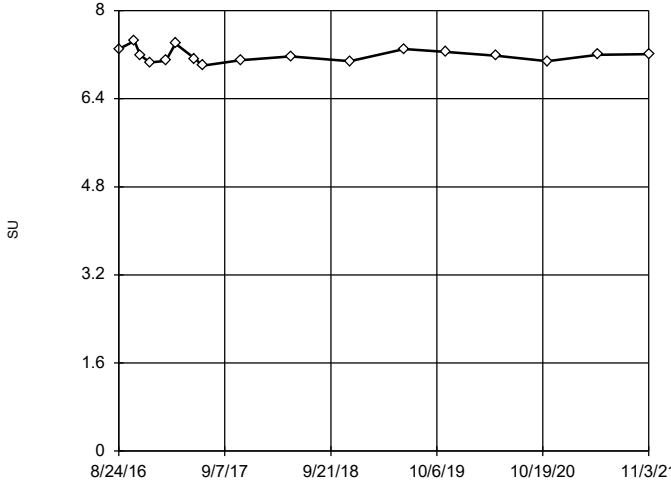
Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 17

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 = 7.876, low cutoff = 6.544, based on IQR multiplier of 3.

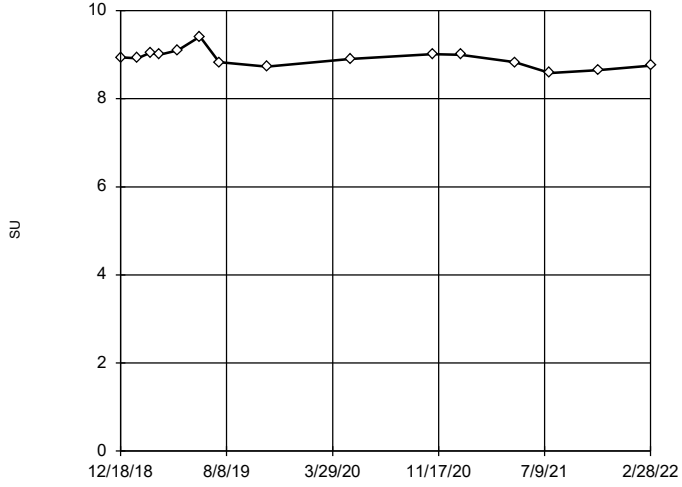
Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



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).

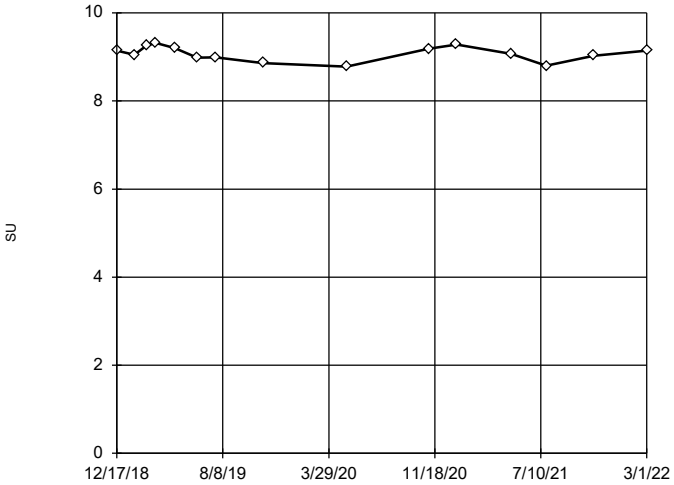
High cutoff = 9.837, low cutoff = 8.014, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1802



n = 15

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 = 9.737, low cutoff = 8.081, based on IQR multiplier of 3.

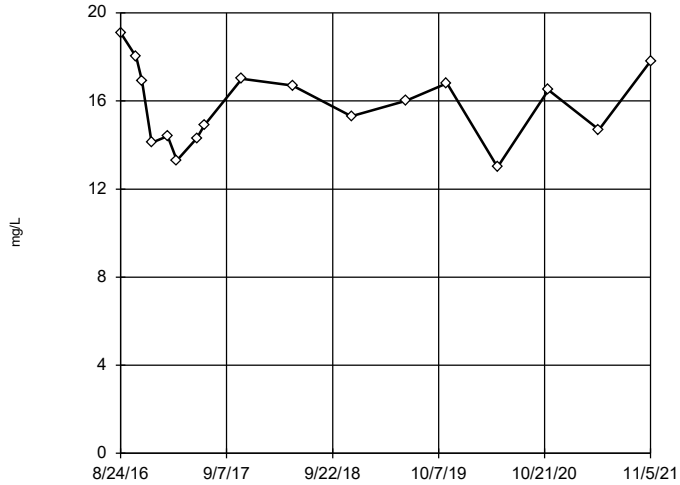
Constituent: pH, field Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 17

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 = 26.05, low cutoff = 7.848, based on IQR multiplier of 3.

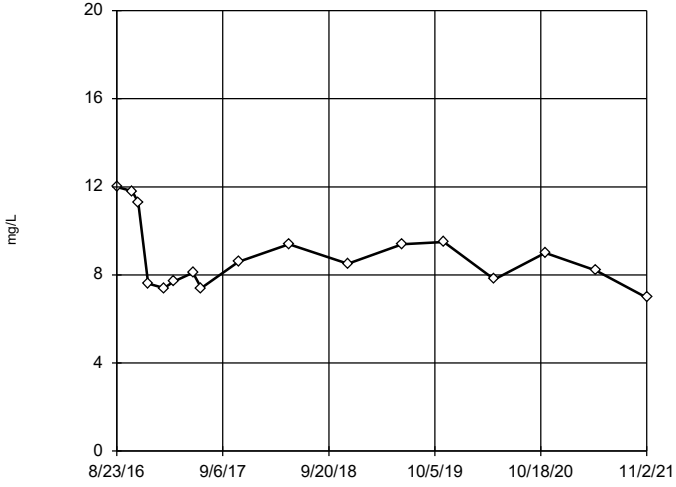
Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 17

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 = 17.81, low cutoff = 4.058, based on IQR multiplier of 3.

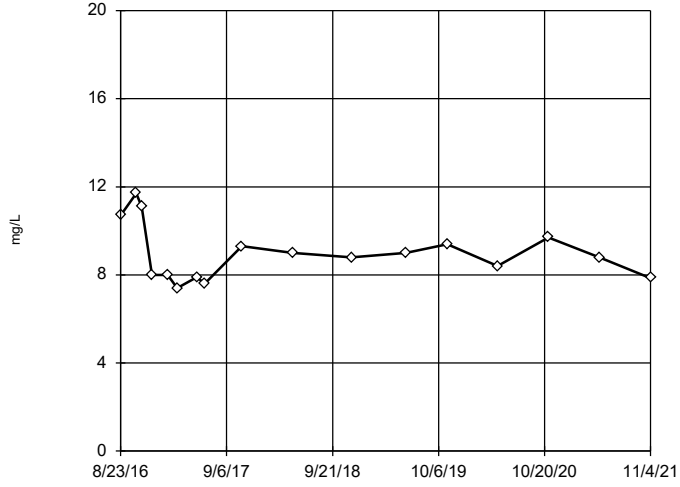
Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-4



n = 17

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

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

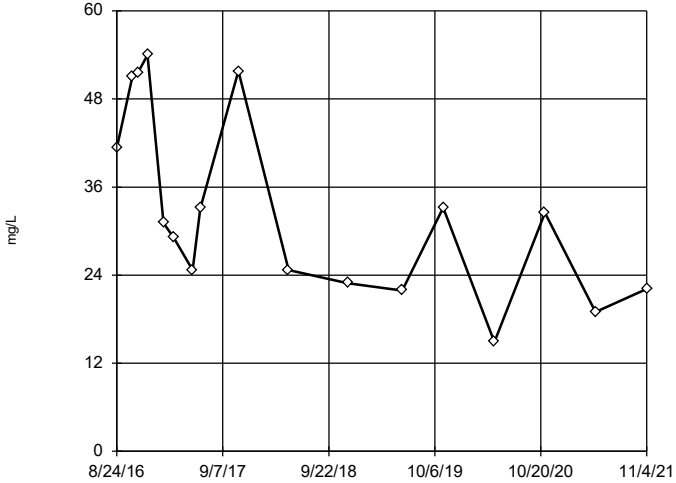
High cutoff = 16.55, low cutoff = 4.588, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 17

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 = 391.2, low cutoff = 2.642, based on IQR multiplier of 3.

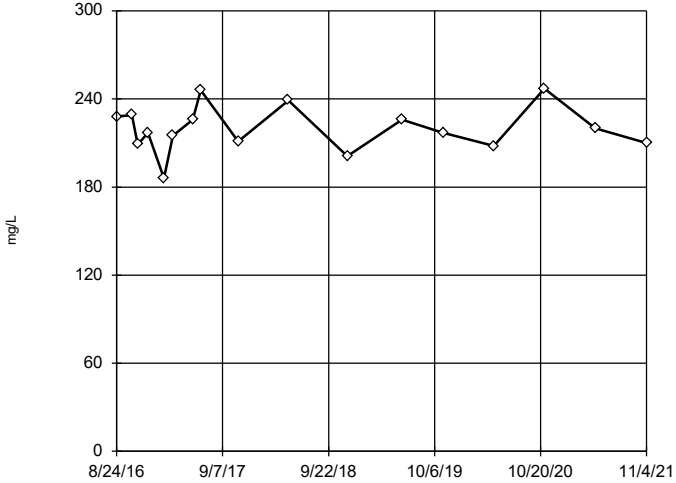
Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 17

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

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

High cutoff = 285.5, low cutoff = 152.5, based on IQR multiplier of 3.

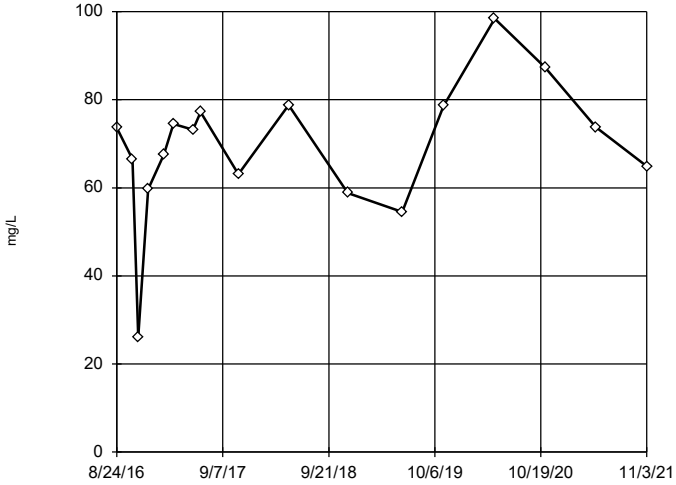
Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 17

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 = 113.8, low cutoff = -55.81, based on IQR multiplier of 3.

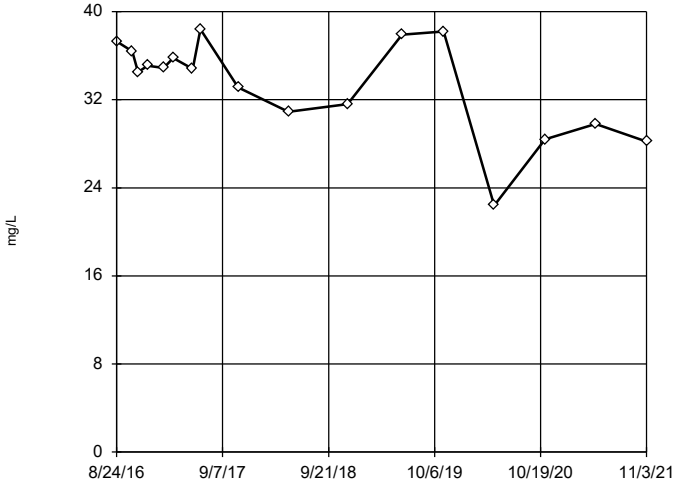
Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 17

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

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

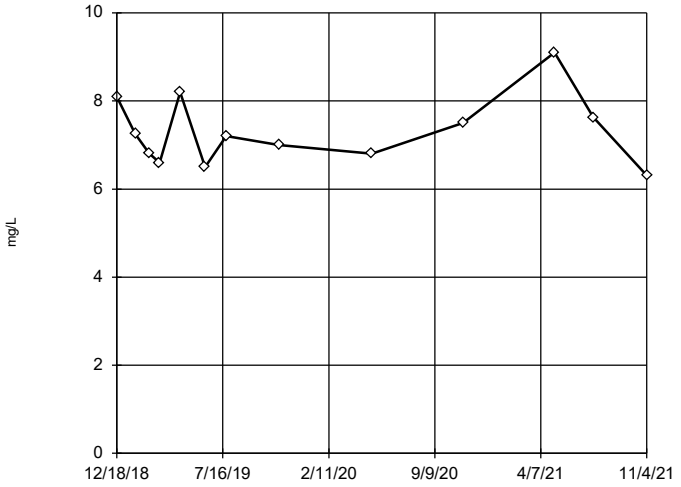
High cutoff = 46.88, low cutoff = -38.23, based on IQR multiplier of 3.

Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

MW-1801



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 = 12.7, low cutoff = 4.146, based on IQR multiplier of 3.

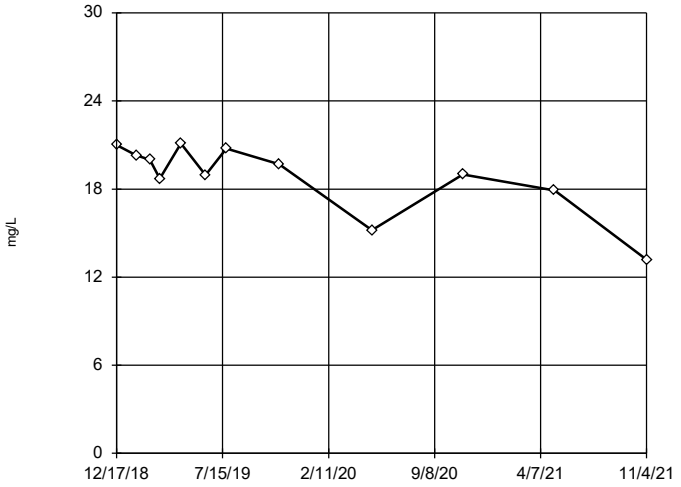
Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



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 = 23.89, low cutoff = -20.46, based on IQR multiplier of 3.

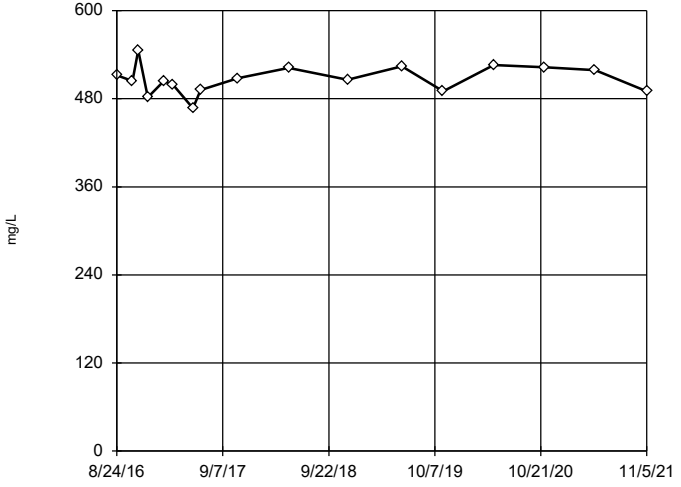
Constituent: Sulfate Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-10 (bg)



n = 17

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

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

High cutoff = 617, low cutoff = 396.5, based on IQR multiplier of 3.

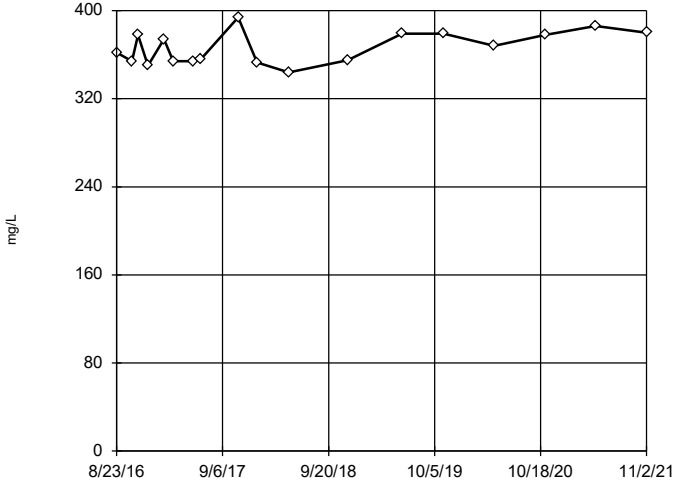
Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-2



n = 18

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

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

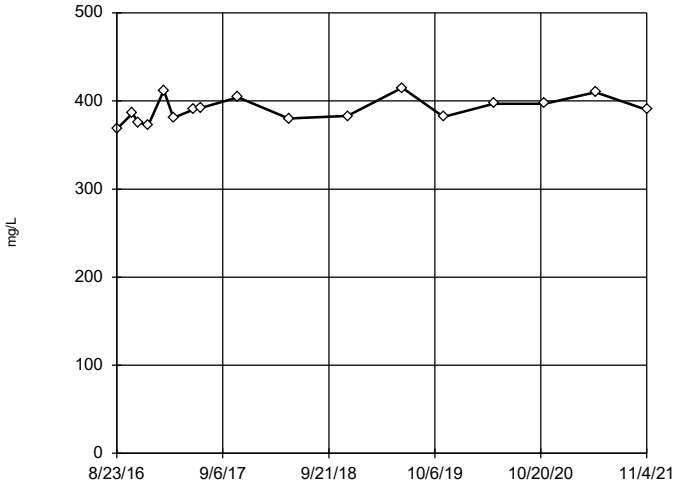
High cutoff = 465.1, low cutoff = 288.5, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-4



n = 17

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 = 467, low cutoff = 326.3, based on IQR multiplier of 3.

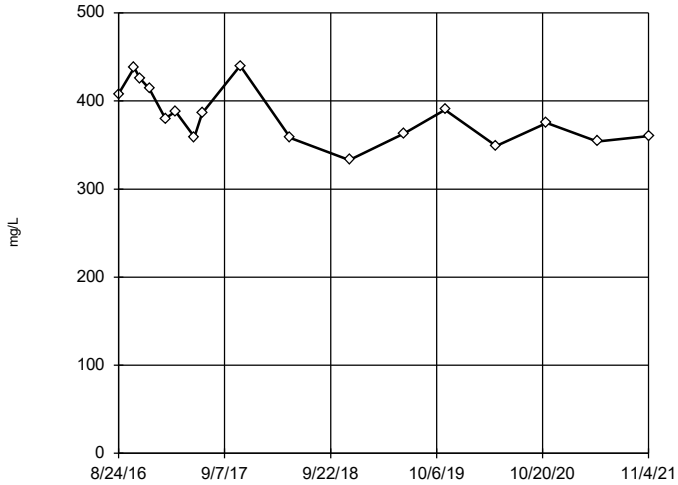
Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-6 (bg)



n = 17

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 = 619.2, low cutoff = 237.9, based on IQR multiplier of 3.

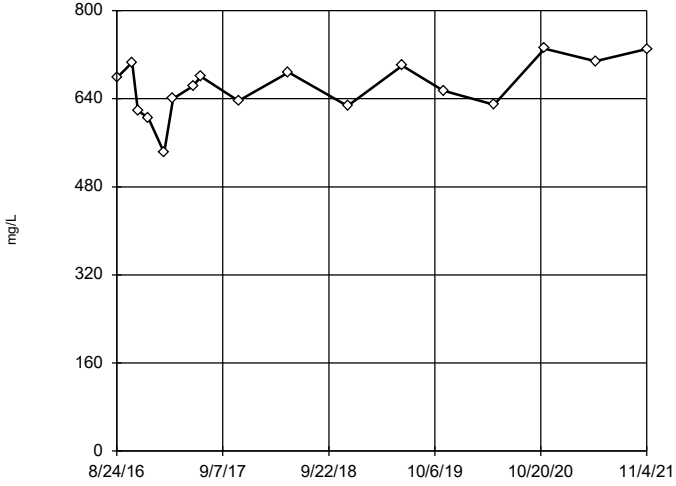
Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-7R (bg)



n = 17

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 = 845.3, low cutoff = -576.7, based on IQR multiplier of 3.

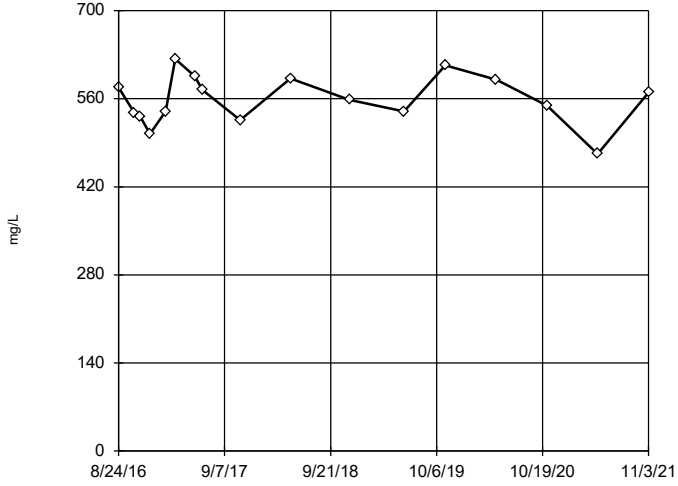
Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

LF-MW-8 (bg)



n = 17

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

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

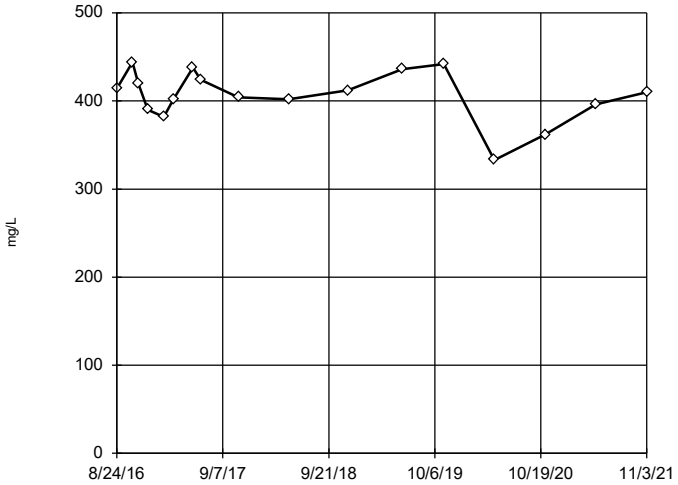
High cutoff = 715.5, low cutoff = -188.5, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Tukey's Outlier Screening

LF-MW-9 (bg)



n = 17

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 = 492.7, low cutoff = -402.8, based on IQR multiplier of 3.

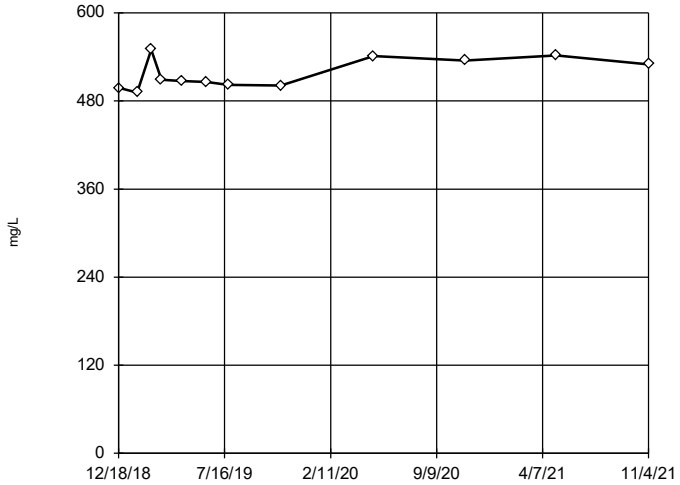
Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1801



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 = 664.2, low cutoff = 406.2, based on IQR multiplier of 3.

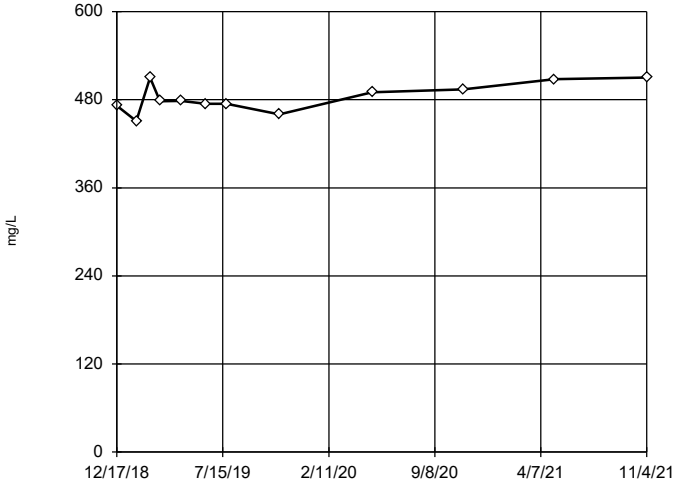
Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:41 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Tukey's Outlier Screening

MW-1802



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 = 594.2, low cutoff = 399, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 7/14/2022 3:42 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney Test - Significant Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/19/2022, 12:18 PM

Constituent	Well	Calc.	0.01	Method
Calcium (mg/L)	**LF-MW-8 (bg)**	**-2.798**	**Yes**	**Mann-W**
Chloride (mg/L)	**LF-MW-4**	**3.208**	**Yes**	**Mann-W**
Chloride (mg/L)	**LF-MW-9 (bg)**	**-2.742**	**Yes**	**Mann-W**

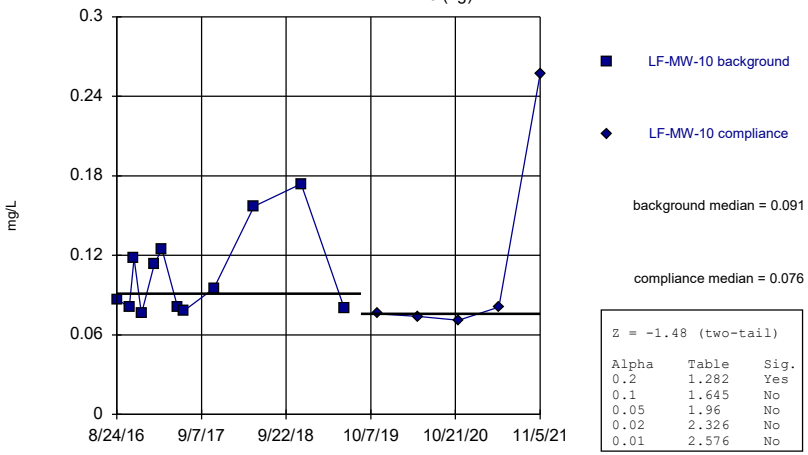
Mann-Whitney Test - All Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/19/2022, 12:18 PM

Constituent	Well	Calc.	0.01	Method
Boron (mg/L)	LF-MW-10 (bg)	-1.48	No	Mann-W
Boron (mg/L)	LF-MW-2	-0.1972	No	Mann-W
Boron (mg/L)	LF-MW-4	-1.729	No	Mann-W
Boron (mg/L)	LF-MW-6 (bg)	-2.004	No	Mann-W
Boron (mg/L)	LF-MW-7R (bg)	-0.896	No	Mann-W
Boron (mg/L)	LF-MW-8 (bg)	1.963	No	Mann-W
Boron (mg/L)	LF-MW-9 (bg)	-2.058	No	Mann-W
Calcium (mg/L)	LF-MW-10 (bg)	-0.7388	No	Mann-W
Calcium (mg/L)	LF-MW-2	1.405	No	Mann-W
Calcium (mg/L)	LF-MW-4	-2.432	No	Mann-W
Calcium (mg/L)	LF-MW-6 (bg)	-0.5274	No	Mann-W
Calcium (mg/L)	LF-MW-7R (bg)	-0.1581	No	Mann-W
Calcium (mg/L)	**LF-MW-8 (bg)**	**-2.798**	**Yes**	**Mann-W**
Calcium (mg/L)	LF-MW-9 (bg)	-2.372	No	Mann-W
Chloride (mg/L)	LF-MW-10 (bg)	2.161	No	Mann-W
Chloride (mg/L)	LF-MW-2	0.2635	No	Mann-W
Chloride (mg/L)	**LF-MW-4**	**3.208**	**Yes**	**Mann-W**
Chloride (mg/L)	LF-MW-6 (bg)	0.1582	No	Mann-W
Chloride (mg/L)	LF-MW-7R (bg)	0.8438	No	Mann-W
Chloride (mg/L)	LF-MW-8 (bg)	0.8965	No	Mann-W
Chloride (mg/L)	**LF-MW-9 (bg)**	**-2.742**	**Yes**	**Mann-W**
Fluoride (mg/L)	LF-MW-10 (bg)	0.7894	No	Mann-W
Fluoride (mg/L)	LF-MW-2	2.081	No	Mann-W
Fluoride (mg/L)	LF-MW-4	1.934	No	Mann-W
Fluoride (mg/L)	LF-MW-6 (bg)	0.9557	No	Mann-W
Fluoride (mg/L)	LF-MW-7R (bg)	1.429	No	Mann-W
Fluoride (mg/L)	LF-MW-8 (bg)	1.814	No	Mann-W
Fluoride (mg/L)	LF-MW-9 (bg)	1.855	No	Mann-W
pH, field (SU)	LF-MW-10 (bg)	-0.9516	No	Mann-W
pH, field (SU)	LF-MW-2	0.4177	No	Mann-W
pH, field (SU)	LF-MW-4	0.2316	No	Mann-W
pH, field (SU)	LF-MW-6 (bg)	-1.004	No	Mann-W
pH, field (SU)	LF-MW-7R (bg)	-1.003	No	Mann-W
pH, field (SU)	LF-MW-8 (bg)	-0.3692	No	Mann-W
pH, field (SU)	LF-MW-9 (bg)	0.3166	No	Mann-W
Sulfate (mg/L)	LF-MW-10 (bg)	-0.1581	No	Mann-W
Sulfate (mg/L)	LF-MW-2	-0.5805	No	Mann-W
Sulfate (mg/L)	LF-MW-4	0	No	Mann-W
Sulfate (mg/L)	LF-MW-6 (bg)	-1.74	No	Mann-W
Sulfate (mg/L)	LF-MW-7R (bg)	-0.2111	No	Mann-W
Sulfate (mg/L)	LF-MW-8 (bg)	1.95	No	Mann-W
Sulfate (mg/L)	LF-MW-9 (bg)	-2.055	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-10 (bg)	0.3694	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-2	2.175	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-4	1.055	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-6 (bg)	-1.528	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-7R (bg)	1.634	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-8 (bg)	0.2637	No	Mann-W
Total Dissolved Solids (mg/L)	LF-MW-9 (bg)	-1.318	No	Mann-W

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



Z = -1.48 (two-tail)

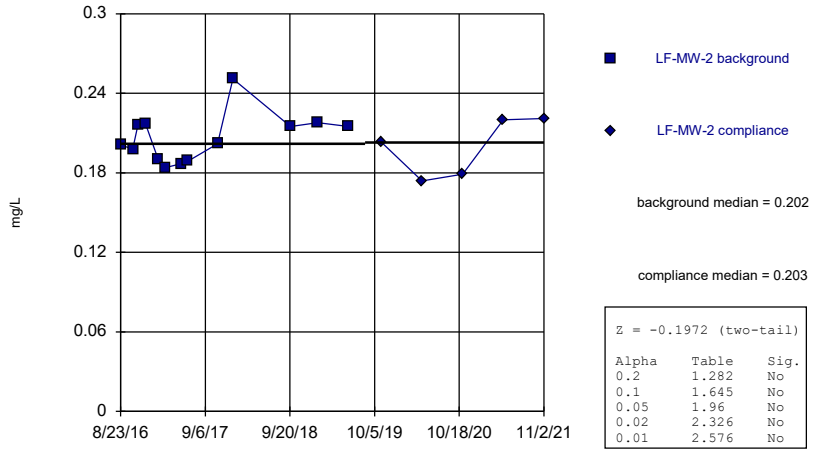
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



Z = -0.1972 (two-tail)

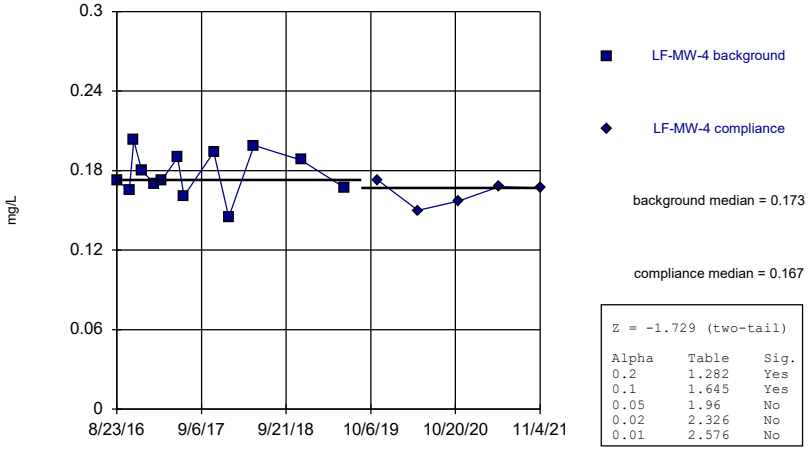
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



Z = -1.729 (two-tail)

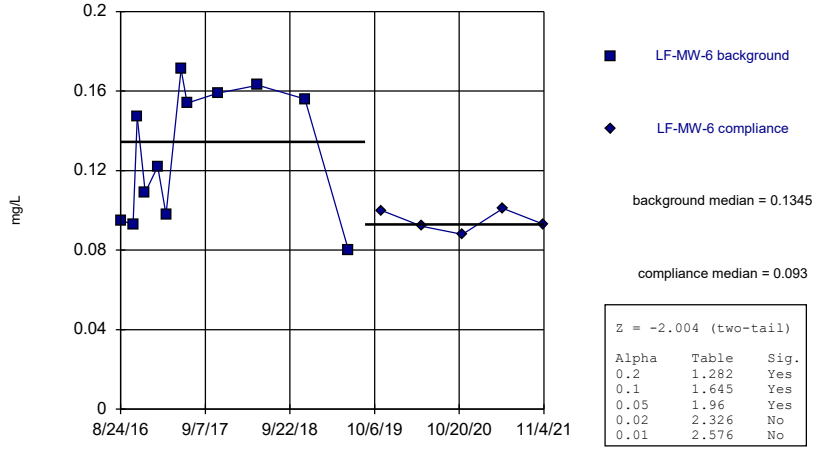
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = -2.004 (two-tail)

