Annual Groundwater Monitoring Report

Southwestern Electric Power Company

John W. Turk Power Plant

Landfill CCR Unit

Fulton, Arkansas

January 31, 2025

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BOUNDLESS ENERGY

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Abbreviations:
ASD - Alternate Source Demonstration
CCR – Coal Combustion Residual
GWPS - Groundwater protection standards
SSI - Statistically Significant Increase
SSL - Statistically Significant Level

I.   Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year at the Landfill (LF) Coal Combustion Residual (CCR) unit at Turk Power Plant. The Southwestern Electric Power Company is wholly-owned subsidiary of American Electric Power Company (AEP). 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, 2025.

In general, the following activities were completed:

- At the start of the current annual reporting period, the LF was operating under the Detection monitoring program.

- At the end of the current annual reporting period, the LF was operating under the Detection monitoring program.

- Groundwater samples were collected and analyzed for Appendix III constituents, as specified in 40 CFR 257.94 *et seq.* and AEP's *Groundwater Sampling and Analysis Plan (2021)*.

- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units.

- During the 1st semi-annual 2024 sampling event (June 2024):

  o No SSIs were determined

- The 2nd semi-annual 2024 sampling event (November 2024) data are still undergoing statistical analysis.

- The background data was re-established in October 2024.

- A statistical process in accordance with 40 CFR 257.93 to evaluate groundwater data was updated, certified, and posted to AEP's CCR website in 2021 titled: AEP's *Statistical Analysis Plan (*Geosyntec 2021). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009).

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

- A map, aerial photograph or a drawing showing the LF, 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 (Attached as **Appendix 1**);
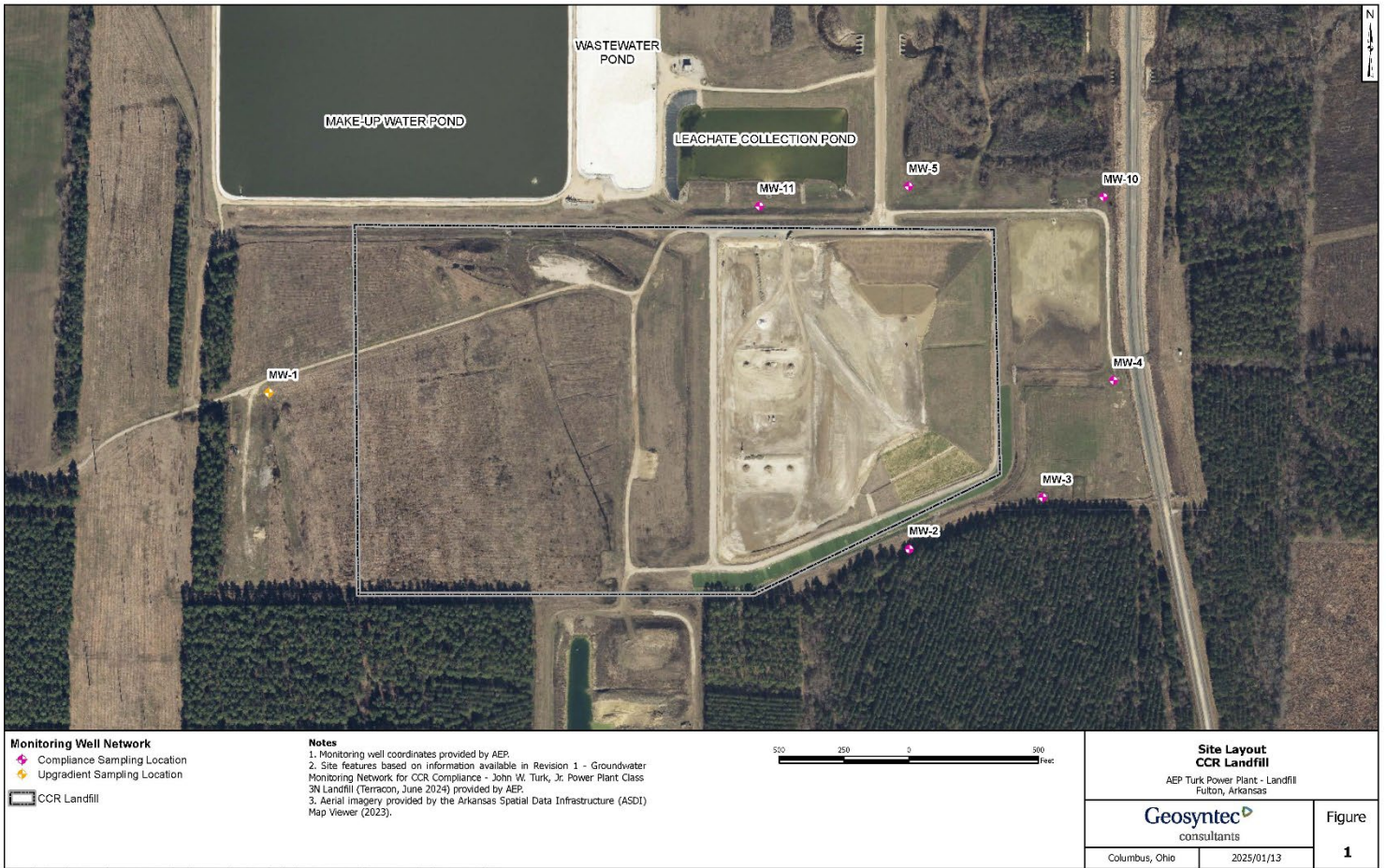
- Statistical comparison of monitoring data to determine if there have been SSI(s) (Attached as **Appendix 2**);

- A discussion of whether any alternate source demonstrations were performed, and the conclusions (where applicable Attached as **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 SSI over background concentrations, if applicable;

- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened, if applicable;

- 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

The figure that follows depicts the PE-certified groundwater monitoring network, the monitoring well locations and their corresponding identification numbers.

Landfill Monitoring Wells	
Up Gradient	Down Gradient
MW-1	MW-2
	MW-3
	MW-4
	MW-5
	MW-10
	MW-11

Monitoring Well Network
Compliance Sampling Location
Upgradient Sampling Location
CCR Landfill

Notes
1. Monitoring well coordinates provided by AEP.
2. Site features based on information available in Revision 1 - Groundwater Monitoring Network for CCR Compliance - John W. Turk, Jr. Power Plant Class 3N Landfill (Terracon, June 2024) provided by AEP.
3. Aerial imagery provided by the Arkansas Spatial Data Infrastructure (ASDI) Map Viewer (2023).

Site Layout
CCR Landfill
AEP Turk Power Plant - Landfill
Fulton, Arkansas

Geosyntec consultants
Columbus, Ohio   2025/01/13

Figure **1**

III. Monitoring Wells Installed or Decommissioned

There were no new groundwater monitoring wells installed or decommissioned during 2024. The network design was updated in 2024 in the *Groundwater Monitoring Network Design Report* (June 2024) and is posted at the CCR website for Turk Power Plant's LF. That network design report, viewable on the AEP CCR web site, discusses the facility location, the hydrogeological setting, the hydrostratigraphic units, the uppermost aquifer, downgradient monitoring well locations and the upgradient monitoring well locations.

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

Appendix 1 contains the groundwater velocity, groundwater flow direction, potentiometric maps developed after each sampling event and the groundwater quality data collected during this time period.

- The groundwater flow rate and direction for the confirmatory sampling events reflect that seen during the semi-annual sampling events.

V. Groundwater Quality Data Statistical Analysis

Appendix 2 contains the statistical analysis reports available for this reporting period.

As required by the detection monitoring rules, 40 CFR 257.94, two rounds of sampling were conducted in June and November including all Appendix III parameters.

- During the 1st semi-annual 2024 sampling event (June 2024):
    - No SSIs were determined
- The 2nd semi-annual 2024 sampling event (November 2024) data are still undergoing statistical analysis.
- The background data was re-established in October 2024.

VI. Alternate Source Demonstration

No alternate source demonstration was prepared in 2024.

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

No transition was made during the reporting period and the CCR Unit remained in detection monitoring.

Detection monitoring will continue in 2025.

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

The background data was re-established in October 2024.

IX.   Description of Any Problems Encountered in 2024 and Actions Taken

No significant problems were encountered. The low flow sampling effort went smoothly, and the schedule was met to support the annual groundwater report preparation covering the year 2024 groundwater monitoring activities.

X.   A Projection of Key Activities for the Upcoming Year

Key activities for the next include:

- Complete statistical evaluation of the second semi-annual groundwater monitoring event that took place on November 2024.

- Detection monitoring on a twice per year schedule all constituents listed in Appendix III as required by 40 CFR 257.94.

- Perform statistical analysis on the sampling results for the Appendix III parameters as required by 40 CFR 257.94.

- Evaluation of the detection monitoring results from a statistical analysis viewpoint, looking for any SSIs above background.

- Responding to any new data received in light of CCR rule requirements.

- Preparation of the next annual groundwater report.

APPENDIX 1- Groundwater Data Tables and Figures

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

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
6/1/2016	Background	0.247	218	284	1.1734	7.0	478	1,752
7/25/2016	Background	0.274	247	294	0.7506 J1	6.5	767	2,245
9/1/2016	Background	0.258	251	271	1.0888	6.5	469	1,742
11/2/2016	Background	0.321	275	360	0.5629 J1	6.6	1,479	3,008
12/15/2016	Background	0.333	310	350	2	6.7	830	2,328
2/1/2017	Background	0.212	230	331	2	7.0	461	1,812
2/21/2017	Background	0.184	215	281	1.1213	7.0	407	1,660
5/2/2017	Background	0.137	176	230	1.23	7.4	334	1,020
6/29/2017	Background	0.135	177	202	1.1529	7.4	301	1,374
7/19/2017	Background	0.17	183	226	1.1435	6.7	407	1,504
8/10/2017	Detection	0.181	207	243	0.9589 J1	7.0	417	1,600
4/26/2018	Detection	0.126	153	166	1.657	7.3	294	1,220
9/5/2018	Detection	0.098	198	216	< 0.083 U1	7.1	280	1,216
4/17/2019	Detection	0.120	160	197	1.51	7.5	317	1,188
9/19/2019	Detection	0.242	244	239	1.03	7.4	463	1,462
5/27/2020	Detection	0.109	157	172	1.37	8.1	269	1,120
11/9/2020	Detection	0.086	156	186	1.52	8.1	274	1,160
12/27/2020	Detection	--	--	--	--	7.3	--	--
6/29/2021	Detection	0.084	141	166	1.45	7.0	264	1,140
11/29/2021	Detection	0.25	289 M1, P3	227	1.07	7.0	774	1,970
6/7/2022	Detection	0.159	180	171	1.36	7.3	353	1,240
11/28/2022	Detection	0.396	287 M1	264	1.17	7.2	718	1,830
6/14/2023	Detection	0.084	155	169	1.43	7.2	264	1,100
11/29/2023	Detection	0.082	154	180	1.42	7.0	270	1,110
6/25/2024	Detection	0.079	151	172	1.43	6.8	279	1,080
11/19/2024	Detection	0.102	170	172	1.58	7.3	278	1,080

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
6/1/2016	Background	< 0.93 U1	< 1.05 U1	38	0.0809225 J1	< 0.07 U1	1	1.08847 J1	--	1.1734	1.15566 J1	0.099	0.01991 J1	2.54209 J1	2.09098 J1	1.23972 J1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	49	0.159579 J1	< 0.07 U1	1	1.25472 J1	--	0.7506 J1	< 0.68 U1	0.118	0.01078 J1	3.09725 J1	3.00699 J1	< 0.86 U1
9/1/2016	Background	1.45614 J1	< 1.05 U1	41	0.16559 J1	0.810967 J1	0.406151 J1	0.950716 J1	1.844	1.0888	< 0.68 U1	0.087	0.01003 J1	4.13353 J1	3.88471 J1	< 0.86 U1
11/2/2016	Background	3.5 J1	< 1.05 U1	42.76	< 0.02 U1	< 0.07 U1	0.9 J1	1.1 J1	1.287	0.5629 J1	< 0.68 U1	0.105	< 0.005 U1	1.57 J1	3.33 J1	< 0.86 U1
12/15/2016	Background	0.950637 J1	< 1.05 U1	39	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.605475 J1	2.076	2	< 0.68 U1	0.102	< 0.005 U1	1.57771 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	32	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.688421 J1	1.203	2	< 0.68 U1	0.081	0.01216 J1	1.43338 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	31	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.564016 J1	0.899	1.1213	< 0.68 U1	0.078	0.00711 J1	1.7175 J1	2.52261 J1	< 0.86 U1
5/2/2017	Background	< 0.93 U1	< 1.05 U1	29.84	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.57 J1	1.114	1.23	0.74 J1	0.06633	< 0.005 U1	2.15 J1	3.43 J1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	27.71	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.33 J1	4.687	1.1529	< 0.68 U1	0.05943	< 0.005 U1	1.68 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	30.71	< 0.02 U1	< 0.07 U1	0.24 J1	0.78 J1	0.842	1.1435	0.71 J1	0.06479	< 0.005 U1	1.82 J1	< 0.99 U1	< 0.86 U1

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
6/1/2016	Background	0.07	57.4	12	0.5064 J1	7.9	42	343
7/25/2016	Background	0.152	120	10	0.4781 J1	6.9	121	486
9/1/2016	Background	0.128	109	15	0.4811 J1	6.9	108	514
11/2/2016	Background	0.369	398	25	0.493 J1	6.9	346	960
12/15/2016	Background	0.109	95.2	47	0.5233 J1	7.0	79	562
2/1/2017	Background	0.05	38.9	9	0.5086 J1	7.5	28	248
2/21/2017	Background	0.05	40.8	10	< 0.083 U1	7.9	33	252
5/2/2017	Background	0.04823	51.2	5	0.52 J1	7.9	19	208
6/29/2017	Background	0.05514	59.6	7	0.4428 J1	7.9	48	336
7/19/2017	Background	0.08324	65.5	8	0.4694 J1	7.5	44	332
8/10/2017	Detection	0.07471	62.9	10	0.451 J1	7.5	25	304
4/26/2018	Detection	0.04343	51.8	6	< 0.083 U1	7.6	22	264
9/5/2018	Detection	0.098	111	13	< 0.083 U1	7.4	66	348
4/17/2019	Detection	0.037	76.8	5.86	0.34	7.9	18.6	310
9/19/2019	Detection	0.098	113	10.1	0.30	8.0	76.8	416
5/27/2020	Detection	0.051	75.7	6.17	0.28	8.5	17.2	311
7/14/2020	Detection	--	--	--	--	7.9	--	--
11/9/2020	Detection	0.059	89.9	7.55	0.34	8.5	52.9	332
12/22/2020	Detection	--	--	--	--	7.8	--	--
6/29/2021	Detection	0.034 J1	75.1	3.26	0.30	7.4	15.5	320
11/29/2021	Detection	0.045 J1	89.3	13.9	0.29	7.5	40.9	340
6/7/2022	Detection	0.035 J1	67.3	5.26	0.33	7.4	21.8	280
11/28/2022	Detection	0.064	143	52.8	0.26	7.5	161	610
1/19/2023	Detection	--	66.6	--	--	7.5	--	--
6/14/2023	Detection	0.054	75.4	4.73	0.31	7.4	49.1	320
11/29/2023	Detection	0.043 J1	81.2	11.6	0.28	7.3	33.3	340
6/25/2024	Detection	0.031 J1	70.8	5.75	0.31	7.2	21.9	300
11/19/2024	Detection	0.048 J1	92	22.3	0.36	7.7	46.6	360

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
6/1/2016	Background	< 0.93 U1	1.75982 J1	120	0.122549 J1	< 0.07 U1	2	0.904166 J1	--	0.5064 J1	2.01553 J1	0.015	0.01145 J1	2.82795 J1	1.14538 J1	< 0.86 U1
7/25/2016	Background	< 0.93 U1	1.39254 J1	152	0.131235 J1	< 0.07 U1	0.862157 J1	1.21412 J1	--	0.4781 J1	< 0.68 U1	0.048	0.00701 J1	4.69255 J1	< 0.99 U1	< 0.86 U1
9/1/2016	Background	5	< 1.05 U1	162	0.141798 J1	< 0.07 U1	3	1.1267 J1	3.045	0.4811 J1	1.22736 J1	0.031	0.01382 J1	6	3.91967 J1	< 0.86 U1
11/2/2016	Background	1.91737 J1	< 1.05 U1	107	0.0819 J1	< 0.07 U1	3	1.53886 J1	1.939	0.493 J1	1.26945 J1	0.088	0.00947 J1	5	1.45298 J1	< 0.86 U1
12/15/2016	Background	1.7294 J1	< 1.05 U1	158	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.355698 J1	1.919	0.5233 J1	< 0.68 U1	0.028	< 0.005 U1	2.15202 J1	1.67636 J1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	80	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.217505 J1	0.933	0.5086 J1	< 0.68 U1	0.011	< 0.005 U1	2.91607 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	83	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.233088 J1	1.335	< 0.083 U1	< 0.68 U1	0.012	< 0.005 U1	2.62555 J1	< 0.99 U1	< 0.86 U1
5/2/2017	Background	1.46 J1	1.37 J1	93	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.32 J1	1.935	0.52 J1	< 0.68 U1	0.00925	< 0.005 U1	1.08 J1	1.32 J1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	101	< 0.02 U1	< 0.07 U1	< 0.23 U1	0.58 J1	3.373	0.4428 J1	< 0.68 U1	0.01089	< 0.005 U1	0.87 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	97.5	0.02 J1	< 0.07 U1	0.76 J1	0.71 J1	2.712	0.4694 J1	1.14 J1	0.01387	0.005 J1	1.18 J1	< 0.99 U1	< 0.86 U1

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
6/1/2016	Background	0.04	93.9	3	0.3926 J1	7.6	17	357
7/25/2016	Background	0.168	393	37	0.4403 J1	7.4	699	1,612
9/1/2016	Background	0.09	149	14	0.4288 J1	7.3	119	564
11/2/2016	Background	0.151	264	48	0.5852 J1	7.4	424	1,188
12/15/2016	Background	0.06	67.8	15	0.6047 J1	7.4	43	408
2/1/2017	Background	0.03	53	7	< 0.083 U1	7.4	19	220
2/21/2017	Background	0.05	81.5	12	< 0.083 U1	7.6	76	340
5/2/2017	Background	0.04375	77.3	6	0.37 J1	7.6	27	328
6/29/2017	Background	0.05282	95.6	6	0.3475 J1	7.6	32	332
7/19/2017	Background	0.09178	122	15	< 0.083 U1	7.2	95	510
8/10/2017	Detection	0.09788	160	23	0.438 J1	7.5	190	716
4/26/2018	Detection	0.03713	61.3	4	< 0.083 U1	7.4	28	278
9/5/2018	Detection	0.073	160	58	< 0.083 U1	7.3	554	1,234
1/22/2019	Detection	--	--	7.3	--	--	--	--
4/17/2019	Detection	0.035	81.1	3.70	0.21	7.5	13.7	364
9/19/2019	Detection	0.074	143	27.3	0.22	7.9	148	612
5/27/2020	Detection	0.053	82.0	11.3	0.22	8.2	11.7	370
7/14/2020	Detection	--	--	--	--	7.9	--	--
11/9/2020	Detection	0.056	85.6	28.8	0.29	8.1	12.9	402
12/22/2020	Detection	--	--	--	--	7.3	--	--
6/29/2021	Detection	0.067	118	88.8	0.29	7.2	92.0	670
11/29/2021	Detection	0.07 J1	225	263	0.25	7.0	193	1,040
6/7/2022	Detection	0.050	122	123	0.30	7.3	100	710
11/28/2022	Detection	0.077	207	265	0.29	7.2	276	1,160
1/19/2023	Detection	--	--	--	--	7.2	--	--
6/14/2023	Detection	0.077	144	145	0.32	7.3	187	830
11/29/2023	Detection	0.070	154	174	0.29	7.1	185	900
6/25/2024	Detection	0.063	191	246	0.29	6.9	268	1,080
11/19/2024	Detection	0.078	273	329	0.33	7.3	381	1,420

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
6/1/2016	Background	< 0.93 U1	< 1.05 U1	73	0.194411 J1	< 0.07 U1	1	0.664792 J1	--	0.3926 J1	0.940276 J1	0.01	0.01506 J1	0.949404 J1	< 0.99 U1	< 0.86 U1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	238	0.137503 J1	< 0.07 U1	0.493284 J1	0.785774 J1	--	0.4403 J1	< 0.68 U1	0.075	< 0.005 U1	1.16782 J1	< 0.99 U1	< 0.86 U1
9/1/2016	Background	1.90159 J1	< 1.05 U1	81	0.185901 J1	< 0.07 U1	0.955367 J1	0.803817 J1	3.55	0.4288 J1	< 0.68 U1	0.014	< 0.005 U1	1.14299 J1	1.25976 J1	< 0.86 U1
11/2/2016	Background	1.9135 J1	2.32209 J1	160	0.0958 J1	< 0.07 U1	0.571016 J1	1.33502 J1	2.83	0.5852 J1	1.51713 J1	0.03	< 0.005 U1	1.68622 J1	< 0.99 U1	< 0.86 U1
12/15/2016	Background	1.36647 J1	1.8418 J1	55	0.261831 J1	< 0.07 U1	0.471105 J1	0.395502 J1	1.920	0.6047 J1	< 0.68 U1	0.009	< 0.005 U1	0.30882 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	1.38687 J1	< 1.05 U1	55	0.157528 J1	< 0.07 U1	0.906786 J1	0.761635 J1	0.942	< 0.083 U1	< 0.68 U1	0.003	0.00701 J1	1.02923 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	1.75888 J1	< 1.05 U1	66	0.239409 J1	< 0.07 U1	4	1.21066 J1	1.156	< 0.083 U1	2.18988 J1	0.008	0.00692 J1	0.551231 J1	< 0.99 U1	0.918887 J1
5/2/2017	Background	< 0.93 U1	2.37 J1	47.28	0.1 J1	< 0.07 U1	0.31 J1	0.35 J1	2.80	0.37 J1	< 0.68 U1	0.00679	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	63.01	0.13 J1	< 0.07 U1	1.64	0.89 J1	1.894	0.3475 J1	1.12 J1	0.00836	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	79.28	0.15 J1	< 0.07 U1	0.58 J1	0.72 J1	3.43	< 0.083 U1	< 0.68 U1	0.01353	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1

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
6/1/2016	Background	0.36	391	653	0.6203 J1	7.2	190	2,352
7/25/2016	Background	0.455	729	1,055	< 0.083 U1	7.4	694	4,084
9/1/2016	Background	0.402	569	1,065	0.5614 J1	7.1	671	3,500
11/2/2016	Background	0.393	513	993	0.374 J1	7.4	538	3,450
12/15/2016	Background	0.305	280	930	0.3995 J1	7.3	434	2,980
2/1/2017	Background	0.445	669	1,159	< 0.083 U1	6.8	747	3,720
2/21/2017	Background	0.365	439	730	< 0.083 U1	7.2	186	2,404
5/2/2017	Background	0.376	496	1,024	0.44 J1	6.9	572	3,370
6/29/2017	Background	0.264	264	659	0.4605 J1	7.0	157	2,276
7/19/2017	Background	0.296	306	1,052	< 0.083 U1	6.9	557	3,120
8/10/2017	Detection	0.429	648	1,105	0.512 J1	7.0	692	3,788
4/26/2018	Detection	0.347	383	1,140	< 0.083 U1	7.0	557	3,654
9/5/2018	Detection	0.255	516	1,241	< 0.083 U1	6.8	748	5,442
12/20/2018	Detection	--	--	110	--	--	--	2,792
4/17/2019	Detection	0.261	452	1,000	0.38	7.0	164	2,798
9/19/2019	Detection	0.330	573	895	0.34	7.0	157	2,780
5/27/2020	Detection	0.206	328	831	0.27	7.5	246	2,390
11/9/2020	Detection	0.384	664	1,150	0.26	7.5	634	3,150
12/22/2020	Detection	--	--	--	--	6.4	--	--
6/29/2021	Detection	0.390	458	895	0.32	6.8	351	2,630
11/29/2021	Detection	0.49	692	1,020	0.22	6.7	496	2,900
6/7/2022	Detection	0.263	492	1,010	0.2 J1	5.7	497	4,100
6/24/2022	Detection	--	--	--	--	6.1	--	--
11/28/2022	Detection	0.358	600	1,180	0.2 J1	6.9	579	3,100
6/14/2023	Detection	0.215	445	997	0.24	6.7	309	2,640 S7
11/29/2023	Detection	0.143	366	840	0.27	6.7	93	2,170
6/25/2024	Detection	0.214	444	881	0.26	6.2	249	2,640
11/19/2024	Detection	0.150	418	1,020	0.24	6.5	435	2,800 S7

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
6/1/2016	Background	< 0.93 U1	1.83781 J1	69	0.23746 J1	< 0.07 U1	7	3.34813 J1	--	0.6203 J1	1.47143 J1	0.131	0.01634 J1	2.98754 J1	6	< 0.86 U1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	110	0.454281 J1	< 0.07 U1	19	8	--	< 0.083 U1	4.81995 J1	0.162	0.01917 J1	1.38966 J1	3.81662 J1	< 0.86 U1
9/1/2016	Background	1.44388 J1	1.75655 J1	144	0.506995 J1	< 0.07 U1	23	9	1.909	0.5614 J1	6	0.098	0.028	3.08827 J1	13	< 0.86 U1
11/2/2016	Background	2.65159 J1	1.40633 J1	56	0.0976 J1	< 0.07 U1	4	2.56138 J1	1.195	0.374 J1	2.26641 J1	0.105	< 0.005 U1	1.80188 J1	13	< 0.86 U1
12/15/2016	Background	< 0.93 U1	2.20107 J1	63	0.0334569 J1	< 0.07 U1	0.630135 J1	0.943538 J1	2.64	0.3995 J1	< 0.68 U1	0.125	< 0.005 U1	3.76575 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	1.15118 J1	< 1.05 U1	29	< 0.02 U1	< 0.07 U1	0.266332 J1	0.771837 J1	0.913	< 0.083 U1	< 0.68 U1	0.072	0.00591 J1	0.342891 J1	11	< 0.86 U1
2/21/2017	Background	0.987123 J1	< 1.05 U1	78	0.170596 J1	< 0.07 U1	9	4.18392 J1	4.46	< 0.083 U1	2.76588 J1	0.104	0.01482 J1	2.52827 J1	7	< 0.86 U1
5/2/2017	Background	2.26 J1	< 1.05 U1	41.07	0.03 J1	< 0.07 U1	0.33 J1	1.02 J1	4.274	0.44 J1	< 0.68 U1	0.09813	0.006 J1	1.41 J1	4.09 J1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	65.4	0.05 J1	< 0.07 U1	1.05	1.64 J1	13.21	0.4605 J1	< 0.68 U1	0.116	< 0.005 U1	2.65 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	2.44 J1	64.91	0.07 J1	< 0.07 U1	1.4	1.64 J1	3.521	< 0.083 U1	1.34 J1	0.133	0.013 J1	3.06 J1	1.18 J1	< 0.86 U1

Table 1. Groundwater Data Summary: MW-5
Turk - 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
6/1/2016	Background	0.06	284	100	0.4866 J1	7.7	329	1,272
7/25/2016	Background	0.04	491	188	0.4938 J1	7.7	465	1,694
9/1/2016	Background	0.05	251	96	0.408 J1	7.5	319	1,250
11/2/2016	Background	0.06	234	80	0.5023 J1	7.6	281	1,034
12/15/2016	Background	0.03	217	55	0.2941 J1	7.7	220	1,036
2/1/2017	Background	0.05	272	78	0.7224 J1	6.8	265	1,092
2/21/2017	Background	0.06	270	80	< 0.083 U1	7.7	273	1,156
5/2/2017	Background	0.06152	275	91	0.54 J1	7.1	287	1,192
6/29/2017	Background	0.04842	248	73	< 0.083 U1	7.0	228	1,104
7/19/2017	Background	0.04983	208	66	< 0.083 U1	6.6	216	932
8/10/2017	Detection	0.06474	267	70	< 0.083 U1	6.8	233	1,052
4/26/2018	Detection	0.08795	310	105	< 0.083 U1	7.0	303	1,408
9/5/2018	Detection	0.086	380	134	< 0.083 U1	6.4	273	1,502
4/17/2019	Detection	0.082	290	138	0.30	7.2	343	1,292
9/19/2019	Detection	0.075	306	110	0.27	6.8	275	1,326
5/27/2020	Detection	0.078	301	114	0.28	7.4	319	1,320
11/9/2020	Detection	0.060	240	75.2	0.30	7.5	273	1,080
12/22/2020	Detection	--	--	--	--	6.5	--	--
6/29/2021	Detection	0.095	284	140	0.33	6.8	339	1,400
11/29/2021	Detection	0.16 J1	419	155	0.30	6.7	371	1,430
6/7/2022	Detection	0.035 J1	220	62.3	0.27	6.4	210	950
11/28/2022	Detection	0.025 J1	262	166	0.28	7.1	273	1,120
6/14/2023	Detection	0.064	279	135	0.28	6.6	312	1,290
11/29/2023	Detection	0.049 J1	51.2	82.9	0.26	6.7	283	1,030
6/25/2024	Detection	0.062	270	103	0.30	6.6	292	1,160
11/19/2024	Detection	0.068	303	76.5	0.35	6.7	264	930

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
6/1/2016	Background	< 0.93 U1	< 1.05 U1	40	0.0620377 J1	< 0.07 U1	0.662999 J1	0.611001 J1	--	0.4866 J1	< 0.68 U1	0.049	0.02124 J1	1.45446 J1	2.29756 J1	< 0.86 U1
7/25/2016	Background	4.2029 J1	< 1.05 U1	42	0.165141 J1	< 0.07 U1	2	1.38215 J1	--	0.4938 J1	1.36311 J1	0.164	0.01234 J1	4.13266 J1	8	< 0.86 U1
9/1/2016	Background	0.948881 J1	< 1.05 U1	41	0.141298 J1	< 0.07 U1	0.560473 J1	0.970337 J1	1.411	0.408 J1	< 0.68 U1	0.024	0.01038 J1	3.3054 J1	1.06126 J1	< 0.86 U1
11/2/2016	Background	< 0.93 U1	< 1.05 U1	38	< 0.02 U1	< 0.07 U1	0.37232 J1	0.68278 J1	3.11	0.5023 J1	< 0.68 U1	0.024	< 0.005 U1	0.760667 J1	1.57137 J1	< 0.86 U1
12/15/2016	Background	< 0.93 U1	< 1.05 U1	35	< 0.02 U1	< 0.07 U1	0.558695 J1	0.494922 J1	1.159	0.2941 J1	< 0.68 U1	0.015	< 0.005 U1	< 0.29 U1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	43	< 0.02 U1	< 0.07 U1	0.86197 J1	0.547445 J1	0.632	0.7224 J1	< 0.68 U1	0.018	0.01495 J1	0.862299 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	43	< 0.02 U1	< 0.07 U1	1	0.733647 J1	0.747	< 0.083 U1	< 0.68 U1	0.021	0.00912 J1	0.957474 J1	< 0.99 U1	< 0.86 U1
5/2/2017	Background	1.2 J1	< 1.05 U1	38.42	< 0.02 U1	< 0.07 U1	0.420 J1	0.600 J1	4.45	0.54 J1	< 0.68 U1	0.02349	0.016 J1	1.11 J1	< 0.99 U1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	35.21	< 0.02 U1	< 0.07 U1	< 0.230 U1	0.680 J1	5.057	< 0.083 U1	< 0.68 U1	0.01696	0.011 J1	2.2 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	35.22	< 0.02 U1	< 0.07 U1	0.460 J1	0.810 J1	1.381	< 0.083 U1	0.95 J1	0.01583	0.026	0.97 J1	< 0.99 U1	< 0.86 U1

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
6/1/2016	Background	0.07	245	509	0.5264 J1	7.8	582	2,252
7/25/2016	Background	0.07	348	680	0.4623 J1	6.7	960	2,936
9/1/2016	Background	0.08	349	400	0.5157 J1	6.6	444	1,896
11/2/2016	Background	0.09	407	378	0.373 J1	6.8	499	1,916
12/15/2016	Background	0.05	363	514	0.3419 J1	6.3	559	2,298
2/1/2017	Background	0.05	369	53	1.2456	6.0	62	2,280
2/21/2017	Background	0.177	673	762	< 0.083 U1	7.8	1,452	3,814
5/2/2017	Background	0.08024	213	305	0.52 J1	5.8	371	1,618
6/29/2017	Background	0.08018	256	277	1.1688	5.8	389	1,666
7/19/2017	Background	0.0858	454	470	3.17	6.3	560	2,146
8/10/2017	Detection	0.07623	392	544	0.37 J1	6.2	619	2,252
4/26/2018	Detection	0.06224	298	326	0.9038 J1	7.3	452	1,826
9/5/2018	Detection	0.074	410	405	< 0.083 U1	7.5	484	1,872
4/17/2019	Detection	0.046	313	431	0.21	7.4	554	2,002
9/19/2019	Detection	0.05 J1	339	365	0.21	6.6	481	1,900
5/27/2020	Detection	0.04 J1	389	378	0.19	7.6	487	1,780
11/9/2020	Detection	0.04 J1	264	282	0.24	6.4	366	1,610
6/29/2021	Detection	0.033 J1	254	320	0.24	6.2	420	1,720
11/29/2021	Detection	0.03 J1	222	240	0.18	6.4	278	1,430
6/24/2022	Detection	< 0.02 U1	216	207	< 0.064 U1	6.4	295	1,230
11/28/2022	Detection	0.267	706	992	0.33	6.6	1,710	3,800
1/19/2023	Detection	--	696	--	--	6.7	--	--
6/14/2023	Detection	0.052	307	238	0.21	6.8	444	1,580
11/29/2023	Detection	0.038 J1	172	79.2	0.18	6.8	161	900
6/25/2024	Detection	0.038 J1	273	226	0.23	6.3	479	1,580
11/19/2024	Detection	0.035 J1	190	67.6	0.25	6.6	143	850 S7

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
6/1/2016	Background	< 0.93 U1	< 1.05 U1	68	0.0420664 J1	< 0.07 U1	2	0.608593 J1	--	0.5264 J1	< 0.68 U1	0.039	0.01929 J1	0.808299 J1	1.28039 J1	< 0.86 U1
7/25/2016	Background	< 0.93 U1	< 1.05 U1	57	0.0790461 J1	< 0.07 U1	0.841449 J1	0.890358 J1	--	0.4623 J1	< 0.68 U1	0.073	0.00766 J1	1.38895 J1	1.70224 J1	0.912736 J1
9/1/2016	Background	< 0.93 U1	< 1.05 U1	55	0.0599978 J1	< 0.07 U1	1	0.876633 J1	0.525	0.5157 J1	< 0.68 U1	0.029	0.00756 J1	1.18242 J1	< 0.99 U1	< 0.86 U1
11/2/2016	Background	1.07709 J1	< 1.05 U1	51	< 0.02 U1	< 0.07 U1	0.843928 J1	0.995858 J1	0.658	0.373 J1	0.773158 J1	0.042	< 0.005 U1	1.02999 J1	< 0.99 U1	< 0.86 U1
12/15/2016	Background	< 0.93 U1	< 1.05 U1	51	< 0.02 U1	< 0.07 U1	1	0.642068 J1	0.951	0.3419 J1	< 0.68 U1	0.017	< 0.005 U1	0.729956 J1	< 0.99 U1	< 0.86 U1
2/1/2017	Background	< 0.93 U1	< 1.05 U1	60	< 0.02 U1	< 0.07 U1	1	0.67122 J1	0.344	1.2456	< 0.68 U1	0.02	0.00911 J1	0.7751 J1	< 0.99 U1	< 0.86 U1
2/21/2017	Background	< 0.93 U1	< 1.05 U1	47	< 0.02 U1	< 0.07 U1	2	0.951093 J1	0.63	< 0.083 U1	0.870989 J1	0.095	0.01349 J1	2.06399 J1	< 0.99 U1	< 0.86 U1
5/2/2017	Background	< 0.93 U1	< 1.05 U1	58.09	< 0.02 U1	< 0.07 U1	1.43	0.74 J1	1.4731	0.52 J1	< 0.68 U1	0.01559	< 0.005 U1	0.59 J1	< 0.99 U1	< 0.86 U1
6/29/2017	Background	< 0.93 U1	< 1.05 U1	52.23	< 0.02 U1	< 0.07 U1	1.24	0.61 J1	2.112	1.1688	0.83 J1	0.01916	< 0.005 U1	0.59 J1	< 0.99 U1	< 0.86 U1
7/19/2017	Background	< 0.93 U1	< 1.05 U1	48.43	< 0.02 U1	< 0.07 U1	1.900	0.77 J1	3.154	3.1700	1.1 J1	0.0401	0.007 J1	0.870 J1	< 0.99 U1	< 0.86 U1

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
6/1/2016	Background	0.222	656	784	0.5131 J1	8.0	1,116	3,432
7/25/2016	Background	0.158	554	668	0.4984 J1	7.3	760	3,031
9/1/2016	Background	0.151	527	699	0.543 J1	6.6	726	2,956
11/2/2016	Background	0.165	544	729	0.4413 J1	6.9	830	2,980
12/15/2016	Background	0.152	524	675	0.448 J1	6.2	718	2,376
2/1/2017	Background	0.156	516	748	< 0.083 U1	6.1	820	2,876
2/21/2017	Background	0.155	507	682	< 0.083 U1	8.0	740	2,856
5/2/2017	Background	0.141	491	758	0.49 J1	6.0	757	--
6/29/2017	Background	0.15	522	682	0.4399 J1	6.4	704	2,928
7/19/2017	Background	0.161	532	711	< 0.083 U1	6.1	740	2,804
8/10/2017	Background	0.158	533	727	0.546 J1	--	734	2,868
4/26/2018	Background	0.158	531	792	< 0.083 U1	7.5	827	3,306
9/5/2018	Background	0.165	709	948	0.483 J1	7.5	969	3,414
4/17/2019	Background	0.133	529	867	0.36	7.4	923	3,656
9/19/2019	Background	0.147	614	837	0.34	6.6	863	3,520
5/27/2020	Background	<0.200 U1	540	870	0.307	7.6	860	3,280
11/9/2020	Background	<0.200 U1	527	808	0.400	6.5	819	2,930
6/29/2021	Background	<0.200 U1	536	855	0.398	6.2	909	2,990
11/29/2021	Background	<0.200 U1	545	790	0.400 B	6.8	762	2,670
6/7/2022	Background	<0.200 U1	514	687	<0.150 U1	6.1	625	2,110
11/28/2022	Background	<0.200 U1	472	752	0.279	6.7	757	2,410
6/14/2023	Background	<0.200 U1	521	806	0.343	6.5	913	2,810
11/29/2023	Background	0.133	492	849	0.31	7.4	850	2,680
6/25/2024	Background	0.129	505	819	0.36	7.0	899	2,880
11/19/2024	Background	0.131	530	744	0.39	7.5	779	2,640 S7

Notes:

Combined radium values were calculated from the sum of the reported radium-226 and radium-228 results.

Radium data quality flags were not included. Reported negative radium-226 or radium-228 results were replaced with zero.

--: Not analyzed

<: 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.

B: The same analyte is found in the associated blank.

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) recovery was outside acceptance limits.

mg/L: milligrams per liter

P3: The precision on the matrix spike duplicate (MSD) was above acceptance limits.

pCi/L: picocuries per liter

S7: Sample did not achieve constant weight.

SU: standard unit

µg/L: micrograms per liter

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2024-06		2024-11	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	MW-1 [1]	2.0	15.0	4.1	12.8	4.8
	MW-2 [2]	2.0	10.1	6.0	28.7	2.1
	MW-3 [2]	2.0	13.3	4.6	26.1	2.3
	MW-4 [2]	2.0	13.1	4.6	23.1	2.6
	MW-5 [2]	2.0	23.9	2.6	15.2	4.0
	MW-10 [2]	2.0	19.2	3.2	11.3	5.4
	MW-11 [2]	2.0	37.0	1.6	28.3	2.2

Notes:

[1] - Background Well

[2] - Downgradient Well

MW-11 was added to the CCR network in June 2024 and will now be included in the calculations.

LEACHATE COLLECTION POND

WASTEWATER POND

MAKE-UP WATER POND

MW-7 273.52
MW-8 278.56
MW-6 274.75
MW-5 279.60
MW-10 282.47
MW-11 284.08
MW-1 295.54
MW-4 282.07
CELL 1
CELL 2
MW-3 285.06
MW-2 284.55
MW-9D

Contour labels: 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294

Legend

- ⬥ Groundwater Monitoring Well
- —— Groundwater Elevation Contour
- → Groundwater Flow Direction
- ▪▪ Property Boundary

Notes

1. Monitoring well coordinates and water level data (collected on June 25, 2024) provided by AEP.
2. Site features based on information available in Report 1 - Groundwater Monitoring Network for CCR Compliance - John W. Turk, Jr. Power Plant Class 3N Landfill (Terracon, October 2016) provided by AEP.
3. Groundwater elevation units are feet above mean sea level (ft amsl).
4. MW-9D is screened within the lower aquifer and excluded from the potentiometric surface calculations.
5. Wells MW-1 through MW-11 were resurveyed on August 30, 2023.
6. Aerial imagery provided by the Arkansas Spatial Data Infrastructure (ASDI) Map Viewer (2023).

500 250 0 500 Feet
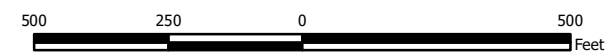
Groundwater Elevation Contour Map
June 2024

AEP Turk Power Plant - Landfill
Fulton, Arkansas

Geosyntec ▷
consultants

Figure

1

Columbus, Ohio   2024/07/24

A:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Turk\2024\Turk_Jun2024_wo_9D_v1.mxd. Okiemute.Commander. 7/24/2024. CHA8423/02/08.