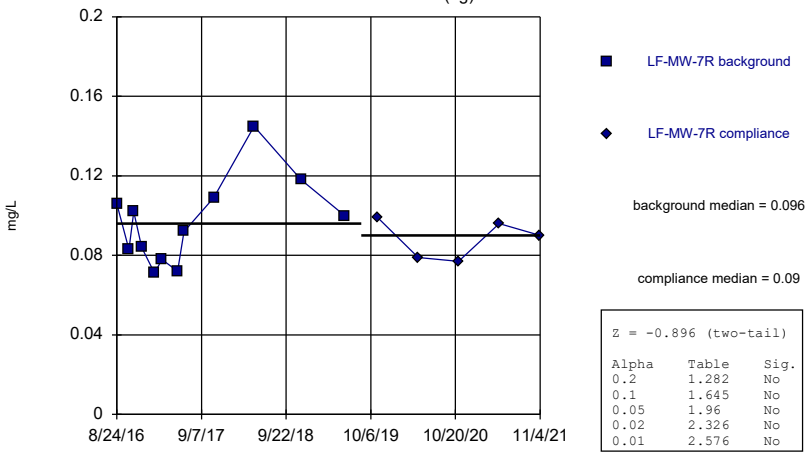
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Boron Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



Z = -0.896 (two-tail)

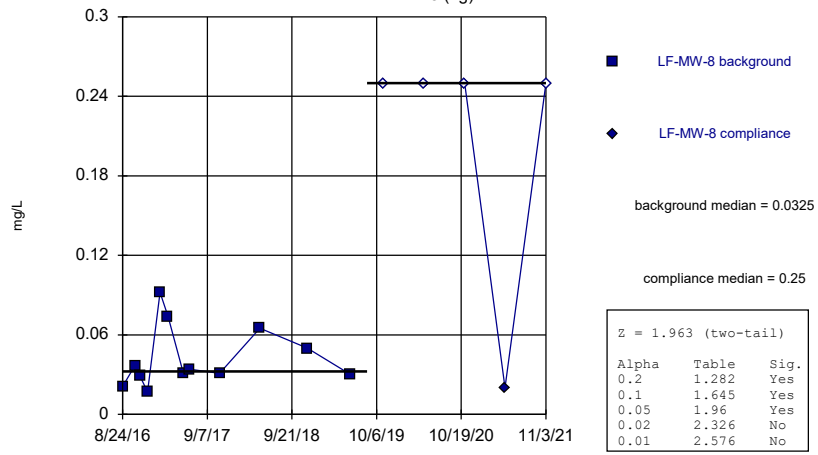
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Boron Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = 1.963 (two-tail)

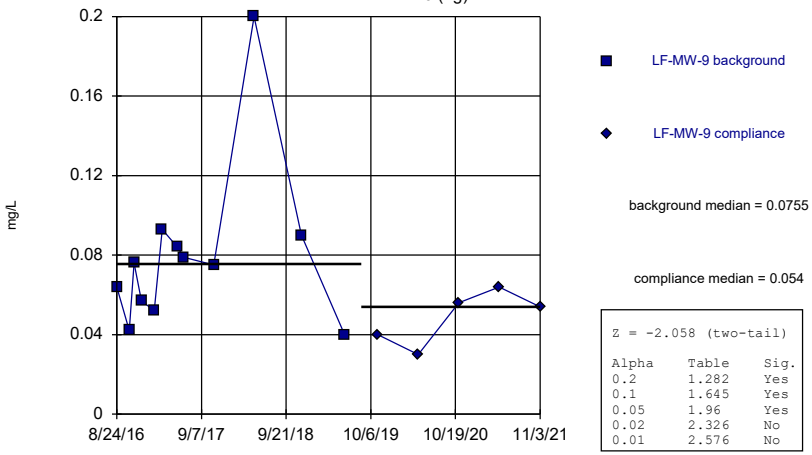
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Boron Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = -2.058 (two-tail)

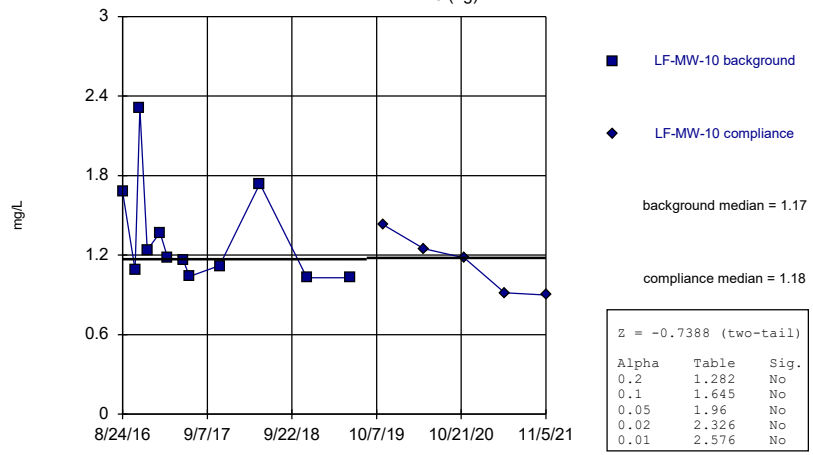
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Boron Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



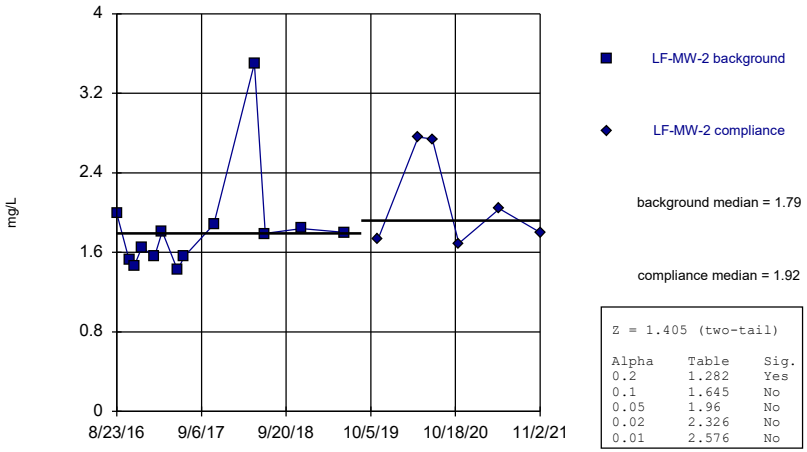
Z = -0.7388 (two-tail)

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 Analysis Run 7/19/2022 12:16 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



background median = 1.79

compliance median = 1.92

Z = 1.405 (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

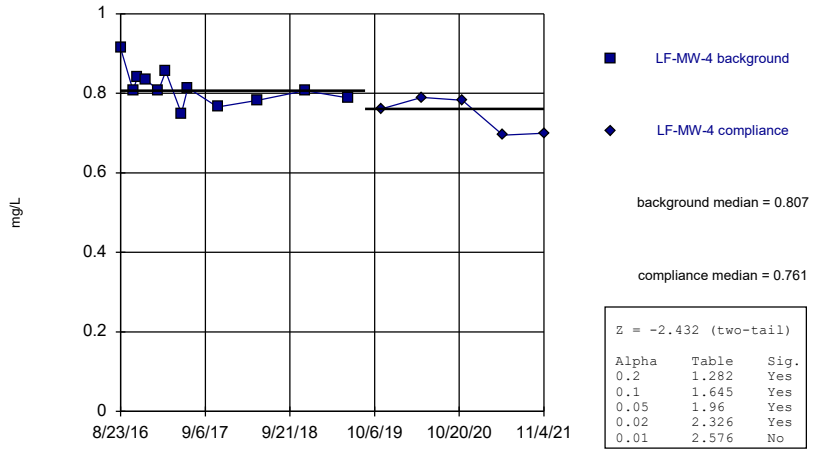
Constituent: Calcium Analysis Run 7/19/2022 12:16 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



background median = 0.807

compliance median = 0.761

Z = -2.432 (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

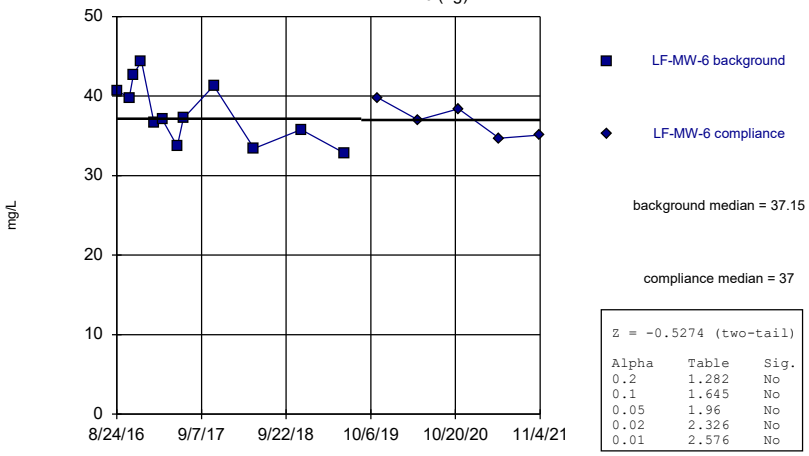
Constituent: Calcium Analysis Run 7/19/2022 12:16 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



background median = 37.15

compliance median = 37

Z = -0.5274 (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

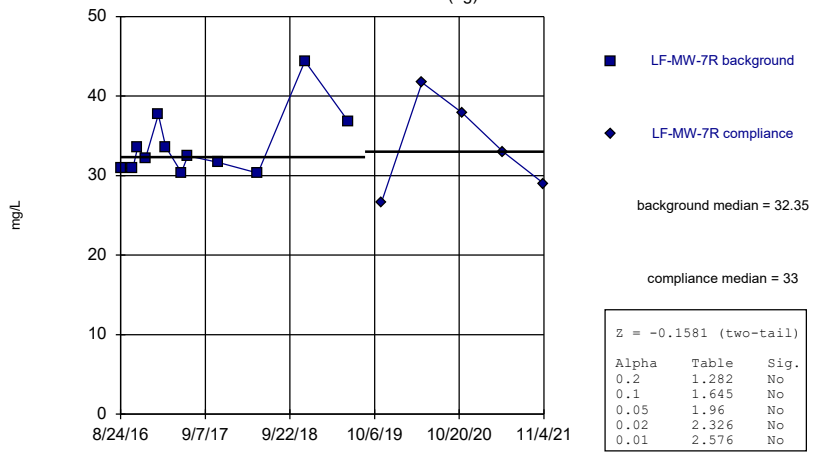
Constituent: Calcium Analysis Run 7/19/2022 12:16 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



background median = 32.35

compliance median = 33

Z = -0.1581 (two-tail)

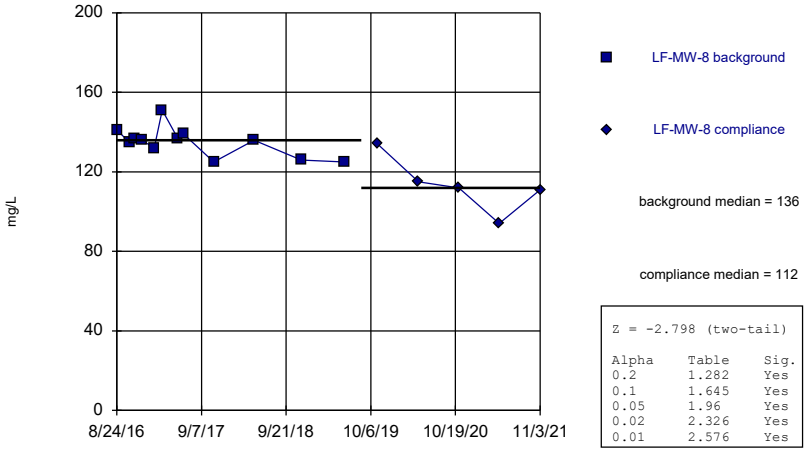
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Calcium Analysis Run 7/19/2022 12:16 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = -2.798 (two-tail)

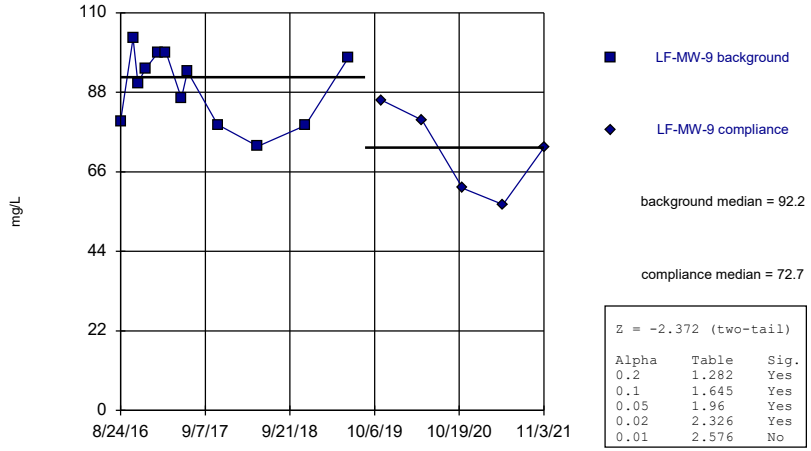
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Calcium Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = -2.372 (two-tail)

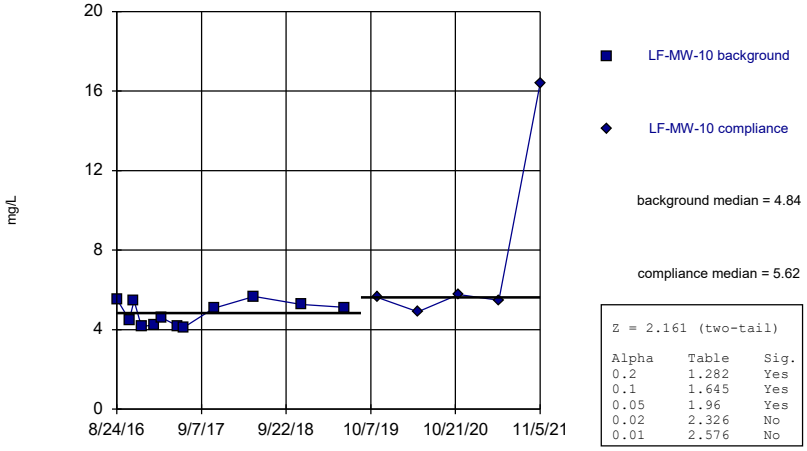
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	No

Constituent: Calcium Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



Z = 2.161 (two-tail)

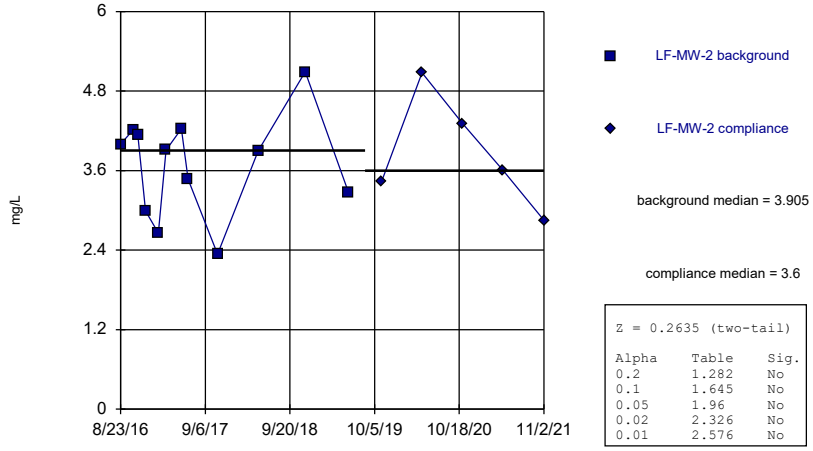
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



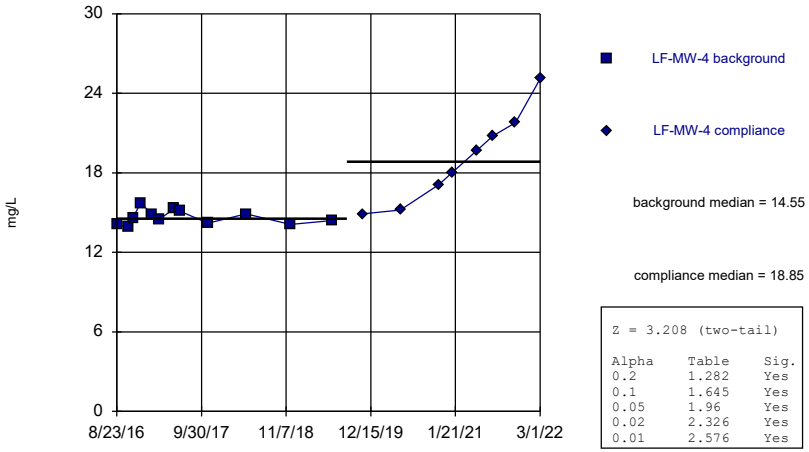
Z = 0.2635 (two-tail)

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 Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4

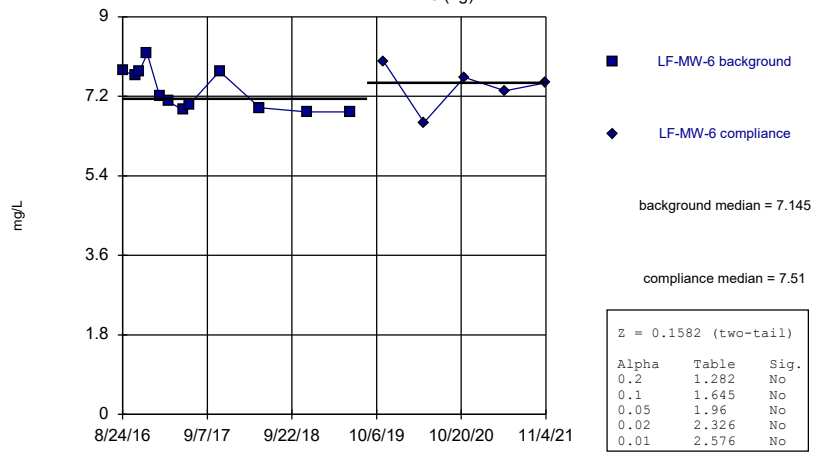


Constituent: Chloride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)

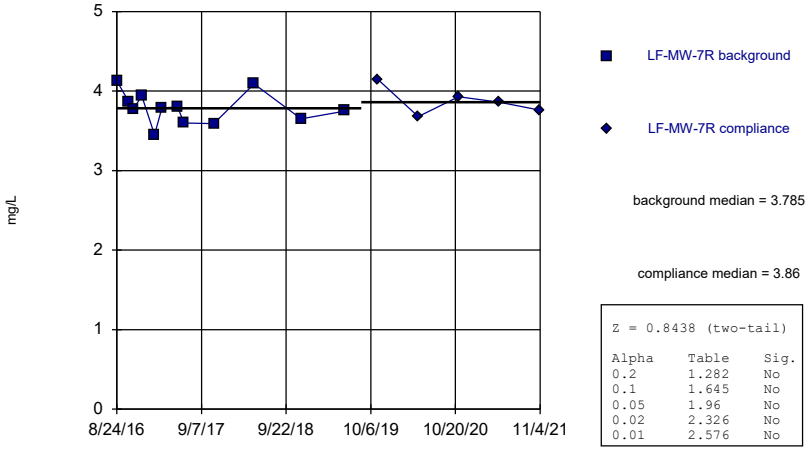


Constituent: Chloride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)

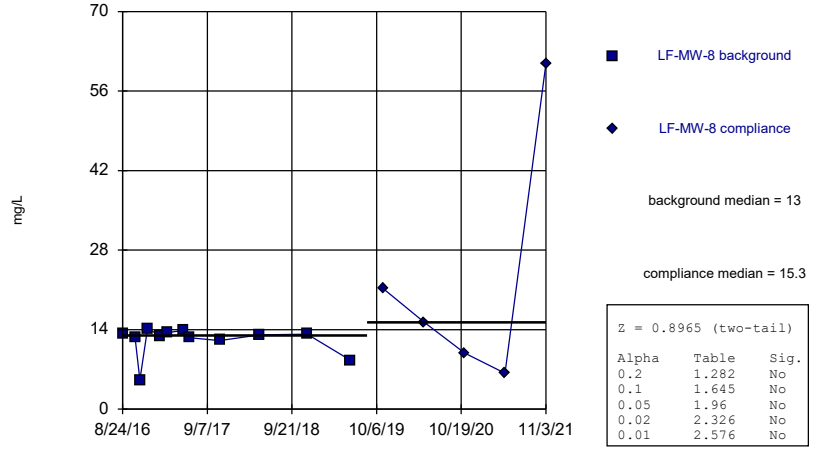


Constituent: Chloride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

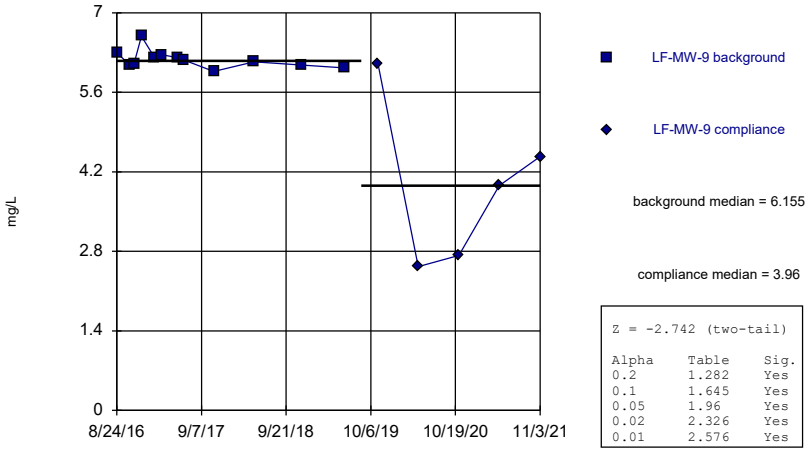
LF-MW-8 (bg)



Constituent: Chloride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)

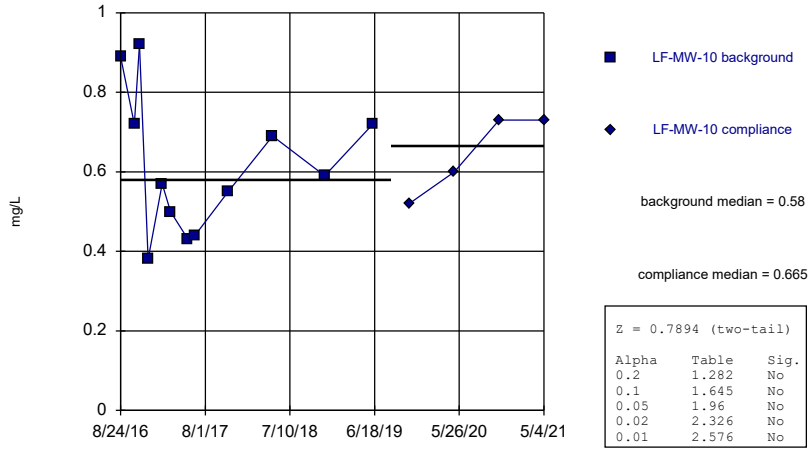


Constituent: Chloride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)

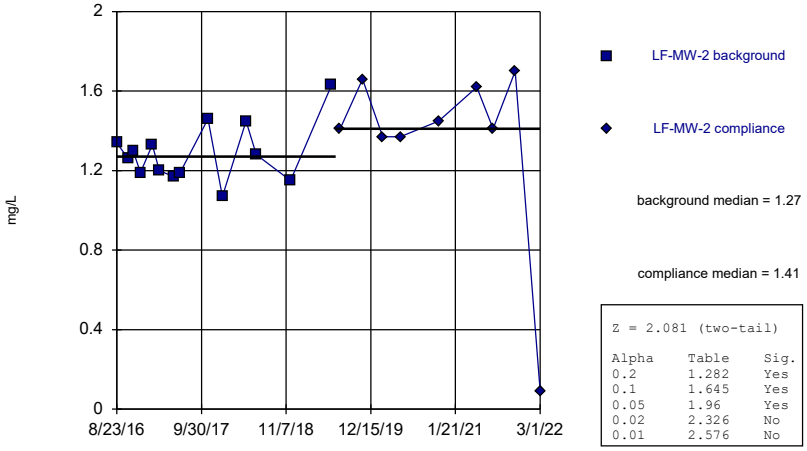


Constituent: Fluoride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2

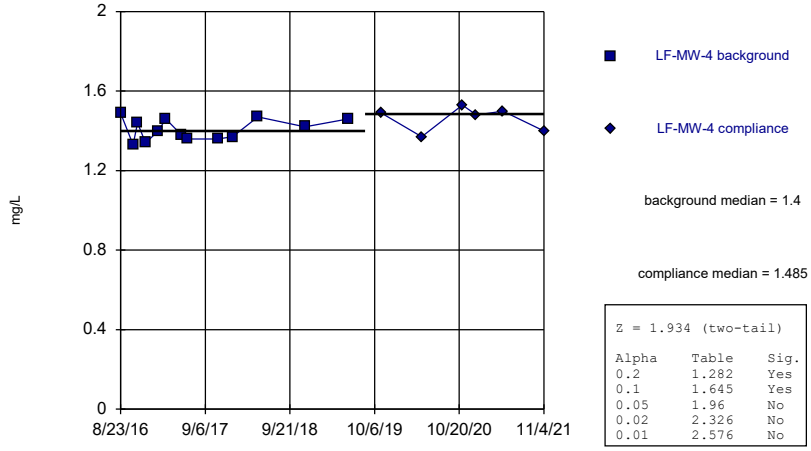


Constituent: Fluoride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

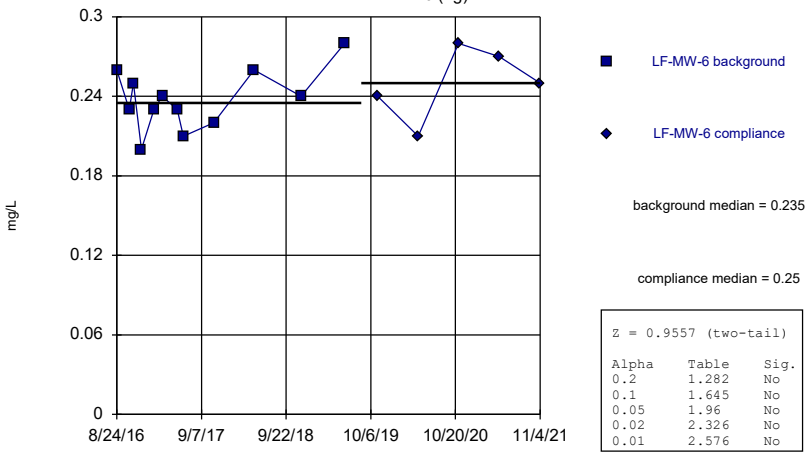
LF-MW-4



Constituent: Fluoride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = 0.9557 (two-tail)

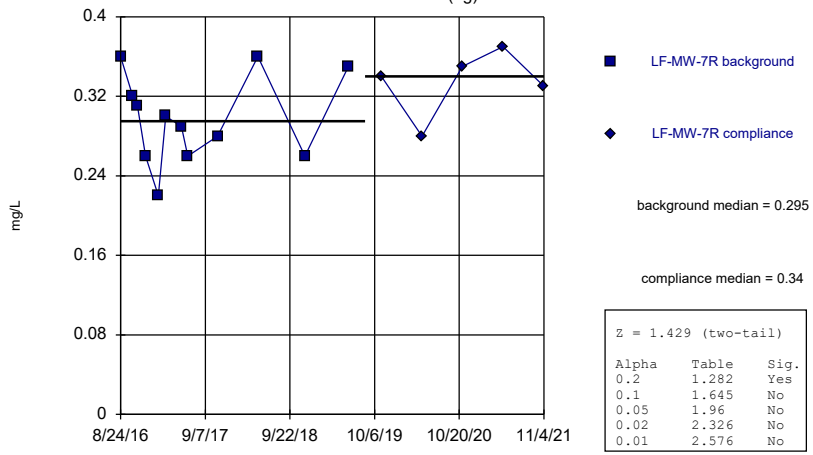
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



Z = 1.429 (two-tail)

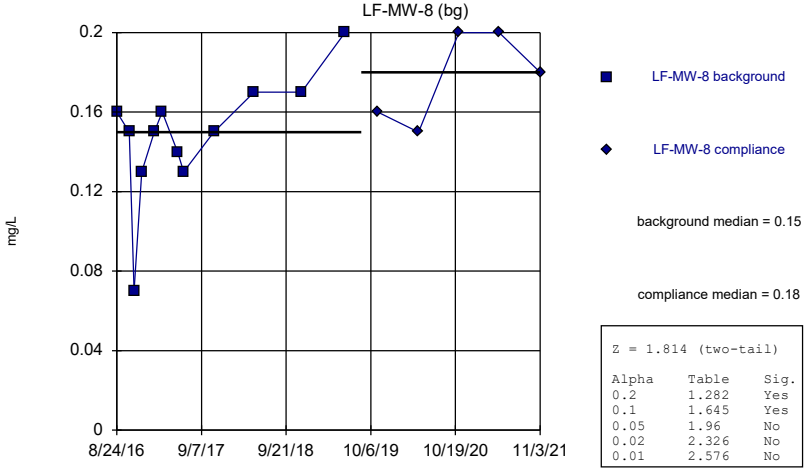
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = 1.814 (two-tail)

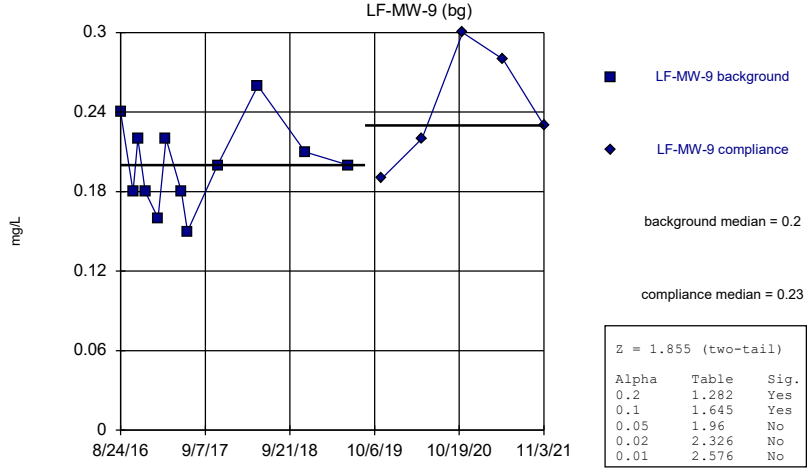
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



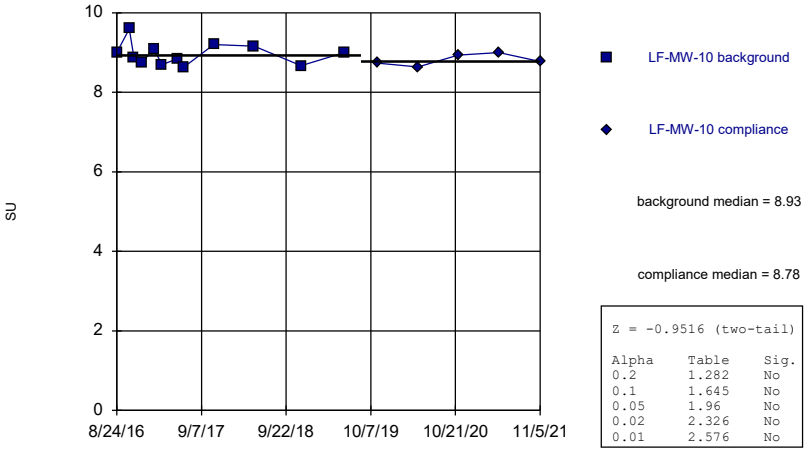
Z = 1.855 (two-tail)

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: Fluoride Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



Z = -0.9516 (two-tail)

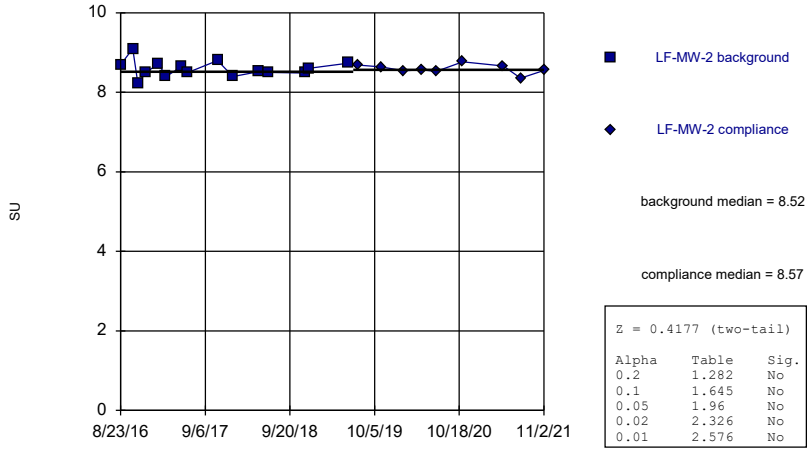
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



Z = 0.4177 (two-tail)