LEACHATE COLLECTION POND

WASTEWATER POND

MAKE-UP WATER POND

MW-7
275.03

MW-8
279.99

MW-6
278.22

MW-5
279.70

MW-10
280.73

MW-11
283.79

CELL 1

MW-4
280.47

MW-1
296.61

CELL 2

MW-3
285.52

MW-2
291.78

MW-9D

276
278
280
282
284
286
288
290
292
294
296

Legend

- Groundwater Monitoring Well
- Groundwater Elevation Contour
- Groundwater Flow Direction
- Property Boundary

Notes

1. Monitoring well coordinates and water level data (collected on November 19, 2024) provided by AEP.
2. Site features based on information available in Report 1 - Groundwater Monitoring Network for CCR Compliance - John W. Turk, Jr. Power Plant Class 3N Landfill (Terracon, October 2016) provided by AEP.
3. Groundwater elevation units are feet above mean sea level (ft amsl).
4. MW-9D is screened within the lower aquifer and excluded from the potentiometric surface calculations.
5. Wells MW-1 through MW-11 were resurveyed on August 30, 2023.
6. Aerial imagery provided by the Arkansas Spatial Data Infrastructure (ASDI) Map Viewer (2023).

500 250 0 500
Feet

Groundwater Elevation Contour Map
November 2024

AEP Turk Power Plant - Landfill
Fulton, Arkansas

Geosyntec
consultants

Columbus, Ohio   2024/12/17

Figure

2

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APPENDIX 2- Statistical Analyses

The reports summarizing the statistical evaluation follow.

STATISTICAL ANALYSIS SUMMARY, BACKGROUND UPDATE CALCULATIONS

Landfill

John W. Turk, Jr. Plant

Fulton, Arkansas

Prepared for

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Columbus, Ohio 43215-2372

Prepared by

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Project Number: CHA8500B

October 4, 2024

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ACRONYMS AND ABBREVIATIONS

CCR	coal combustion residuals
CFR	code of federal regulations
LPL	lower prediction limit
mg/L	milligrams per liter
PQL	practical quantitation limit
QA/QC	quality assurance and quality control
UPL	upper prediction limit
USEPA	United States Environmental Protection Agency

1.   INTRODUCTION

Groundwater monitoring has been conducted at the Landfill, an existing coal combustions residuals (CCR) unit at the John W. Turk, Jr. Power Plant in Fulton, Arkansas, in accordance with United States Environmental Protection Agency (USEPA) regulations regarding the disposal of CCR in landfills and surface impoundments (Code of Federal Regulations [CFR], Title 40, Section 257, Subpart D, "CCR rule"). It is required under the CCR rule to establish background concentrations for Appendix III parameters in groundwater. These background concentrations are used to calculate prediction limits for future detection monitoring events.

Background concentration values for Appendix III parameters were last calculated for the Landfill in July 2022. Since then, five semiannual detection monitoring events were conducted and compliance monitoring well MW-11 was added to the certified groundwater monitoring network. This report details how data from these recent groundwater monitoring results and historical MW-11 results were analyzed and incorporated into the Landfill background dataset and provides updated prediction limits.

1.1   Previous Monitoring Events and Background Calculations

Before July 2017, at least eight monitoring events were completed to establish background concentrations and calculate prediction limits for Appendix III and Appendix IV parameters under the CCR rule. Additional data were collected prior to background monitoring at the Turk Plant in December 2012 and prior to the placement of CCR at the Turk Landfill. The historical data were also included in the initial background calculations. The data were reviewed for outliers and trends before upper prediction limits (UPLs) were calculated for each Appendix III parameter and lower prediction limits (LPLs) were established for pH. Intrawell prediction limits were selected for all Appendix III parameters with a one-of-two resampling plan. The statistical analyses completed to establish background levels are detailed in the December 2017 *Statistical Analysis Summary* report (Geosyntec 2017).

Calculated background values should be updated every four to eight measurements, as recommended in the United States Environmental Protection Agency (USEPA) *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* (USEPA 2009). These updated background concentration values are used to revise the site-specific prediction limits. The prediction limits have previously been updated twice.

In July 2022, prediction limits for Appendix III parameters were updated with data collected through June 2021 (Geosyntec 2022). Intrawell testing (using a one-of-two retesting procedure) was selected as the method of analysis and these prediction limits were used for detection monitoring events completed between November 2021 and November 2023.

Since the previous background update, compliance monitoring well MW-11 was added to the certified groundwater monitoring network (Terracon 2024). All historical data collected from MW-11 since June 2016 were used to establish background concentrations for Appendix III parameters.

2. STATISTICAL ANALYSIS AND BACKGROUND DATA UPDATE

Five semiannual detection monitoring events were conducted since the last background update (Table 1). Verification resampling was completed (on an individual well or parameter basis) if the initial results for each detection monitoring event identified possible exceedances. Therefore, a minimum of four samples have been collected from each compliance well since the previous background update.

Data from the five semiannual detection monitoring events conducted at the Landfill between November 2021 and November 2023, including both initial and verification resampling results, have been evaluated for inclusion in the background dataset. For downgradient well MW-10, data from the first semiannual event of 2022, completed in June 2022, was removed from the background dataset due to an obstruction found in the well during the sampling event.

To incorporate compliance monitoring well MW-11 into the certified groundwater monitoring network, data from the background and semiannual detection monitoring events (Table 2) were evaluated for inclusion in the background dataset.

The detection monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. The data were reviewed for outliers, and three outliers were removed from the dataset prior to analysis. The selected statistical methods have been certified by a qualified professional engineer (Attachment A).

2.1 Data Validation and QA/QC

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

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.10.0.20 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues that would impact data usability were noted.

2.2 Statistical Analysis

Statistical analyses for the Landfill were conducted in accordance with the *Statistical Analysis Plan* (Geosyntec 2020). These statistical analyses incorporated data from the five semiannual detection monitoring events and associated verification resampling events conducted between November 2021 and November 2023 (Table 1), plus additional data previously collected for MW-11 (Table 2). The results of the statistical analyses are included in Attachment B.

Time series plots of Appendix III parameters (Appendix B) 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).

2.2.1 Outlier Evaluation

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

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

or

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

where:

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

Data that were evaluated as potential outliers are summarized in Attachment B. Tukey's test identified the calcium concentration of 51.2 milligrams per liter (mg/L) at downgradient well MW-5 on 11/29/2023 as an outlier and the value was removed from the dataset. While not identified by Tukey's outlier test, two calcium concentrations at downgradient well MW-10, collected on 11/28/2022 (706 mg/L) and 1/19/2023 (696 mg/L), were flagged as outliers and removed from the dataset to maintain conservative statistical limits.

2.2.2 Trend Analyses

Trend tests were used to identify statistically significant trends for each well-constituent pair. A number of statistically significant trends were identified at both upgradient well MW-1 and all compliance monitoring locations except MW-11, as documented in Attachment B. Well-constituent pairs with statistically significant trends, excluding select pairs identified in Section 2.2.3, were further evaluated using Mann-Whitney tests to evaluate if the datasets should be truncated to better represent present-day groundwater quality concentrations. While a statistically significant trend was not identified for chloride at MW-3, it was also carried forward to the Mann-Whitney test based on the appearance of two distinct populations in the historical record.

2.2.3 Establishment of Updated Background Dataset

Analysis of variance was conducted during the initial background screening to assist in evaluating whether intrawell testing is the most appropriate statistical approach for assessing Appendix III parameters (Geosyntec 2017). Intrawell tests, which compare compliance data from a single well to background data within the same well, are most appropriate 1) when 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. It is necessary to update background statistical limits (calculated prediction limits) periodically because natural systems change continuously with physical changes to the environment. For intrawell analyses, data for all wells and constituents are reevaluated when a minimum of four new data points are available. These four (or more) new data points are used to determine whether earlier concentrations are representative of present-day groundwater quality.

Mann-Whitney (Wilcoxon rank-sum) tests were used to compare the medians of historical data (September 2011–June 2021) to the new compliance samples (November 2021–November 2023) for well-constituent pairs where a significant trend was identified. Mann-Whitney tests were not used to evaluate the data at MW-11, as no statistically significant trends were identified (Attachment B). While statistically significant increasing trends were observed for pH at upgradient well MW-1 and at downgradient wells MW-2 and MW-3 and a statistically significant decreasing trend was found for total dissolved solids (TDS) at downgradient well MW-4, the magnitudes of the slopes were minimal. Also, an increasing trend was observed for fluoride at downgradient well MW-5; however, the trend was impacted by nondetect values. Mann-Whitney tests were not evaluated for these well-constituent pairs and the entire dataset was used when reestablishing the background values.

The Mann-Whitney test results for the remaining well-constituent pairs were evaluated to determine whether the medians of the two groups were similar at the 99% confidence level (Attachment B). Where no significant difference was found, the new compliance data were added to the background dataset. Where a statistically significant difference was found, the data were reviewed to evaluate the cause of the difference and to assess which was most appropriate: adding newer data to the background dataset, replacing the background dataset with the newer data, or continuing to use the existing background dataset. If the differences appeared to have been caused by a release, then the previous background dataset would continue to be used.

Significant differences were found between the two groups for the following upgradient well/parameter pairs:

- Increases were found for fluoride at MW-1.

- Decreases were found for boron, chloride, sulfate, and TDS at MW-1.

The datasets for boron, chloride, fluoride, sulfate and TDS at MW-1 were truncated to better represent present-day conditions.

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

- Decreases were found for boron at MW-2, MW-3, MW-4, MW-5, and MW-10.

- Decreases were found for chloride at MW-2, MW-3, MW-5, and MW-10.

- Decreases were found for sulfate at MW-2, MW-3, MW-4, MW-5, and MW-10.

- Decreases were found for TDS at MW-2, MW-3, MW-5, and MW-10.

While pre-waste placement data is available at all wells except MW-11, the datasets for the well-constituent pairs listed above were truncated to better reflect present-day conditions and generate more conservative background values (Attachment B).

After the revised background set was established, a parametric or nonparametric analysis was selected based on the distribution of the data and the frequency of nondetect data. Estimated results less than the practical quantitation limit (PQL)—that is, "J-flagged" data—were considered detections, and the estimated results were used in the statistical analyses. Nonparametric analyses were selected for datasets with at least 50% nondetect 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 nondetect adjustment was applied to datasets with between 15% and 50% nondetect data. For datasets with fewer than 15% nondetect data, nondetect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or nonparametric) and transformation (where applicable) for each background dataset are shown in Attachment B.

2.2.4 Updated Prediction Limits

Most historical data through November 2023, except as noted above, were used to update the intrawell UPLs (and intrawell LPLs, for pH) and to represent background values (Table 3).

The intrawell UPLs and LPLs were calculated for a one-of-two retesting procedure; that is, if at least one sample in a series of two has no measurement greater than the UPL and if the pH result is greater than or equal to the LPL, then it can be concluded that a statistically significant increase has not occurred. In practice, where the initial result is not greater than the UPL and where the pH result is greater than or equal to the LPL, a second sample will not be collected. The retesting procedures allow an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated with intrawell prediction limits.

2.3 Conclusions

Five detection monitoring events were completed between November 2021 and November 2023 in accordance with the CCR rule. Data from these events were included in the new dataset. Additionally, historical data from MW-11 was incorporated into the dataset following the addition of MW-11 to the certified groundwater monitoring network (Terracon 2024). The laboratory and field data from these events were reviewed prior to statistical analysis, and no QA/QC issues that impacted data usability were identified. Trend tests and 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 testing (using a one-of-two retesting procedure) was selected as the method of analysis, and testing data were updated for all Appendix III parameters.

3. REFERENCES

Geosyntec. 2017. *Statistical Analysis Summary. Landfill – John W. Turk Plant*. Geosyntec Consultants, Inc. December.

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Terracon. 2024. *Groundwater Monitoring Network for CCR Compliance – John W. Turk Jr. Power Plant Class 3N Landfill.* Terracon Consultants, Inc. June.

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

TABLES

Table 1. Groundwater Data Summary
Statistical Analysis Summary – Background Update Calculations
Turk Plant – Landfill

Geosyntec Consultants, Inc.

Parameter	Unit	MW-1				
		11/29/2021	6/7/2022	11/28/2022	6/14/2023	11/29/2023
		2021-D2	2022-D1	2022-D2	2023-D1	2023-D2
Boron	mg/L	0.25	0.159	0.396	0.084	0.082
Calcium	mg/L	289 M1, P3	180	287 M1	155	154
Chloride	mg/L	227	171	264	169	180
Fluoride	mg/L	1.07	1.36	1.17	1.43	1.42
Sulfate	mg/L	774	353	718	264	270
Total Dissolved Solids	mg/L	1,970	1,240	1,830	1,100	1,110
pH	SU	7.0	7.3	7.2	7.2	7.0

Parameter	Unit	MW-2					
		11/29/2021	6/7/2022	11/28/2022	1/19/2023	11/29/2023	6/14/2023
		2021-D2	2022-D1	2022-D2	2022-D2-R1	2023-D2	2023-D1
Boron	mg/L	0.045 J1	0.035 J1	0.064	--	0.043 J1	0.054
Calcium	mg/L	89.3	67.3	143	66.6	81.2	75.4
Chloride	mg/L	13.9	5.26	52.8	--	11.6	4.73
Fluoride	mg/L	0.29	0.33	0.26	--	0.28	0.31
Sulfate	mg/L	40.9	21.8	161	--	33.3	49.1
Total Dissolved Solids	mg/L	340	280	610	--	340	320
pH	SU	7.5	7.4	7.5	7.5	7.3	7.4

Parameter	Unit	MW-3					
		11/29/2021	6/7/2022	11/28/2022	1/19/2023	6/14/2023	11/29/2023
		2021-D2	2022-D1	2022-D2	2022-D2-R1	2023-D1	2023-D2
Boron	mg/L	0.07 J1	0.050	0.077	--	0.077	0.070
Calcium	mg/L	225	122	207	--	144	154
Chloride	mg/L	263	123	265	--	145	174
Fluoride	mg/L	0.25	0.30	0.29	--	0.32	0.29
Sulfate	mg/L	193	100	276	--	187	185
Total Dissolved Solids	mg/L	1,040	710	1,160	--	830	900
pH	SU	7.0	7.3	7.2	7.2	7.3	7.1

Parameter	Unit	MW-4					
		11/29/2021	6/24/2022	6/7/2022	11/28/2022	6/14/2023	11/29/2023
		2021-D2	2022-D1-R1	2022-D1	2022-D2	2023-D1	2023-D2
Boron	mg/L	0.49	--	0.263	0.358	0.215	0.143
Calcium	mg/L	692	--	492	600	445	366
Chloride	mg/L	1,020	--	1,010	1,180	997	840
Fluoride	mg/L	0.22	--	0.2 J1	0.2 J1	0.24	0.27
Sulfate	mg/L	496	--	497	579	309	93
Total Dissolved Solids	mg/L	2,900	--	4,100	3,100	2,640 S7	2,170
pH	SU	6.7	6.1	5.7	6.9	6.7	6.7

Parameter	Unit	MW-5				
		11/29/2021	6/7/2022	11/28/2022	6/14/2023	11/29/2023
		2021-D2	2022-D1	2022-D2	2023-D1	2023-D2
Boron	mg/L	0.16 J1	0.035 J1	0.025 J1	0.064	0.049 J1
Calcium	mg/L	419	220	262	279	51.2
Chloride	mg/L	155	62.3	166	135	82.9
Fluoride	mg/L	0.30	0.27	0.28	0.28	0.26
Sulfate	mg/L	371	210	273	312	283
Total Dissolved Solids	mg/L	1,430	950	1,120	1,290	1,030
pH	SU	6.7	6.4	7.1	6.6	6.7

Parameter	Unit	MW-10*				
		11/29/2021	11/28/2022	1/19/2023	6/14/2023	11/29/2023
		2021-D2	2022-D2	2022-D2-R1	2023-D1	2023-D2
Boron	mg/L	0.03 J1	0.267	--	0.052	0.038 J1
Calcium	mg/L	222	706	696	307	172
Chloride	mg/L	240	992	--	238	79.2
Fluoride	mg/L	0.18	0.33	--	0.21	0.18
Sulfate	mg/L	278	1,710	--	444	161
Total Dissolved Solids	mg/L	1,430	3,800	--	1,580	900
pH	SU	6.4	6.6	6.7	6.8	6.8

Notes:

*: The first semiannual detection monitoring event of 2022 (June) was removed from the background due to an obstruction found in the well.

--: not measured

D1: first semiannual detection monitoring event of the year

D2: second semiannual detection monitoring event of the year

J1: estimated value. Parameter was detected in concentrations below the reporting limit

M1: the associated matrix spike (MS) or matrix spike duplicate (MSD) recovery was outside acceptance limits.

mg/L: milligrams per liter

P3: the precision on the matrix spike duplicate (MSD) was above acceptance limits.

R1: first verification event associated with detection monitoring round

S7: sample did not achieve constant weight.

SU: standard unit

U1: parameter was not present in concentrations above the method detection limit and is reported as the reporting limit

Table 2. MW-11 Data Summary
Statistical Analysis Summary – Background Update Calculations
Turk Plant – Landfill

Parameter	Unit	MW-11					
		6/1/2016	7/25/2016	9/1/2016	11/2/2016	12/15/2016	2/1/2017
		Background	Background	Background	Background	Background	Background
Boron	mg/L	0.222	0.158	0.151	0.165	0.152	0.156
Calcium	mg/L	656	554	527	544	524	516
Chloride	mg/L	784	668	699	729	675	748
Fluoride	mg/L	0.5131 J1	0.4984 J1	0.543 J1	0.4413 J1	0.448 J1	1 U1
Sulfate	mg/L	1,116	760	726	830	718	820
Total Dissolved Solids	mg/L	3,432	3,031	2,956	2,980	2,376	2,876
pH	SU	8.0	7.3	6.6	6.9	6.2	6.1

Parameter	Unit	MW-11					
		2/21/2017	5/2/2017	6/29/2017	7/19/2017	8/10/2017	4/26/2018
		Background	Background	Background	2017-D1	2017-D2	2018-D1
Boron	mg/L	0.155	0.141	0.15	0.161	0.158	0.158
Calcium	mg/L	507	491	522	532	533	531
Chloride	mg/L	682	758	682	711	727	792
Fluoride	mg/L	1 U1	0.49 J1	0.4399 J1	1 U1	0.546 J1	1 U1
Sulfate	mg/L	740	757	704	740	734	827
Total Dissolved Solids	mg/L	2,856	--	2,928	2,804	2,868	3,306
pH	SU	8.0	6.0	6.4	6.1	--	7.5

Parameter	Unit	MW-11					
		9/5/2018	4/17/2019	9/19/2019	5/27/2020	11/9/2020	6/29/2021
		2018-D2	2019-D1	2019-D2	2020-D1	2020-D2	2021-D1
Boron	mg/L	0.165	0.133	0.147	0.200 U1	0.200 U1	0.200 U1
Calcium	mg/L	709	529	614	540	527	536
Chloride	mg/L	948	867	837	870	808	855
Fluoride	mg/L	0.483 J1	0.36	0.34	0.307	0.400	0.398
Sulfate	mg/L	969	923	863	860	819	909
Total Dissolved Solids	mg/L	3,414	3,656	3,520	3,280	2,930	2,990
pH	SU	7.5	7.4	6.6	7.6	6.5	6.2

Parameter	Unit	MW-11					
		11/29/2021	6/7/2022	11/28/2022	6/14/2023	11/29/2023	6/25/2024
		2021-D2	2022-D1	2022-D2	2023-D1	2023-D2	2024-D1
Boron	mg/L	0.200 U1	0.200 U1	0.200 U1	0.200 U1	0.133	0.129
Calcium	mg/L	545	514	472	521	492	505
Chloride	mg/L	790	687	752	806	849	819
Fluoride	mg/L	0.400	0.150 U1	0.279	0.343	0.31	0.36
Sulfate	mg/L	762	625	757	913	850	899
Total Dissolved Solids	mg/L	2,670	2,110	2,410	2,810	2,680	2,880
pH	SU	6.8	6.9	6.7	6.5	7.4	7.0

Notes:

--: not measured

D1: first semiannual detection monitoring event of the year

D2: second semiannual detection monitoring event of the year

J1: estimated value. Parameter was detected in concentrations below the reporting limit

mg/L: milligrams per liter

SU: standard unit

U1: parameter was not present in concentrations above the method detection limit and is reported as the reporting limit

Table 3. Background Level Summary
Statistical Analysis Summary – Background Update Calculations
Turk Plant – Landfill

Analyte	Unit	Description	MW-2	MW-3	MW-4	MW-5	MW-10	MW-11
Boron	mg/L	Intrawell Background Value (UPL)	0.401	0.188	0.517	0.123	0.233	0.187
Calcium	mg/L	Intrawell Background Value (UPL)	133	237	766	380	475	709
Chloride	mg/L	Intrawell Background Value (UPL)	41.7	305	1,241	177	836	924
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	0.978	1.00	1.00	1.25	0.626
pH	SU	Intrawell Background Value (UPL)	8.3	8.0	7.6	7.8	7.6	8.1
		Intrawell Background Value (LPL)	6.4	6.4	6.2	6.1	5.8	5.6
Sulfate	mg/L	Intrawell Background Value (UPL)	347	497	894	406	1,710	1,028
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	719	1,317	4,734	1,601	3,854	3,724

Notes:
LPL: lower prediction limit
mg/L: milligrams per liter
SU: standard units
UPL: upper prediction limit

ATTACHMENT A
Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Turk 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

15296   Arkansas   10.14.2024
_____   _____   _____
License Number   Licensing State   Date

ATTACHMENT B
Statistical Analysis Output

October 3, 2024

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
500 W. Wilson Bridge Road, Suite 250
Worthington, OH 43085
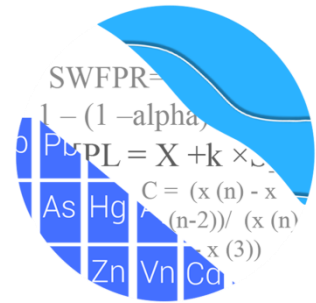
RE: Background Update 2023 – Turk Landfill

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the proposed background update of prediction limits with data through November 2023 for American Electric Power's Turk Landfill. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (CCR Rule, 2015) as well as with the United States Environmental Protection Agency (USEPA) Unified Guidance (2009).

The Turk Landfill is a lined landfill that has been sampling groundwater at each well for the CCR program since June 2016. Prior to regulation under this program, groundwater data collection began in 2011 before waste was placed at the Landfill in 2013. Groundwater sampling continued through March 2016 and prior to the start of sampling under the CCR regulations. All data collected through March 2016 are, reportedly, considered background data due downgradient well placement of approximately 300 feet away from the Landfill and transport times of groundwater estimated at 30 ft./year. Additionally, the landfill is lined, and pre-waste data are available to characterize natural conditions of groundwater.

The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- Upgradient well MW-1
- Downgradient wells MW-2, MW-3, MW-4, MW-5, MW-10, and MW-11

Data were sent electronically to Groundwater Stats Consulting, and the statistical analysis was reviewed by Kristina Rayner, Founder and Senior Statistician to Groundwater Stats Consulting. The statistical analysis was prepared according to the background screening conducted in December 2017 that was approved by Dr. Kirk Cameron.

The following CCR Detection Monitoring constituents were evaluated:

- **Appendix III Parameters**: boron, calcium, chloride, fluoride, pH, sulfate, and TDS

Time series plots for these parameters are provided for all wells and constituents; and are used to evaluate concentrations over time as well as for the purpose of updating statistical limits (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). Values in background which have been flagged as outliers may be seen in a lighter font and as a disconnected symbol on the graph. A summary of these values follows this letter (Figure C). 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.

Note that observations collected on 6/24/22 from downgradient well MW-10, reportedly, were collected with an obstruction in the well; therefore, these observations are not used for statistical analyses and are flagged as outliers.

During the initial background screening conducted in December 2017 data at all wells were evaluated 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 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 Method:

- 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 non-detects, a nonparametric test is utilized. While the false positive rate associated with the parametric limits is based on an annual 10% as recommended by the EPA Unified Guidance (2009), the false positive rate associated with the nonparametric

limits is dependent upon the available background sample size, number of future comparisons, and verification resample plan. 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. Non-detects are handled as follows:

- No statistical analyses are required on wells and analytes containing 100% non-detects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% non-detects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the most recent practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% non-detects, the Kaplan-Meier non-detect adjustment is applied to the background data for parametric limits. 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% non-detects.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits is necessary to accommodate these types of changes. In the intrawell case, data for all wells and constituents are re-evaluated when a minimum of 4 new data points for each well are available to determine whether earlier concentrations are representative of present-day groundwater quality. In some cases, the earlier portion of data are deselected prior to construction of limits in order to provide sensitive limits that will rapidly detect changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Summary of Initial Background Screening – December 2017

Outlier Evaluation

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

Tukey's outlier test noted an outlier for sulfate in well MW-4, and this value was flagged as such in the database. A substitution of the most recent reporting limit was applied when varying detection limits existed in data. The results were submitted with the background screening report.

Seasonality

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

Trends

While trends may be identified visually, 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 may be deselected as necessary to obtain regulatory conservative limits. When the historical records of data are truncated for the reasons above, a summary report is provided to show the date ranges used in construction of the statistical limits.

The results of the trend analyses showed several statistically significant trends, both decreasing and increasing. At the time of the screening, the majority of these trends were relatively low in magnitude when compared to average concentrations. Therefore, no adjustments were made to the data sets with a few exceptions as described below.

While the test identified an increasing trend for fluoride at well MW-10, the trend was low in magnitude compared to average concentrations at this well; however, the most recent measurement reported in July 2017 was higher than all other historic measurements. Therefore, the background period used in the statistical analysis included all historical data through June 2017.

A few well/constituent pairs utilized a truncated background period to establish statistical limits due to decreasing trends. For those cases, distinct concentration differences were apparent in background data, with the more recent concentrations considerably lower than historical measurements. Selecting the more recent measurements for construction

of statistical limits will result in lower limits that are considered more conservative from a regulatory perspective. The truncated well/constituent pairs included: chloride in wells MW-2 and MW-3; sulfate in wells MW-2 and MW-3; and total dissolved solids in well MW-3.

Appendix III – Determination of Spatial Variation

The Analysis of Variance (ANOVA) is typically used to statistically evaluate differences in average concentrations among upgradient wells, which assists in identifying whether the interwell or intrawell methods are the most appropriate statistical approach for a given parameter. However, this evaluation was not possible at the Turk Landfill because only one upgradient well currently exists in the monitoring well network. Since pre-waste data are available for all wells at the Turk Landfill, the ANOVA was used to evaluate whether natural spatial variation exists in groundwater among the entire well network at the site using all pre-CCR data through March 2016 to determine whether interwell or intrawell statistical limits are recommended. In all cases except pH, variation was identified by the ANOVA. Because pre-waste data are available and groundwater downgradient of the facility is not suspected to be affected from practices at the site, the intrawell method was recommended for each of the Appendix III parameters.

Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when multiple upgradient wells are available and when average concentrations are similar across upgradient wells. Intrawell tests, which compare compliance data from a single well to screened historical data within the same well, are appropriate when limited upgradient well data are available; when upgradient wells exhibit spatial variation; or when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective. Additionally, downgradient water quality must be considered to be unimpacted from the facility.

All Appendix III parameters were evaluated during the background screening, and the results of those findings were submitted with that report. All available data through July 2017, with the exceptions noted above for truncated background periods, at each well were used to establish intrawell background limits, based on a 1-of-2 resample plan, that are used for future comparisons of compliance data at each well during subsequent semi-annual sample events.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of an additional sample to determine whether the initial exceedance is confirmed. When the resample confirms the initial exceedance, a statistically significant increase (SSI) is identified, and further research would be required to identify the cause of

the exceedance (i.e. impact from the site, natural variation, or an off-site source). If the resample falls within the statistical limit, the initial exceedance is considered to be a false positive result, and therefore, no further action is necessary.

Background Update – Conducted in August 2024

Intrawell prediction limits, which compare the most recent compliance sample from a given well to historical data from the same well, are updated by testing for the appropriateness of consolidating new sampling observations with the screened background data. This process requires a minimum of four new measurements as mentioned above. Background data sets were last updated in July 2022 and a summary of those findings was included with that report. Well/constituent pairs were updated with background data through June 2021 at that time.

During this analysis, historical data, as discussed below, were evaluated for updating with newer data through November 2023. Time series graphs and Tukey's outlier test were used to identify potential outliers. The Sen's Slope/Mann Kendall trend test was used to evaluate whether statistically significant increasing or decreasing trends are present at the 99% confidence level. The Mann-Whitney test was further used to compare the medians of more recent data to the medians of earlier concentrations at the 99% confidence level.

Outlier Evaluation

The Appendix III parameters at all wells were screened for outliers using Tukey's outlier test and visual screening and confirmed previously flagged values (Figure C). However, due to the natural log transformation as well as a high degree of variation in several records, Tukey's test did not identify a number of values that were flagged as outliers and deselected prior to construction of prediction limits during this analysis. Any values not identified by Tukey's outlier test but were flagged in the database were considerably higher than remaining concentrations within a given well and would have resulted in statistical limits that are not conservative from a regulatory perspective. As mentioned above, observations collected on 6/24/22 from downgradient well MW-10, reportedly, were collected with an obstruction in the well; therefore, these observations are not used for statistical analyses and are flagged as outliers. A summary of all flagged values follows this letter (Figure C).

Trend Tests

Among the majority of records, concentrations appear to have statistically significantly decreased over time. To quantify the magnitude of the decrease (and in some cases the

increase) in concentrations, trend tests were used to evaluate all well/constituent pairs (Figure D). Statistically significant trends were identified for the following well/constituent pairs:

Increasing:
- Fluoride: MW-1 (upgradient) and MW-5
- pH: MW-1 (upgradient), MW-2, and MW-3

Decreasing:
- Boron: MW-1 (upgradient), MW-2, MW-3, MW-4, MW-5, and MW-10
- Chloride: MW-1 (upgradient), MW-2, MW-4, MW-5, and MW-10
- Sulfate: MW-1 (upgradient), MW-2, MW-3, MW-4, MW-5, and MW-10
- TDS: MW-1 (upgradient), MW-2, MW-3, MW-4, MW-5, and MW-10

Note that no statistically significant trends were identified for any Appendix III parameters at well MW-11; therefore, no adjustments were required for any of the data sets at this well.

When statistically significant trends are present, data are further evaluated to determine if earlier data require deselection to eliminate the influence of the trend and generate statistical limits that are representative of present-day groundwater quality concentrations.

Mann-Whitney Evaluation

For the majority of records identified with statistically significant trends, it was noted that the historical data sets in each respective record contained more variable and higher concentrations than the than the group of more recent and stable measurements. The Mann-Whitney test was used on records with statistically significant trends in order to quantify the differences between two observed populations (Figure E). While the Sen's Slope/Mann Kendall trend test did not identify a statistically significant trend for chloride at well MW-3, two distinct populations were observed in this record; therefore, data were further evaluated for this well/constituent pair using the Mann-Whitney test.

The following records, however, were not evaluated with the Mann-Whitney: fluoride at well MW-5, pH at wells MW-1, MW-2, and MW-3, and TDS at MW-4. Although statistically significant trends were identified by the Sen's Slope/Mann Kendall test, in the case of fluoride at well MW-5, the trend resulted from reported non-detects in the middle of the record; and in the cases of pH at well MW-1, MW-2, and MW-3 as well as TDS at well

MW-4, the magnitudes of the slopes were marginal relative to average concentrations for each well/constituent pair. Therefore, these records were not truncated.

Historical data from the following well/constituent pairs identified with statistically significant differences at the 99% confidence level were truncated from the record to construct statistical limits that are conservative from a regulatory perspective and can readily identify changes in groundwater concentrations:

- Boron: MW-1 (upgradient), MW-2, MW-3, MW-4, MW-5, and MW-10
- Chloride: MW-1 (upgradient), MW-2, MW-3, MW-5, and MW-10
- Fluoride: MW-1 (upgradient)
- Sulfate: MW-1 (upgradient), MW-2, MW-3, MW-4, MW-5, and MW-10
- TDS: MW-1 (upgradient), MW-2, MW-3, MW-5, and MW-10

Both a summary of statistically significant results along with a list of well/constituent pairs using a truncated portion of their record used in construction of statistical limits follow this report.

<u>Prediction Limits</u>

Intrawell prediction limits using all historical data through November 2023, except for cases discussed above, combined with a 1-of-2 resample plan, were constructed, and a summary of the updated limits follows this letter (Figure F).

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

For Groundwater Stats Consulting,

Andrew T. Collins
Project Manager

Kristina L. Rayner
Senior Statistician

Sanitas™ v.10.0.20 Software licensed to Groundwater Stats Consulting. UG

Page 1

Date Ranges

Boron (mg/L)
        MW-1 background:5/5/2015-11/29/2023
        MW-2 background:5/5/2015-11/29/2023
        MW-3 background:8/5/2014-11/29/2023
        MW-4 background:7/25/2016-11/29/2023
        MW-5 background:6/1/2016-11/29/2023
        MW-10 background:8/19/2015-11/29/2023
Chloride (mg/L)
        MW-1 background:2/1/2017-11/29/2023
        MW-2 background:11/5/2014-11/29/2023
        MW-3 background:5/5/2014-11/29/2023
        MW-5 background:6/1/2016-11/29/2023
        MW-10 background:6/1/2016-11/29/2023
Fluoride (mg/L)
        MW-1 background:2/10/2014-11/29/2023
Sulfate (mg/L)
        MW-1 background:12/15/2016-11/29/2023
        MW-2 background:11/5/2014-11/29/2023
        MW-3 background:8/5/2014-11/29/2023
        MW-4 background:11/18/2015-11/29/2023
        MW-5 background:6/1/2016-11/29/2023
        MW-10 background:9/1/2016-11/29/2023
Total Dissolved Solids (mg/L)
        MW-1 background:2/1/2017-11/29/2023
        MW-2 background:5/5/2015-11/29/2023
        MW-3 background:8/5/2014-11/29/2023
        MW-5 background:6/1/2016-11/29/2023
        MW-10 background:8/19/2015-11/29/2023

Time Series

Constituent: Boron   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Constituent: Boron   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Constituent: Calcium   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Constituent: Calcium   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Legend:
- MW-1 (bg)
- MW-2
- MW-3
- MW-4

Constituent: Chloride   Analysis Run 8/30/2024 12:23 PM
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Legend:
- MW-5
- MW-10
- MW-11

Constituent: Chloride   Analysis Run 8/30/2024 12:23 PM
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Legend:
- MW-1 (bg)
- MW-2
- MW-3
- MW-4

Constituent: Fluoride   Analysis Run 8/30/2024 12:23 PM
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Legend:
- MW-5
- MW-10
- MW-11

Constituent: Fluoride   Analysis Run 8/30/2024 12:23 PM
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

SU

Legend:
- MW-1 (bg)
- MW-2
- MW-3
- MW-4

Constituent: pH   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

SU

Legend:
- MW-5
- MW-10
- MW-11

Constituent: pH   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

mg/L

Legend:
- MW-1 (bg)
- MW-2
- MW-3
- MW-4

Constituent: Sulfate   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

mg/L

Legend:
- MW-5
- MW-10
- MW-11

Constituent: Sulfate   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Time Series

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:23 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Boron   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Boron   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Calcium   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Calcium   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Chloride   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Chloride   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Fluoride   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Fluoride   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

SU

n=42 MW-1 (bg)   n=45 MW-2   n=44 MW-3   n=43 MW-4

Constituent: pH   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

SU

n=42 MW-5   n=41 MW-10   n=22 MW-11

Constituent: pH   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

mg/L

n=42 MW-1 (bg)   n=42 MW-2   n=42 MW-3   n=41 MW-4

Constituent: Sulfate   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

mg/L

n=41 MW-5   n=40 MW-10   n=23 MW-11

Constituent: Sulfate   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Box & Whiskers Plot

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:24 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Outlier Summary

	MW-10 Boron (mg/L)	MW-2 Calcium (mg/L)	MW-3 Calcium (mg/L)	MW-5 Calcium (mg/L)	MW-10 Calcium (mg/L)	MW-2 Chloride (mg/L)	MW-10 Chloride (mg/L)	MW-2 Fluoride (mg/L)	MW-10 Fluoride (mg/L)	MW-10 pH (SU)
8/8/2012										
2/10/2014						140 (o)		0.95 (o)		
11/5/2014								1.4 (o)		
7/25/2016			393 (o)	491 (o)						
11/2/2016		398 (o)								
2/21/2017					673 (o)					
7/19/2017									3.17 (o)	
6/24/2022	<0.2 (O)				216 (O)		207 (O)		<0.15 (O)	6.35 (O)
11/28/2022					706 (o)					
1/19/2023					696 (o)					
11/29/2023				51.2 (o)						

	MW-4 Sulfate (mg/L)	MW-10 Sulfate (mg/L)	MW-1 Total Dissolved Solids (mg/L)	MW-10 Total Dissolved Solids (mg/L)
8/8/2012			8200 (o)	
2/10/2014				
11/5/2014	2300 (o)			
7/25/2016				
11/2/2016				
2/21/2017				
7/19/2017				
6/24/2022		295 (O)		1230 (O)
11/28/2022				
1/19/2023				
11/29/2023				

Tukey's Outlier Test - Significant Results

Turk Landfill   Client: Geosyntec   Data: Turk Landfill   Printed 8/7/2024, 3:48 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Calcium (mg/L)	**MW-5**	**Yes**	**491,51.2**	**7/25/2016,11/29/2023**	**NP**	**NaN**	**23**	**276.5**	**81.76**	**normal**	**ShapiroWilk**
Calcium (mg/L)	**MW-11**	**Yes**	**656,709**	**6/1/2016,9/5/2018**	**NP**	**NaN**	**23**	**540.7**	**52.66**	**ln(x)**	**ShapiroWilk**
Fluoride (mg/L)	**MW-10**	**Yes**	**3.17**	**7/19/2017**	**NP**	**NaN**	**41**	**0.4055**	**0.5066**	**ln(x)**	**ShapiroWilk**

Tukey's Outlier Test - All Results

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (mg/L)	MW-1 (bg)	No	n/a	n/a	NP	NaN	42	0.5242	0.5828	ln(x)	ShapiroWilk
Boron (mg/L)	MW-2	No	n/a	n/a	NP	NaN	43	0.3838	0.4332	ln(x)	ShapiroWilk
Boron (mg/L)	MW-3	No	n/a	n/a	NP	NaN	43	0.3505	0.4599	ln(x)	ShapiroWilk
Boron (mg/L)	MW-4	No	n/a	n/a	NP	NaN	42	0.4084	0.107	x^2	ShapiroWilk
Boron (mg/L)	MW-5	No	n/a	n/a	NP	NaN	42	0.1538	0.1303	ln(x)	ShapiroWilk
Boron (mg/L)	MW-10	No	n/a	n/a	NP	NaN	41	0.1513	0.1229	ln(x)	ShapiroWilk
Boron (mg/L)	MW-11	No	n/a	n/a	NP	NaN	23	0.1698	0.02627	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-1 (bg)	No	n/a	n/a	NP	NaN	23	207.1	51.04	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-2	No	n/a	n/a	NP	NaN	24	92.28	70.12	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-3	No	n/a	n/a	NP	NaN	23	136.5	77.83	ln(x)	ShapiroWilk
Calcium (mg/L)	MW-4	No	n/a	n/a	NP	NaN	23	490.1	136.6	normal	ShapiroWilk
Calcium (mg/L)	**MW-5**	**Yes**	**491,51.2**	**7/25/2016,11/29/2023**	**NP**	**NaN**	**23**	**276.5**	**81.76**	**normal**	**ShapiroWilk**
Calcium (mg/L)	MW-10	No	n/a	n/a	NP	NaN	24	360.6	147	ln(x)	ShapiroWilk
Calcium (mg/L)	**MW-11**	**Yes**	**656,709**	**6/1/2016,9/5/2018**	**NP**	**NaN**	**23**	**540.7**	**52.66**	**ln(x)**	**ShapiroWilk**
Chloride (mg/L)	MW-1 (bg)	No	n/a	n/a	NP	NaN	42	341.9	150	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-2	No	n/a	n/a	NP	NaN	42	34.71	34.7	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-3	No	n/a	n/a	NP	NaN	43	171.8	220.4	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-4	No	n/a	n/a	NP	NaN	43	1018	232.4	x^3	ShapiroWilk
Chloride (mg/L)	MW-5	No	n/a	n/a	NP	NaN	42	233.9	183.1	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-10	No	n/a	n/a	NP	NaN	41	566.1	302.1	sqrt(x)	ShapiroWilk
Chloride (mg/L)	MW-11	No	n/a	n/a	NP	NaN	23	770.6	76.18	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-1 (bg)	No	n/a	n/a	NP	NaN	42	0.9813	0.4668	normal	ShapiroWilk
Fluoride (mg/L)	MW-2	No	n/a	n/a	NP	NaN	42	0.4033	0.2185	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-3	No	n/a	n/a	NP	NaN	42	0.42	0.2658	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-4	No	n/a	n/a	NP	NaN	42	0.4198	0.2824	ln(x)	ShapiroWilk
Fluoride (mg/L)	MW-5	No	n/a	n/a	NP	NaN	42	0.4241	0.2804	ln(x)	ShapiroWilk
Fluoride (mg/L)	**MW-10**	**Yes**	**3.17**	**7/19/2017**	**NP**	**NaN**	**41**	**0.4055**	**0.5066**	**ln(x)**	**ShapiroWilk**
Fluoride (mg/L)	MW-11	No	n/a	n/a	NP	NaN	23	0.3604	0.135	x^2	ShapiroWilk
pH (SU)	MW-1 (bg)	No	n/a	n/a	NP	NaN	42	7.023	0.4013	ln(x)	ShapiroWilk
pH (SU)	MW-2	No	n/a	n/a	NP	NaN	45	7.336	0.507	sqrt(x)	ShapiroWilk
pH (SU)	MW-3	No	n/a	n/a	NP	NaN	44	7.213	0.4231	sqrt(x)	ShapiroWilk
pH (SU)	MW-4	No	n/a	n/a	NP	NaN	43	6.872	0.3716	x^6	ShapiroWilk
pH (SU)	MW-5	No	n/a	n/a	NP	NaN	42	6.922	0.4394	ln(x)	ShapiroWilk
pH (SU)	MW-10	No	n/a	n/a	NP	NaN	42	6.678	0.4888	ln(x)	ShapiroWilk
pH (SU)	MW-11	No	n/a	n/a	NP	NaN	22	6.877	0.6202	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-1 (bg)	No	n/a	n/a	NP	NaN	42	831.4	627.7	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-2	No	n/a	n/a	NP	NaN	42	583.7	764.1	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-3	No	n/a	n/a	NP	NaN	42	667.9	877.8	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-4	No	n/a	n/a	NP	NaN	42	637.5	356.1	x^(1/3)	ShapiroWilk
Sulfate (mg/L)	MW-5	No	n/a	n/a	NP	NaN	41	479.1	296	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-10	No	n/a	n/a	NP	NaN	41	889.2	587.4	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-11	No	n/a	n/a	NP	NaN	23	814	105.8	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-1 (bg)	No	n/a	n/a	NP	NaN	42	2319	1377	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-2	No	n/a	n/a	NP	NaN	42	1250	1260	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-3	No	n/a	n/a	NP	NaN	42	1550	1565	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-4	No	n/a	n/a	NP	NaN	43	3353	733	sqrt(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-5	No	n/a	n/a	NP	NaN	42	1637	671.4	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-10	No	n/a	n/a	NP	NaN	41	2641	1148	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	MW-11	No	n/a	n/a	NP	NaN	22	2949	381.5	normal	ShapiroWilk