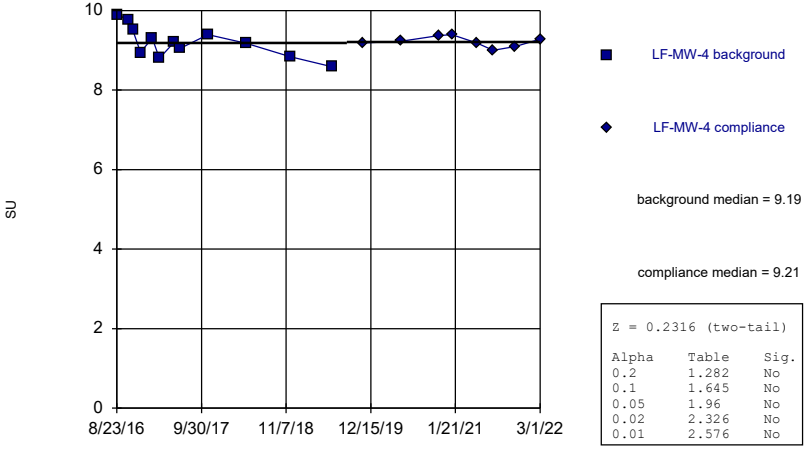
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



Z = 0.2316 (two-tail)

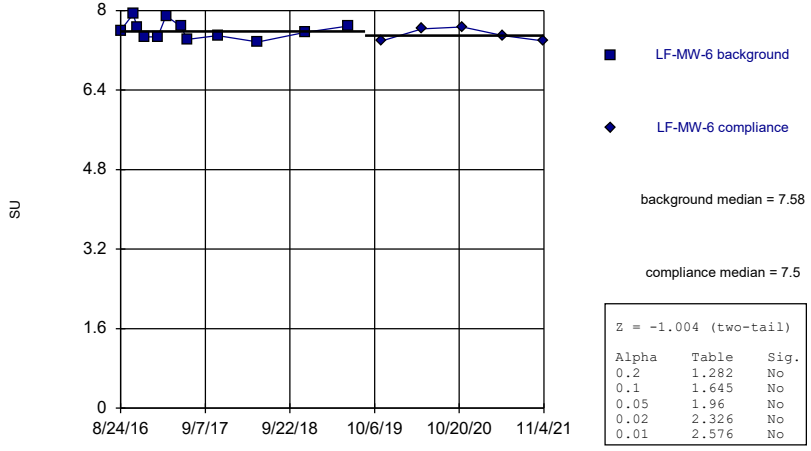
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



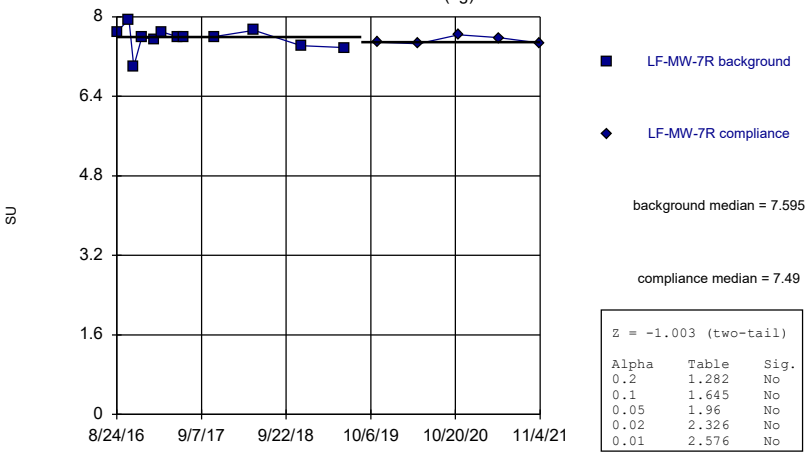
Z = -1.004 (two-tail)

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 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)

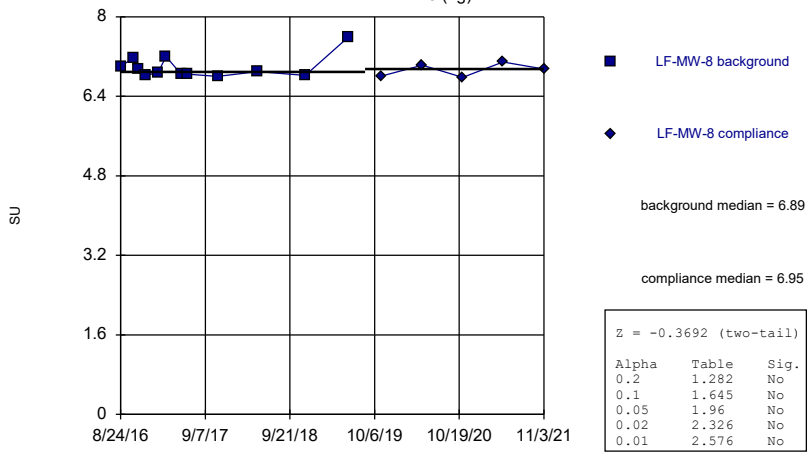


Constituent: pH, field Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)

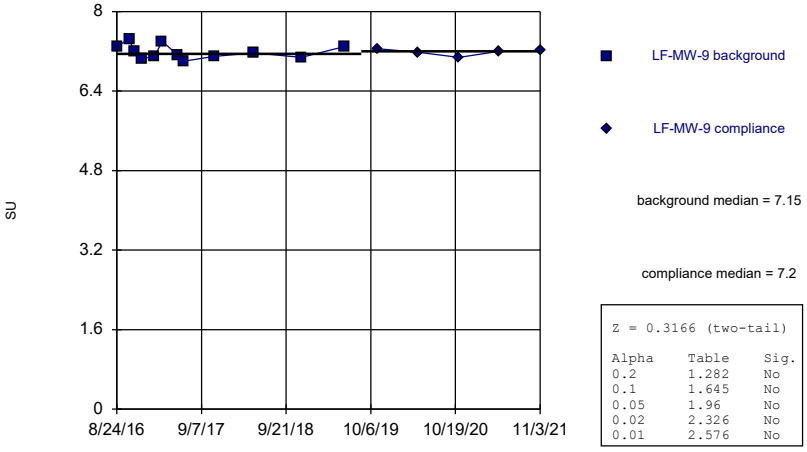


Constituent: pH, field Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)

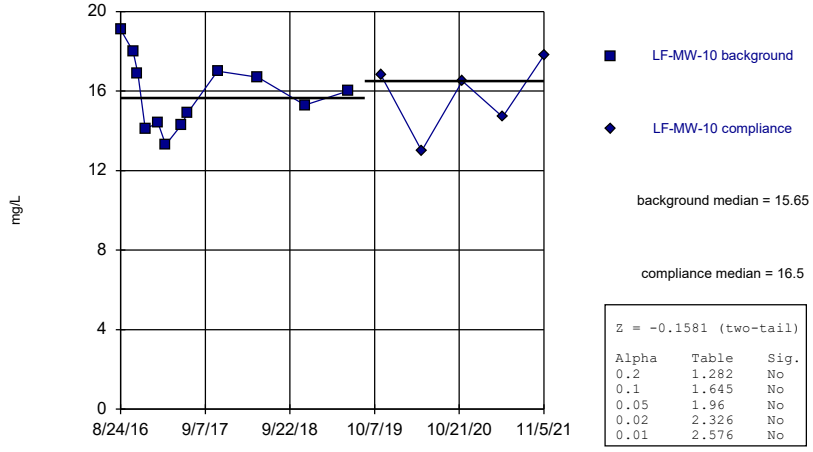


Constituent: pH, field Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

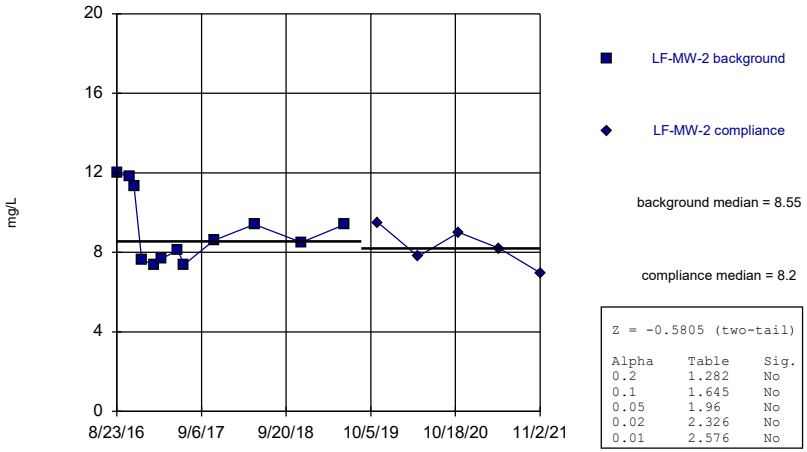
LF-MW-10 (bg)



Constituent: Sulfate Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



Z = -0.5805 (two-tail)

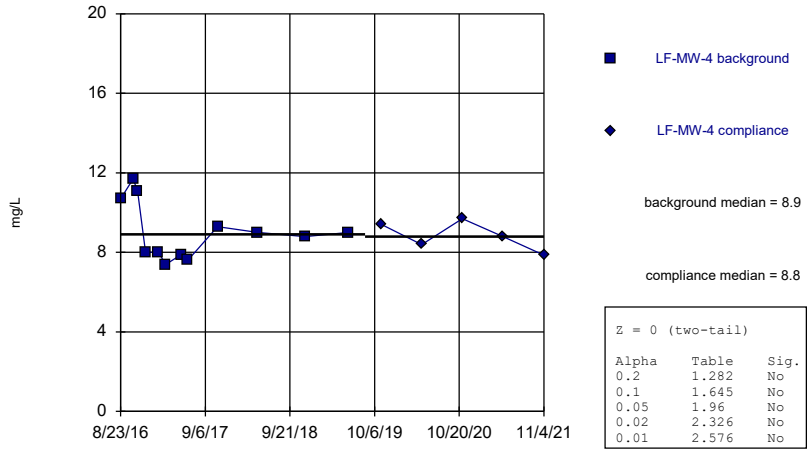
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



Z = 0 (two-tail)

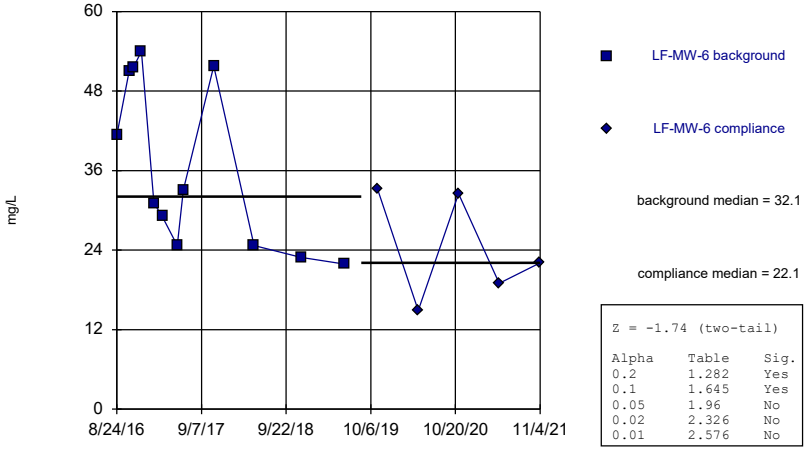
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = -1.74 (two-tail)

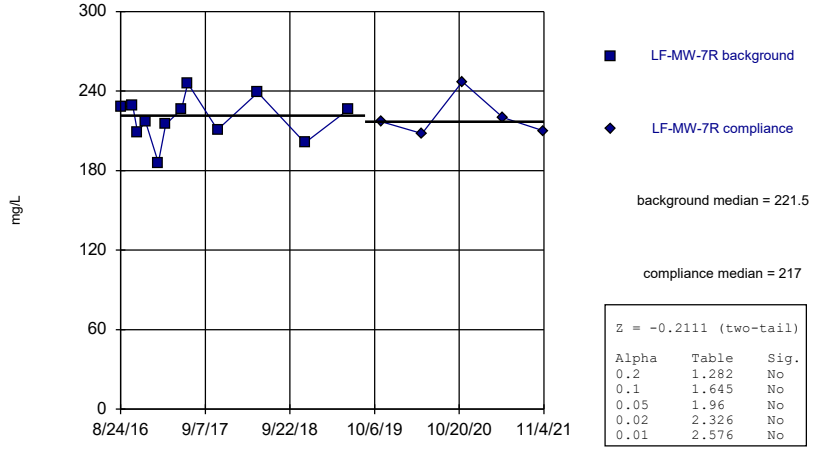
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



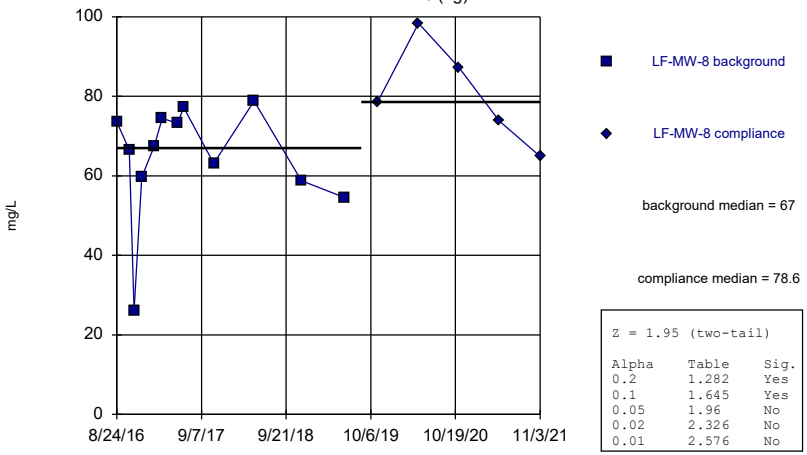
Z = -0.2111 (two-tail)

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 Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-8 (bg)



Z = 1.95 (two-tail)

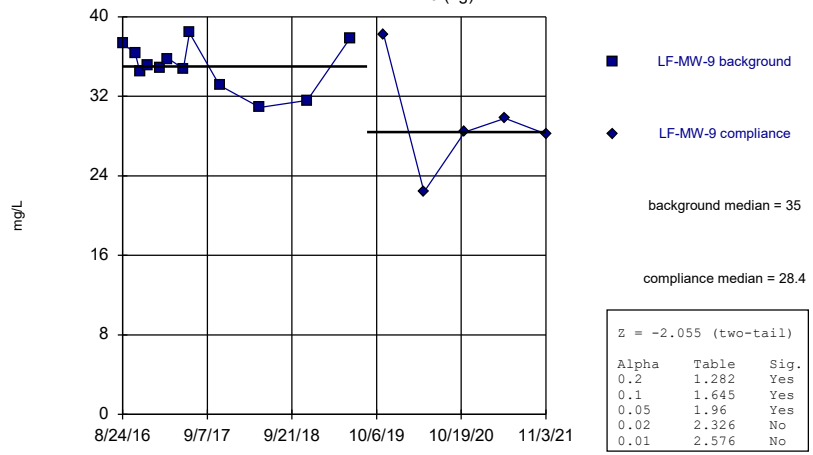
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-9 (bg)



Z = -2.055 (two-tail)

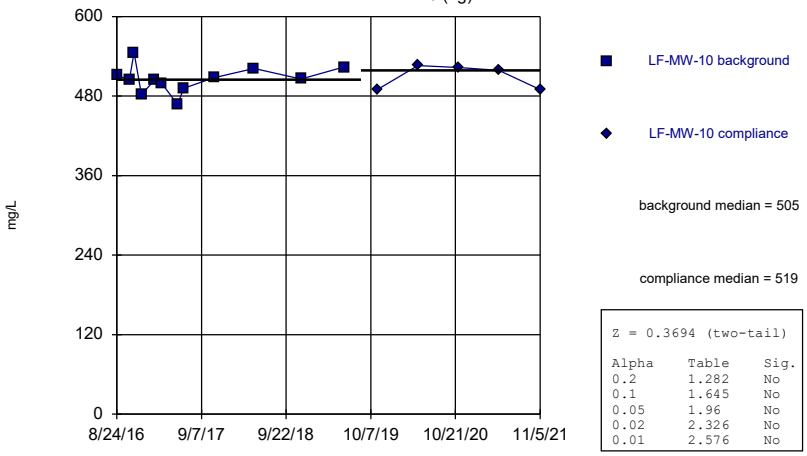
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-10 (bg)



Z = 0.3694 (two-tail)

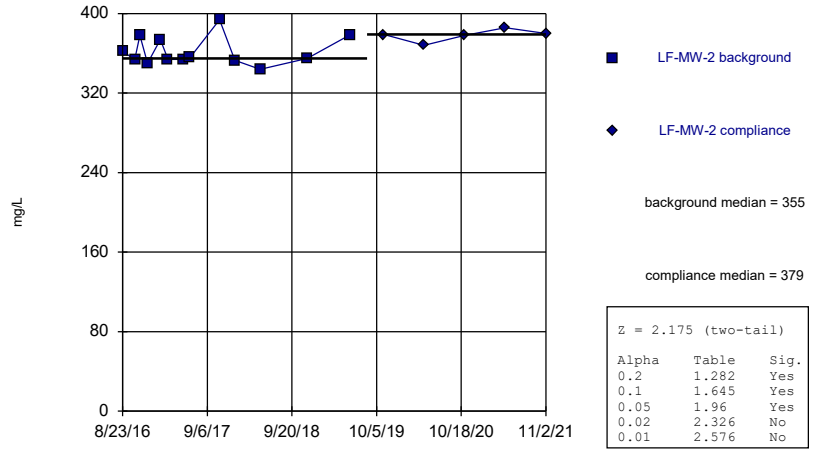
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-2



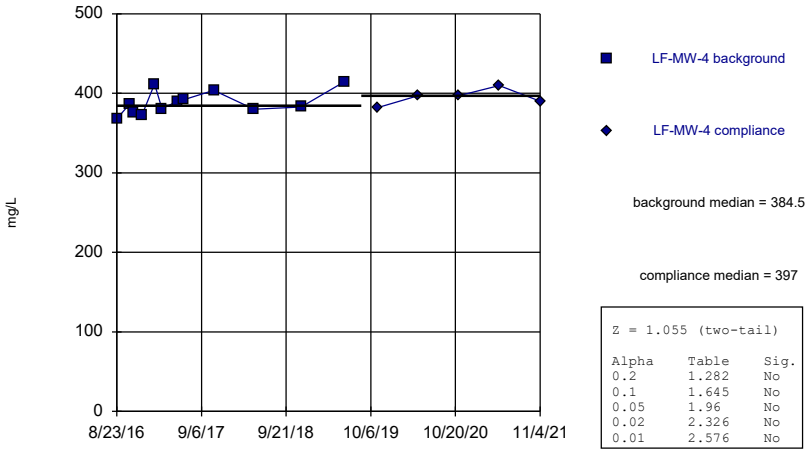
Z = 2.175 (two-tail)

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: Total Dissolved Solids Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-4



Z = 1.055 (two-tail)

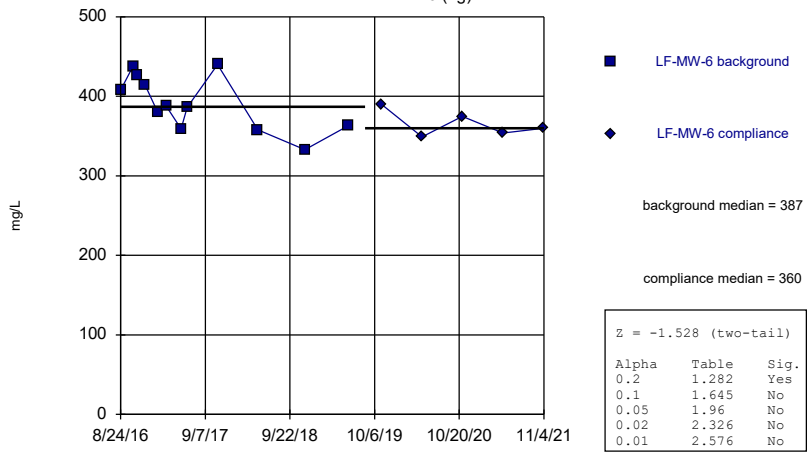
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-6 (bg)



Z = -1.528 (two-tail)

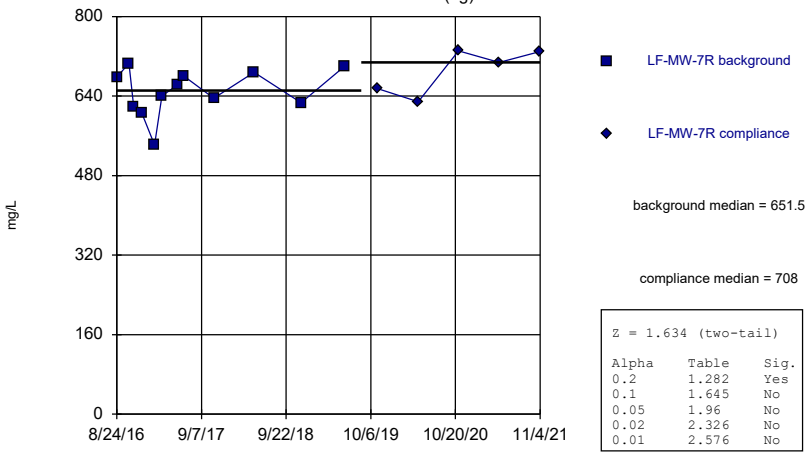
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

LF-MW-7R (bg)



Z = 1.634 (two-tail)

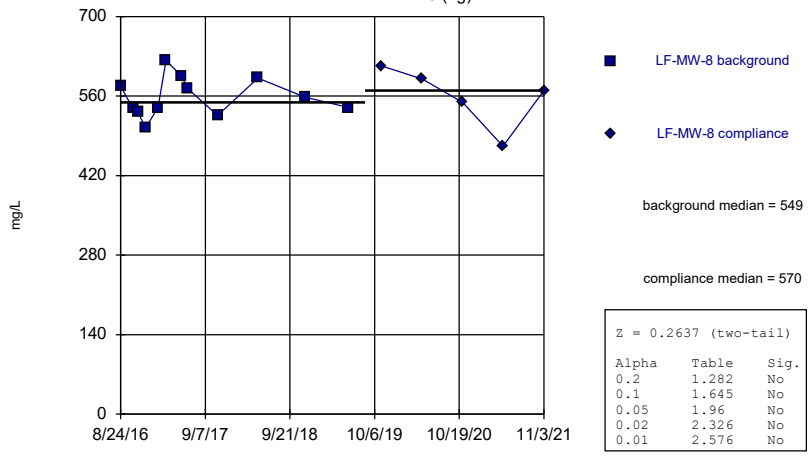
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Total Dissolved Solids Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

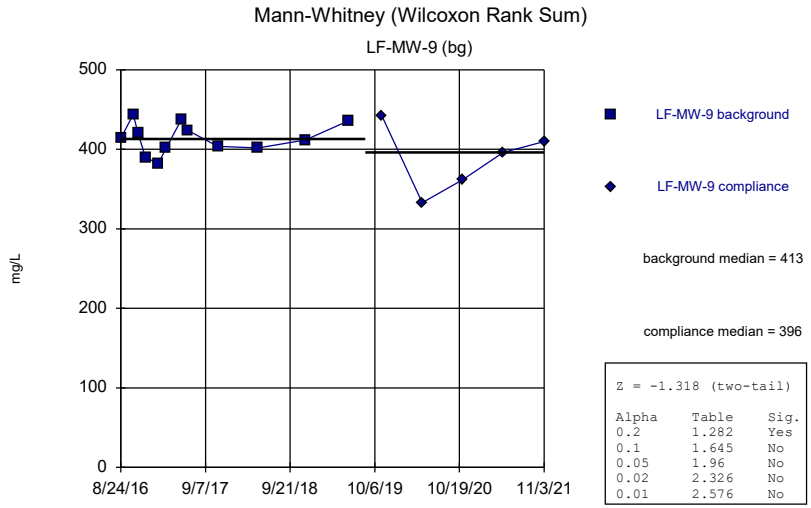
LF-MW-8 (bg)



Z = 0.2637 (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 Analysis Run 7/19/2022 12:17 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF



Constituent: Total Dissolved Solids Analysis Run 7/19/2022 12:17 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney Test - 1800 Wells - Significant Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/19/2022, 12:20 PM

Constituent	Well	Calc.	0.01	Method
Chloride (mg/L)	**MW-1801**	**3.02**	**Yes**	**Mann-W**

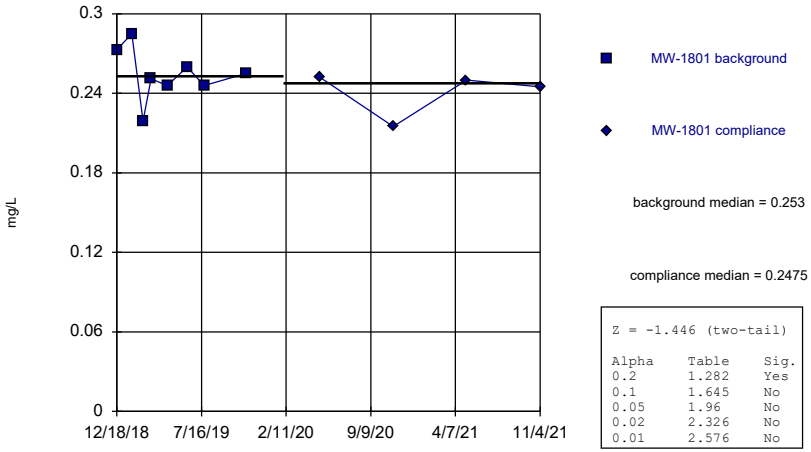
Mann-Whitney Test - 1800 Wells - All Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/19/2022, 12:20 PM

Constituent	Well	Calc.	0.01	Method
Boron (mg/L)	MW-1801	-1.446	No	Mann-W
Boron (mg/L)	MW-1802	-0.4253	No	Mann-W
Calcium (mg/L)	MW-1801	1.193	No	Mann-W
Calcium (mg/L)	MW-1802	1.686	No	Mann-W
Chloride (mg/L)	**MW-1801**	**3.02**	**Yes**	**Mann-W**
Chloride (mg/L)	MW-1802	1.616	No	Mann-W
Fluoride (mg/L)	MW-1801	-1.104	No	Mann-W
Fluoride (mg/L)	MW-1802	0.2548	No	Mann-W
pH, field (SU)	MW-1801	-1.681	No	Mann-W
pH, field (SU)	MW-1802	-0.5792	No	Mann-W
Sulfate (mg/L)	MW-1801	0.2932	No	Mann-W
Sulfate (mg/L)	MW-1802	-2.463	No	Mann-W
Total Dissolved Solids (mg/L)	MW-1801	1.953	No	Mann-W
Total Dissolved Solids (mg/L)	MW-1802	2.045	No	Mann-W

Mann-Whitney (Wilcoxon Rank Sum)

MW-1801



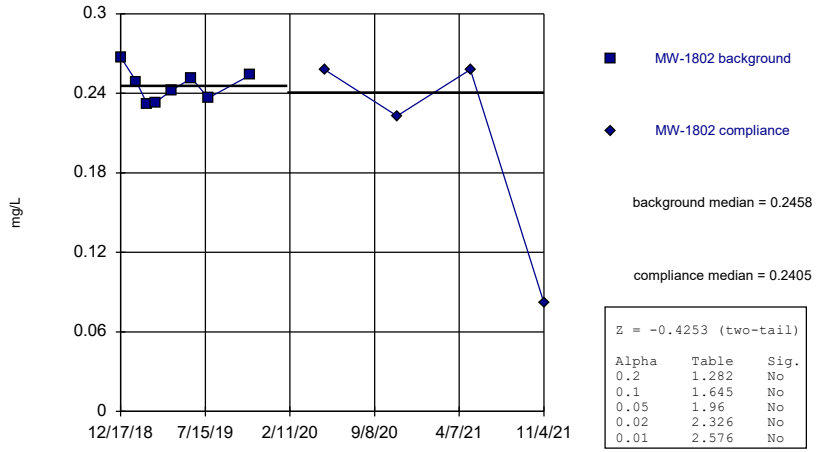
Z = -1.446 (two-tail)

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: Boron Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

MW-1802



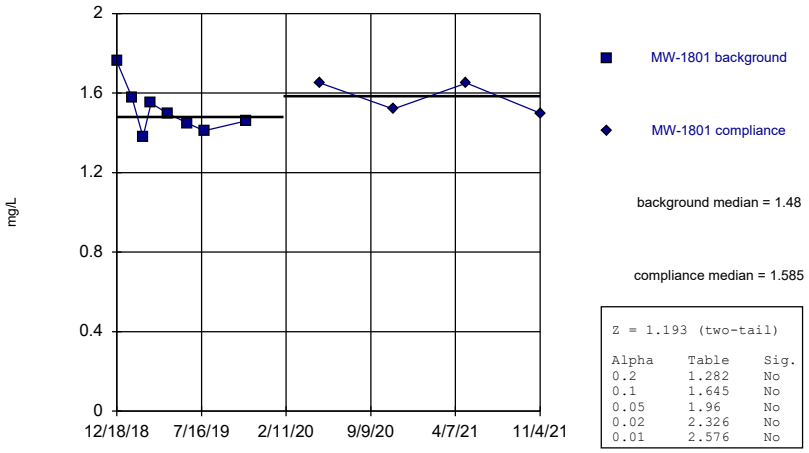
Z = -0.4253 (two-tail)

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: Boron Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

MW-1801



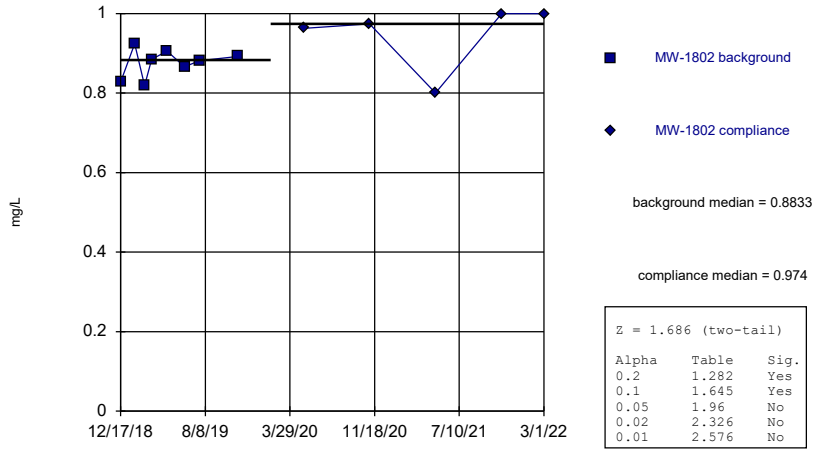
Z = 1.193 (two-tail)

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 Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

MW-1802



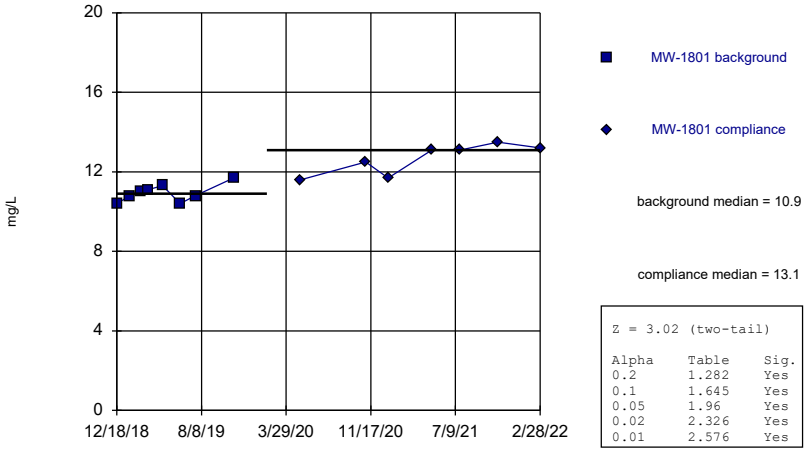
Z = 1.686 (two-tail)

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 Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

MW-1801



Z = 3.02 (two-tail)

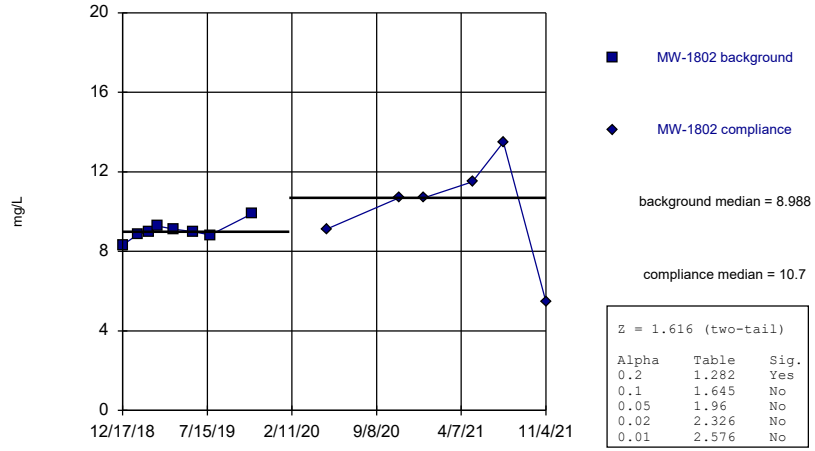
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	Yes
0.02	2.326	Yes
0.01	2.576	Yes

Constituent: Chloride Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1802



Z = 1.616 (two-tail)

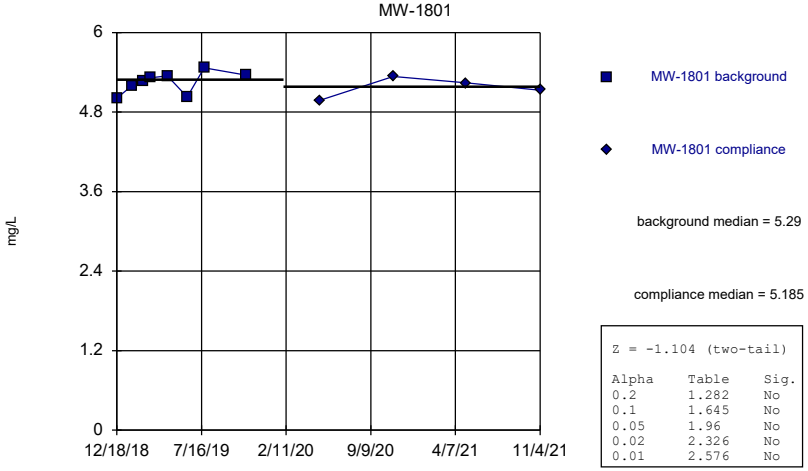
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Chloride Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1801



Z = -1.104 (two-tail)

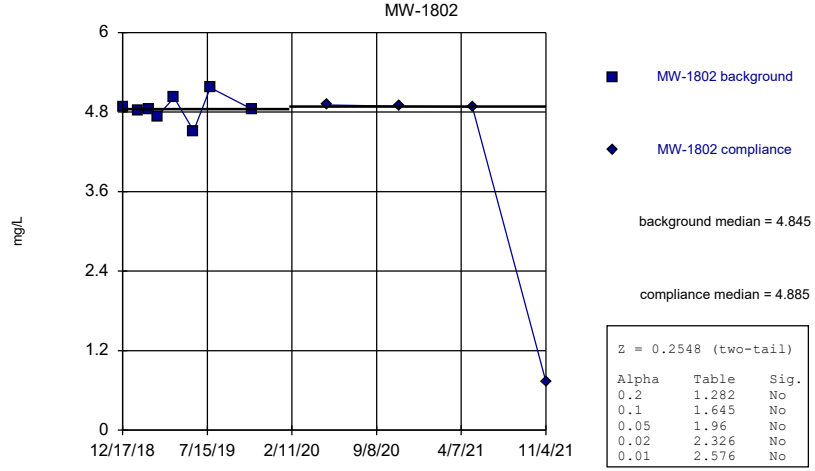
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Fluoride Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1802



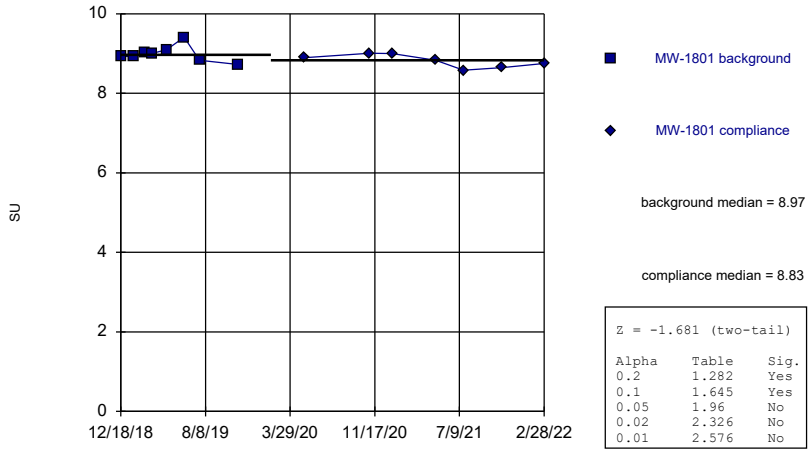
Z = 0.2548 (two-tail)

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: Fluoride Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

MW-1801



Z = -1.681 (two-tail)

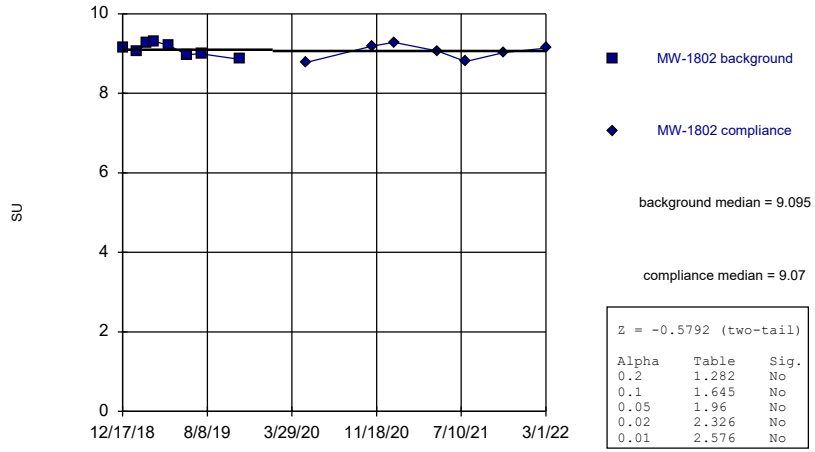
Alpha	Table	Sig.
0.2	1.282	Yes
0.1	1.645	Yes
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1802



Z = -0.5792 (two-tail)

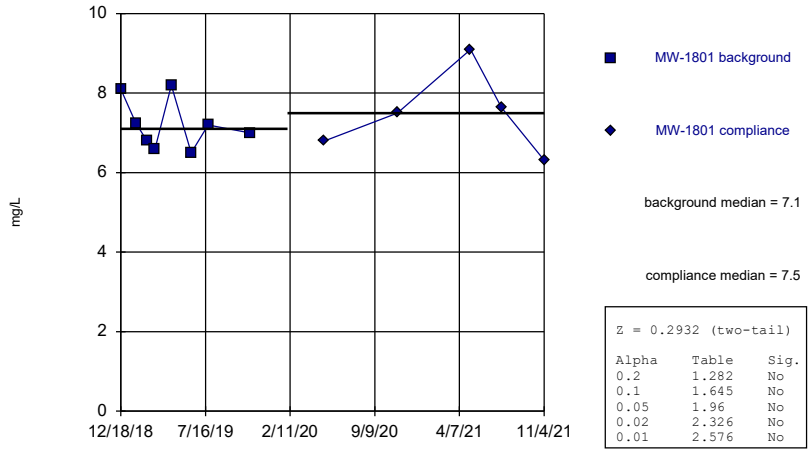
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: pH, field Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1801



Z = 0.2932 (two-tail)

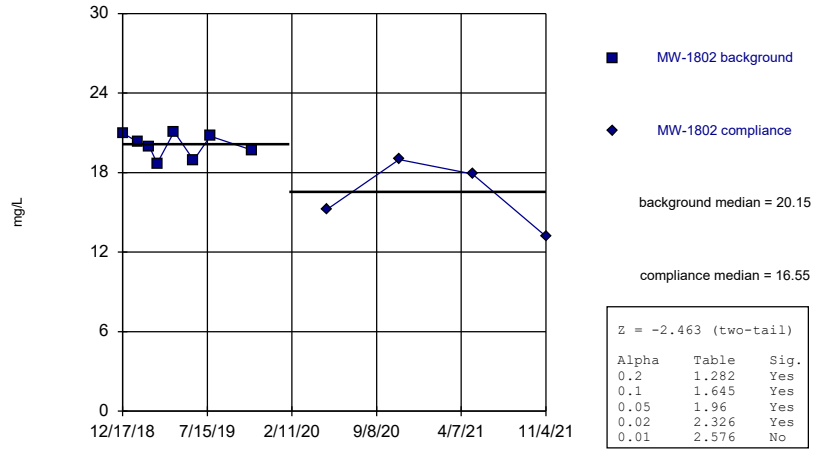
Alpha	Table	Sig.
0.2	1.282	No
0.1	1.645	No
0.05	1.96	No
0.02	2.326	No
0.01	2.576	No

Constituent: Sulfate Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1802



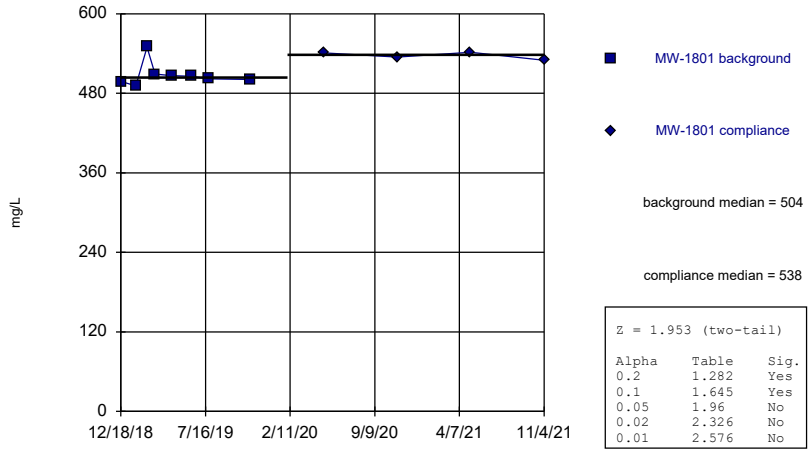
Z = -2.463 (two-tail)

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: Sulfate Analysis Run 7/19/2022 12:19 PM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Mann-Whitney (Wilcoxon Rank Sum)

MW-1801



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

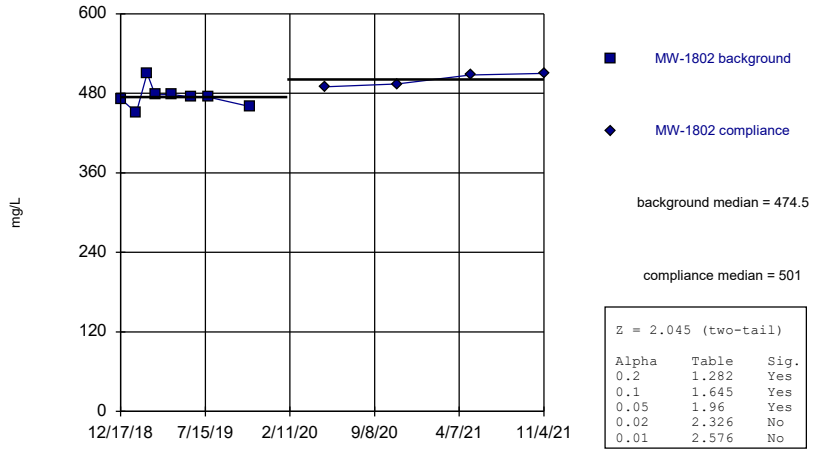
Constituent: Total Dissolved Solids Analysis Run 7/19/2022 12:19 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Mann-Whitney (Wilcoxon Rank Sum)

MW-1802



Z = 2.045 (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: Total Dissolved Solids Analysis Run 7/19/2022 12:19 PM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

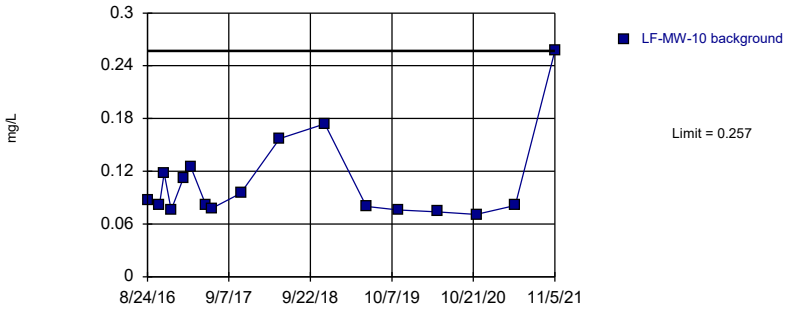
Intrawell Prediction Limit - All Results

Amos Landfill Client: Geosyntec Data: Amos LF Printed 7/20/2022, 11:57 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	%NDs	Transform	Alpha	Method
Boron (mg/L)	LF-MW-10	0.257	n/a	n/a	1 future	n/a	17	0	n/a	0.005914	NP Intra (normality) 1 of 2
Boron (mg/L)	LF-MW-2	0.2432	n/a	n/a	1 future	n/a	18	0	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-4	0.2064	n/a	n/a	1 future	n/a	18	0	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-6	0.1888	n/a	n/a	1 future	n/a	17	0	sqrt(x)	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-7R	0.1329	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-8	0.1005	n/a	n/a	1 future	n/a	17	23.53	ln(x)	0.00188	Param Intra 1 of 2
Boron (mg/L)	LF-MW-9	0.1484	n/a	n/a	1 future	n/a	17	0	sqrt(x)	0.00188	Param Intra 1 of 2
Boron (mg/L)	MW-1801	0.293	n/a	n/a	1 future	n/a	12	0	No	0.00188	Param Intra 1 of 2
Boron (mg/L)	MW-1802	0.2821	n/a	n/a	1 future	n/a	12	0	x^4	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-10	2.016	n/a	n/a	1 future	n/a	17	0	sqrt(x)	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-2	3.5	n/a	n/a	1 future	n/a	19	0	n/a	0.004832	NP Intra (normality) 1 of 2
Calcium (mg/L)	LF-MW-4	0.9039	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-6	44.59	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-7R	43.19	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-8	157.1	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	LF-MW-9	111.5	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	MW-1801	1.781	n/a	n/a	1 future	n/a	12	0	No	0.00188	Param Intra 1 of 2
Calcium (mg/L)	MW-1802	1.049	n/a	n/a	1 future	n/a	13	0	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-10	16.4	n/a	n/a	1 future	n/a	17	0	n/a	0.005914	NP Intra (normality) 1 of 2
Chloride (mg/L)	LF-MW-2	5.322	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-4	25.1	n/a	n/a	1 future	n/a	20	0	n/a	0.004291	NP Intra (normality) 1 of 2
Chloride (mg/L)	LF-MW-6	8.312	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-7R	4.212	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	LF-MW-8	60.9	n/a	n/a	1 future	n/a	17	0	n/a	0.005914	NP Intra (normality) 1 of 2
Chloride (mg/L)	LF-MW-9	6.59	n/a	n/a	1 future	n/a	17	0	n/a	0.005914	NP Intra (normality) 1 of 2
Chloride (mg/L)	MW-1801	14.01	n/a	n/a	1 future	n/a	15	0	No	0.00188	Param Intra 1 of 2
Chloride (mg/L)	MW-1802	13.41	n/a	n/a	1 future	n/a	14	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-10	0.9502	n/a	n/a	1 future	n/a	16	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-2	1.737	n/a	n/a	1 future	n/a	23	0	x^2	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-4	1.546	n/a	n/a	1 future	n/a	19	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-6	0.2904	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-7R	0.3987	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-8	0.2219	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	LF-MW-9	0.2963	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	MW-1801	5.575	n/a	n/a	1 future	n/a	12	0	No	0.00188	Param Intra 1 of 2
Fluoride (mg/L)	MW-1802	5.319	n/a	n/a	1 future	n/a	12	0	x^6	0.00188	Param Intra 1 of 2
pH, field (SU)	LF-MW-10	9.436	8.4	n/a	1 future	n/a	17	0	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-2	8.933	8.247	n/a	1 future	n/a	24	0	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-4	9.831	8.595	n/a	1 future	n/a	20	0	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-6	7.922	7.236	n/a	1 future	n/a	17	0	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-7R	7.96	7.151	n/a	1 future	n/a	17	0	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	LF-MW-8	7.6	6.78	n/a	1 future	n/a	17	0	n/a	0.01183	NP Intra (normality) 1 of 2
pH, field (SU)	LF-MW-9	7.439	6.936	n/a	1 future	n/a	17	0	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	MW-1801	9.342	8.483	n/a	1 future	n/a	15	0	No	0.0009398	Param Intra 1 of 2
pH, field (SU)	MW-1802	9.431	8.715	n/a	1 future	n/a	15	0	No	0.0009398	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-10	19.38	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-2	12.05	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-4	11.54	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-6	58.87	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-7R	252.1	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-8	101.1	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	LF-MW-9	42.32	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	MW-1801	9.047	n/a	n/a	1 future	n/a	13	0	No	0.00188	Param Intra 1 of 2
Sulfate (mg/L)	MW-1802	24.18	n/a	n/a	1 future	n/a	12	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-10	546.3	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-2	396.3	n/a	n/a	1 future	n/a	18	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-4	419	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-6	449.5	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-7R	762.6	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-8	639.4	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	LF-MW-9	466.3	n/a	n/a	1 future	n/a	17	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-1801	563.1	n/a	n/a	1 future	n/a	12	0	No	0.00188	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-1802	526.5	n/a	n/a	1 future	n/a	12	0	No	0.00188	Param Intra 1 of 2

Prediction Limit

Intrawell Non-parametric, LF-MW-10 (bg)



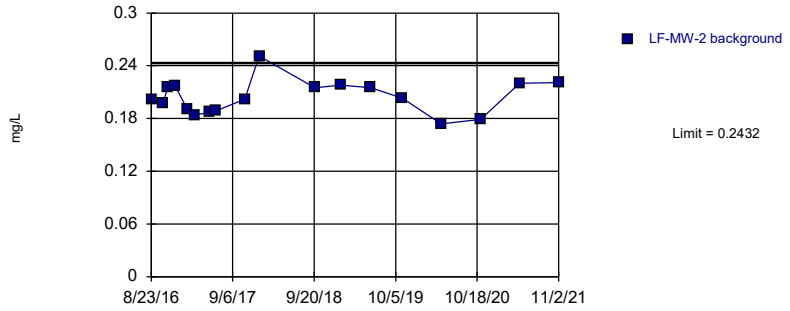
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes 1 future value.

Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



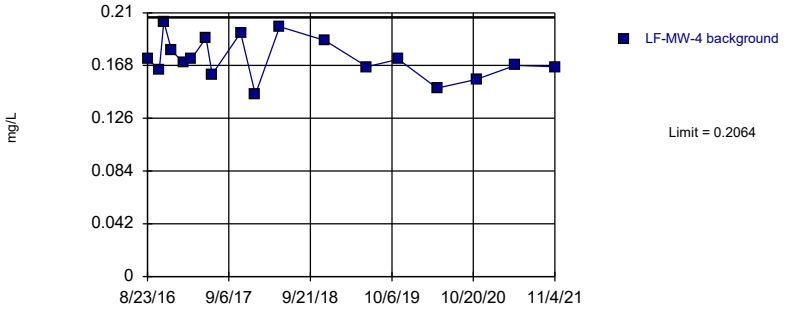
Background Data Summary: Mean=0.2044, Std. Dev.=0.01908, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9447, critical = 0.858. Kappa = 2.032 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



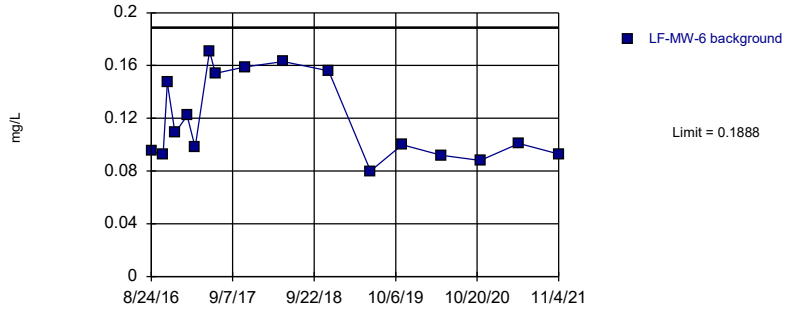
Background Data Summary: Mean=0.1735, Std. Dev.=0.01619, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9654, critical = 0.858. Kappa = 2.032 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)

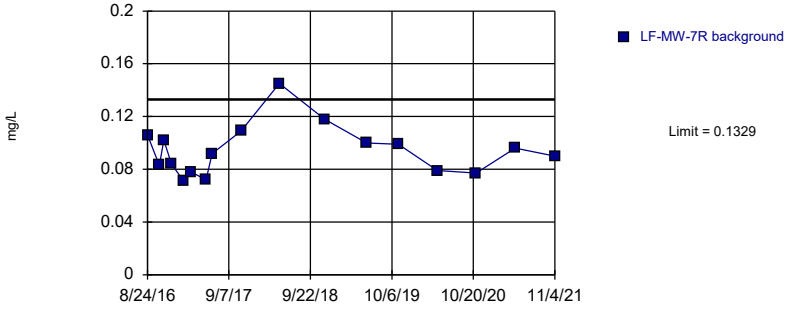


Background Data Summary (based on square root transformation): Mean=0.342, Std. Dev.=0.04502, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.859, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

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



Background Data Summary: Mean=0.09418, Std. Dev.=0.01887, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.915, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

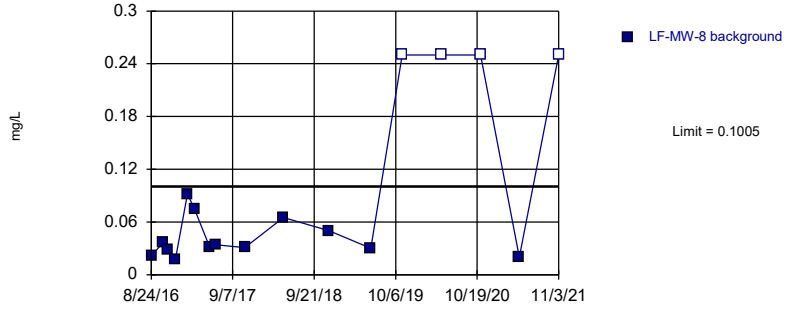
Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



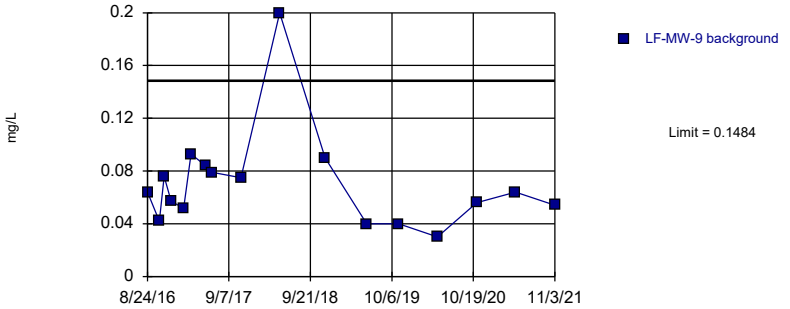
Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-3.35, Std. Dev.=0.5121, n=17, 23.53% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8597, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



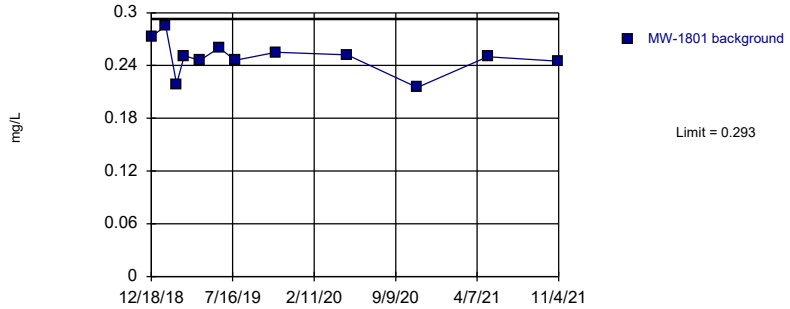
Background Data Summary (based on square root transformation): Mean=0.2584, Std. Dev.=0.06177, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.858, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1801



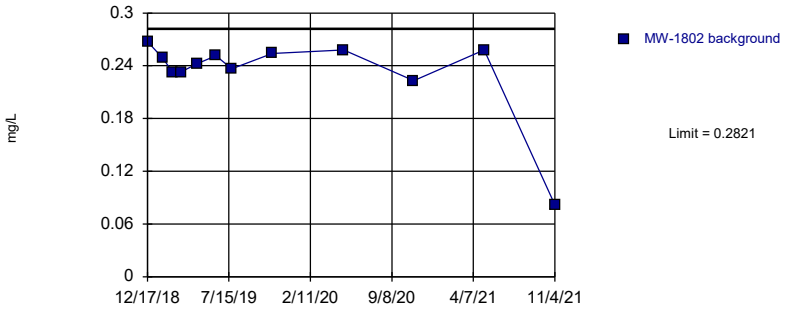
Background Data Summary: Mean=0.2498, Std. Dev.=0.01937, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9259, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary (based on x^4 transformation): Mean=0.003412, Std. Dev.=0.00131, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8797, 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.

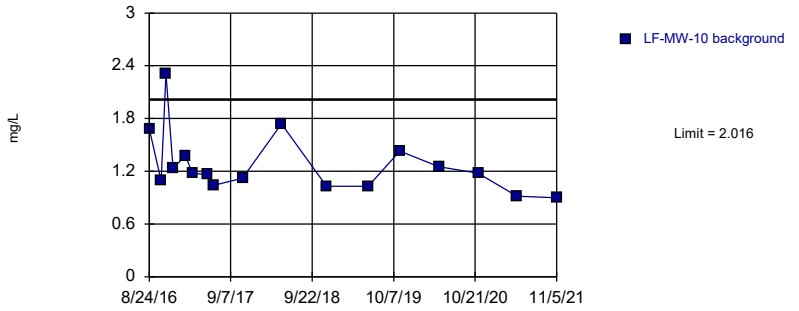
Constituent: Boron Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 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=1.12, Std. Dev.=0.1459, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8725, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

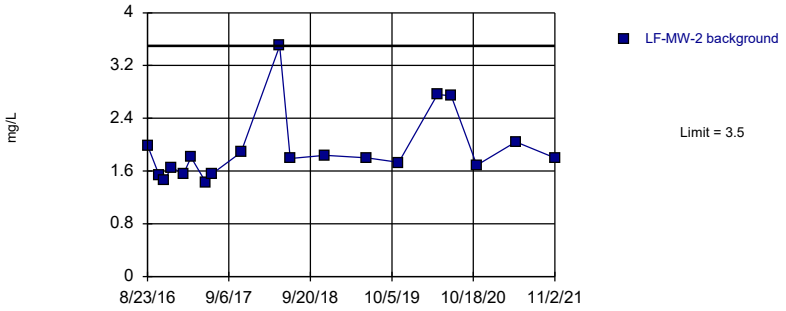
Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, LF-MW-2



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 19 background values. Well-constituent pair annual alpha = 0.009641. Individual comparison alpha = 0.004832 (1 of 2). Assumes 1 future value.

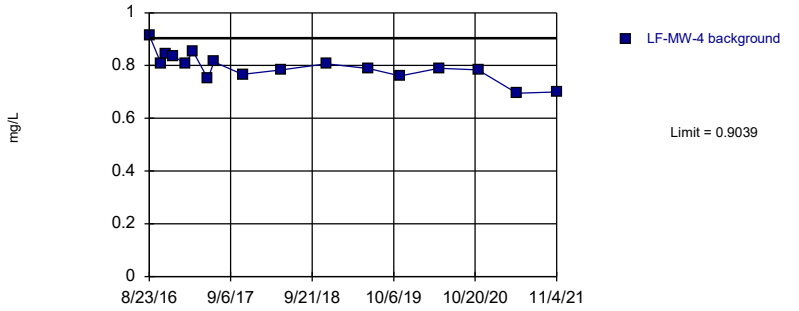
Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



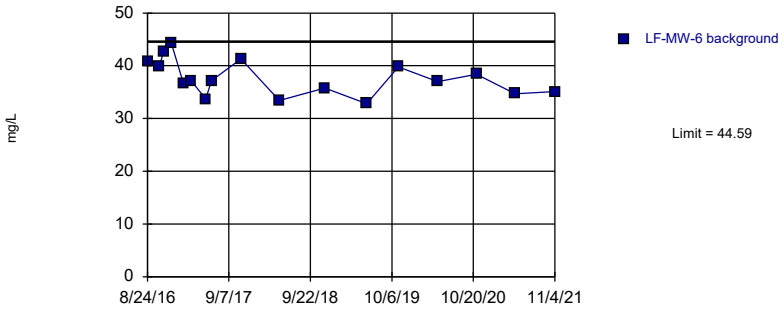
Background Data Summary: Mean=0.794, Std. Dev.=0.05352, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.964, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



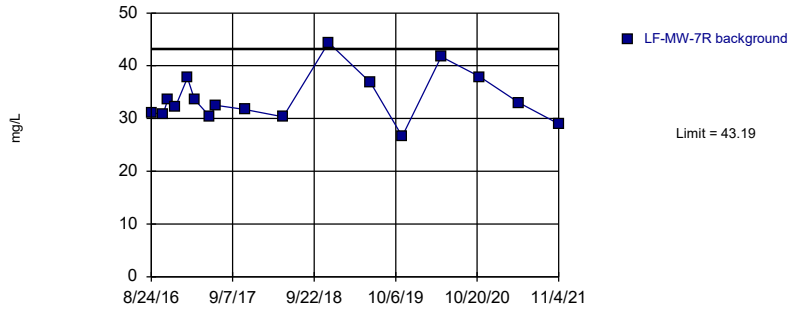
Background Data Summary: Mean=37.68, Std. Dev.=3.365, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9649, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

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



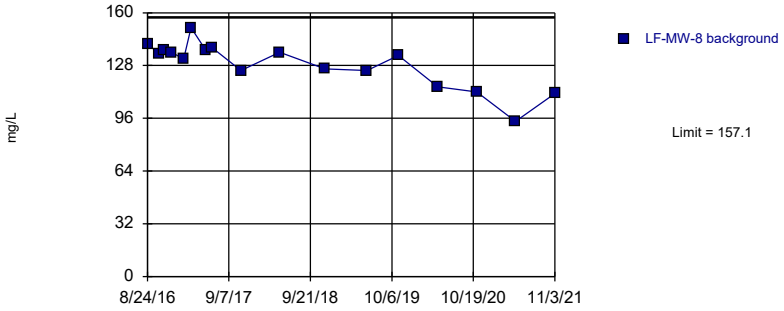
Background Data Summary: Mean=33.72, Std. Dev.=4.61, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9242, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



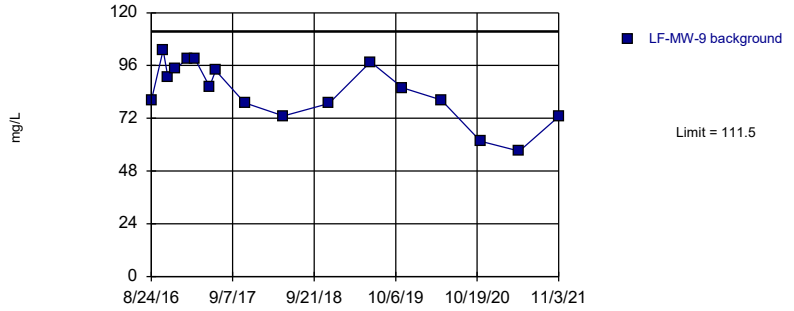
Background Data Summary: Mean=128.6, Std. Dev.=13.9, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9162, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)

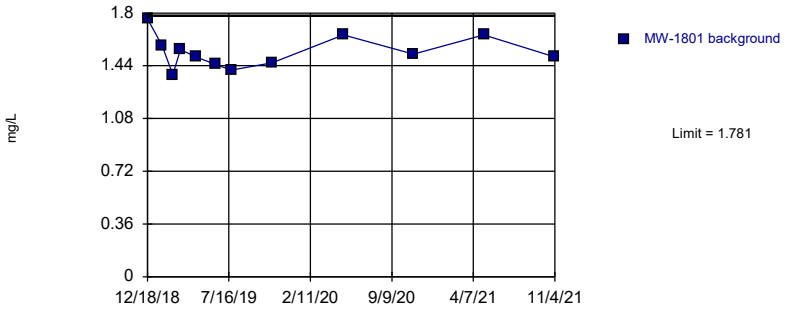


Background Data Summary: Mean=84.25, Std. Dev.=13.27, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.949, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1801



Background Data Summary: Mean=1.534, Std. Dev.=0.1106, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9585, 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.

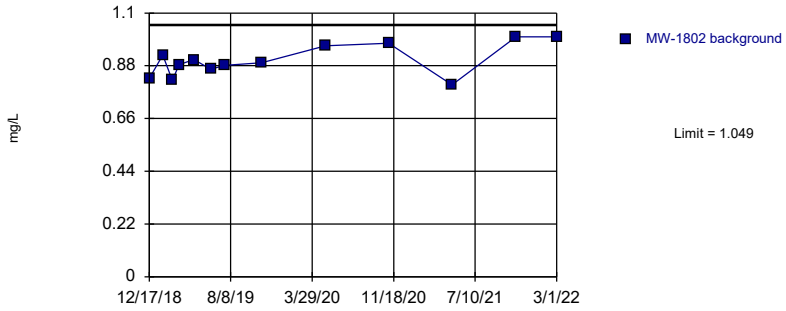
Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=0.9029, Std. Dev.=0.0668, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9457, 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.

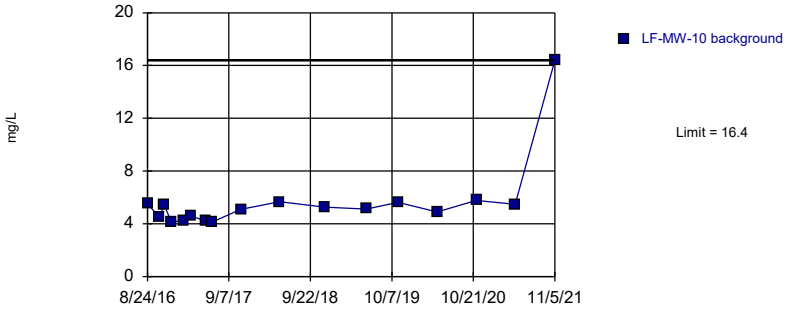
Constituent: Calcium Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, LF-MW-10 (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. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes 1 future value.