Tukey's Outlier Screening
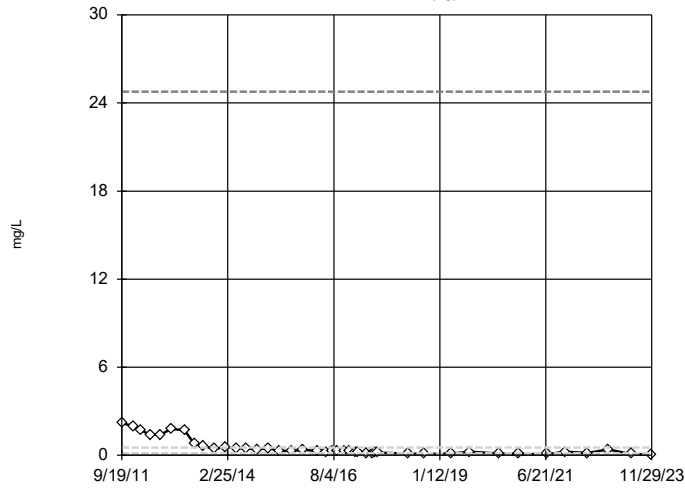
MW-1 (bg)

n = 42

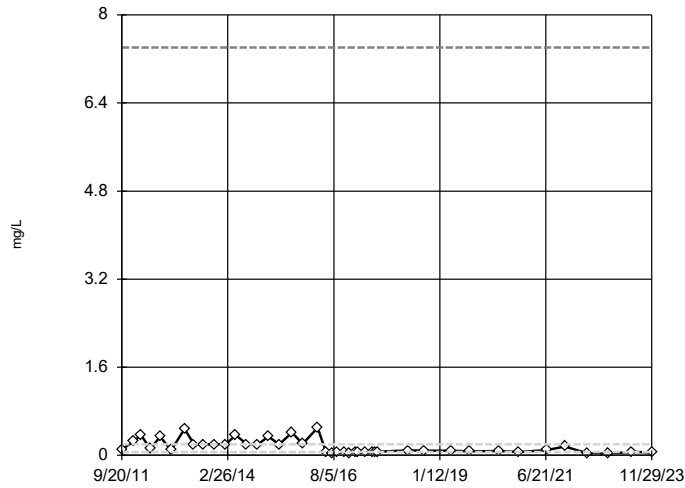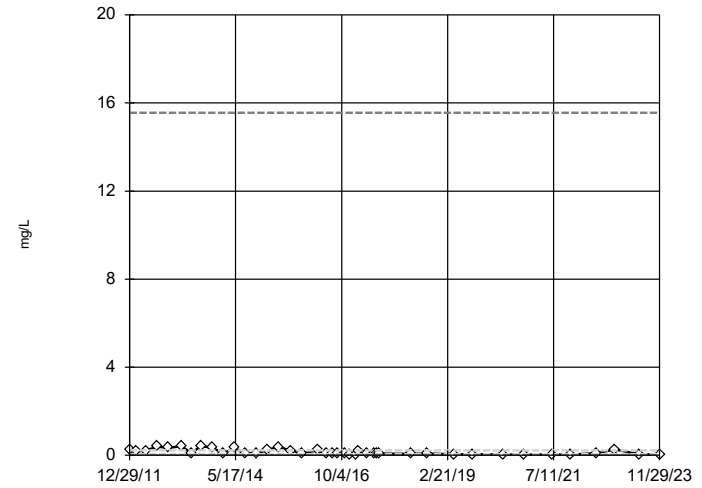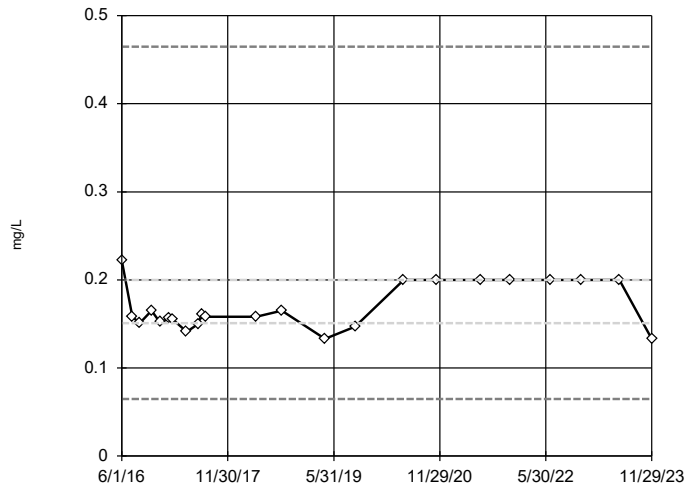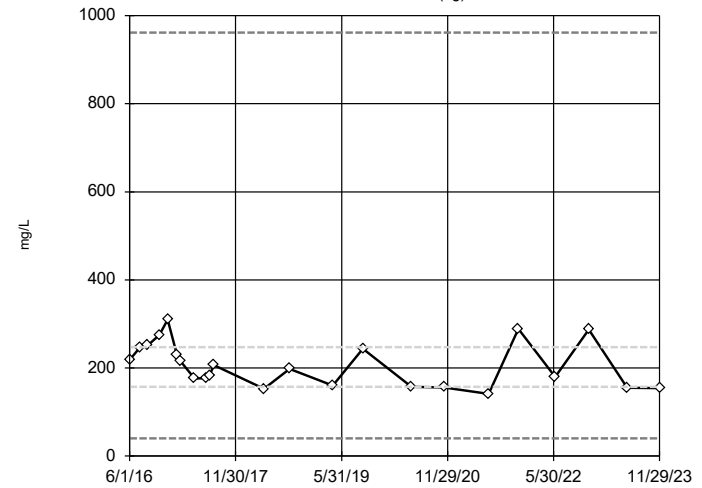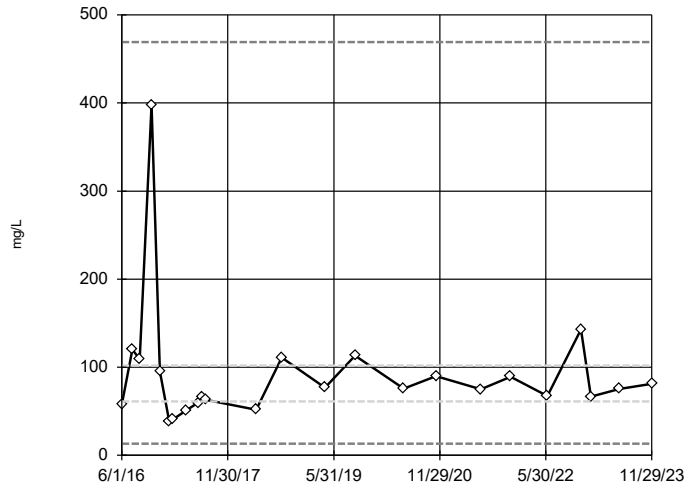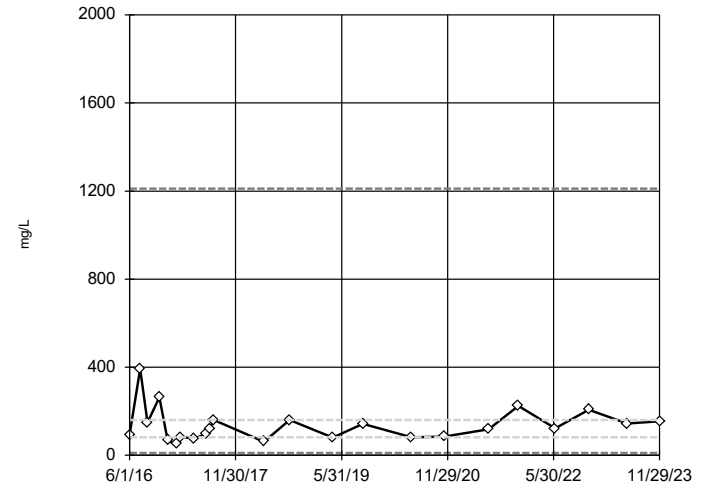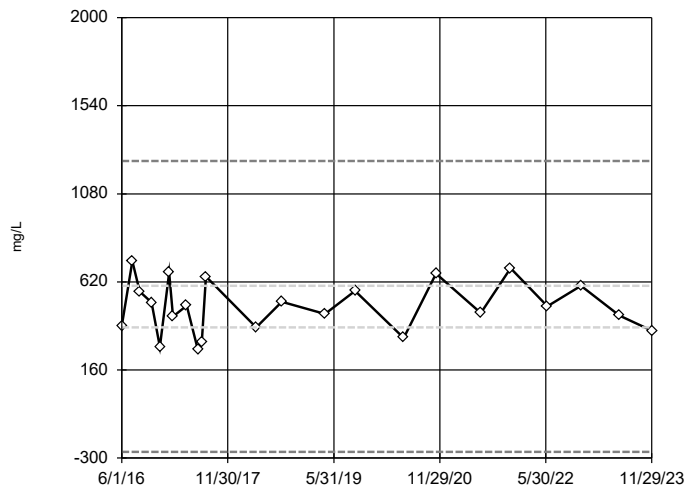No outliers found. Tukey's method selected by user.

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

High cutoff = 24.76, low cutoff = 0.003166, based on IQR multiplier of 3.

Constituent: Boron   Analysis Run 8/7/2024 3:46 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
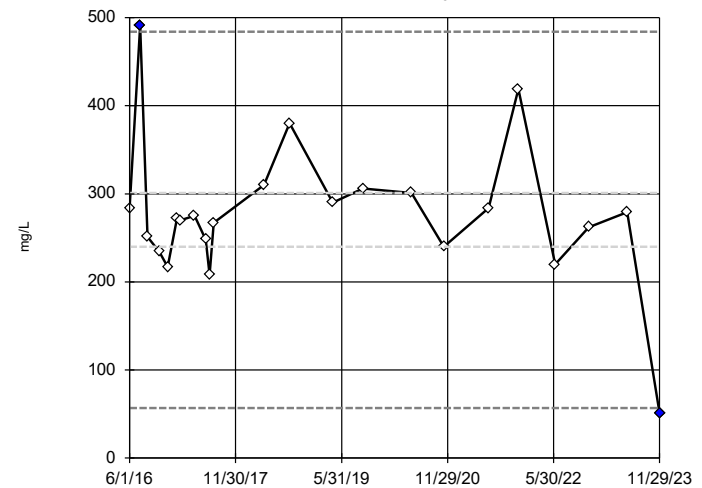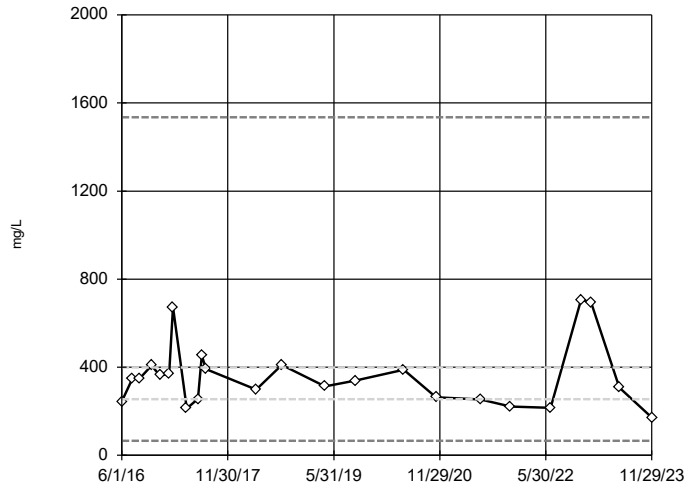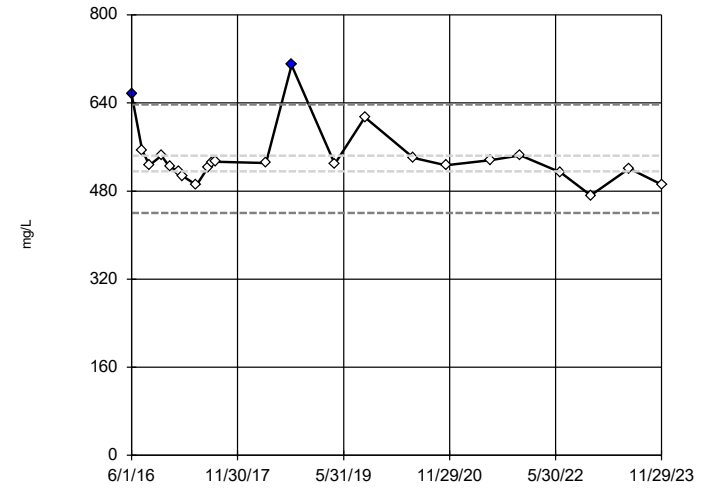
Tukey's Outlier Screening
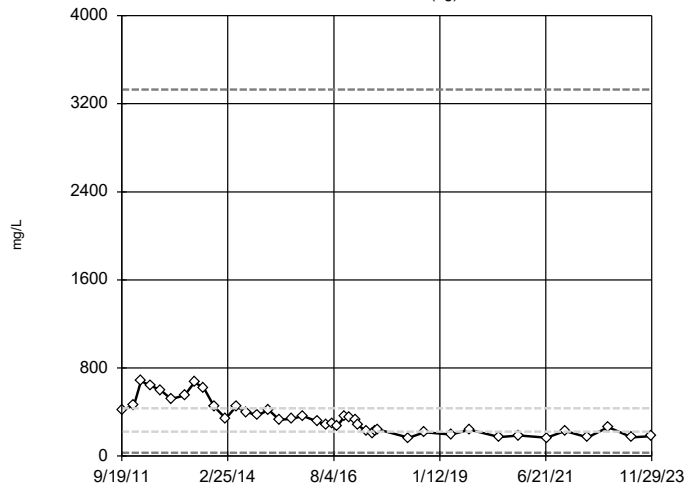
MW-2

n = 43
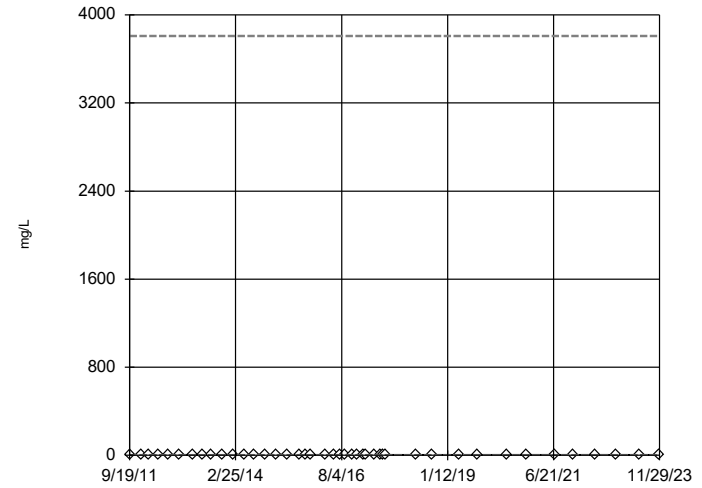
No outliers found. Tukey's method selected by user.

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

High cutoff = 3808, low cutoff = 0.00001248, based on IQR multiplier of 3.

Constituent: Boron   Analysis Run 8/7/2024 3:46 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
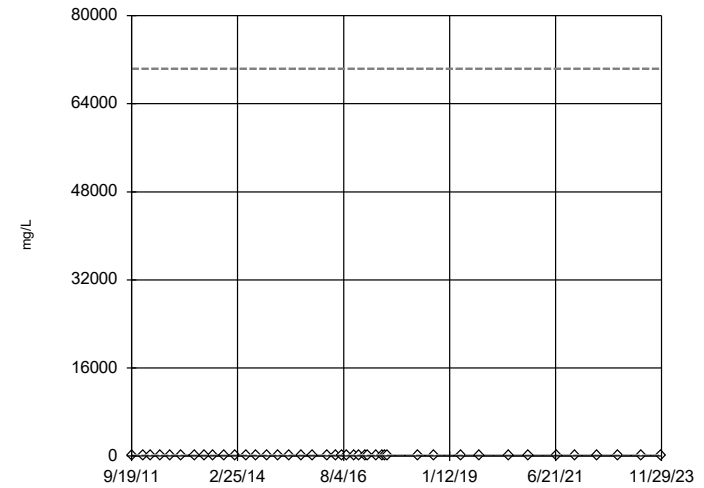
Tukey's Outlier Screening

MW-3

n = 43
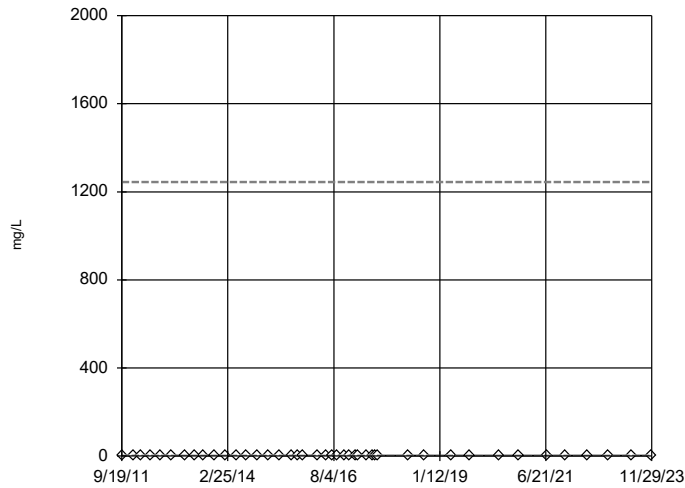
No outliers found. Tukey's method selected by user.

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

High cutoff = 1244, low cutoff = 0.00003472, based on IQR multiplier of 3.

Constituent: Boron   Analysis Run 8/7/2024 3:46 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-4

n = 42
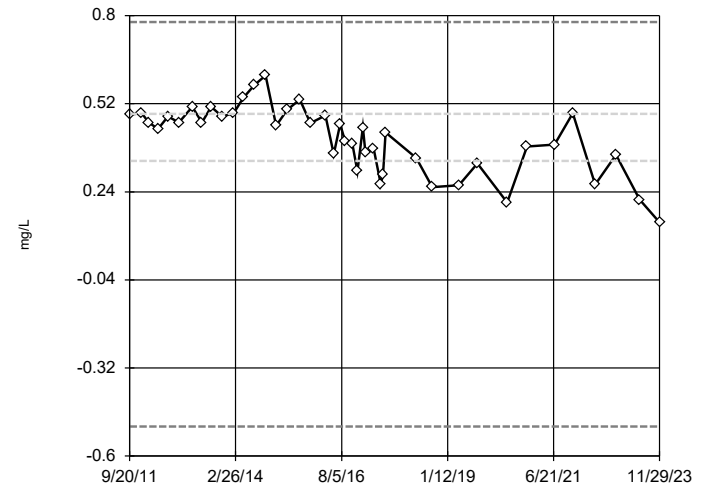
No outliers found. Tukey's method selected by user.

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

High cutoff = 0.7801, low cutoff = -0.5058, based on IQR multiplier of 3.

Constituent: Boron   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

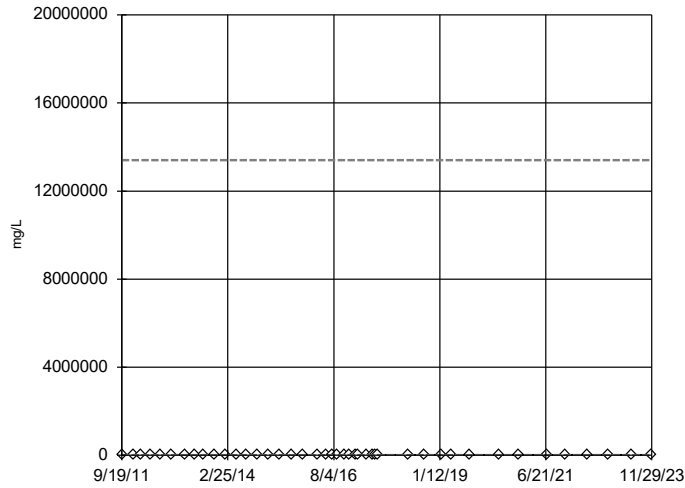## Tukey's Outlier Screening

MW-5

mg/L

n = 42

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 = 7.407, low cutoff = 0.00162, based on IQR multiplier of 3.