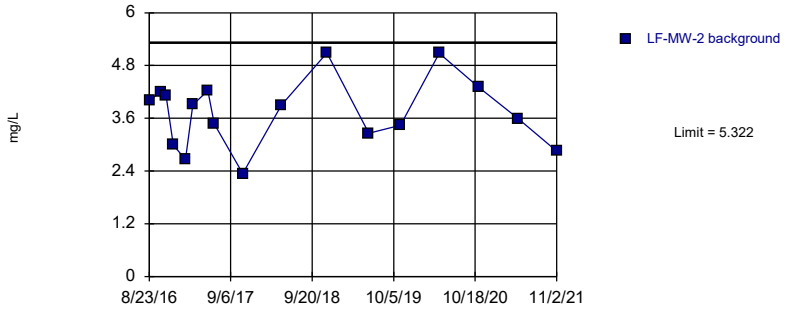
Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



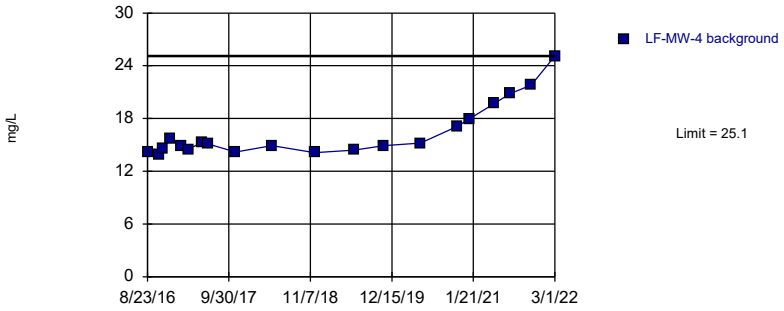
Background Data Summary: Mean=3.734, Std. Dev.=0.7734, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9697, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Non-parametric, LF-MW-4



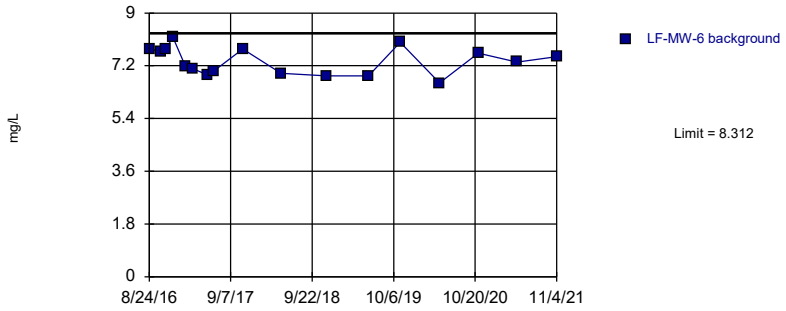
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 20 background values. Well-constituent pair annual alpha = 0.008564. Individual comparison alpha = 0.004291 (1 of 2). Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



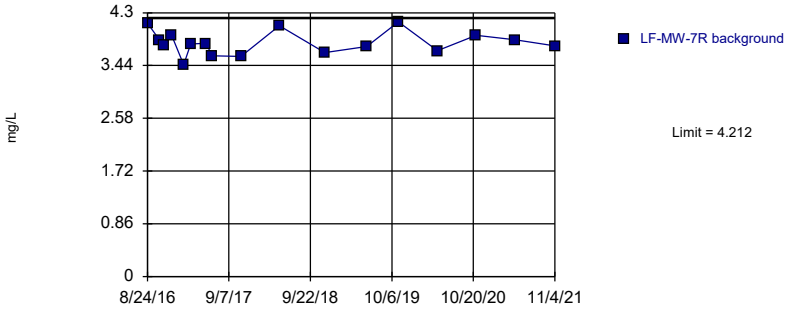
Background Data Summary: Mean=7.356, Std. Dev.=0.4653, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.947, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

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



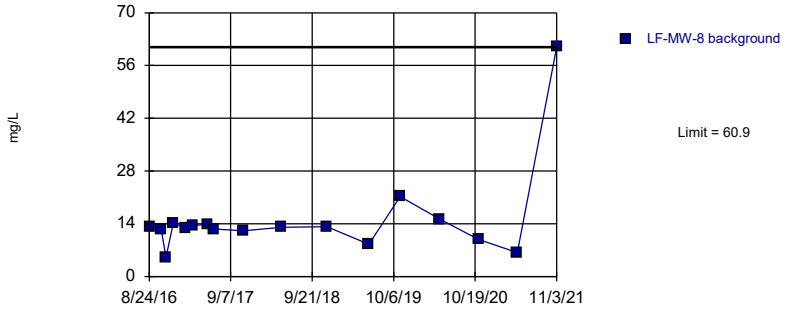
Background Data Summary: Mean=3.812, Std. Dev.=0.1944, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9675, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

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

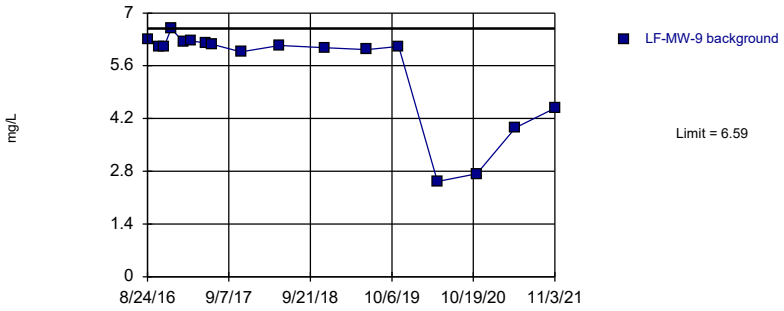


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Non-parametric, LF-MW-9 (bg)



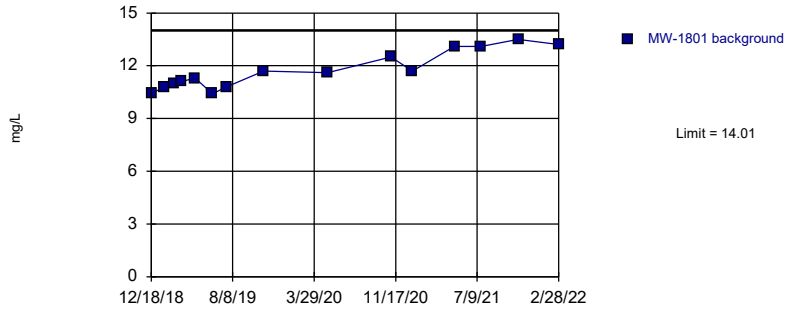
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 17 background values. Well-constituent pair annual alpha = 0.01179. Individual comparison alpha = 0.005914 (1 of 2). Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1801



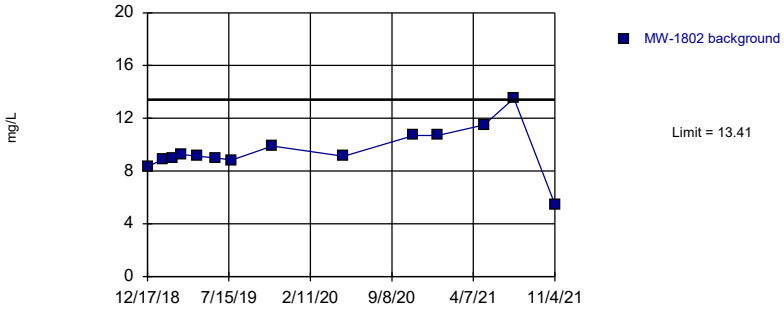
Background Data Summary: Mean=11.75, Std. Dev.=1.07, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9009, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



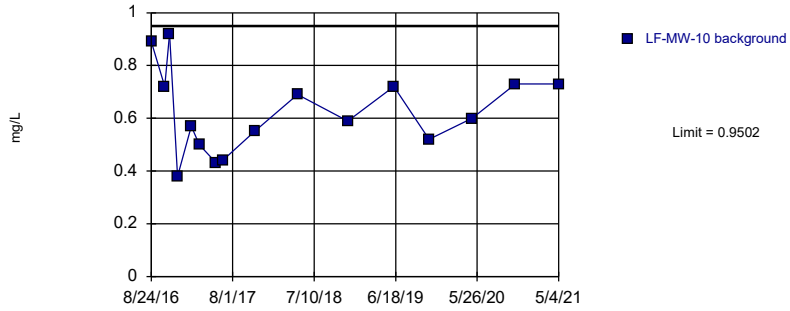
Background Data Summary: Mean=9.519, Std. Dev.=1.806, n=14. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9063, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Chloride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)

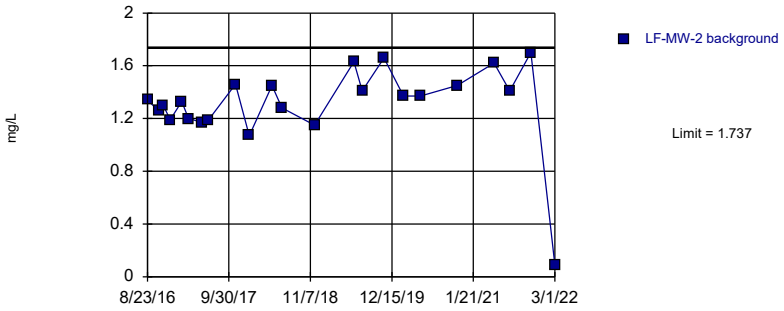


Background Data Summary: Mean=0.6238, Std. Dev.=0.1573, n=16. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9556, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-2



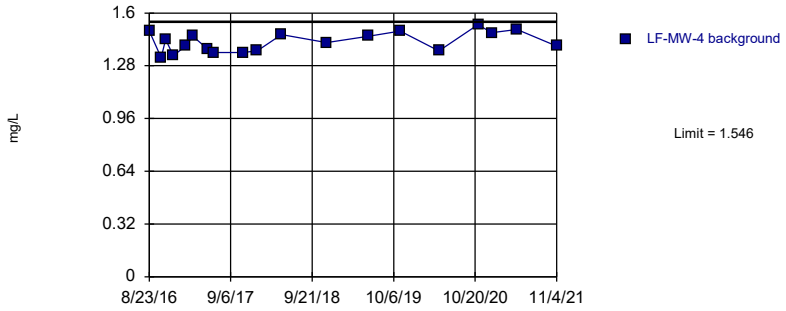
Background Data Summary (based on square transformation): Mean=1.808, Std. Dev.=0.6198, n=23. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.931, critical = 0.881. Kappa = 1.95 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-4



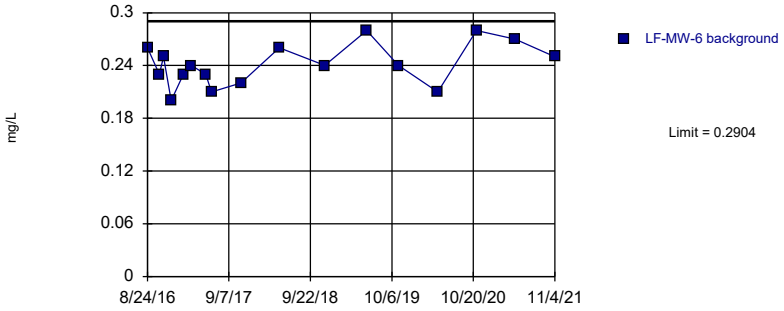
Background Data Summary: Mean=1.424, Std. Dev.=0.06094, n=19. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9428, critical = 0.863. Kappa = 2.01 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



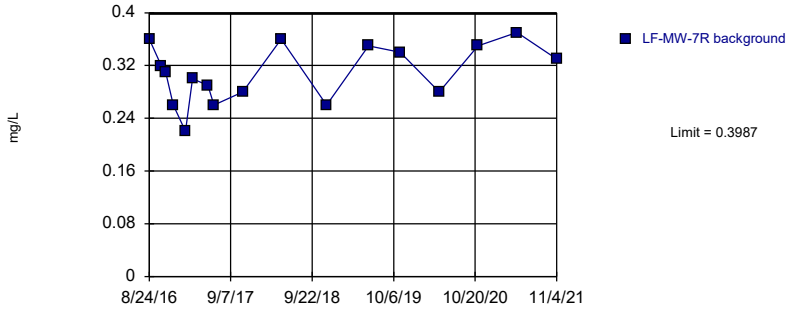
Background Data Summary: Mean=0.2412, Std. Dev.=0.02395, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9647, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

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



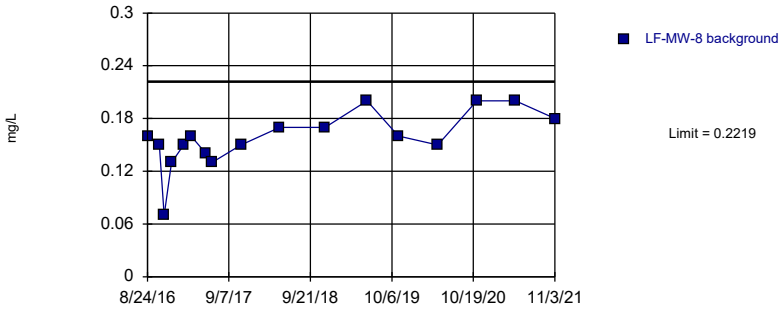
Background Data Summary: Mean=0.3082, Std. Dev.=0.04405, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9471, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



Background Data Summary: Mean=0.1571, Std. Dev.=0.03158, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8963, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

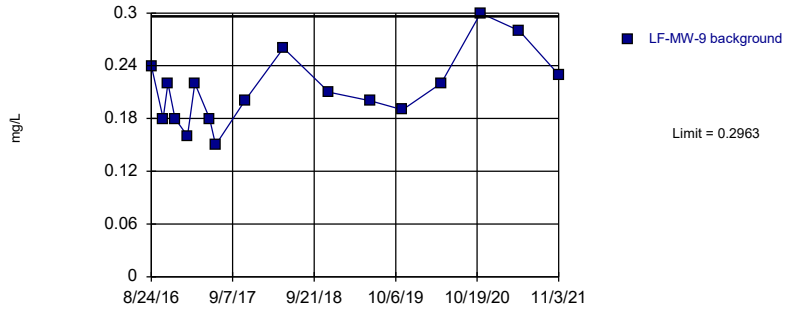
Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



Background Data Summary: Mean=0.2129, Std. Dev.=0.04058, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9612, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

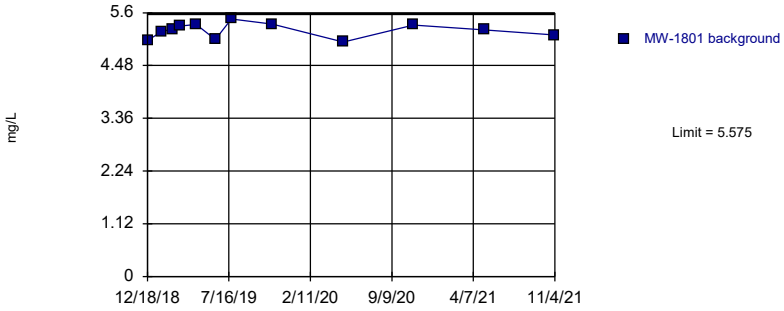
Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1801



Background Data Summary: Mean=5.224, Std. Dev.=0.1571, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9383, 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.

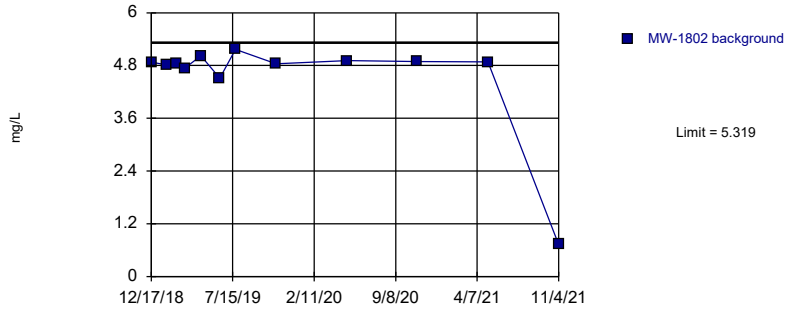
Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



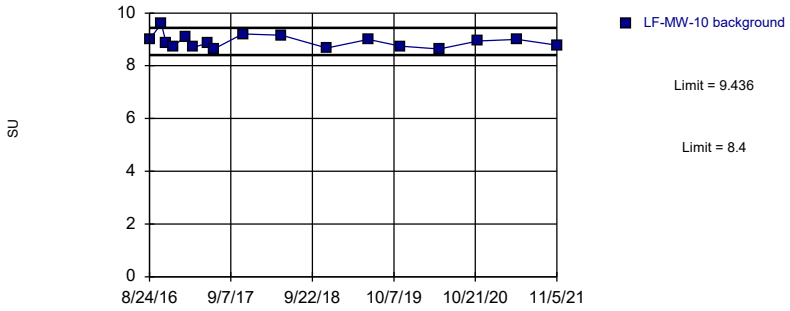
Background Data Summary (based on x^6 transformation): Mean=12322, Std. Dev.=4625, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8158, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Fluoride Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=8.918, Std. Dev.=0.2521, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9005, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

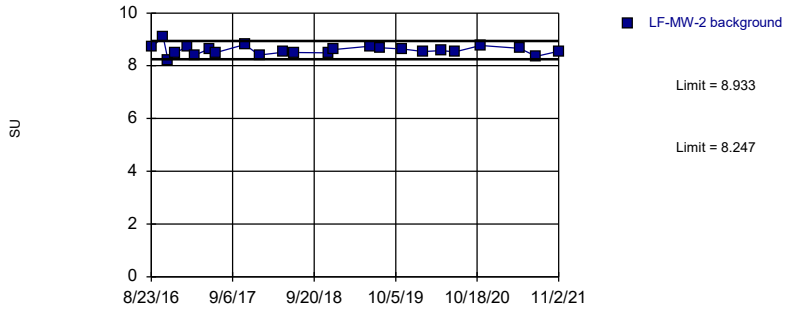
Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



Background Data Summary: Mean=8.59, Std. Dev.=0.1773, n=24. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9573, critical = 0.884. Kappa = 1.937 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

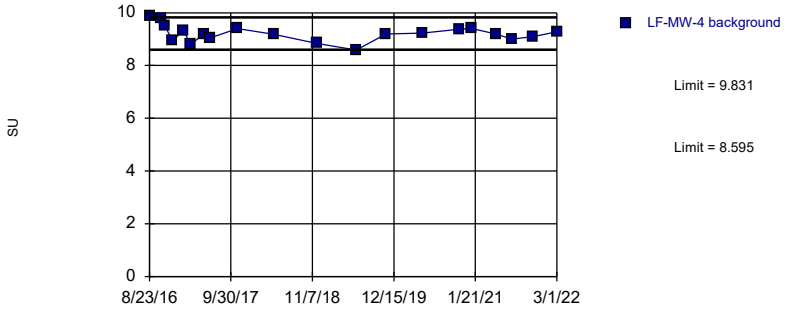
Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



Background Data Summary: Mean=9.213, Std. Dev.=0.3106, n=20. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.976, critical = 0.868. Kappa = 1.988 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

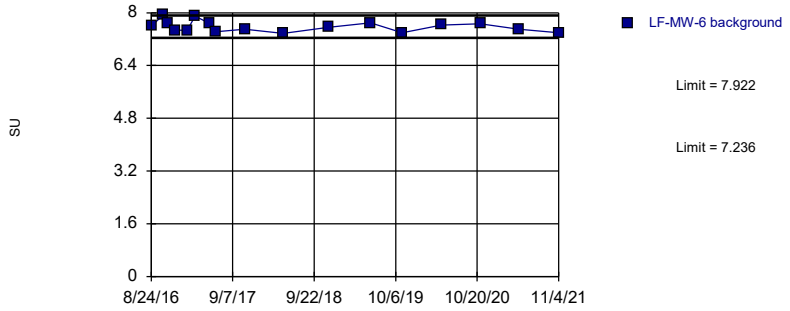
Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



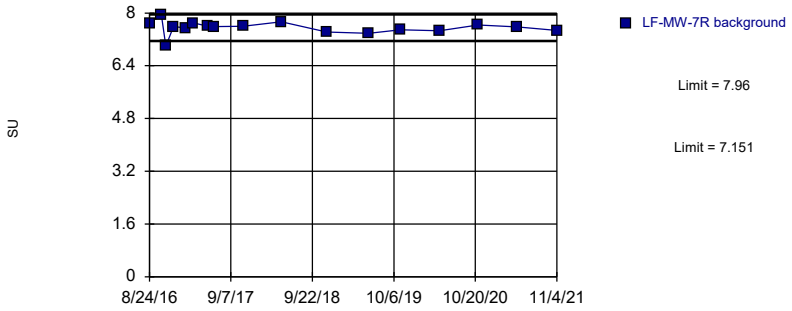
Background Data Summary: Mean=7.579, Std. Dev.=0.1668, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9159, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

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



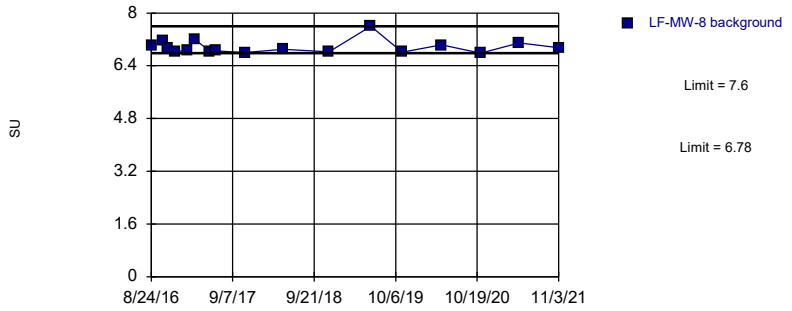
Background Data Summary: Mean=7.556, Std. Dev.=0.1969, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9005, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

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



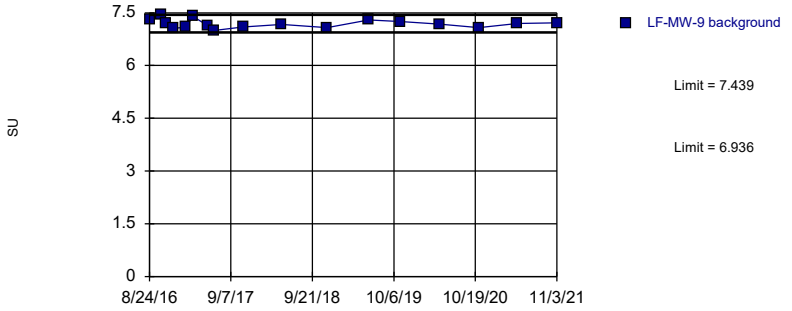
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limits are highest and lowest of 17 background values. Well-constituent pair annual alpha = 0.02359. Individual comparison alpha = 0.01183 (1 of 2). Assumes 1 future value.

Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



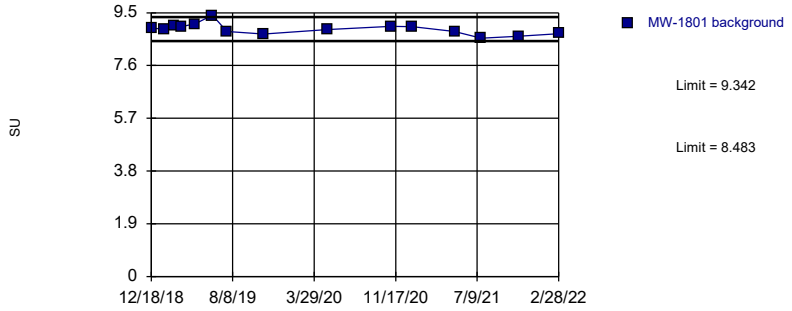
Background Data Summary: Mean=7.188, Std. Dev.=0.1223, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9501, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1801

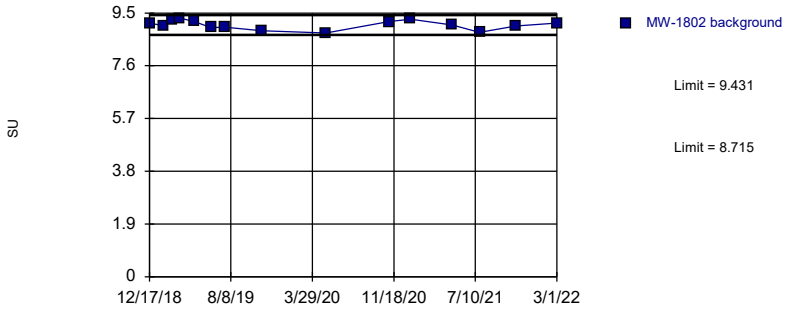


Background Data Summary: Mean=8.913, Std. Dev.=0.2031, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9536, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: pH, field Analysis Run 7/20/2022 11:50 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=9.073, Std. Dev.=0.1693, n=15. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9534, 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.

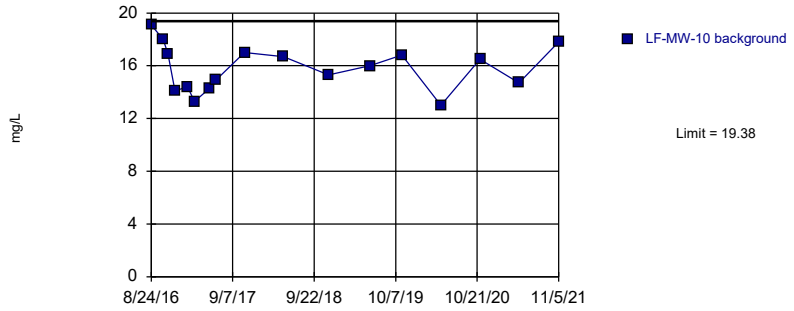
Constituent: pH, field Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=15.81, Std. Dev.=1.735, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9691, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

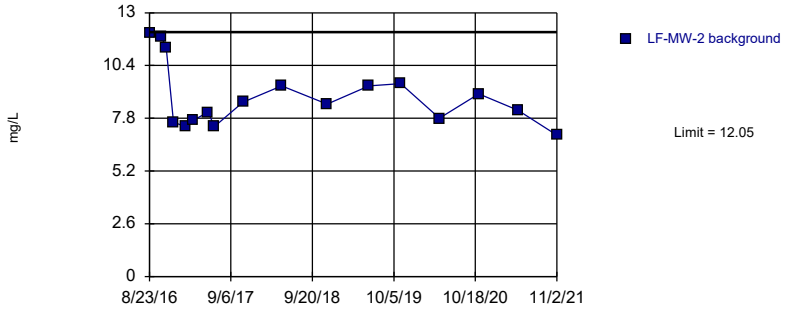
Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



Background Data Summary: Mean=8.863, Std. Dev.=1.553, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8792, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

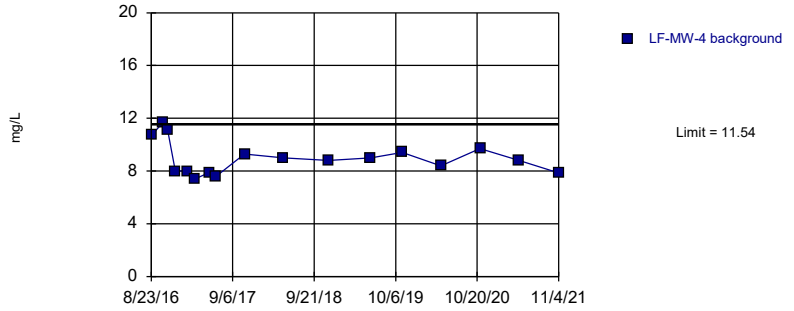
Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-4



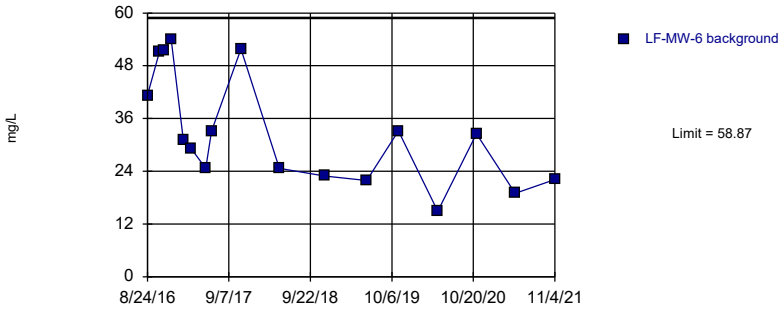
Background Data Summary: Mean=8.98, Std. Dev.=1.245, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9174, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



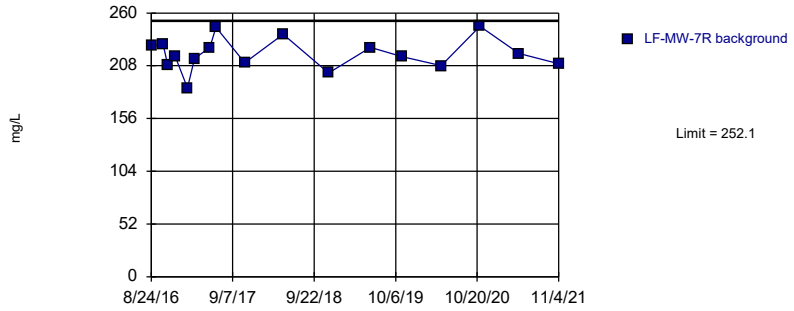
Background Data Summary: Mean=32.88, Std. Dev.=12.65, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8976, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

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



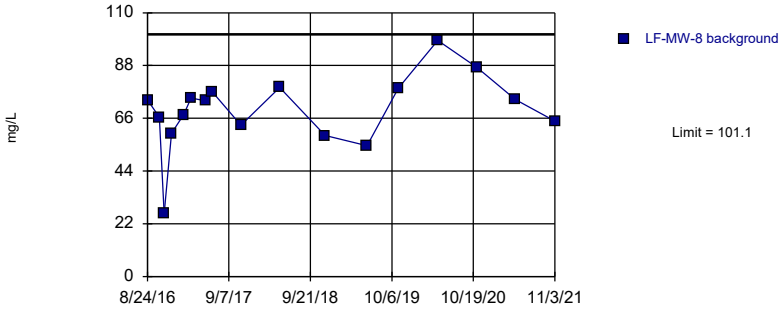
Background Data Summary: Mean=219.7, Std. Dev.=15.79, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9701, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)



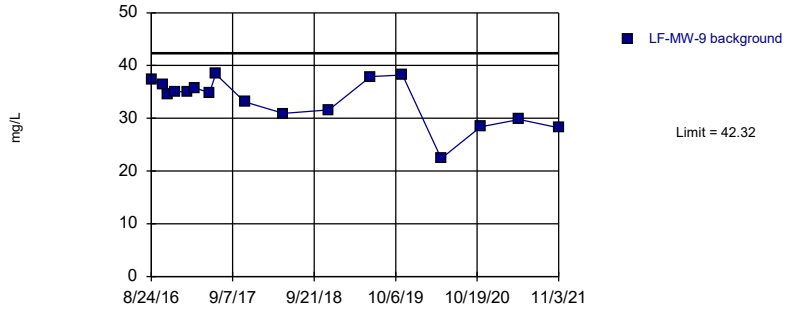
Background Data Summary: Mean=69.21, Std. Dev.=15.51, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9187, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)

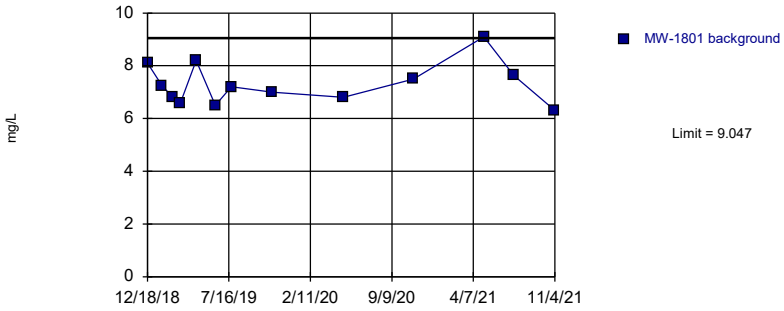


Background Data Summary: Mean=33.39, Std. Dev.=4.346, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9108, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1801



Background Data Summary: Mean=7.307, Std. Dev.=0.7932, n=13. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.933, 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.

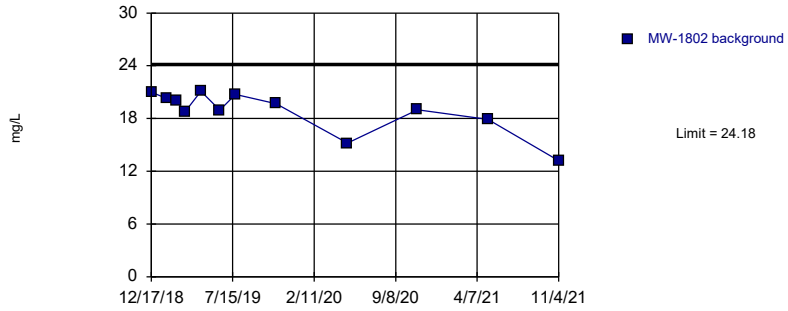
Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=18.82, Std. Dev.=2.405, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8362, 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.