Constituent: Boron   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening
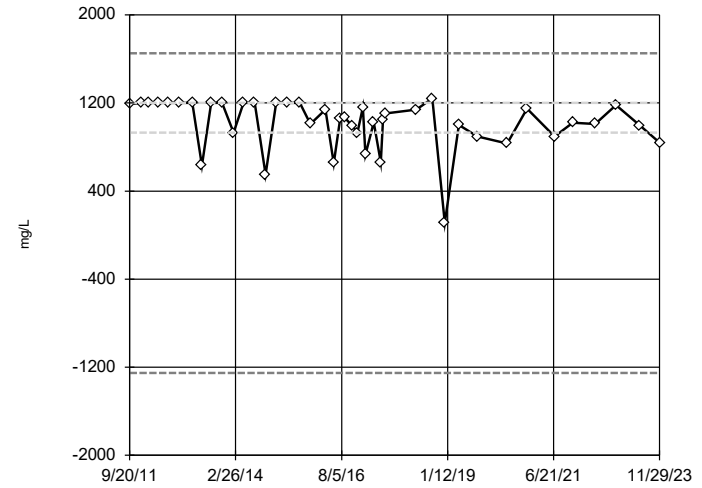
MW-10

mg/L

n = 41

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 = 15.56, low cutoff = 0.000846, based on IQR multiplier of 3.

Constituent: Boron   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-11

mg/L

n = 23

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 = 0.4647, low cutoff = 0.06499, based on IQR multiplier of 3.

Constituent: Boron   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
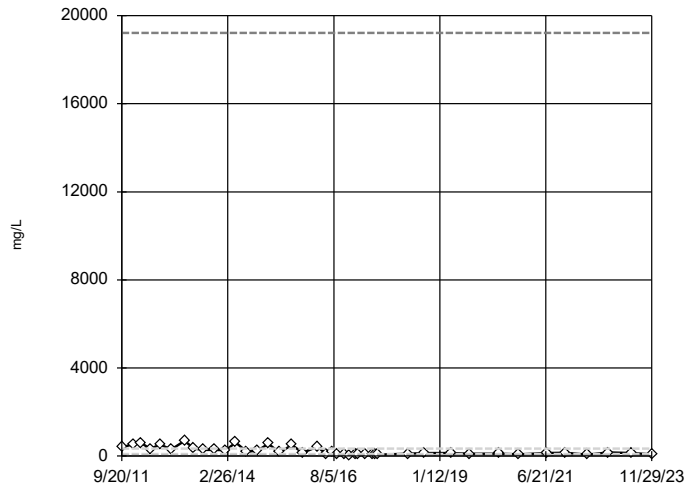
Tukey's Outlier Screening

MW-1 (bg)

mg/L

n = 23

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 = 961.8, low cutoff = 40.32, based on IQR multiplier of 3.

Constituent: Calcium   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

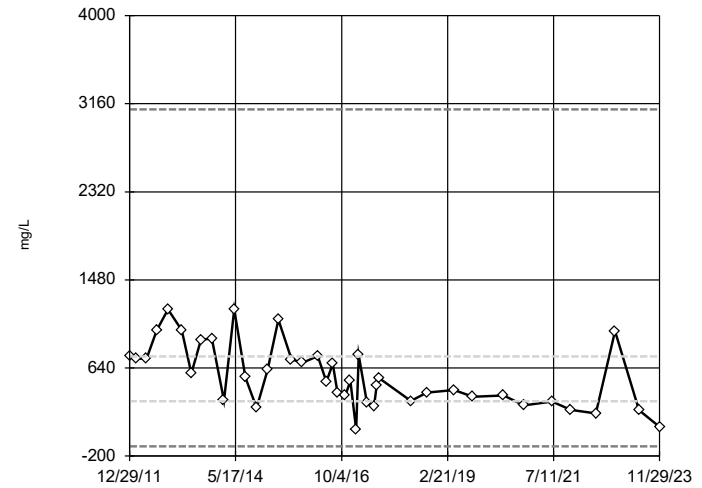## Tukey's Outlier Screening

MW-2

n = 24

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 = 469.1, low cutoff = 13.3, based on IQR multiplier of 3.

Constituent: Calcium   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

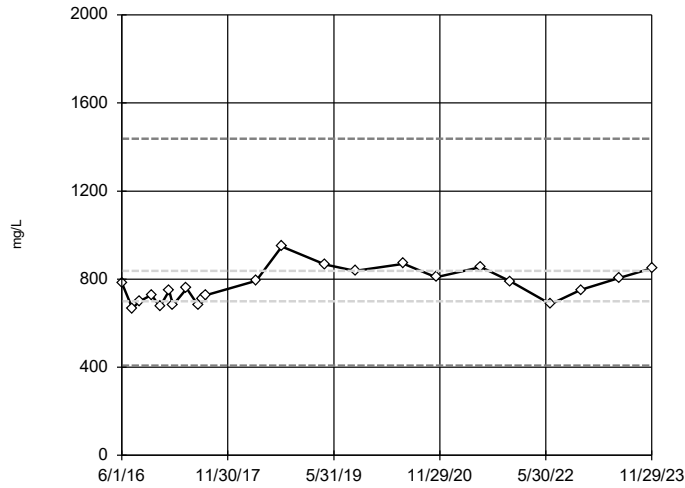## Tukey's Outlier Screening

MW-3

n = 23

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 = 1211, low cutoff = 10.77, based on IQR multiplier of 3.

Constituent: Calcium   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-4

n = 23

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

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

High cutoff = 1251, low cutoff = -268, based on IQR multiplier of 3.

Constituent: Calcium   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-5

n = 23

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

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

High cutoff = 484, low cutoff = 57, based on IQR multiplier of 3.

Constituent: Calcium   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

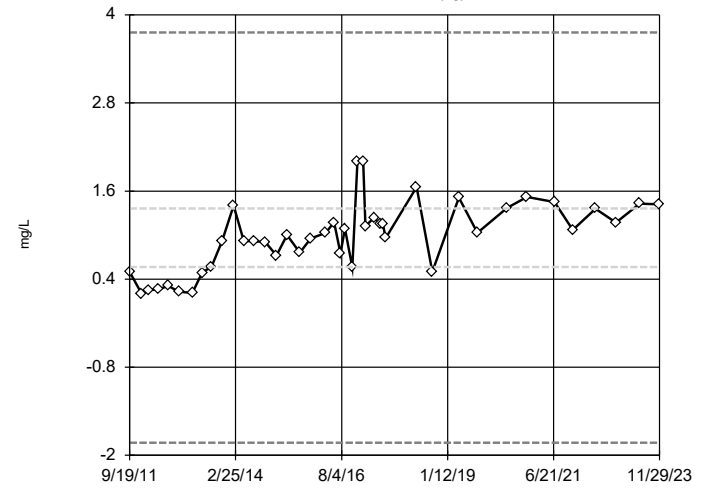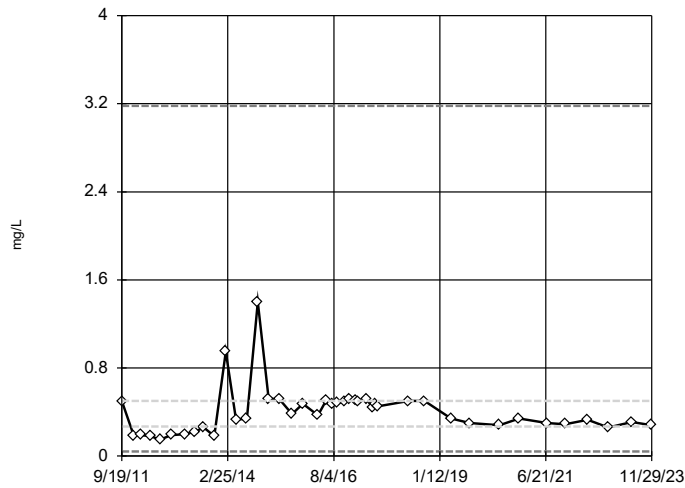## Tukey's Outlier Screening

MW-10

n = 24

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 = 1535, low cutoff = 66.35, based on IQR multiplier of 3.

Constituent: Calcium   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-11

n = 23

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 = 637.5, low cutoff = 440.4, based on IQR multiplier of 3.

Constituent: Calcium   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
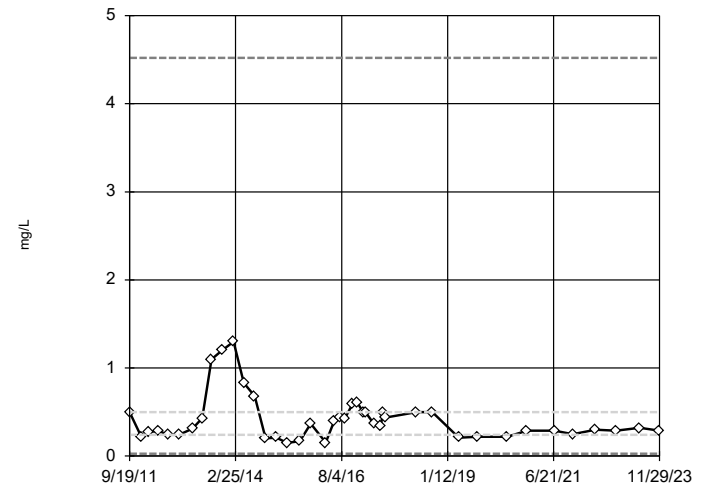
Tukey's Outlier Screening

MW-1 (bg)

n = 42

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 = 3328, low cutoff = 28.9, based on IQR multiplier of 3.

Constituent: Chloride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
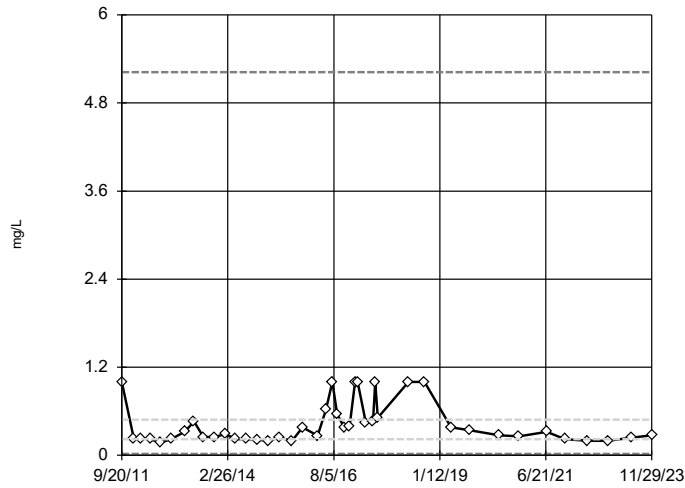
Tukey's Outlier Screening

MW-2

n = 42

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 = 70335, low cutoff = 0.007452, based on IQR multiplier of 3.

Constituent: Chloride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
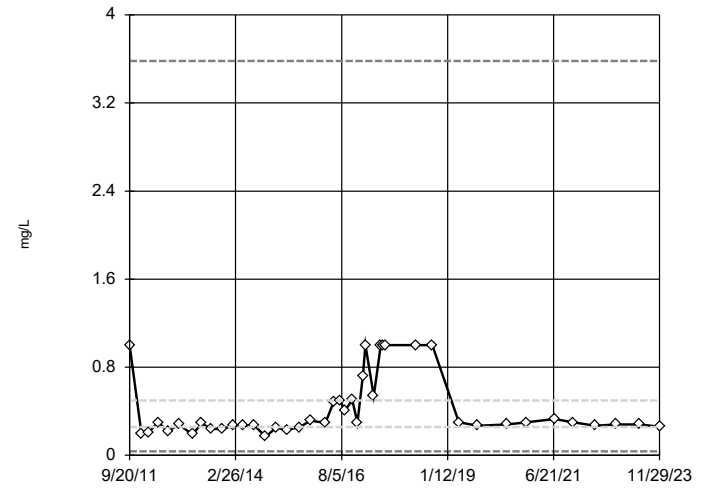
Tukey's Outlier Screening

MW-3

n = 43

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 1.3e7, low
cutoff = 0.0002363, based
on IQR multiplier of 3.

Constituent: Chloride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-4

n = 43

No outliers found.
Tukey's method select-
ed by user.

Data were cube transform-
ed to achieve best W stat-
istic (graph shown in
original units).

High cutoff = 1651, low
cutoff = -1253, based
on IQR multiplier of 3.

Constituent: Chloride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
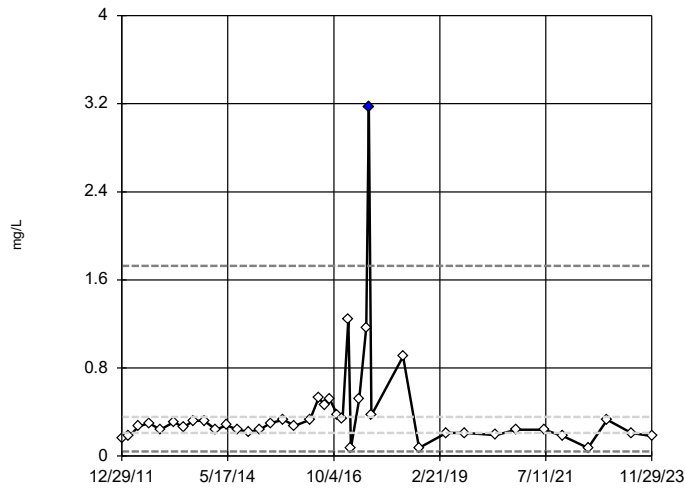
Tukey's Outlier Screening

MW-5

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 19213, low
cutoff = 1.514, based
on IQR multiplier of 3.

Constituent: Chloride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening
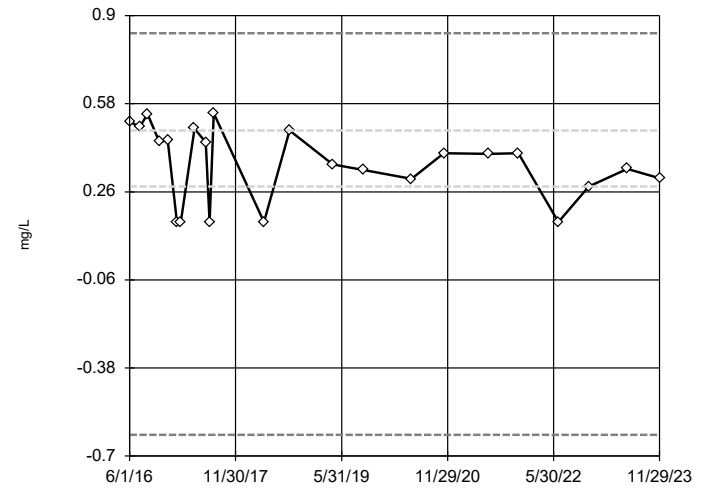
MW-10

n = 41

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 3107, low
cutoff = -107.2, based
on IQR multiplier of 3.

Constituent: Chloride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening
MW-11

n = 23

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 = 1437, low cutoff = 407.1, based on IQR multiplier of 3.

Constituent: Chloride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening
MW-1 (bg)

n = 42

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

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

High cutoff = 3.761, low cutoff = -1.829, based on IQR multiplier of 3.

Constituent: Fluoride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

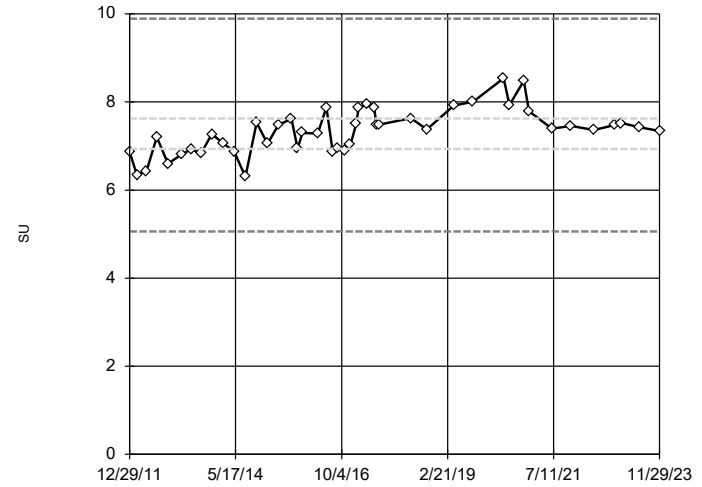## Tukey's Outlier Screening
MW-2

n = 42

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 = 3.182, low cutoff = 0.0424, based on IQR multiplier of 3.

Constituent: Fluoride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
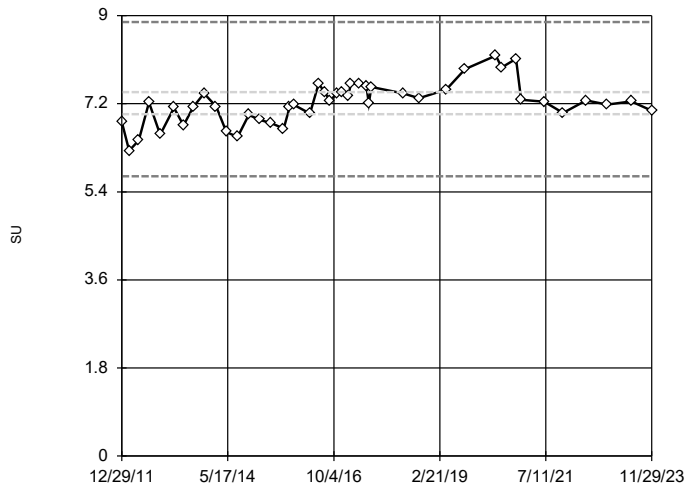
Tukey's Outlier Screening
MW-3

n = 42

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 = 4.521, low cutoff = 0.02654, based on IQR multiplier of 3.

Constituent: Fluoride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-4

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 5.221, low
cutoff = 0.02046, based
on IQR multiplier of 3.

Constituent: Fluoride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-5

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 3.583, low
cutoff = 0.03586, based
on IQR multiplier of 3.

Constituent: Fluoride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-10

n = 41

Outlier is drawn as solid.
Tukey's method select-
ed by user.

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

High cutoff = 1.728, low
cutoff = 0.04322, based
on IQR multiplier of 3.

Constituent: Fluoride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-11

n = 23

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 0.8364,
low cutoff = -0.6233,
based on IQR multiplier
of 3.

Constituent: Fluoride   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-1 (bg)

n = 42
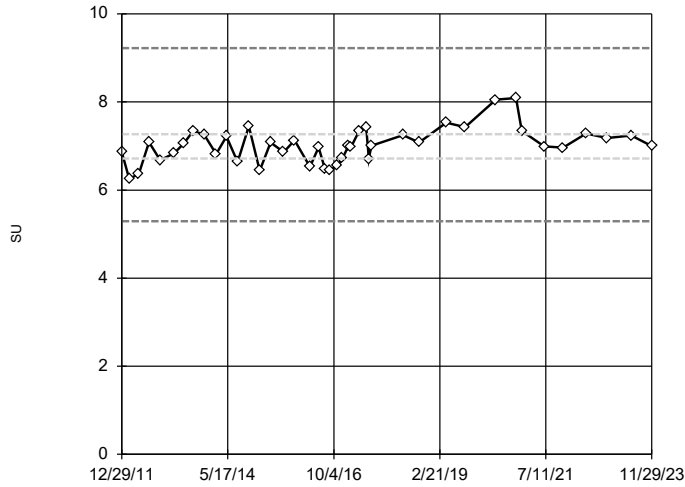
No outliers found. Tukey's method select-ed by user.

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

High cutoff = 9.226, low cutoff = 5.292, based on IQR multiplier of 3.

Constituent: pH   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
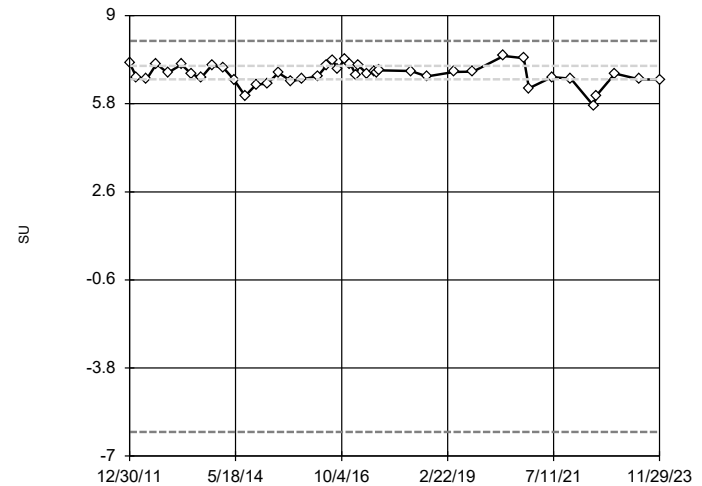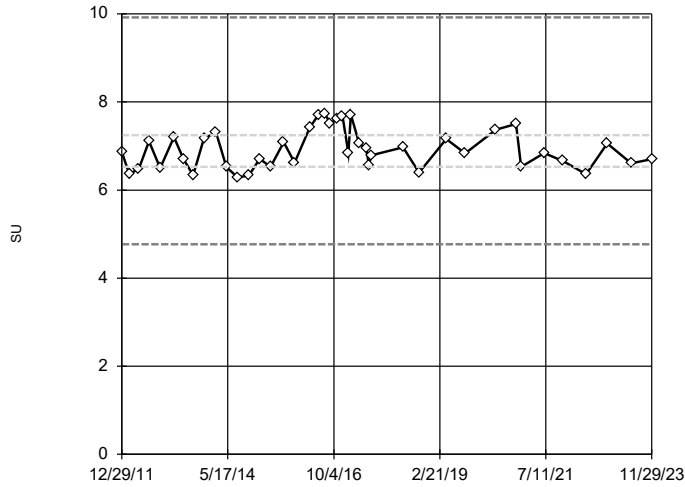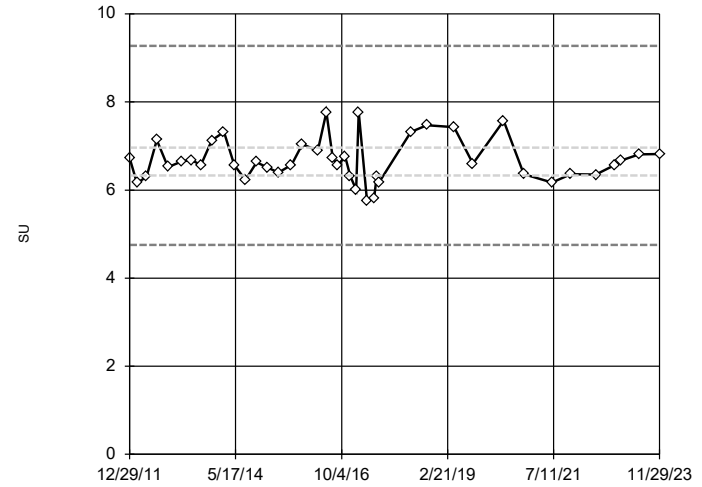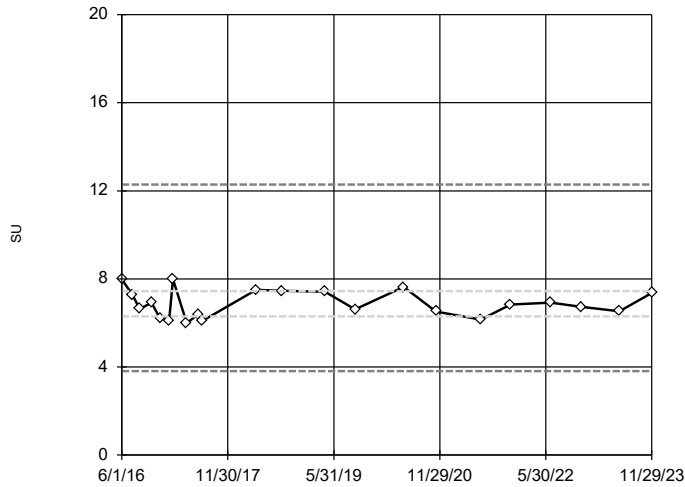
Tukey's Outlier Screening

MW-2

n = 45

No outliers found. Tukey's method select-ed by user.

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

High cutoff = 9.891, low cutoff = 5.061, based on IQR multiplier of 3.

Constituent: pH   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-3

n = 44

No outliers found. Tukey's method select-ed by user.

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

High cutoff = 8.869, low cutoff = 5.719, based on IQR multiplier of 3.

Constituent: pH   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-4

n = 43

No outliers found. Tukey's method select-ed by user.

Data were x^6 transform-ed to achieve best W stat-istic (graph shown in original units).

High cutoff = 8.084, low cutoff = -6.118, based on IQR multiplier of 3.

Constituent: pH   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
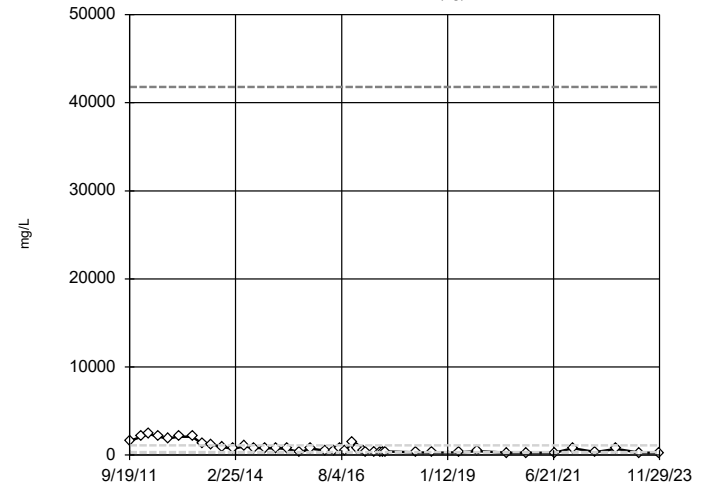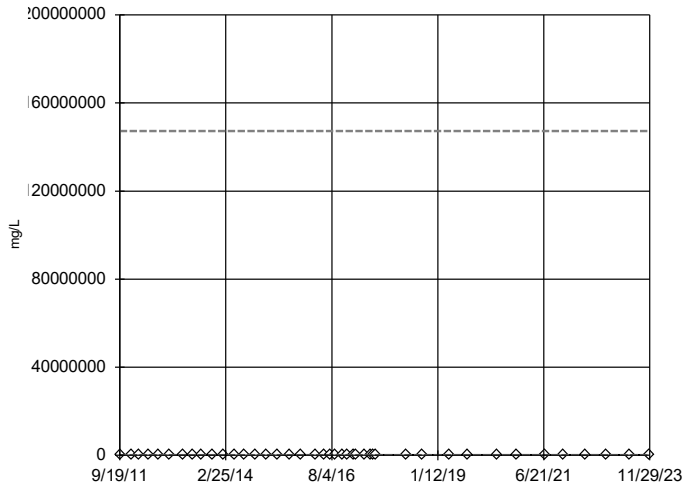
Tukey's Outlier Screening
MW-5

n = 42

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 = 9.921, low cutoff = 4.772, based on IQR multiplier of 3.

Constituent: pH   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

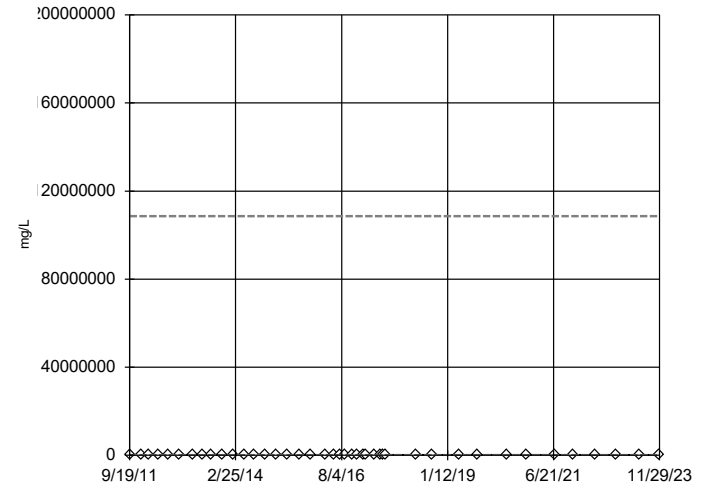## Tukey's Outlier Screening
MW-10

n = 42

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 = 9.276, low cutoff = 4.752, based on IQR multiplier of 3.

Constituent: pH   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

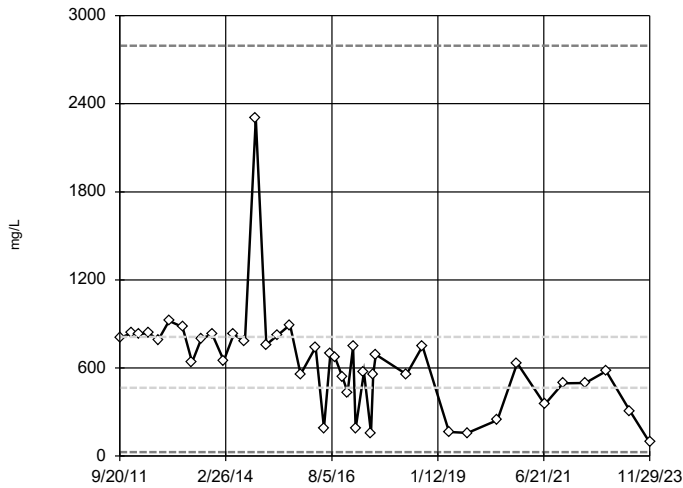## Tukey's Outlier Screening
MW-11

n = 22

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 = 12.29, low cutoff = 3.812, based on IQR multiplier of 3.

Constituent: pH   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening
MW-1 (bg)

n = 42

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 = 41798, low cutoff = 8.528, based on IQR multiplier of 3.

Constituent: Sulfate   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening
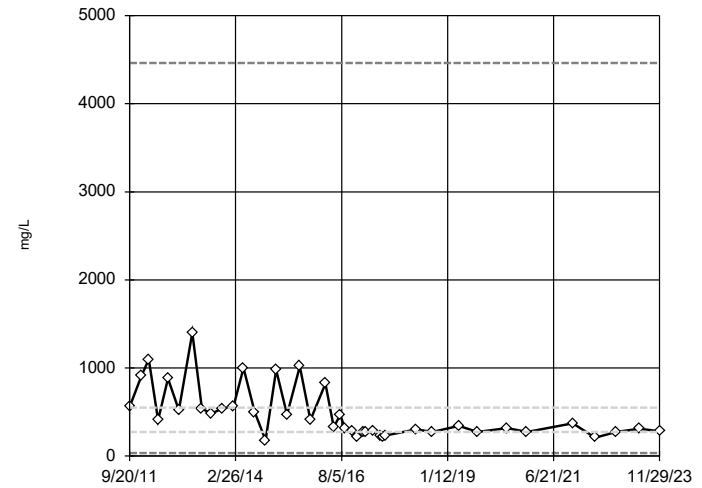
MW-2

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 1.5e8, low
cutoff = 0.0004135, based
on IQR multiplier of 3.

Constituent: Sulfate   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
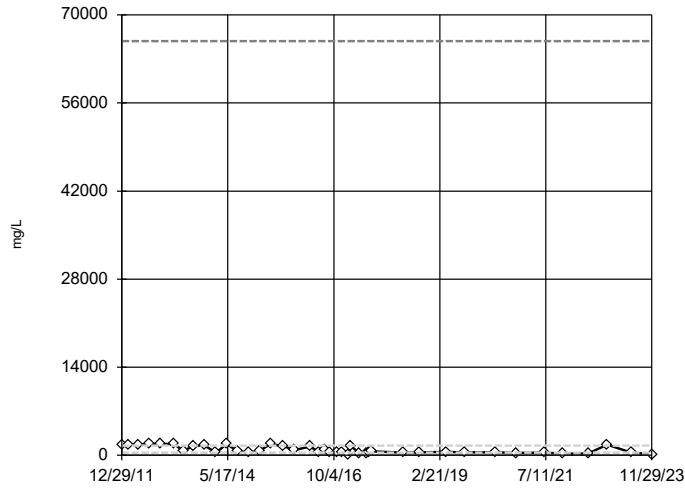
Tukey's Outlier Screening

MW-3

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 1.1e8, low
cutoff = 0.0005526, based
on IQR multiplier of 3.

Constituent: Sulfate   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-4

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 2795, low
cutoff = 26.63, based
on IQR multiplier of 3.

Constituent: Sulfate   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
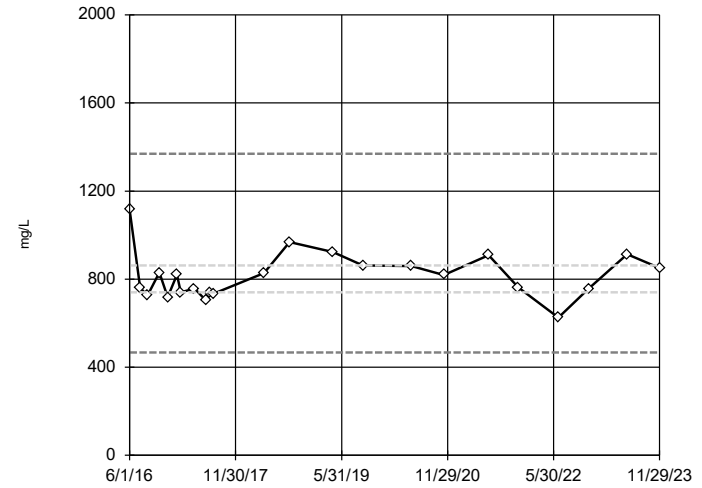
Tukey's Outlier Screening

MW-5

n = 41

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 4462, low
cutoff = 33.58, based
on IQR multiplier of 3.

Constituent: Sulfate   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
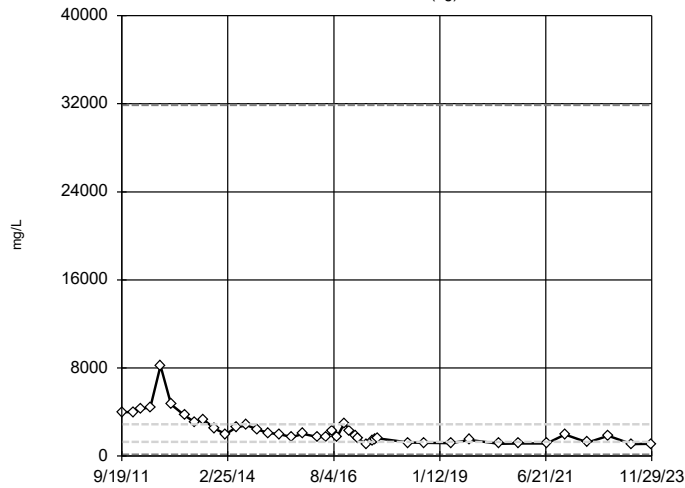
Tukey's Outlier Screening
MW-10

n = 41

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 = 65807, low cutoff = 10.45, based on IQR multiplier of 3.

Constituent: Sulfate   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
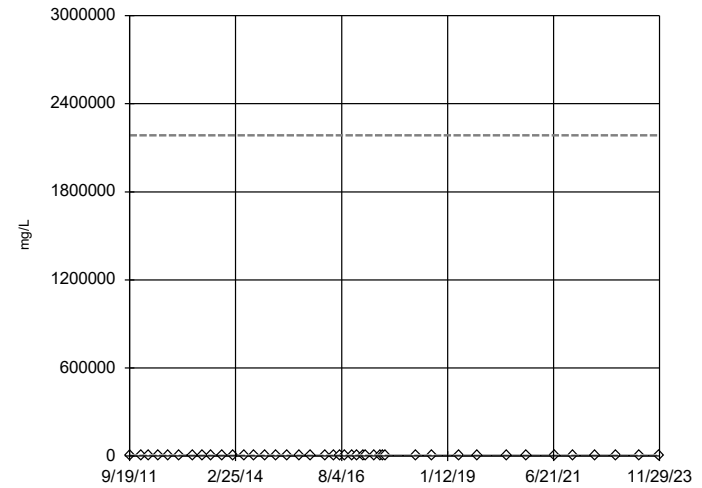
Tukey's Outlier Screening
MW-11

n = 23

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 = 1369, low cutoff = 466.5, based on IQR multiplier of 3.

Constituent: Sulfate   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening
MW-1 (bg)

n = 42

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 = 31898, low cutoff = 118.8, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
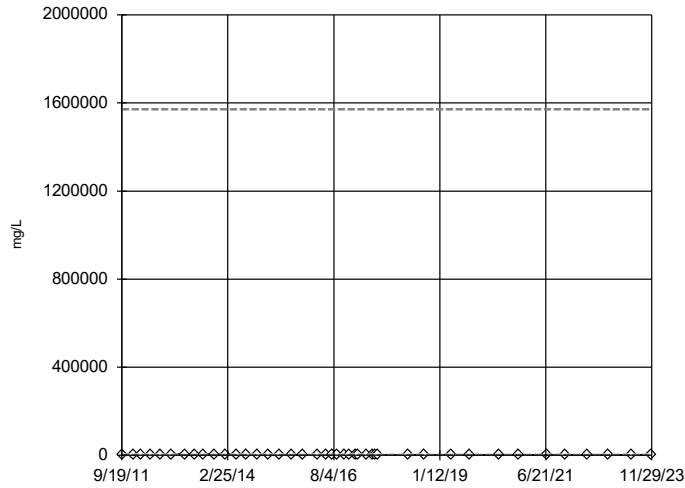
Tukey's Outlier Screening
MW-2

n = 42

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 = 2185780, low cutoff = 0.4398, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

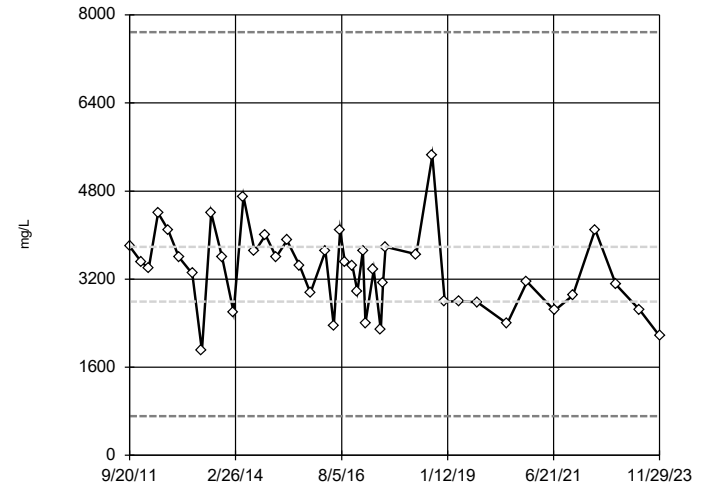## Tukey's Outlier Screening

MW-3

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 1571073,
low cutoff = 0.7366, based
on IQR multiplier of 3.

Constituent: Total Dissolved Solids   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

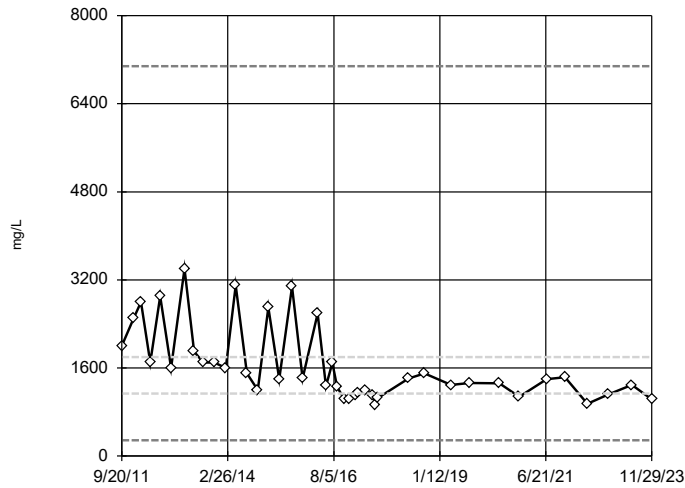## Tukey's Outlier Screening

MW-4

n = 43

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 7686, low
cutoff = 713.8, based
on IQR multiplier of 3.

Constituent: Total Dissolved Solids   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-5

n = 42

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 7082, low
cutoff = 288.8, based
on IQR multiplier of 3.

Constituent: Total Dissolved Solids   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

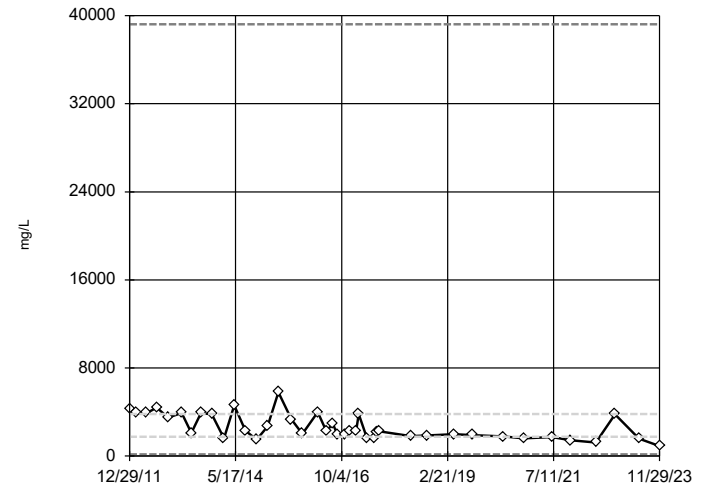## Tukey's Outlier Screening

MW-10

n = 41

No outliers found.
Tukey's method select-
ed by user.

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

High cutoff = 39211, low
cutoff = 169.9, based
on IQR multiplier of 3.

Constituent: Total Dissolved Solids   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Tukey's Outlier Screening

MW-11

n = 22
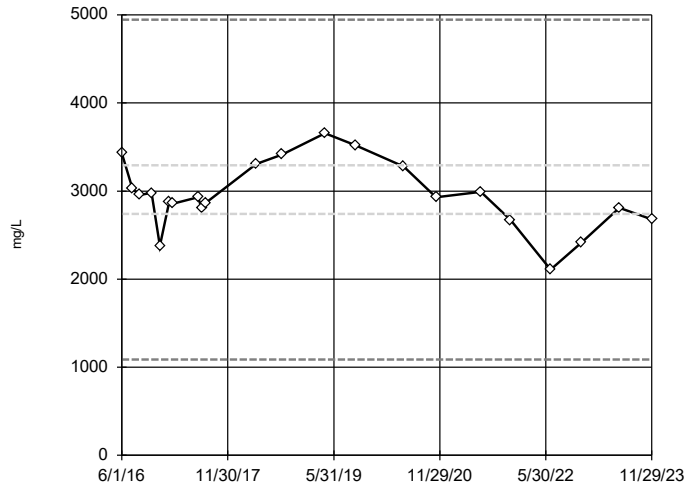
No outliers found.
Tukey's method select-
ed by user.