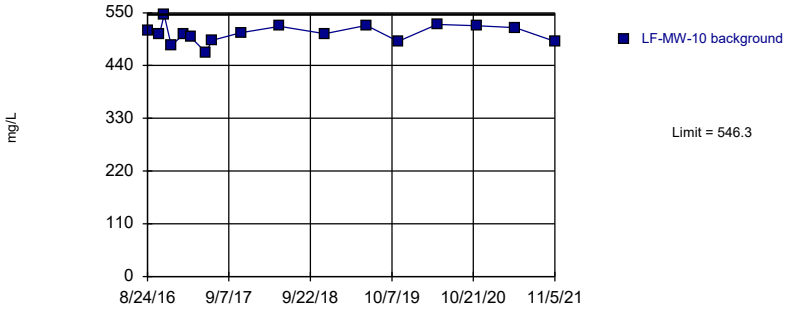
Constituent: Sulfate Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-10 (bg)



Background Data Summary: Mean=506.7, Std. Dev.=19.25, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.983, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

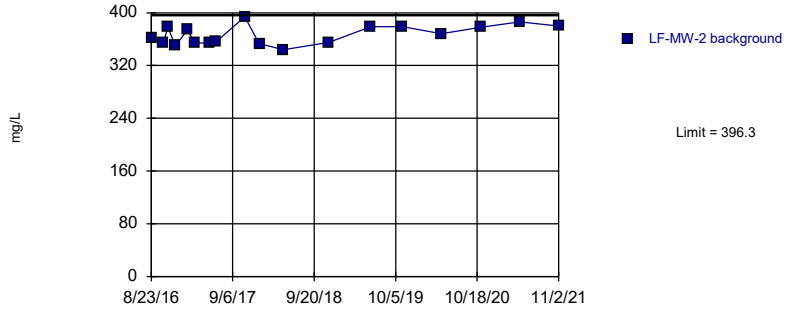
Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-2



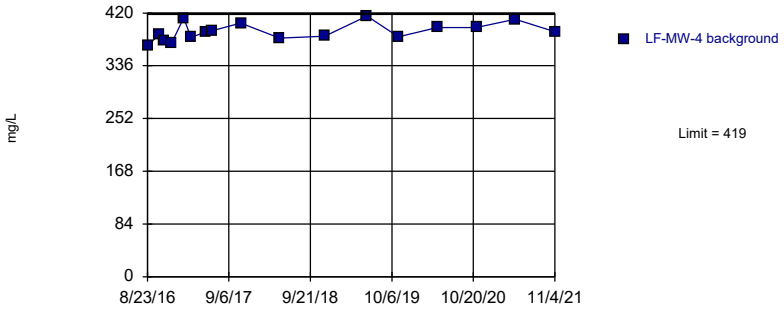
Background Data Summary: Mean=366.6, Std. Dev.=14.65, n=18. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.918, critical = 0.858. Kappa = 2.032 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-4



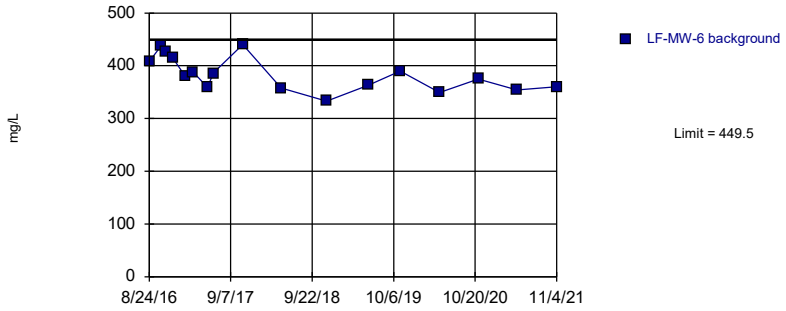
Background Data Summary: Mean=390.3, Std. Dev.=13.96, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9608, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-6 (bg)



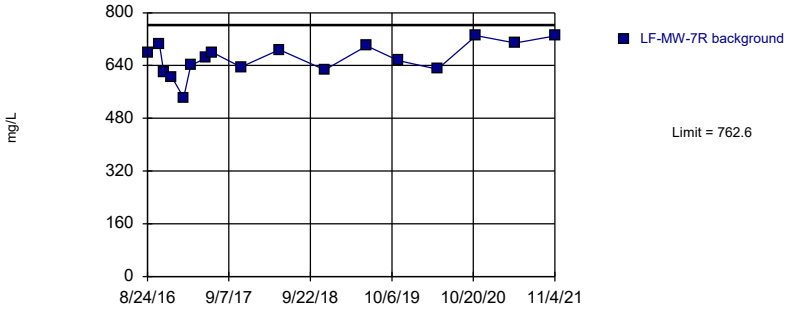
Background Data Summary: Mean=383.6, Std. Dev.=32.1, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9434, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

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



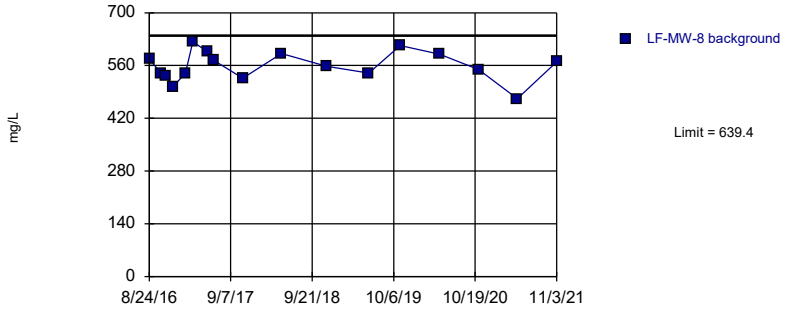
Background Data Summary: Mean=661, Std. Dev.=49.44, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9558, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Sanitas™ v.9.6.33 Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, LF-MW-8 (bg)

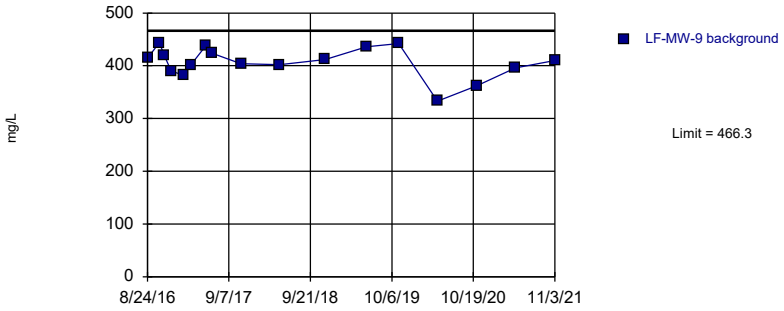


Background Data Summary: Mean=558.5, Std. Dev.=39.38, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9778, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III
Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, LF-MW-9 (bg)



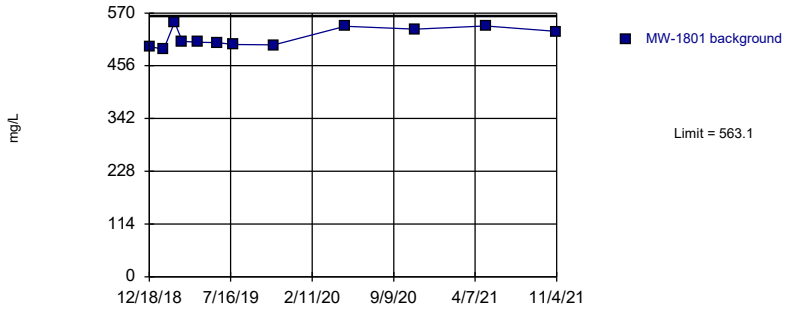
Background Data Summary: Mean=406.5, Std. Dev.=29.08, n=17. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9292, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1801



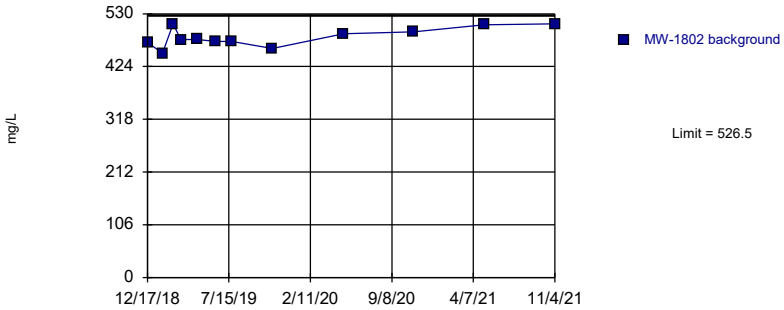
Background Data Summary: Mean=517.7, Std. Dev.=20.35, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8869, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

Prediction Limit

Intrawell Parametric, MW-1802



Background Data Summary: Mean=483.4, Std. Dev.=19.34, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9315, 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 7/20/2022 11:51 AM View: Appendix III

Amos Landfill Client: Geosyntec Data: Amos LF

APPENDIX 3

The alternative source demonstrations follow.

ALTERNATIVE SOURCE DEMONSTRATION REPORT FEDERAL CCR RULE

Amos Plant Landfill
Winfield, West Virginia

Submitted to

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

941 Chatham Lane, Suite 103
Columbus, Ohio 43221

July 5, 2022

CHA8495

TABLE OF CONTENTS

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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
cm/sec	Centimeters per second
LF	Landfill
LPL	Lower Prediction Limit
mg/L	Milligram per liter
QA	Quality Assurance
QC	Quality Control
SRF	Stress Relief Fracture
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 statistically significant increases (SSIs) for calcium and chloride at the Amos Plant Landfill (LF) following the second semi-annual detection monitoring event of 2021.

Following completion of four detection monitoring events, the previously calculated upper prediction limits (UPLs) for the LF were recalculated for each Appendix III parameter to represent background values (Geosyntec, 2020a). 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 (Geosyntec, 2020b). 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 2021 was performed in November 2021 (initial sampling event) and March 2022 (verification sampling event) and the results were compared to the recalculated prediction limits. During this detection monitoring event, SSIs were identified for calcium at MW-1802 based on intrawell comparisons and for chloride at MW-4 and MW-1801 based on intrawell comparisons. 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 2021 was completed in November 2021 (initial event) and March 2022 (verification event) 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 SSIs identified for calcium at MW-1802 and for chloride at MW-4 and MW-1801 are from a source other than the LF.

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 increases in calcium at monitoring well MW-1802 and chloride at monitoring wells MW-4 and MW-1801 were based on Type IV causes (Natural Variation) and not by a release from the LF.

SECTION 2

ALTERNATIVE SOURCE DEMONSTRATION

A brief description of the site geology and hydrology, the ASD evaluation methodology, and the proposed alternative source are described below.

2.1 Site Geology Summary

The LF 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-4 and MW-1802 are downgradient wells for the northern valley, and MW-1801 is a downgradient well for the southern valley. The northern and southern valleys are hydrologically separated from each other.

Bedrock in the vicinity of MW-4, MW-1801, and MW-1802 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; **Attachment A**). Although not represented in boring logs associated with LF monitoring well network construction, the sedimentary package associated with the Monongahela and Conemaugh Formations contains occasional thin limestone and coal beds. The Pittsburgh Coal and Pittsburgh Limestone beds serve as marker beds indicating the contact between the Monongahela and Conemaugh formations. The Pittsburgh limestone bed has been observed in boring logs at the nearby Fly Ash Pond (Arcadis, 2020).

2.2 Site Hydrological Summary

Groundwater flows through the stress relief fracture formations, illustrated in a conceptual site model included in the Groundwater Monitoring Network Report (Arcadis, 2020; included as **Attachment A**). Bedrock groundwater flow generally follows surface topography, flowing downslope of ridges towards valley floors (Arcadis, 2020).

The LF monitoring well network monitors groundwater flow within the Uppermost Aquifer, which was defined by Arcadis (2020) as the saturated portion of the stress relief fracturing system. This Uppermost Aquifer unit is independent of any single lithologic unit - the stress relief fracturing system occurs in both the Conemaugh and Monongahela Formations and spans multiple lithologies comprising these formations. According to the Groundwater Monitoring Network Report, “the stress relief fracture (SRF) system is hydraulically connected from ridges to valleys” (Arcadis, 2020), as determined by a multiple lines of evidence approach discussed in Section 3.2.3 of the report. These multiple lines of evidence include evaluation of boring logs, assessment of groundwater geochemistry, hydraulic testing consisting of packer testing and

pump yield testing, and high resolution water level monitoring using pressure transducers deployed in monitoring wells across the site.

Hydraulic testing yielded estimated hydraulic conductivity values of 2.5 x 10^{-6} centimeters per second (cm/sec) and 1.2 x 10^{-5} cm/sec for MW-1801 and MW-1802, respectively. High resolution water level monitoring conducted by Arcadis, and seasonal water level monitoring have not revealed seasonal flow regime changes at or near the LF monitoring well network. The current LF monitoring well network consists of upgradient monitoring wells MW-6, MW-7R, MW-8, MW-9, and MW-10, and downgradient compliance wells MW-2, MW-1801, MW-4, and MW-1802. Previous LF monitoring wells network wells MW-1 and MW-5 have been removed from the monitoring network after it was determined that groundwater from those locations was representative of shallow perched groundwater zones (Arcadis, 2020).

2.3 Landfill Leachate Data Analysis

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. A preliminary review did not identify any Type V (anthropogenic) causes. Therefore, natural variation, which is a Type IV cause, was examined as a potential cause of the SSIs.

LF leachate concentrations of boron, major cations, and major anions known to be indicative of CCR leachate were examined and compared to monitoring well network groundwater to evaluate whether LF leachate influenced downgradient well geochemistry. Piper diagrams, which visually represent the relative concentrations of major cations and anions in the groundwater and leachate analytical samples, were created to further visualize groundwater geochemistry at MW-4, MW-1801, and MW-1802 compared to the geochemistry of the leachate (**Figure 3**). The data shown in these Piper diagrams captures the background and detection monitoring periods: 2017 through 2022 for MW-4 and 2018 through 2022 for MW-1801 and MW-1802.

The groundwater geochemistry at MW-4, MW-1801, and MW-1802 has remained unchanged throughout the monitoring period, as illustrated by the tight clustering of sample results for each well on the Piper Diagrams. Groundwater compositions are distinct from leachate, particularly for the relative anion percentages, illustrating geochemical stability of site groundwater and a lack of influence from leachate on the groundwater composition. Relative percentages of anions at each of the downgradient wells of interest are more similar to background well MW-8, as shown by their similar locations on the lower right hand triangle of the Piper Diagram (**Figure 3**).

Boron and sulfate are typically considered conservative parameters due to their lack of attenuation by chemical processes in groundwater flow, and they function as indicators for potential CCR unit releases due to their high relative concentration in CCR. Boron concentrations in LF leachate samples collected in October 2021 from the northern valley and southern valley were 95.8 milligrams per liter (mg/L) and 107 mg/L, respectively. The concentrations of boron at MW-4,

MW-1801, and MW-1802 are consistently less than 0.3 mg/L (**Figure 4**). LF leachate sulfate concentrations in October 2021 northern valley leachate and southern valley samples were 14,400 mg/L and 18,400 mg/L, respectively. The concentrations of sulfate at MW-4, MW-1801, and MW-1802 are consistently less than 25 mg/L (**Figure 5**).

If LF leachate, which contains boron and sulfate concentration several orders of magnitude higher than the wells of interest, were impacting groundwater quality at downgradient monitoring wells, an increase in boron and sulfate concentrations at MW-4, MW-1801, and MW-1802 would be expected. The current boron and sulfate concentrations at the wells of interest do not display increasing trends (**Figure 4** and **Figure 5,** respectively), which suggests that changes in calcium and chloride in groundwater at these locations cannot be attributed to a release from the LF.

2.4 Examination of Natural Variability

SSIs were observed for calcium at compliance well MW-1802 and chloride at compliance wells MW-4 and MW-1801. However, chloride concentrations at upgradient well MW-8 have historically been above those observed at MW-1801 and comparable to those observed at MW-4 (**Figure 6**). Calcium concentrations at upgradient wells MW-6, MW-7R, and MW-8 have also historically been several orders of magnitude above those at downgradient well MW-1802 (**Figure 7**). The high chloride and calcium concentrations at MW-8 indicate that the native geologic material (which is predominantly claystone and sandstone) contains chloride and calcium which may be released into solution at concentrations higher than or comparable to those typically found at MW-4, MW-1801, and MW-1802. Additionally, the site geology contains thin limestone beds, the dissolution of which may provide a source for aqueous calcium in groundwater.

Monitoring wells MW-8, MW-6, and MW-7R are located hydraulically upgradient of the LF and contain higher chloride and calcium concentrations than those observed at downgradient compliance wells. Thus, the recent chloride and calcium concentrations are generally within the observed background chloride and calcium concentration ranges. These observations suggest that calcium and chloride concentrations at the downgradient locations are attributable to natural variations within groundwater from native geologic material.

2.5 Summary of Findings

A demonstration was conducted to assess whether the SSIs for calcium at MW-1802 and for chloride at MW-4 and MW-1801 were based on a Type IV cause (Natural Variation) and not by a release from the Amos Plant LF. The following is concluded:

1. The ASD is not a Type I (sampling error), Type II (laboratory), III (statistical), or V (anthropogenic) based on a review of the data.

2. Groundwater chemistry at the downgradient wells with calcium and chloride SSIs is generally stable and does not show evidence of interaction with LF leachate.

3. Boron and sulfate concentrations at the downgradient wells with SSIs do not show increasing trends. If impacts from LF leachate were occurring, increasing boron and sulfate groundwater concentrations would be expected.

4. Upgradient monitoring wells contain greater chloride and calcium concentrations than downgradient compliance wells. Given that the Uppermost Aquifer unit is horizontally continuous throughout the site, concentrations observed at downgradient compliance wells are within the expected range attributable to natural variation within the aquifer unit.

2.6 Sampling Requirements

The conclusions of this ASD support the determination that the identified SSIs are from natural variation and not due to a release from the LF. 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 SSIs for calcium at MW-1802 and for chloride at MW-4 and MW-1801 are attributed to variation of natural groundwater quality. Therefore, no further action is warranted, and the Amos Plant LF will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment B**.

SECTION 4

REFERENCES

Arcadis, 2020. FGD Landfill – CCR Revised Groundwater Monitoring Well Network Evaluation. May.

Geosyntec Consultants, 2020a. Statistical Analysis Summary – Background Update Calculations. John E. Amos Plant Landfill. Winfield, West Virginia. February.

Geosyntec Consultants, 2020b. Statistical Analysis Plan – Revision 1. October.

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 Comparison
Amos - Landfill

Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-2		MW-4		MW-1801		MW-1802	
			11/2/2021	3/1/2022	11/4/2021	3/1/2022	11/4/2021	2/28/2022	11/4/2021	3/1/2022
Boron	mg/L	Intrawell Background Value (UPL)	0.247		0.214		0.306		0.276	
		Analytical Result	0.221	--	0.167	--	0.245	--	0.082	--
Calcium	mg/L	Intrawell Background Value (UPL)	2.10		0.912		1.83		0.978	
		Analytical Result	1.8	--	0.7	--	1.5	--	**1.0**	**1.0**
Chloride	mg/L	Intrawell Background Value (UPL)	5.40		15.9		12.1		10.2	
		Analytical Result	2.85	--	**21.8**	**25.1**	**13.5**	**13.2**	5.47	--
Fluoride	mg/L	Intrawell Background Value (UPL)	1.61		1.52		5.67		5.36	
		Analytical Result	**1.70**	0.09	1.40	--	5.13	--	0.73	--
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	
		Analytical Result	8.6	**6.3**	9.1	9.3	8.7	8.8	9.0	9.1
Sulfate	mg/L	Intrawell Background Value (UPL)	12.9		12.2		8.88		22.4	
		Analytical Result	6.97	--	7.86	--	6.31	--	13.2	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	394		422		550		522	
		Analytical Result	380	--	390	--	530	--	510	--

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
- FGD Landfill Permitted Limits
- Northern Valley
- Southern Valley

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

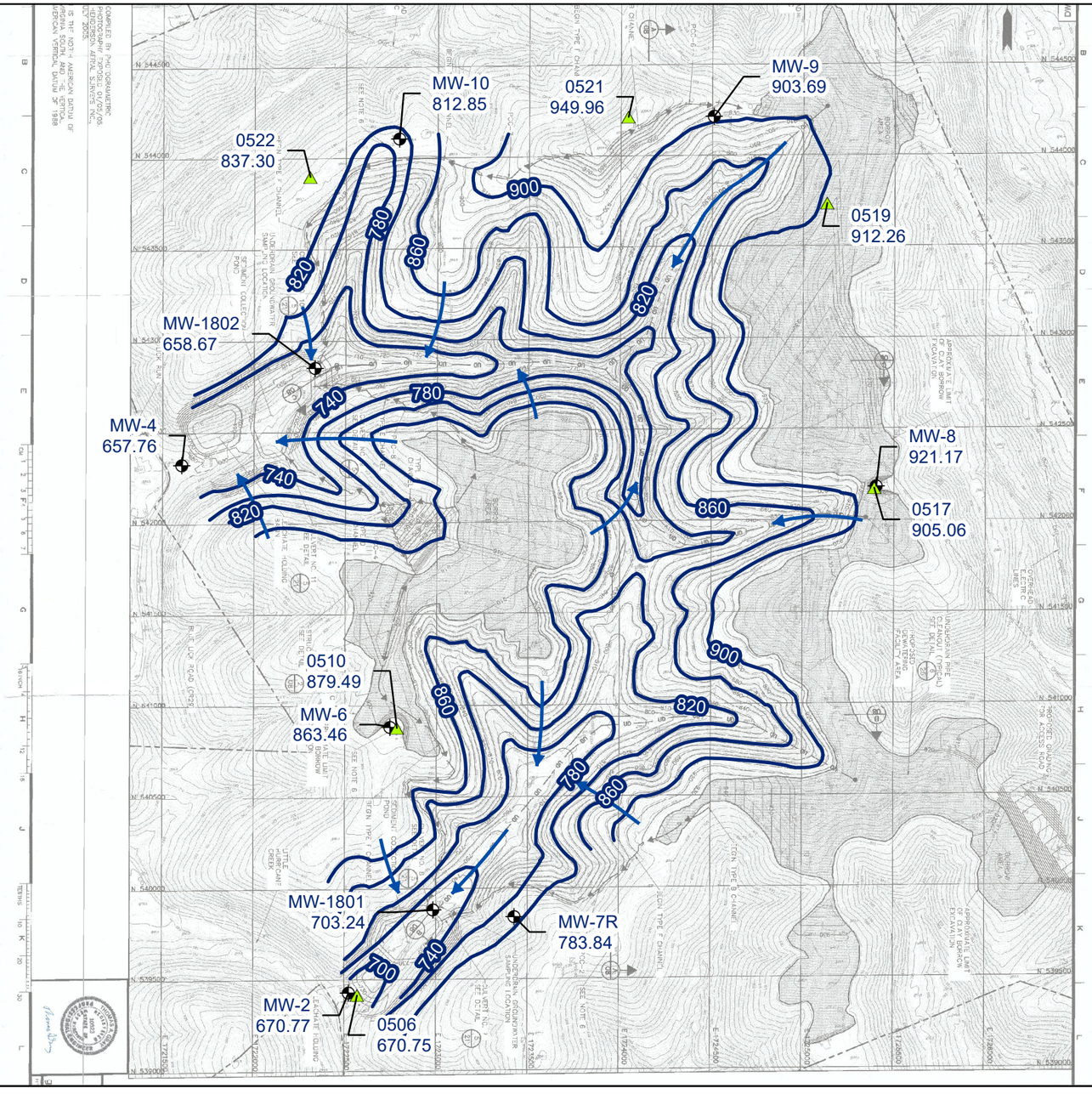
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | June 2022

Figure **1**

\\annarbor-01\data\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\AEP-Amos_Landfill_Site_Layout.mxd. Jennifer.Souza. 4/29/2021. CHA8423/04/08.



Legend

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

Notes

- Monitoring well coordinates and water level data (collected on November 1, 2021) 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 2021

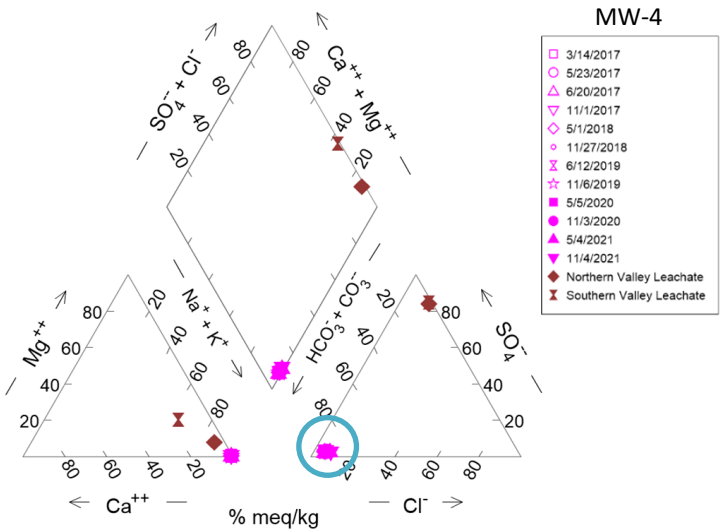
AEP Amos Generating Plant
Winfield, West Virginia

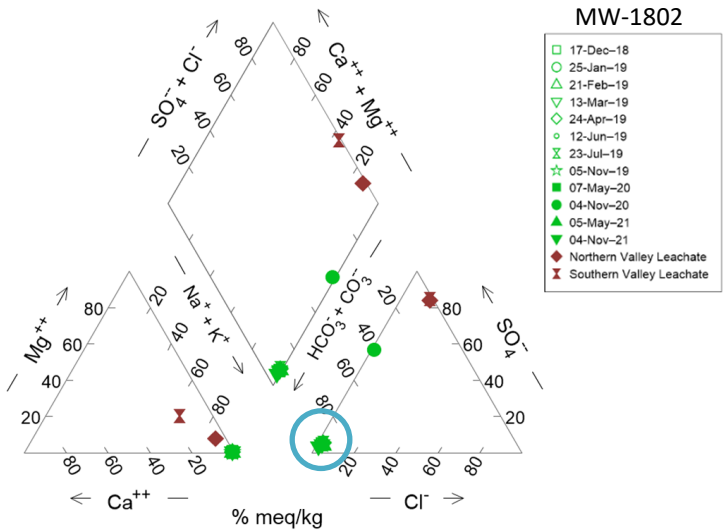
Geosyntec consultants

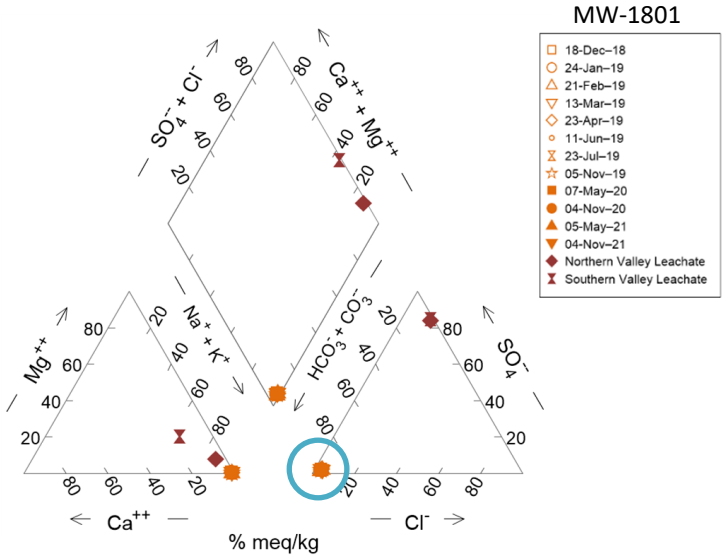
Columbus, Ohio | 2022/06/07

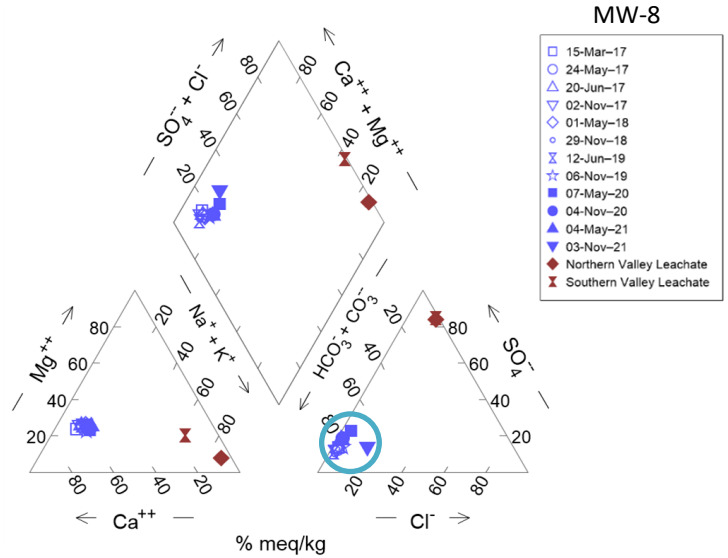
Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2021\AEP-Amos_Landfill_GW_2021-11.mxd. HDuff. 1/10/2022. CHA8423/04/08.









Piper Diagrams – Leachate Comparison

Amos Landfill

Notes: Landfill leachate samples were collected on October 7, 2021. Leachate samples were not analyzed for potassium (K^+). All groundwater samples for each monitoring location are circled in blue on the anion distribution triangle.

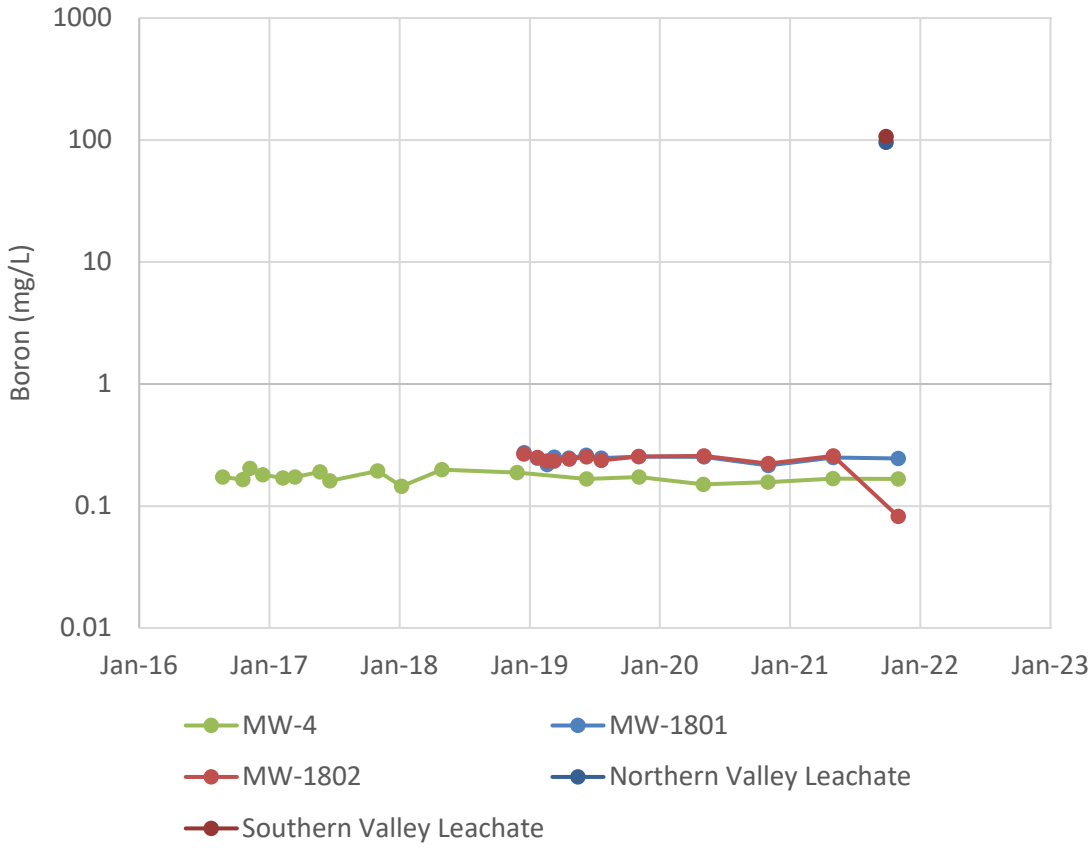
Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure 3

Columbus, Ohio

June 2022



Notes: Data was collected under the federal CCR rule and represents total boron in groundwater.

Boron Time Series Graph
Amos Landfill

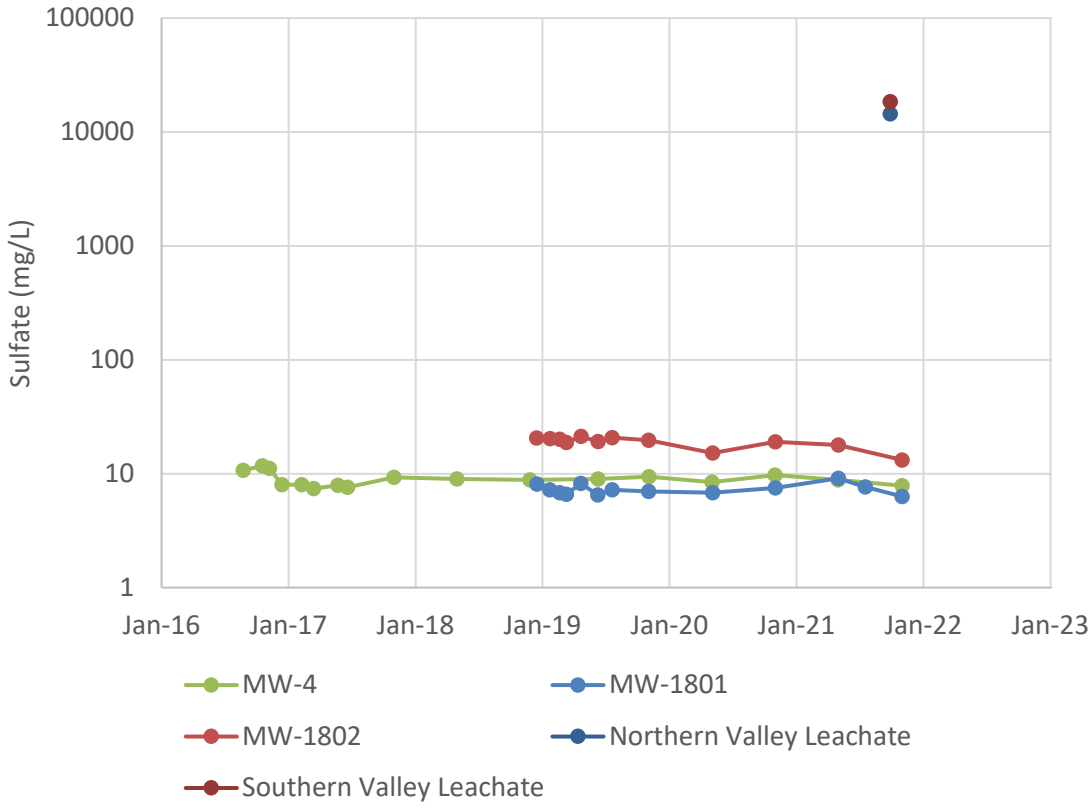
Geosyntec consultants

AMERICAN ELECTRIC POWER

Columbus, Ohio

June 2022

Figure **4**



Notes: Data was collected under the federal CCR rule and represents total sulfate in groundwater.

Sulfate Time Series Graph
Amos Landfill

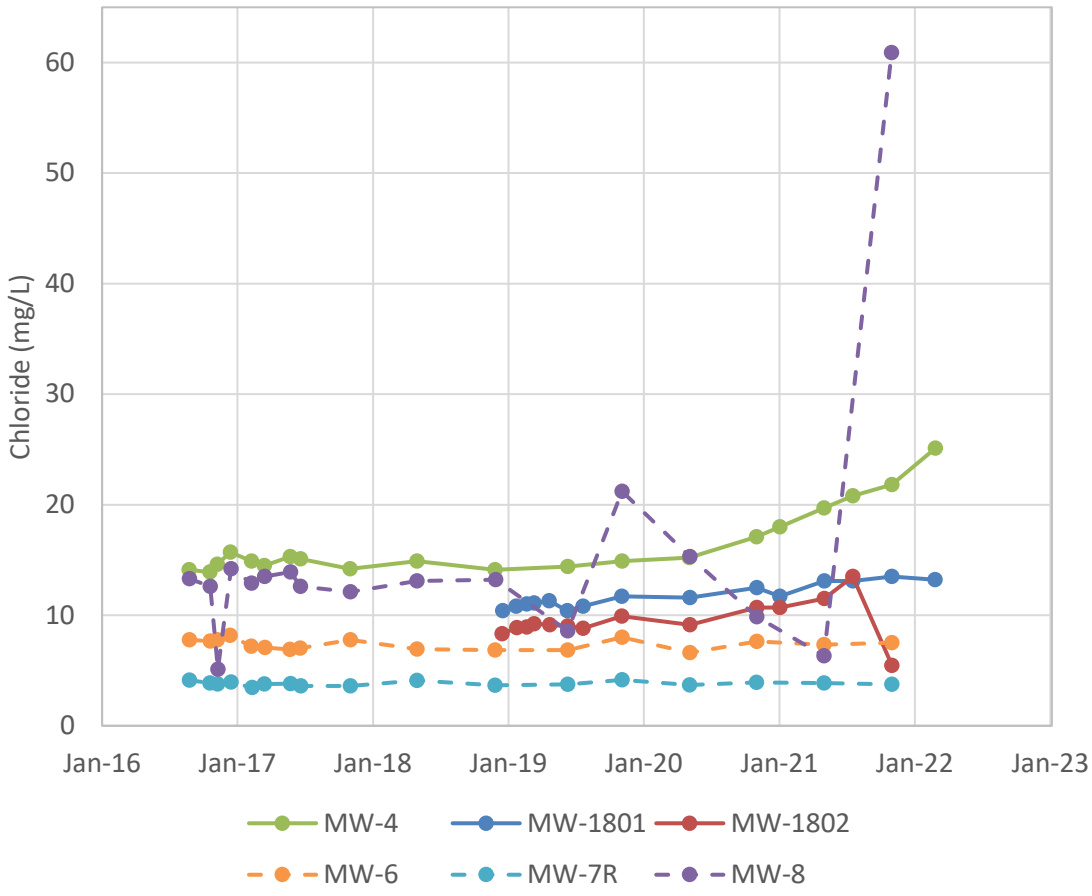
Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **5**

Columbus, Ohio

June 2022



Notes: Upgradient monitoring locations MW-6, MW-7, and MW-8 are shown with dashed lines. Data was collected under the federal CCR rule and represent total chloride in groundwater.

Chloride Time Series Graph
Amos Landfill

Geosyntec consultants

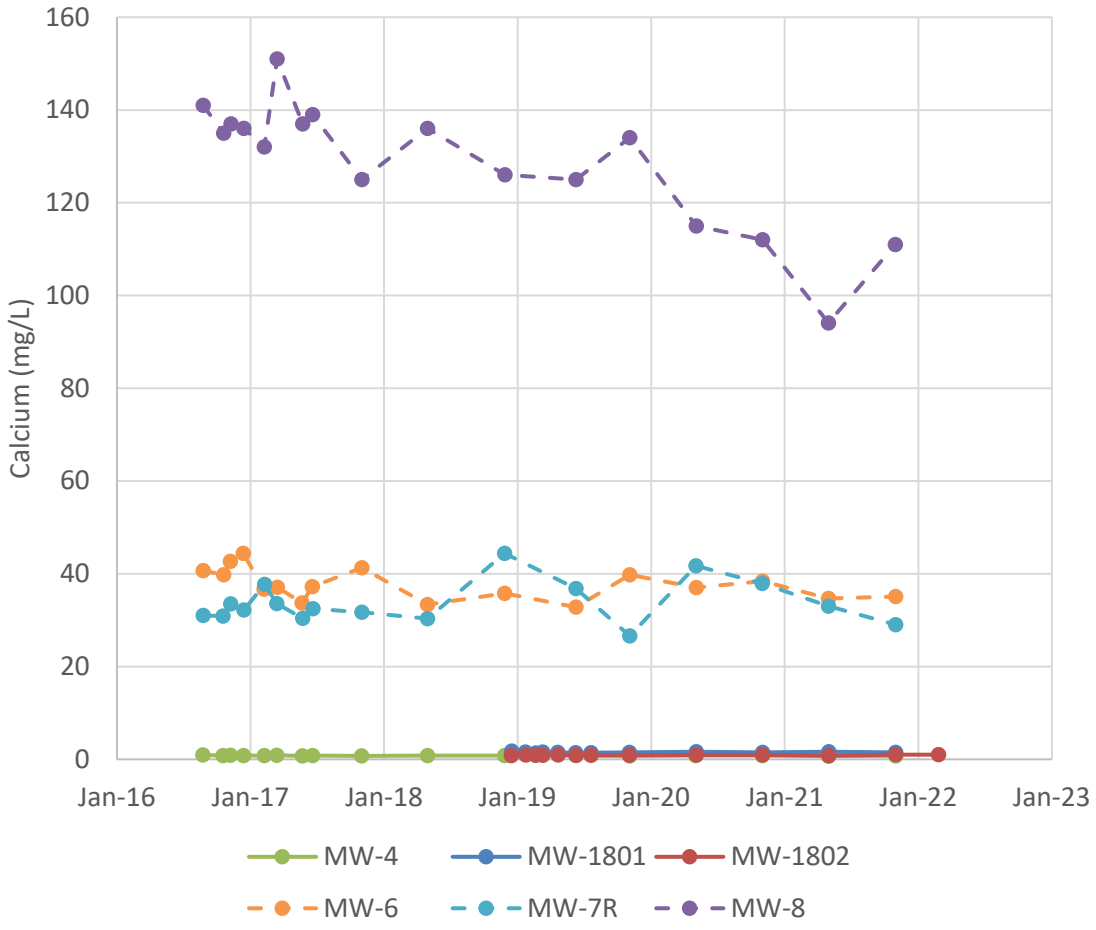
AMERICAN ELECTRIC POWER

Figure **6**

Columbus, Ohio

June 2022

\\cincarbor-01\data\Projects\AEPL\Legal Department - ASD Review\Amos\Landfill\2021-10 2021 1st Semiannual ASD Report\Figures



Notes: Upgradient monitoring locations MW-6, MW-7R, and MW-8 are shown with dashed lines. Data was collected under the federal CCR rule and represent total calcium in groundwater.

Calcium Time Series Graph
Amos Landfill

Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **7**

Columbus, Ohio

June 2022

ATTACHMENT A

Stress Relief Fracture Conceptual Site Model

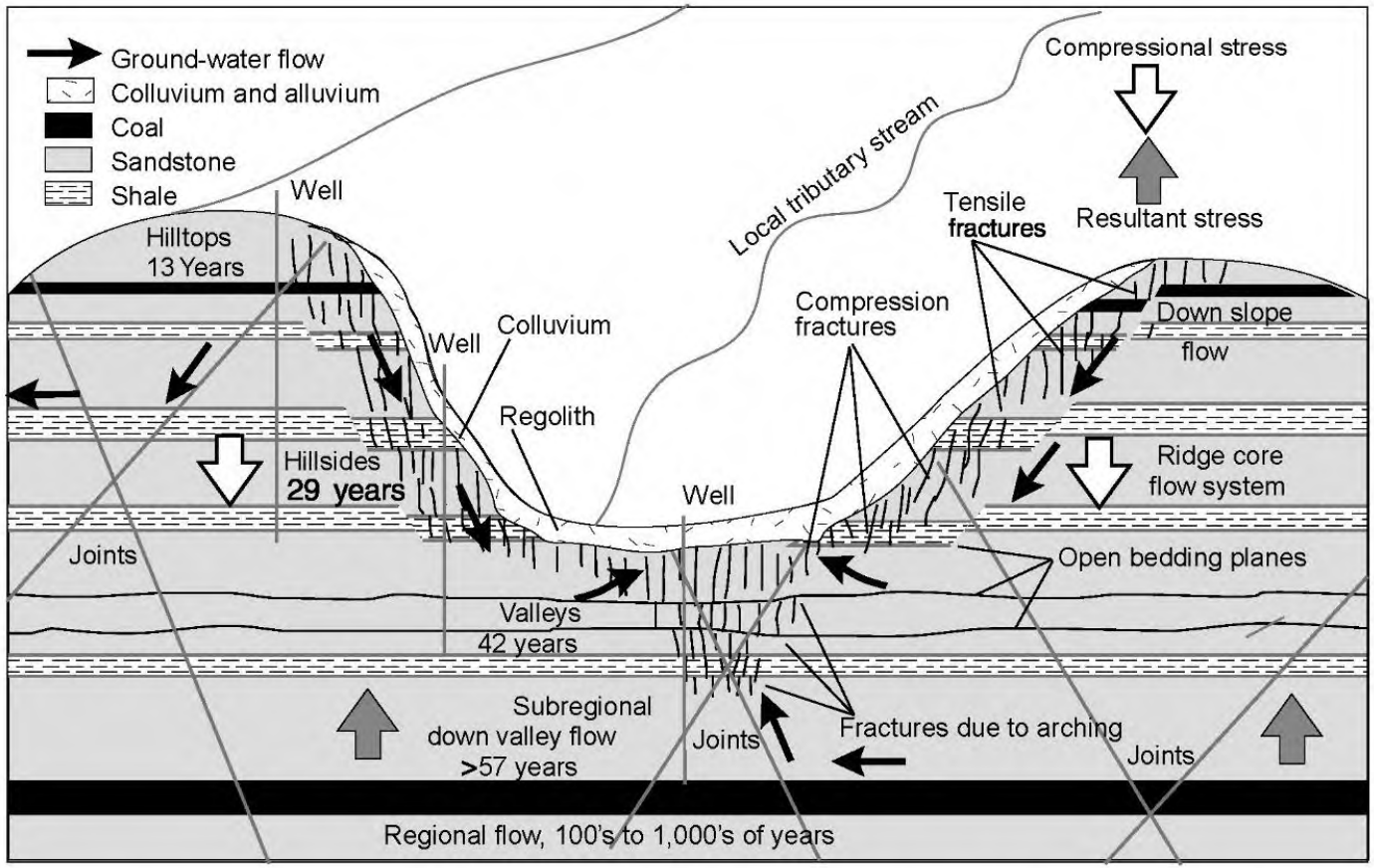


Figure 3. Revised conceptual model of ground-water flow in an Appalachian Plateaus fractured-bedrock aquifer including apparent age of ground water (Modified from Wyrick and Borchers, fig. 3.2-1, 1981 and Kozar, 1998).

References:

- United States Geological Survey (USGS), Wyrick, G.D. and J.W. Borchers, 1981. Hydrologic Effects of Stress-Relief Fracturing in an Appalachian Valley. Water-Supply Paper 2177.

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

STRESS RELIEF FRACTURE SYSTEM CONCEPTUAL SITE MODEL

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4

ATTACHMENT B
Certification by 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.

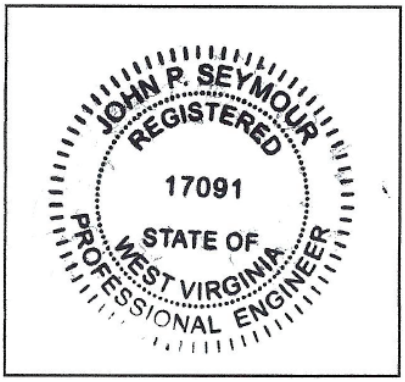
John Seymour

Printed Name of Licensed Professional Engineer

John Seymour

Digitally signed by John Seymour
Date: 2022.07.05 15:17:26 -04'00'

Signature



017091	West Virginia	July 5, 2022
License Number	Licensing State	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

500 W Wilson Bridge Rd, Suite 250
Columbus, Ohio 43085

November 28, 2022

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
cm/sec	Centimeters per second
LF	Landfill
LPL	Lower Prediction Limit
mg/L	Milligram per liter
QA	Quality Assurance
QC	Quality Control
SRF	Stress Relief Fracture
SSI	Statistically Significant Increase
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

SECTION 1

INTRODUCTION AND SUMMARY

1.1 Introduction

This Alternative Source Demonstration (ASD) report has been prepared to address statistically significant increases (SSIs) for calcium and chloride at the John E. Amos Plant Landfill (LF) following the first semi-annual detection monitoring event of 2022.

Following completion of four detection monitoring events, the previously calculated upper prediction limits (UPLs) for the LF were recalculated for each Appendix III parameter to represent background values (Geosyntec, 2022). 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 (Geosyntec, 2020). With this procedure, an 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 2022 was performed in May 2022 (initial sampling event) and July 2022 (verification sampling event), and the results were compared to the recalculated prediction limits. During this detection monitoring event, SSIs were identified for calcium and chloride at MW-1802 based on intrawell comparisons. 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, 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.*

Pursuant to 40 CFR 257.94(e)(2), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report to identify whether the SSIs identified for calcium and chloride at MW-1802 are from a source other than the LF.

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 increases in calcium and chloride at monitoring well MW-1802 were based on Type IV causes (Natural Variation) and not by a release from the LF.

SECTION 2

SITE SUMMARY

A brief description of the site geology and hydrology are provided below.

2.1 Site Geology Summary

The LF 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-1802 is a downgradient well in the northern valley. The northern and southern valleys are hydrologically separated from each other.

Bedrock in the vicinity of MW-1802 consists of a combination of gray siltstone, silty shale, and red claystone. The boring log for MW-1802 identified predominately shale interbedded with sandstone within the screened interval (**Attachment A**). These lithologies make up part of the Pennsylvanian Monongahela and Conemaugh Formations which were deposited by cyclic sequences of limestone, siltstone, sandstone, red and gray shale, and coal (USGS, Nov. 4, 2022).

These formations contain a system of stress relief fractures that are associated with a regional decline in stress and erosion (Arcadis, 2020). Although not represented in boring logs associated with LF monitoring well network construction, the sedimentary package associated with the Monongahela and Conemaugh Formations contains occasional thin limestone and coal beds. The Pittsburgh Coal and Pittsburgh Limestone beds serve as marker beds indicating the contact between the Monongahela and Conemaugh formations. The Pittsburgh limestone bed has been observed in boring logs at the nearby Fly Ash Pond (Arcadis, 2020).

2.2 Site Hydrological Summary

Groundwater flows through the stress relief fracture formations, as illustrated in a conceptual site model included in the Groundwater Monitoring Network Report (Arcadis, 2020; included as **Attachment B**). Bedrock groundwater flow generally follows surface topography, flowing downslope of ridges towards valley floors (Arcadis, 2020).

The LF monitoring well network monitors groundwater flow within the Uppermost Aquifer, which was defined by Arcadis (2020) as the saturated portion of the stress relief fracturing system. This Uppermost Aquifer unit is independent of any single lithologic unit - the stress relief fracturing system occurs in both the Conemaugh and Monongahela Formations and spans multiple lithologies comprising these formations. According to the Groundwater Monitoring Network Report, “the stress relief fracture (SRF) system is hydraulically connected from ridges to valleys” (Arcadis, 2020), as determined by a multiple lines of evidence approach discussed in Section 3.2.3 of the report. These multiple lines of evidence include evaluation of boring logs, assessment of groundwater geochemistry, hydraulic testing consisting of packer testing and pump yield testing,

and high-resolution water level monitoring using pressure transducers deployed in monitoring wells across the site.

Hydraulic testing yielded an estimated hydraulic conductivity value of 1.2×10^{-5} cm/sec for MW-1802. Both high resolution water level monitoring conducted by Arcadis and seasonal water level monitoring have not identified seasonal flow regime changes at or near the LF monitoring well network. The current LF monitoring well network consists of upgradient monitoring wells MW-6, MW-7R, MW-8, MW-9, and MW-10, and downgradient compliance wells MW-2, MW-1801, MW-4, and MW-1802. Previous LF monitoring network wells MW-1 and MW-5 have been removed from the monitoring network after it was determined that groundwater from those locations was representative of shallow perched groundwater zones (Arcadis, 2020).

SECTION 3

ALTERNATIVE SOURCE DEMONSTRATION

An initial review of site geochemistry, site historical data, and laboratory quality assurance and quality control (QA/QC) data 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. A preliminary review of site geochemistry did not identify any Type V (anthropogenic) causes. Therefore, natural variation, which is a Type IV cause, was examined as a potential cause of the SSIs.

3.1 Landfill Leachate Data Analysis

The concentrations of boron, major cations, and major anions known to be indicative of CCR leachate were examined in LF leachate samples and compared to monitoring well network groundwater to evaluate whether LF leachate influenced downgradient groundwater. Piper diagrams, which represent the relative concentrations of major cations and anions in the groundwater and leachate analytical samples, were created to visualize groundwater geochemistry at northern valley downgradient wells MW-4 and MW-1802, background well MW-9, and leachate (**Figure 3**). The data shown in these Piper diagrams captures the background and detection monitoring periods: 2018 through 2022 for MW-1802, 2017 through 2022 for MW-4 and MW-9, and 2021-2022 for leachate samples.

The groundwater geochemistry at northern valley downgradient wells MW-4 and MW-1802 has remained nearly unchanged throughout the monitoring period, as illustrated by the tight clustering of sample results for each well on the Piper Diagrams. Groundwater compositions are distinct from leachate, particularly for the relative anion percentages; leachate samples are comprised predominantly of sulfate while groundwater anion compositions are dominated by alkalinity. These results illustrate stable geochemical composition of site groundwater and a lack of influence from leachate on the groundwater composition. Should downgradient monitoring wells be impacted by LF leachate, variation in relative percentages of major anions would be expected considering the distinct geochemical composition of the leachate samples. No such variation is observed in downgradient monitoring well groundwater samples, both within MW-1802 (the well with SSIs) and downgradient well MW-4. Rather, relative percentages of anions at each of the downgradient wells are similar to background well MW-9, as shown by their similar locations on the lower right-hand triangle of the Piper Diagram (**Figure 3**).

Boron and sulfate are typically considered geochemically conservative parameters due to their lack of attenuation by chemical processes in groundwater flow and they function as indicators for potential CCR unit releases due to their high relative concentration in CCR. Boron concentrations in LF leachate samples collected from the northern valley were 95.8 milligrams per liter (mg/L) in October 2021, and 34.5 mg/L in February 2022. Concentrations of boron at northern valley

downgradient well MW-1802 are consistently less than 0.3 mg/L (**Figure 4**), which is consistent with the other downgradient well location in the northern valley (MW-4). LF leachate sulfate concentrations collected from the northern valley in October 2021 and February 2022 were 14,400 mg/L and 5,300 mg/L, respectively. The concentrations of sulfate at MW-4 and MW-1802 are consistently less than 25 mg/L (**Figure 5**).

If LF leachate, which contains boron and sulfate concentration several orders of magnitude higher than the wells of interest, were impacting groundwater quality at downgradient monitoring wells, an increase in boron and sulfate concentrations at downgradient well MW-1802 would be expected. The current boron and sulfate concentrations at the northern valley downgradient monitoring wells do not display increasing trends (**Figure 4** and **Figure 5,** respectively), which suggests that changes in calcium and chloride in groundwater at MW-1802 are not due to a release from the LF.

3.2 Examination of Natural Variability

SSIs were observed for calcium and chloride at compliance well MW-1802. However, chloride concentrations at northern valley upgradient well MW-8 have historically been above those observed at MW-1802, and concentrations at other northern valley upgradient wells MW-9 and MW-10 have historically been comparable to those observed at MW-1802 (**Figure 6**). Calcium concentrations at northern valley upgradient wells MW-8 and MW-9 have historically been several orders of magnitude above those at downgradient well MW-1802, and concentrations at northern valley upgradient well MW-10 have historically been comparable to and frequently greater than MW-1802 (**Figure 7**). The chloride and calcium concentrations at upgradient monitoring wells indicate that the native geologic material (which is predominantly claystone and sandstone) contains chloride and calcium which may be released into solution at concentrations greater than or comparable to those typically found at MW-1802.

Calcium and chloride are components of halite and limestone, two minerals known to occur in the Pennsylvanian bedrock which encompasses the Monongahela and Conemaugh formations MW-1802 is screened within (Chambers et al., 2012). Chloride is a major component of halite, and calcium is a major component of calcite, the mineral which comprises limestone. Dissolution of these minerals within the regional geology constitutes a source of aqueous chloride and calcium which are then available for downgradient transport through the highly-fractured shallow bedrock. Long-term groundwater quality was monitored at 300 wells in West Virginia from 1999-2008 (Chambers et al., 2012). Samples grouped by geologic age of the aquifer unit indicated that the highest chloride concentrations (> 250 mg/L) were measured at four Pennsylvanian-aged aquifers. Further, the study found that the highest measured calcium concentration of 286 mg/L was in a sample from a Pennsylvanian-aged Monongahela Group aquifer, which is the same formation in which MW-1802 is screened. A comparison of MW-1802 and median values of Pennsylvanian-aged aquifers in West Virginia indicates that calcium and chloride concentrations at MW-1802 are less than the median background levels (**Figure 8**).

Monitoring wells MW-8, MW-9, and MW-10 are located hydraulically upgradient of the LF and contain higher calcium concentrations than those observed at downgradient compliance well MW-1802. Although the chloride concentrations are MW-1802 are higher than those observed at hydraulically upgradient wells MW-9 and MW-10, chloride concentrations at MW-1802 are comparable to these wells and less than both upgradient well MW-8 and background levels from Pennsylvanian-aged wells in West Virginia (Chambers et al., 2012). These observations suggest that calcium and chloride concentrations at the downgradient locations are attributable to natural variations within groundwater from native geologic material.

3.3 Summary of Findings

A demonstration was conducted to assess whether the SSIs for calcium and chloride at MW-1802 were based on a Type IV cause (Natural Variation) and not by a release from the Amos Plant LF. The following is concluded:

1. The ASD is not a Type I (sampling error), Type II (laboratory), Type III (statistical), or Type V (anthropogenic) issue based on a review of the data.

2. Groundwater chemistry at MW-1802, which is the downgradient well with calcium and chloride SSIs, is generally stable and does not show evidence of interaction with LF leachate.

3. Boron and sulfate concentrations at MW-1802 do not show increasing trends. If impacts from LF leachate were occurring, increasing boron and sulfate groundwater concentrations would be expected.

4. Upgradient monitoring wells contain greater calcium concentrations and comparable chloride concentrations to MW-1802. Given that the Uppermost Aquifer unit is horizontally continuous throughout the site, concentrations observed at the downgradient compliance well of interest are within the expected range attributable to natural variation within the aquifer unit. Pennsylvanian-aged aquifer data from a recent United States Geological Survey (USGS) report indicates that MW-1802 also contains lower chloride and calcium concentrations than are typical for wells screened within this geologic material across the state.

3.4 Sampling Requirements

The conclusions of this ASD support the determination that the identified SSIs are from natural variation and not due to a release from the LF. Therefore, the unit will remain in the detection monitoring program. Groundwater at the unit will be sampled for Appendix III parameters on a semi-annual basis.

SECTION 4

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 SSIs for calcium and chloride at MW-1802 are attributed to variation of natural groundwater quality (Type IV). Therefore, no further action is warranted, and the Amos Plant LF will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment C**.

SECTION 5

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Arcadis, 2020. FGD Landfill – CCR Revised Groundwater Monitoring Well Network Evaluation. May.

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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 Comparison
Amos - Landfill

Geosyntec Consultants, Inc.

Analyte	Unit	Description	MW-2		MW-4		MW-1801		MW-1802	
			5/24/2022	7/27/2022	5/25/2022	7/26/2022	5/25/2022	7/27/2022	5/25/2022	7/27/2022
Boron	mg/L	Intrawell Background Value (UPL)	0.243		0.206		0.293		0.282	
		Analytical Result	0.227	--	0.171	--	0.265	--	0.273	--
Calcium	mg/L	Intrawell Background Value (UPL)	3.50		0.904		1.78		1.05	
		Analytical Result	1.82	--	**0.95**	0.89	1.78	--	**1.14**	**1.16**
Chloride	mg/L	Intrawell Background Value (UPL)	5.32		25.1		14.0		13.4	
		Analytical Result	3.39	--	24.2	--	**14.4**	14.0	**17.0**	**14.9**
Fluoride	mg/L	Intrawell Background Value (UPL)	1.74		1.55		5.58		5.32	
		Analytical Result	1.60	--	1.34	--	5.22	--	4.71	--
pH	SU	Intrawell Background Value (UPL)	8.9		9.8		9.3		9.4	
		Intrawell Background Value (LPL)	8.2		8.6		8.5		8.7	
		Analytical Result	**6.1**	8.7	**8.3**	9.2	**8.4**	8.8	**6.1**	9.1
Sulfate	mg/L	Intrawell Background Value (UPL)	12.1		11.5		9.05		24.2	
		Analytical Result	9.29	--	9.79	--	5.42	--	19.0	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	396		419		563		527	
		Analytical Result	370	--	400	--	510	--	520	--

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
Background values are shaded gray.
--: Not sampled

FIGURES

Legend

- Upgradient Sampling Location
- Downgradient Sampling Location
- FGD Landfill Permitted Limits
- Northern Valley
- Southern Valley

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

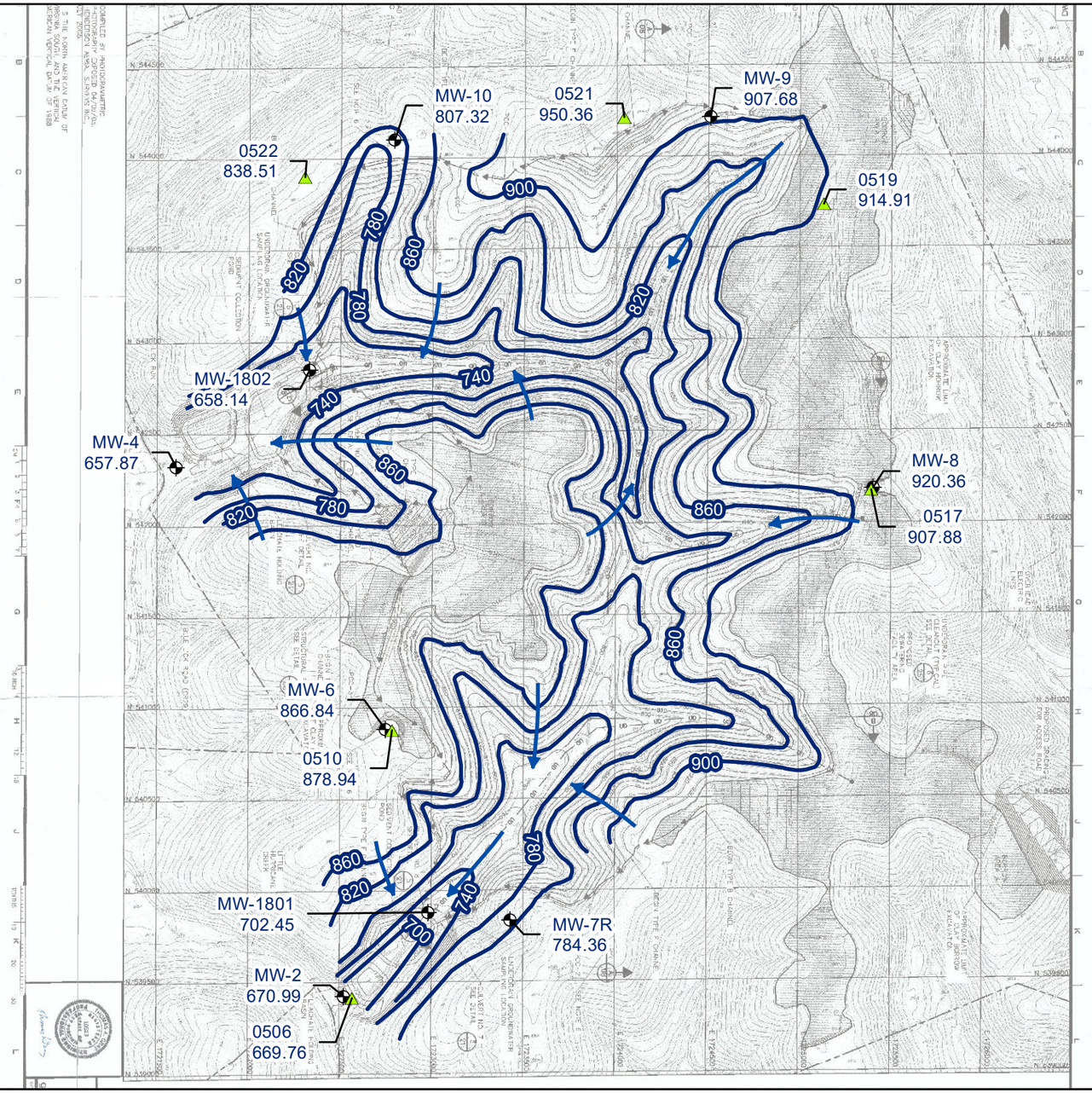
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | October 2022

Figure **1**

\\annarbor-01\data\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\AEP-Amos_Landfill_Site_Layout.mxd. Jennifer.Souza. 4/29/2021. CHA8423/04/08.



Legend

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

Notes

- Monitoring well coordinates and water level data (collected on May 16 and 17, 2022) 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 2022

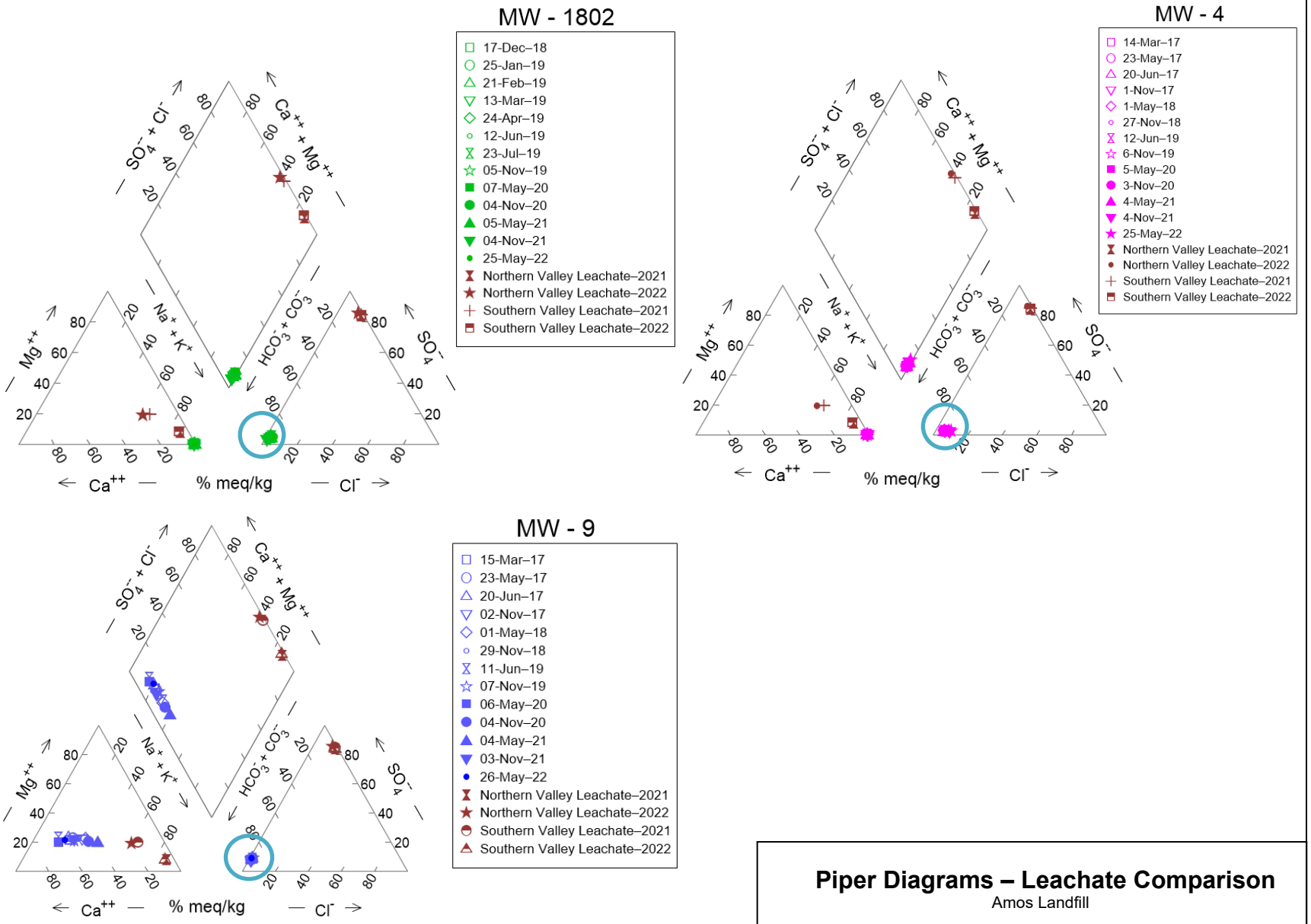
AEP Amos Generating Plant
Winfield, West Virginia

Geosyntec consultants

Columbus, Ohio | October 2022

Figure **2**

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Amos\2022\AEP-Amos_Landfill_GW_2022-05.mxd. ASoltero. 8/15/2022. CHA8423/04/08.



Piper Diagrams – Leachate Comparison

Amos Landfill

Notes: Landfill leachate samples were collected on October 7, 2021, and February 15, 2022. Leachate samples were not analyzed for potassium (K^+). All groundwater samples for each monitoring location are circled in blue on the anion distribution triangle.

Geosyntec consultants

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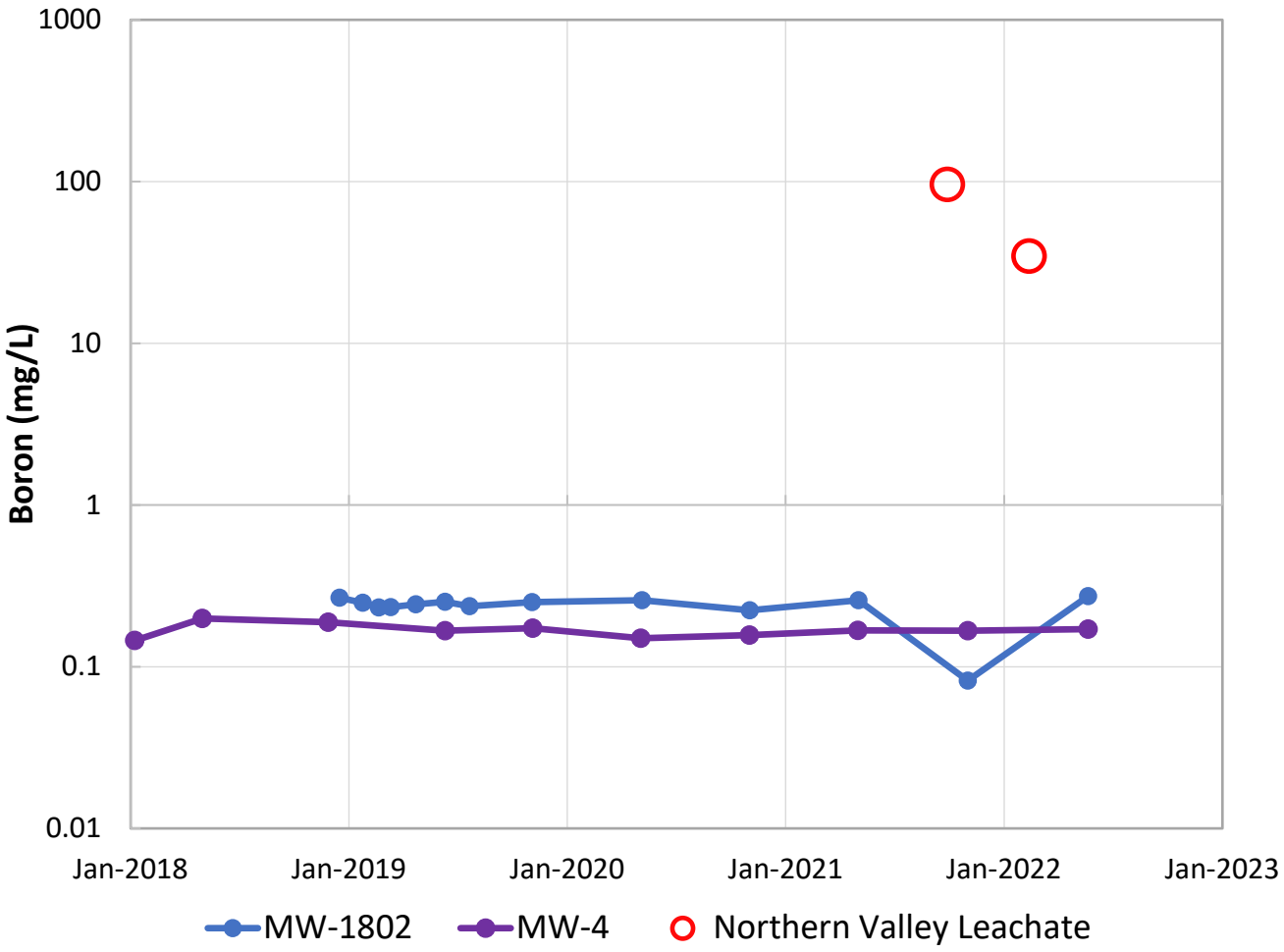
Columbus, Ohio

November 2022

Figure 3

\\cannonbor-01\data\Projects\AEP\Legal Department - ASD Review\Amos\Landfill\2021-10 2021 1st Semiannual ASD Report\Figures



Notes: Data was collected under the federal CCR rule and represents total boron in groundwater.

Boron Time Series Graph
Amos Landfill

Geosyntec consultants

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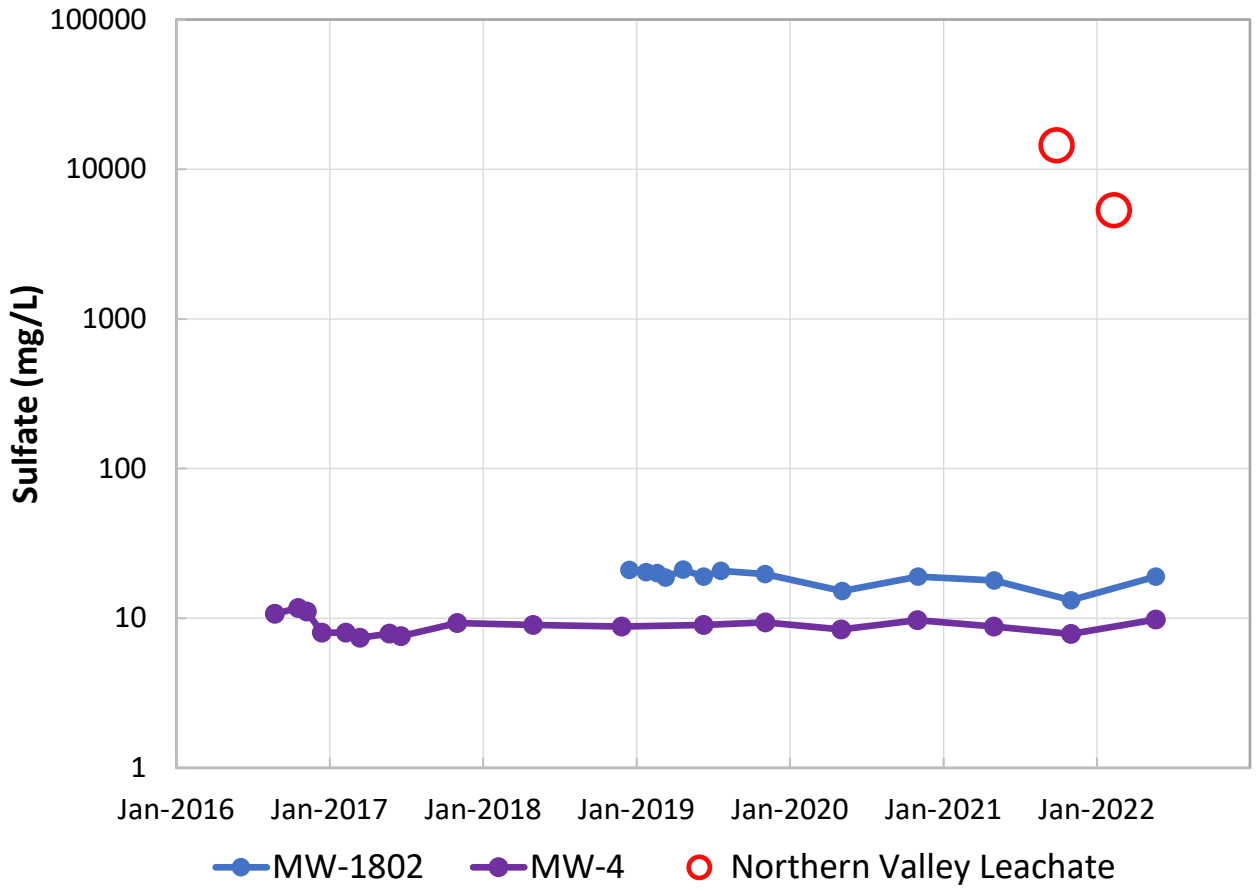
Figure **4**

Columbus, Ohio

November 2022



Notes: Data was collected under the federal CCR rule and represents total sulfate in groundwater.

Sulfate Time Series Graph
Amos Landfill

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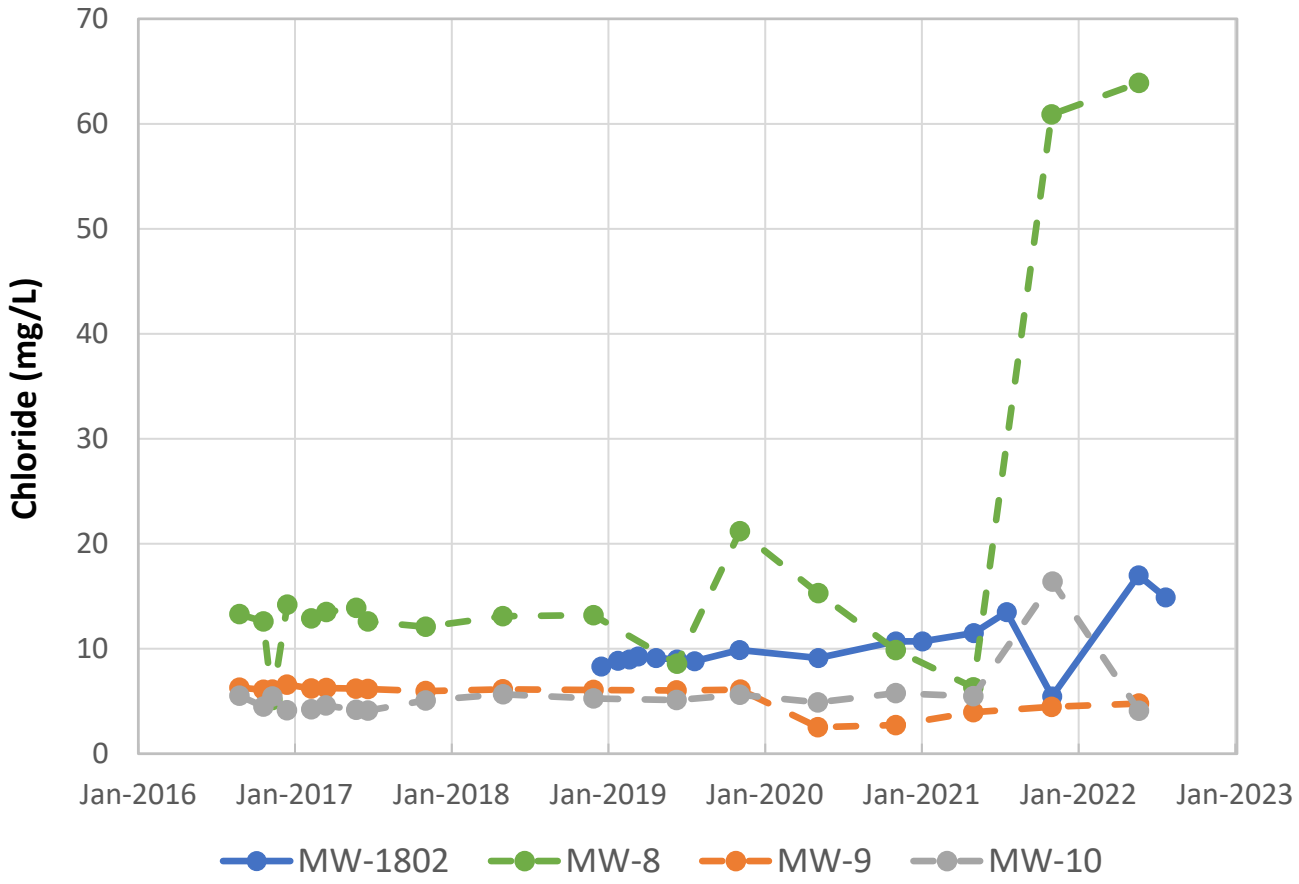
Figure **5**

Columbus, Ohio

November 2022



Notes: Upgradient monitoring locations MW-8, MW-9, and MW-10 are shown with dashed lines. Data was collected under the federal CCR rule and represents total chloride in groundwater. While recent chloride concentrations have increased at upgradient monitoring well MW-8, these values were not used to establish background levels for chloride at downgradient compliance wells due to the usage of intrawell statistical methods.

Chloride Time Series Graph
Amos Landfill

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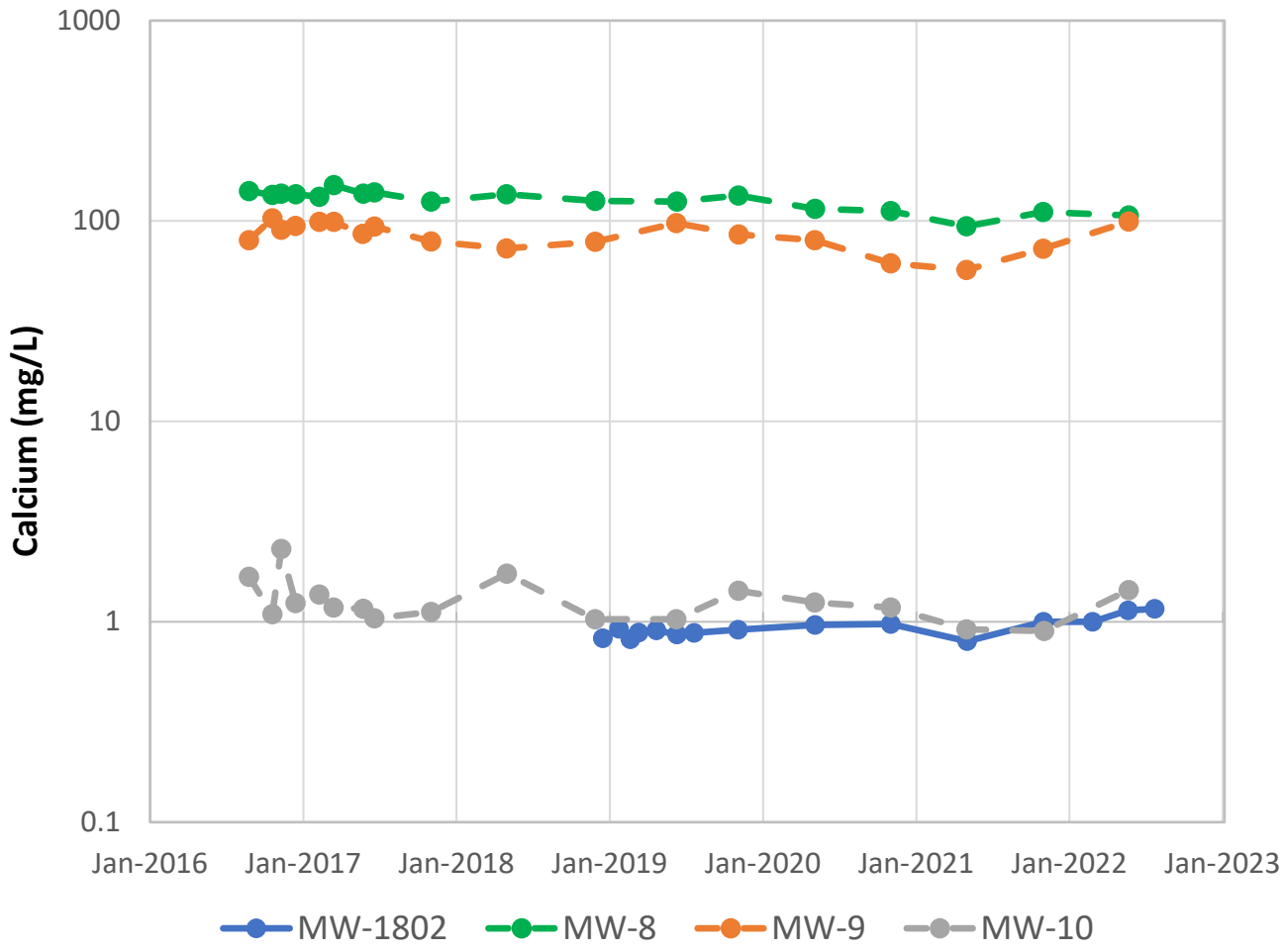
Figure **6**

Columbus, Ohio

November 2022



Notes: Upgradient monitoring locations MW-8, MW-9, and MW-10 are shown with dashed lines. Data was collected under the federal CCR rule and represents total calcium in groundwater.

Calcium Time Series Graph
Amos Landfill

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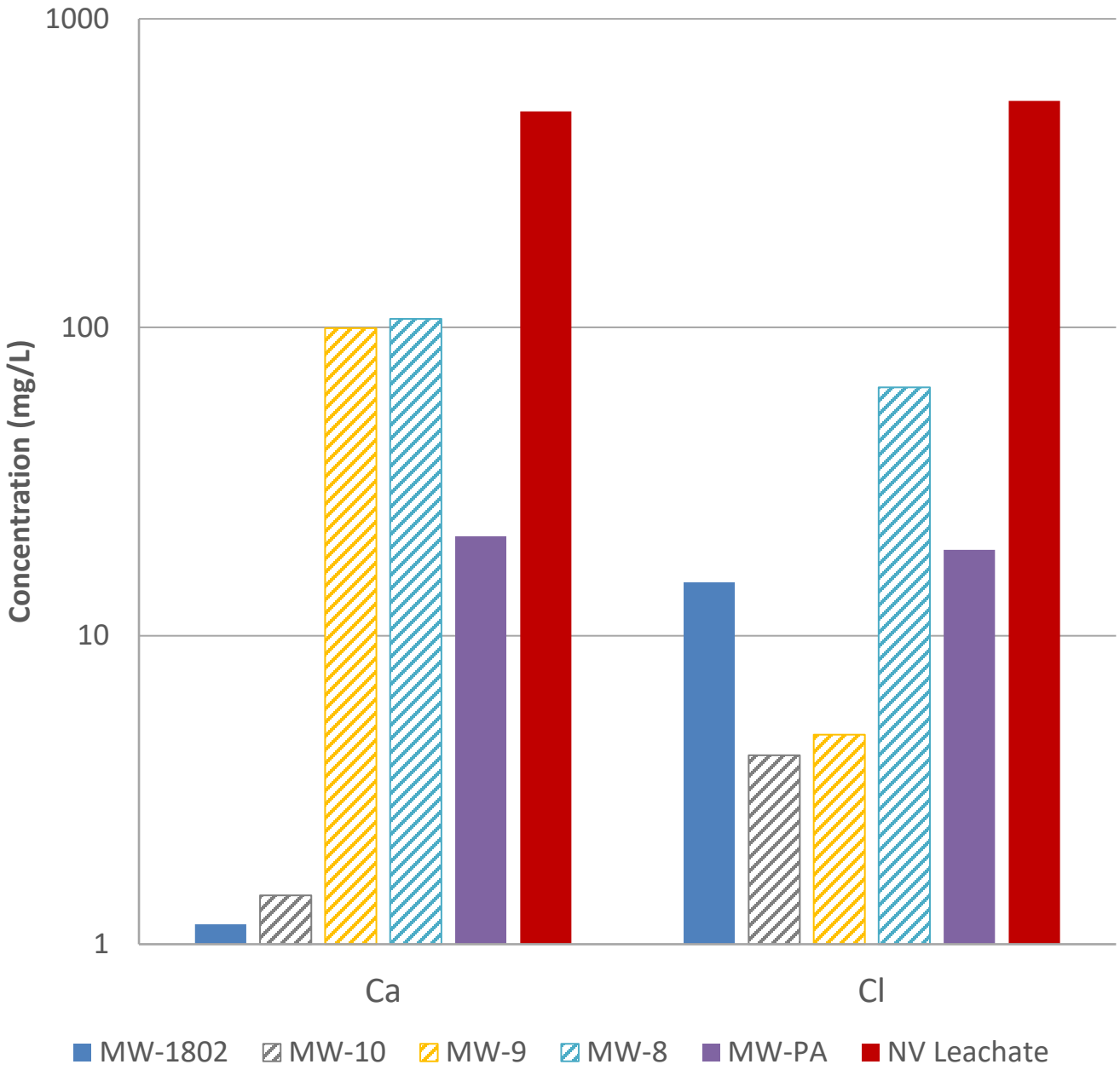
Columbus, Ohio | November 2022

Figure **7**



Notes: MW-PA shown in purple represents median Pennsylvanian-aged aquifer data from Chambers et al., 2012. Northern valley (NV) leachate from the Amos landfill consists of the average of the two previous samples. MW-8, MW-9 and MW-10 are located hydraulically upgradient of the landfill (LF). Data for all monitoring wells was collected under the federal CCR rule and represents total calcium and chloride in groundwater.

Calcium and Chloride Bar Graph
Amos Landfill

Geosyntec consultants

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Columbus, Ohio

November 2022

Figure **8**

ATTACHMENT A
MW-1802 Boring Log

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 38.5 E 81.9**

GROUND ELEVATION **709.8** SYSTEM **NAVD88**

Water Level, ft	▽ 35.0	▼	▼
TIME			
DATE	8/21/2019		

BORING NO. **MW-1802** DATE **5/3/19** SHEET **1** OF **5**

BORING START **8/20/18** BORING FINISH **8/21/18**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.91** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **50** BOTTOM **114.4**

WELL DEVELOPMENT **Surge/Purge** BACKFILL **Bentonite Grout**

FIELD PARTY **Zachary Racer (AEP)** RIG **Direct Circulation - Wireline Core**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
									GW	0-3.5': GRAVEL backfill; large rip-rap and smaller compacted gravels.		0-41': Bentonite Grout
									CL	3.5-4.5': SILTY CLAY; brown; moist; soft; backfill material.		
		4.5	6.0	6-4-5	0		5			4.5-6': NO RECOVERY, due to gravel blocking cutting shoe.		
		6.0	7.5	4-3-4	3.6				CL	6-17': SILTY CLAY; 7.5YR 4/3 (brown); moist; firm; compacted backfill material; becomes wet at 12.5'.		
		7.5	9.0	3-4-5	7.2							
		9.0	10.5	4-4-6	18		10					
		10.5	12.0	5-4-5	13.2							
		12.0	13.5	3-4-6	15.6							
		13.5	15.0	3-5-8	14.4							
		15.0	16.5	4-7-9	15.6		15					
		16.5	18.0	6-25-8	16.8					17-17.5': SANDSTONE, weathered; GLEY1 7/N (gray); dry.		
		18.0	19.5	7-23-15	14.4				CL	17.5-19.5': SILTY CLAY; GLEY1 6/N (gray) mottled with brown, red, tan; moist; soft; crumbles easily.		
		19.5	21.0	20->50/4	10.8				CL			

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

Continued Next Page

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **A. Gillespie**

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **2** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		19.5	21.0	20->50/4	10.8					19.5-22.5': SILTY CLAY; GLEY1 6/N (gray) mottled with brown, tan; dry; soft; crumbles easily.		
		21.0	22.5	27-50/5	9.6							
		22.5	24.4	4	23					22.5-24': SILTSTONE; moderate to weak field strength; GLEY1 6/N; fine-grained texture; massive structure; highly decomposed; moderately to highly disintegrated with tan/brown mottling; moderately to intensely fractured.		
		24.4	29.4		22		25			24-24.4': SILTSTONE; weak field strength; 10R 4/4 (red) mottled; fine-grained texture; massive structure; highly decomposed; moderately to intensely fractured.		
										24.4-29.4': SILTSTONE; weak field strength; 10R 4/4 (red) mottled with tan, gray, and black; fine-grained texture; massive structure; highly decomposed; highly disintegrated, highly mottled; moderately fractured.		
		29.4	33.7	5-11-6	40		30			29.4-32.8': SHALE, weathered; moderate field strength; 10YR 4/4 (red) mottled; fine-grained texture; massive structure; moderately decomposed; moderately to intensely disintegrated; moderately fractured.		
		33.7	39.4	5-4-4-7-5	59		35			32.8-33.7': SHALE; moderate field strength; 5YR 5/4 (tan) mottled; fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated; moderately to intensely fractured.		
										33.7-39.4': SHALE; moderate field strength; 10YR 4/4 (red) with gray, tan, and black mottling; fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated; intensely fractured.		
		39.4	44.4	4-6-4-4	57		40			39.4-44.4': SHALE; moderate field strength; 10YR 4/4 (red) with gray, tan, and black mottling; fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated; intensely fractured.		41-44': Bentonite Pellets
		44.4	54.4	7-8-7-5-5-24-5	120		45			44.4-47.8': SHALE, highly weathered; weak field strength; 10YR 4/4 (red) with gray, tan, and black mottling; fine-grained texture; massive structure;		44-45': Secondary Filter Pack 45-71': Primary Filter Pack

Continued Next Page

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **3** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		44.4	54.4	7-8-7-5-5-24-5	120					highly decomposed; intensely disintegrated; intensely fractured.		
										47.8-49.9': SHALE, less weathered; moderate field strength; 10R 3/3 (red); fine-grained texture; massive structure; moderately decomposed; moderately disintegrated; moderately fractured.		
							50			49.9-50.8': SHALE, interbedded with sandstone; moderate field strength; GLEY1 4/N; fine-grained texture; thinly bedded; moderately decomposed; slightly disintegrated; moderately fractured.		50-70': Screen
										50.8-52.8': SHALE; moderate to strong field strength; 10R 4/3 (red); fine-grained texture; massive structure; slightly decomposed; moderately disintegrated; slightly fractured.		
										52.8-53.1': SHALE, interbedded with sandstone; strong field strength; GLEY1 4/5GY; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; unfractured.		
		54.4	64.4	8-12-5-6-7-4-4-4	114		55			53.1-54.4': SHALE; moderate field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately decomposed; moderately disintegrated; moderately fractured.		
										54.4-55.4': SANDSTONE, interbedded with shale; moderate field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately decomposed; moderately disintegrated; slightly to moderately fractured.		
							60			55.4-57.1': SHALE, interbedded with sandstone; moderate field strength; GLEY1 4/3, 10R 4/3; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
										57.1-64.4': SHALE, weathered; moderate to weak field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately to highly decomposed; moderately to intensely disintegrated with intense gray mottling; intensely fractured.		
		64.4	74.4	4-6-8-6-4-5-4-4-5	117		65			64.4-70.5': SHALE, highly weathered; moderate to weak field strength; 10R 4/3 (red); fine-grained texture; massive structure; moderately to intensely disintegrated with gray mottling; intensely fractured.		
							70			70.5-74.4': SHALE, interbedded with sandstone; strong field strength; 10R 4/3 (red) interbedded with GLEY1 4/N (gray-green); fine-grained		

Continued Next Page

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **4** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		64.4	74.4	4-6-8-6-4-5-4-4-5	117					texture; thinly bedded; slightly to moderately decomposed along some bedding planes; moderately disintegrated with silt filled fractures; moderately fractured.		
		74.4	84.4	8-7-5-5-14-8-7-22-12	120		75			74.4-77.1': SHALE, with some interbedded sandstone lenses; moderate field strength; 10R 4/3 (red); fine-grained texture; thinly bedded; slightly to moderately decomposed at some bedding planes; slightly disintegrated; moderately fractured.		
							80			77.1-82.7': SANDSTONE, with some red shale lenses; strong field strength; GLEY1 4/N; fine-grained texture; thinly bedded; fresh; moderately disintegrated, calcite reacts to HCl in light colored bands within 0.5' of surrounding contact lines, no HCl/calcite in fractures, no Fe staining; moderately fractured.		
										82.7-84.4': SHALE, with some interbedded sandstone lenses; moderate field strength; 10R 4/3 (red); fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
		84.4	94.4	10-11-6-7-7-8-9-8-7-6-6-7-10	120		85			84.4-86.7': SHALE, with sandstone lenses; moderate field strength; 10R 4/2 (red) with GLEY1 4/N lenses; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
										86.7-89.2': SANDSTONE, with shale lenses; moderate field strength; GLEY1 4/N with 10R 4/2 lenses; fine-grained texture; thinly bedded; slightly decomposed; slightly disintegrated; moderately fractured.		
							90			89.2-94.4': SANDSTONE; strong field strength; GLEY1 6/N; fine-grained texture; thinly bedded, micaceous; fresh; slightly disintegrated, some calcite in light bands, no staining, no calcite in fractures; slightly to moderately fractured along bedding planes; fracture at 92.8'.		
		94.4	104.4	7-4-5-4-9-9-8-5-11-5-6-10-19	120		95			94.4-104.4': SANDSTONE; strong field strength; GLEY1 6/N; fine-grained texture; thinly bedded, micaceous, cross-bedding at 94.4-94.8; fresh; slightly disintegrated, calcite in some light bedded planes, no calcite or Fe staining noted in fractures; slightly to moderately fractured along bedding planes.		

Continued Next Page

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **WV015976.0005**

COMPANY **American Electric Power** BORING NO. **MW-1802** DATE **5/3/19** SHEET **5** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **8/20/18** BORING FINISH **8/21/18**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
		94.4	104.4	7-4-5-4-9-9-8-5-11-5-6-10-19	120		100					
		104.4	114.4	15-6-21-6-4-4-8-8-6-4-13-5-7	120		105			104.4-108': SANDSTONE; strong field strength; GLEY1 6/N; fine to medium-grained texture; thinly bedded, micaceous, shale fragments; fresh; moderately disintegrated, calcite along entire sandstone void and shale fragments at base, calcite in void; slightly fractured.		
										108-108.9': SHALE, with interbedded sandstone; moderate field strength; GLEY1 4/N, 10R 4/3 bands; thinly bedded; moderately decomposed between bedding planes; moderately disintegrated along bedding planes; moderately fractured.		
							110			108.9-114.4': SHALE; moderate field strength; 10R 4/3 (red) with GLEY1 4/N mottling; fine-grained texture; massive structure; moderately decomposed; moderately to intensely disintegrated, mottling; moderately fractured.		
							115					
							120					

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ATTACHMENT B

Stress Relief Fracture Conceptual Site Model

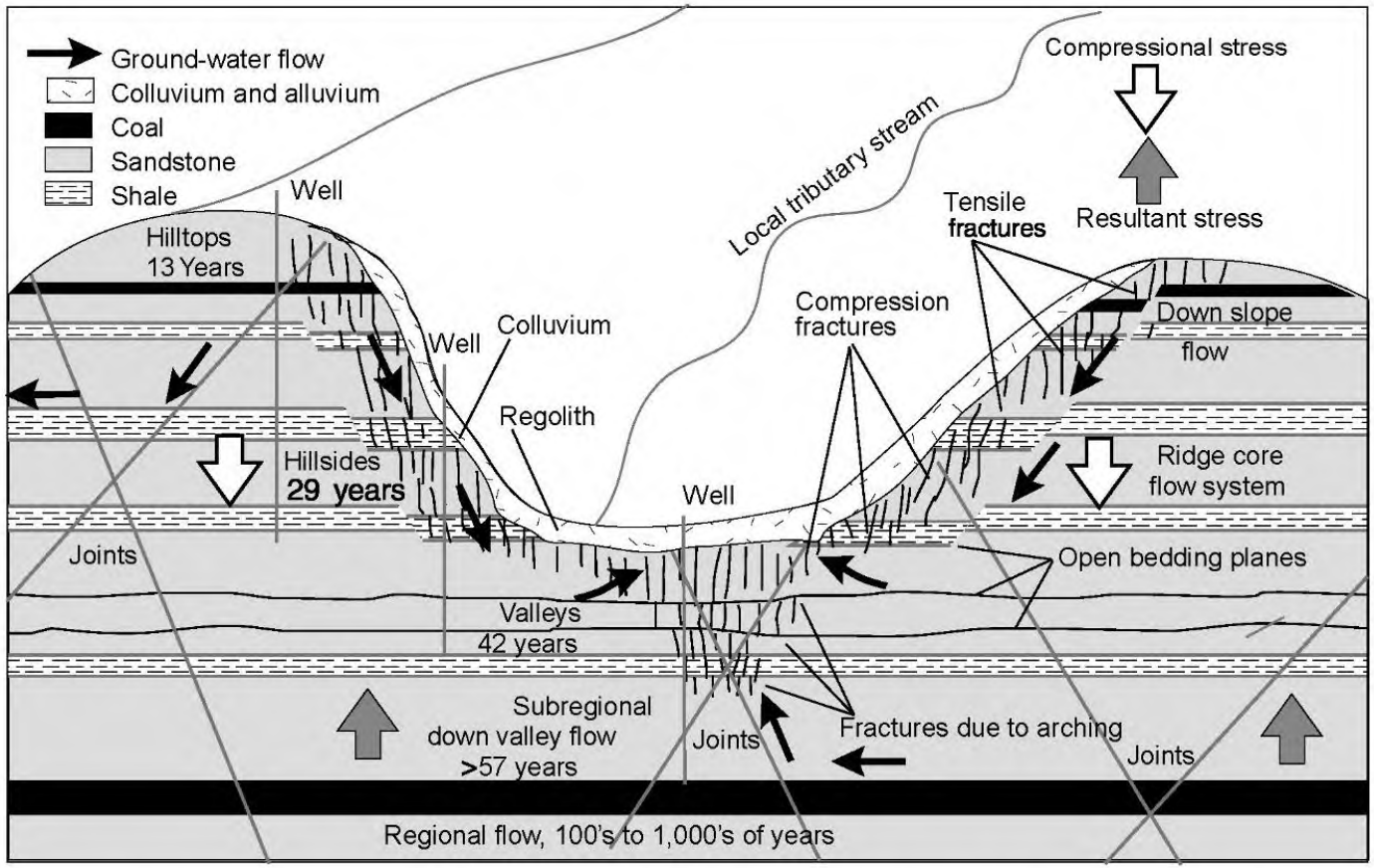


Figure 3. Revised conceptual model of ground-water flow in an Appalachian Plateaus fractured-bedrock aquifer including apparent age of ground water (Modified from Wyrick and Borchers, fig. 3.2-1, 1981 and Kozar, 1998).

References:

- United States Geological Survey (USGS), Wyrick, G.D. and J.W. Borchers, 1981. Hydrologic Effects of Stress-Relief Fracturing in an Appalachian Valley. Water-Supply Paper 2177.

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

STRESS RELIEF FRACTURE SYSTEM CONCEPTUAL SITE MODEL

ARCADIS Design & Consultancy for natural and built assets

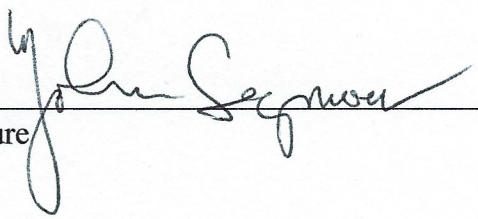
FIGURE
4

ATTACHMENT C
Certification by Qualified Professional Engineer

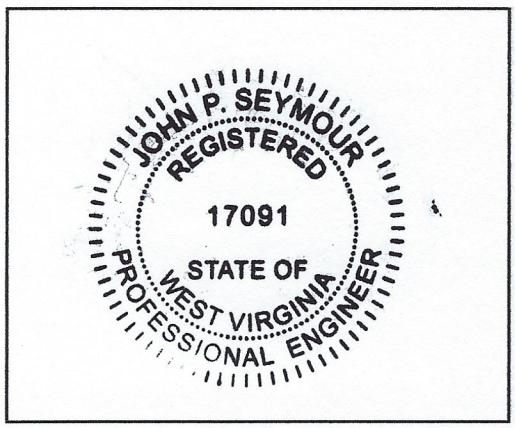
CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

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	11/28/2022
License Number	Licensing State	Date

APPENDIX 4

Not applicable.

APPENDIX 5

Not applicable.