Ladder of Powers trans-
formations did not im-
prove normality; analy-
sis run on raw data.

High cutoff = 4946, low
cutoff = 1089, based on
IQR multiplier of 3.

Constituent: Total Dissolved Solids   Analysis Run 8/7/2024 3:47 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Trend Tests - Significant Results

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Boron (mg/L)	MW-1 (bg)	-0.0941	-7.317	-2.58	Yes	42	0	n/a	0.01	NP
Boron (mg/L)	MW-2	-0.09237	-6.504	-2.58	Yes	43	9.302	n/a	0.01	NP
Boron (mg/L)	MW-3	-0.06347	-5.912	-2.58	Yes	43	13.95	n/a	0.01	NP
Boron (mg/L)	MW-4	-0.02347	-4.988	-2.58	Yes	42	0	n/a	0.01	NP
Boron (mg/L)	MW-5	-0.01499	-3.653	-2.58	Yes	42	16.67	n/a	0.01	NP
Boron (mg/L)	MW-10	-0.01708	-475	-223	Yes	40	12.5	n/a	0.01	NP
Chloride (mg/L)	MW-1 (bg)	-39.23	-7.067	-2.58	Yes	42	0	n/a	0.01	NP
Chloride (mg/L)	MW-2	-6.216	-4.922	-2.58	Yes	41	0	n/a	0.01	NP
Chloride (mg/L)	MW-4	-18.48	-3.039	-2.58	Yes	43	0	n/a	0.01	NP
Chloride (mg/L)	MW-5	-35.08	-4.747	-2.58	Yes	42	0	n/a	0.01	NP
Chloride (mg/L)	MW-10	-60.01	-382	-223	Yes	40	0	n/a	0.01	NP
Fluoride (mg/L)	MW-1 (bg)	0.0981	5.161	2.58	Yes	42	4.762	n/a	0.01	NP
Fluoride (mg/L)	MW-5	0.008384	2.613	2.58	Yes	42	16.67	n/a	0.01	NP
pH (SU)	MW-1 (bg)	0.05069	2.743	2.58	Yes	42	0	n/a	0.01	NP
pH (SU)	MW-2	0.09812	4.384	2.58	Yes	45	0	n/a	0.01	NP
pH (SU)	MW-3	0.08737	3.905	2.58	Yes	44	0	n/a	0.01	NP
Sulfate (mg/L)	MW-1 (bg)	-135.8	-6.366	-2.58	Yes	42	0	n/a	0.01	NP
Sulfate (mg/L)	MW-2	-140.7	-6.096	-2.58	Yes	42	0	n/a	0.01	NP
Sulfate (mg/L)	MW-3	-132	-3.763	-2.58	Yes	42	0	n/a	0.01	NP
Sulfate (mg/L)	MW-4	-45.06	-5.136	-2.58	Yes	41	0	n/a	0.01	NP
Sulfate (mg/L)	MW-5	-43.94	-4.474	-2.58	Yes	41	0	n/a	0.01	NP
Sulfate (mg/L)	MW-10	-109.5	-393	-223	Yes	40	0	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-1 (bg)	-254.6	-6.437	-2.58	Yes	41	0	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-2	-246.5	-5.479	-2.58	Yes	42	0	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-3	-246.5	-3.176	-2.58	Yes	42	0	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-4	-95.76	-2.701	-2.58	Yes	43	0	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-5	-101.1	-4.586	-2.58	Yes	42	0	n/a	0.01	NP
Total Dissolved Solids (mg/L)	MW-10	-226	-396	-223	Yes	40	0	n/a	0.01	NP

Trend Tests - All Results

| Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Alpha	Method
Boron (mg/L)	**MW-1 (bg)**	**-0.0941**	**-7.317**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Boron (mg/L)	**MW-2**	**-0.09237**	**-6.504**	**-2.58**	**Yes**	**43**	**9.302**	n/a	**0.01**	**NP**
Boron (mg/L)	**MW-3**	**-0.06347**	**-5.912**	**-2.58**	**Yes**	**43**	**13.95**	n/a	**0.01**	**NP**
Boron (mg/L)	**MW-4**	**-0.02347**	**-4.988**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Boron (mg/L)	**MW-5**	**-0.01499**	**-3.653**	**-2.58**	**Yes**	**42**	**16.67**	n/a	**0.01**	**NP**
Boron (mg/L)	**MW-10**	**-0.01708**	**-475**	**-223**	**Yes**	**40**	**12.5**	n/a	**0.01**	**NP**
Boron (mg/L)	MW-11	0.00529	47	98	No	23	30.43	n/a	0.01	NP
Calcium (mg/L)	MW-1 (bg)	-9.099	-93	-98	No	23	0	n/a	0.01	NP
Calcium (mg/L)	MW-2	2.692	47	98	No	23	0	n/a	0.01	NP
Calcium (mg/L)	MW-3	8.741	63	92	No	22	0	n/a	0.01	NP
Calcium (mg/L)	MW-4	0.9505	1	98	No	23	0	n/a	0.01	NP
Calcium (mg/L)	MW-5	4.905	35	87	No	21	0	n/a	0.01	NP
Calcium (mg/L)	MW-10	-13.23	-40	-81	No	20	0	n/a	0.01	NP
Calcium (mg/L)	MW-11	-2.374	-48	-98	No	23	0	n/a	0.01	NP
Chloride (mg/L)	**MW-1 (bg)**	**-39.23**	**-7.067**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Chloride (mg/L)	**MW-2**	**-6.216**	**-4.922**	**-2.58**	**Yes**	**41**	**0**	n/a	**0.01**	**NP**
Chloride (mg/L)	MW-3	-13.25	-2.01	-2.58	No	43	0	n/a	0.01	NP
Chloride (mg/L)	**MW-4**	**-18.48**	**-3.039**	**-2.58**	**Yes**	**43**	**0**	n/a	**0.01**	**NP**
Chloride (mg/L)	**MW-5**	**-35.08**	**-4.747**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Chloride (mg/L)	**MW-10**	**-60.01**	**-382**	**-223**	**Yes**	**40**	**0**	n/a	**0.01**	**NP**
Chloride (mg/L)	MW-11	17.87	96	98	No	23	0	n/a	0.01	NP
Fluoride (mg/L)	**MW-1 (bg)**	**0.0981**	**5.161**	**2.58**	**Yes**	**42**	**4.762**	n/a	**0.01**	**NP**
Fluoride (mg/L)	MW-2	0.008025	88	223	No	40	10	n/a	0.01	NP
Fluoride (mg/L)	MW-3	-0.003503	-0.5979	-2.58	No	42	14.29	n/a	0.01	NP
Fluoride (mg/L)	MW-4	0.003484	1.056	2.58	No	42	16.67	n/a	0.01	NP
Fluoride (mg/L)	**MW-5**	**0.008384**	**2.613**	**2.58**	**Yes**	**42**	**16.67**	n/a	**0.01**	**NP**
Fluoride (mg/L)	MW-10	0.005076	69	214	No	39	5.128	n/a	0.01	NP
Fluoride (mg/L)	MW-11	-0.02266	-82	-98	No	23	21.74	n/a	0.01	NP
pH (SU)	**MW-1 (bg)**	**0.05069**	**2.743**	**2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
pH (SU)	**MW-2**	**0.09812**	**4.384**	**2.58**	**Yes**	**45**	**0**	n/a	**0.01**	**NP**
pH (SU)	**MW-3**	**0.08737**	**3.905**	**2.58**	**Yes**	**44**	**0**	n/a	**0.01**	**NP**
pH (SU)	MW-4	-0.01941	-1.016	-2.58	No	43	0	n/a	0.01	NP
pH (SU)	MW-5	0.01558	0.6287	2.58	No	42	0	n/a	0.01	NP
pH (SU)	MW-10	0.003896	0.2587	2.58	No	41	0	n/a	0.01	NP
pH (SU)	MW-11	-0.01576	-10	-92	No	22	0	n/a	0.01	NP
Sulfate (mg/L)	**MW-1 (bg)**	**-135.8**	**-6.366**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Sulfate (mg/L)	**MW-2**	**-140.7**	**-6.096**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Sulfate (mg/L)	**MW-3**	**-132**	**-3.763**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Sulfate (mg/L)	**MW-4**	**-45.06**	**-5.136**	**-2.58**	**Yes**	**41**	**0**	n/a	**0.01**	**NP**
Sulfate (mg/L)	**MW-5**	**-43.94**	**-4.474**	**-2.58**	**Yes**	**41**	**0**	n/a	**0.01**	**NP**
Sulfate (mg/L)	**MW-10**	**-109.5**	**-393**	**-223**	**Yes**	**40**	**0**	n/a	**0.01**	**NP**
Sulfate (mg/L)	MW-11	5.69	27	98	No	23	0	n/a	0.01	NP
Total Dissolved Solids (mg/L)	**MW-1 (bg)**	**-254.6**	**-6.437**	**-2.58**	**Yes**	**41**	**0**	n/a	**0.01**	**NP**
Total Dissolved Solids (mg/L)	**MW-2**	**-246.5**	**-5.479**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Total Dissolved Solids (mg/L)	**MW-3**	**-246.5**	**-3.176**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Total Dissolved Solids (mg/L)	**MW-4**	**-95.76**	**-2.701**	**-2.58**	**Yes**	**43**	**0**	n/a	**0.01**	**NP**
Total Dissolved Solids (mg/L)	**MW-5**	**-101.1**	**-4.586**	**-2.58**	**Yes**	**42**	**0**	n/a	**0.01**	**NP**
Total Dissolved Solids (mg/L)	**MW-10**	**-226**	**-396**	**-223**	**Yes**	**40**	**0**	n/a	**0.01**	**NP**
Total Dissolved Solids (mg/L)	MW-11	-45.97	-53	-92	No	22	0	n/a	0.01	NP

Sen's Slope Estimator

MW-1 (bg)
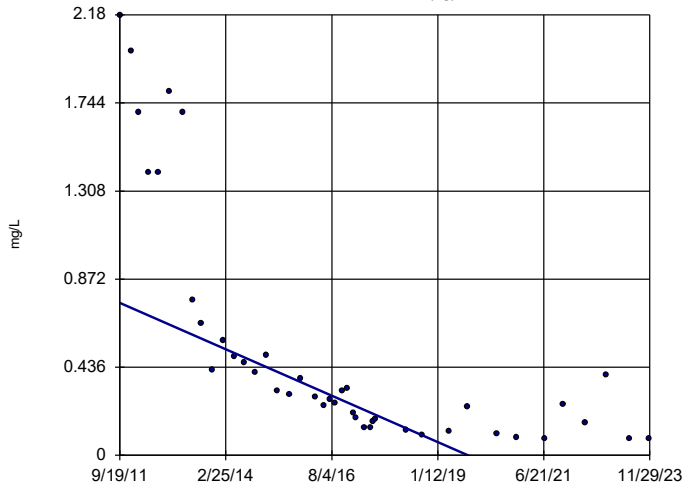
n = 42

Slope = -0.0941 units per year.

Mann-Kendall normal approx. = -7.317 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

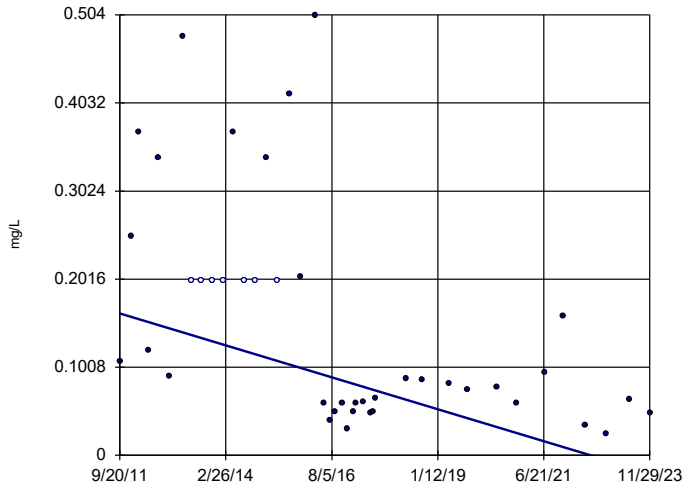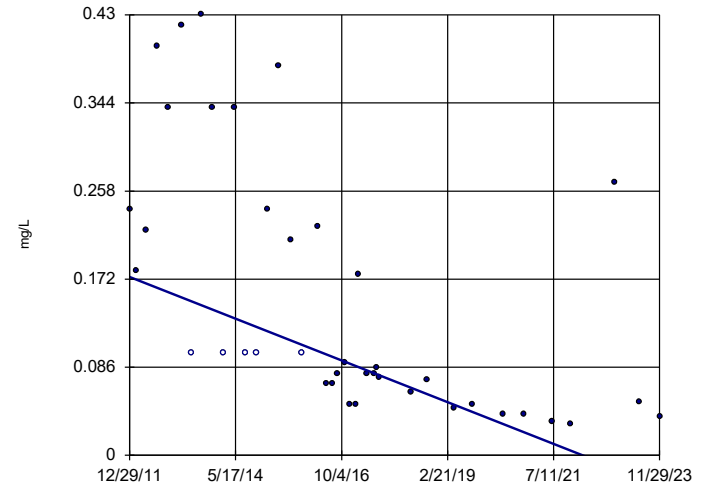Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-2
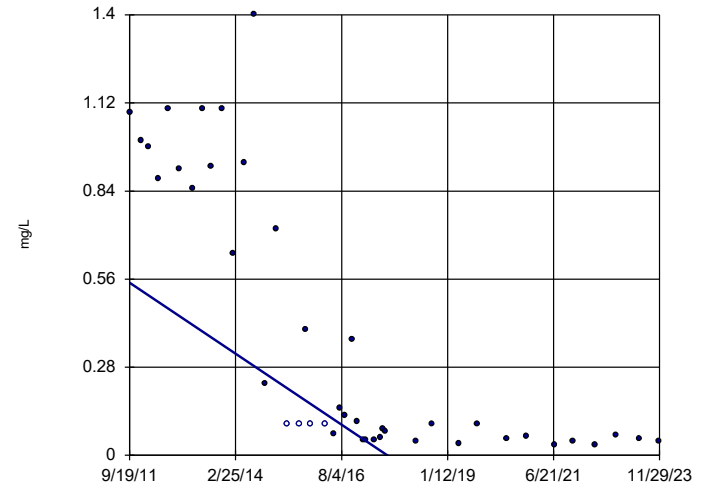
n = 43

Slope = -0.09237 units per year.

Mann-Kendall normal approx. = -6.504 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-3
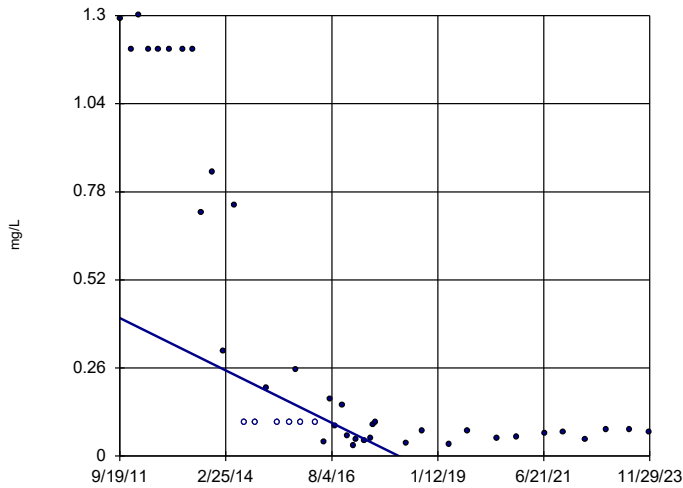
n = 43

Slope = -0.06347 units per year.

Mann-Kendall normal approx. = -5.912 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

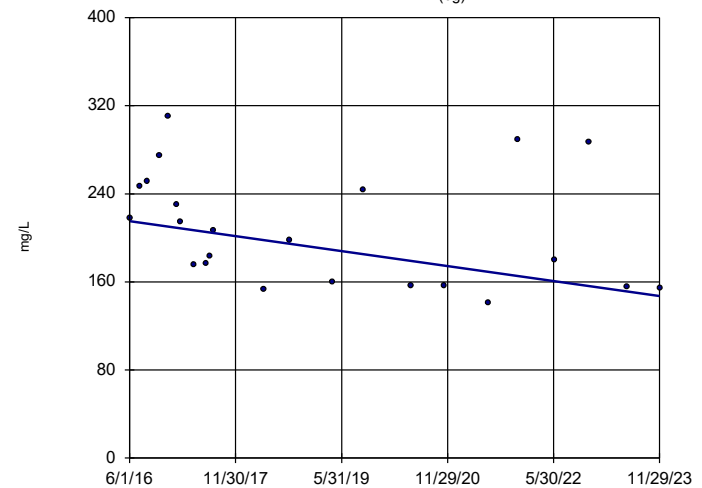Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-4
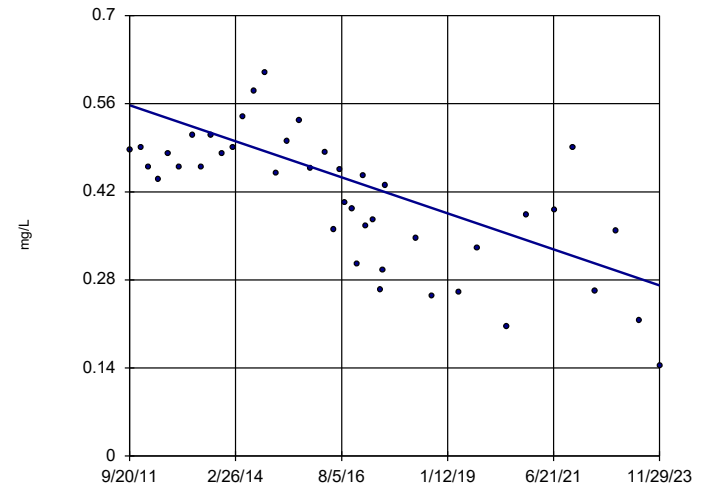
n = 42

Slope = -0.02347 units per year.

Mann-Kendall normal approx. = -4.988 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

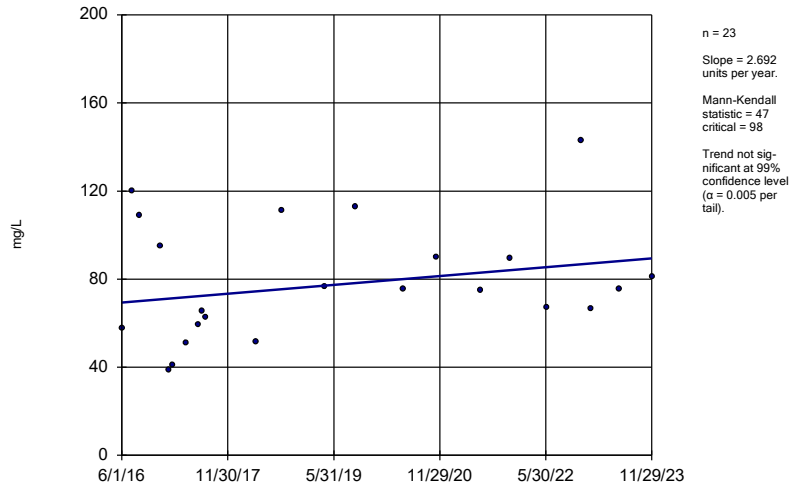Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-5

n = 42

Slope = -0.01499 units per year.

Mann-Kendall normal approx. = -3.653 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-10

n = 40

Slope = -0.01708 units per year.

Mann-Kendall statistic = -475 critical = -223

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-11
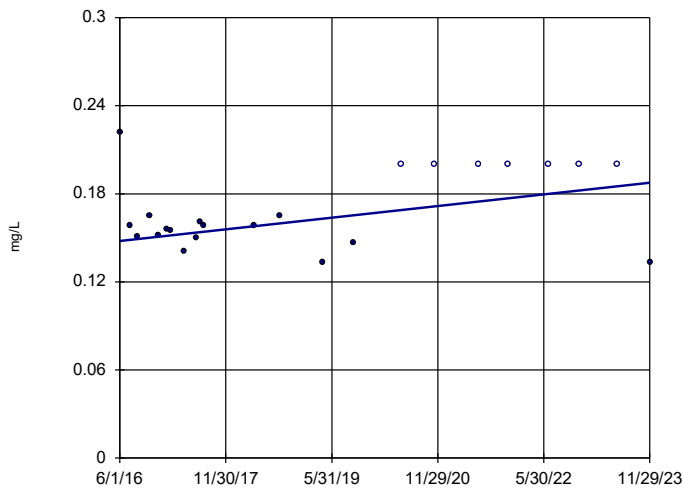
n = 23

Slope = 0.00529 units per year.

Mann-Kendall statistic = 47 critical = 98

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-1 (bg)

n = 23

Slope = -9.099 units per year.

Mann-Kendall statistic = -93 critical = -98

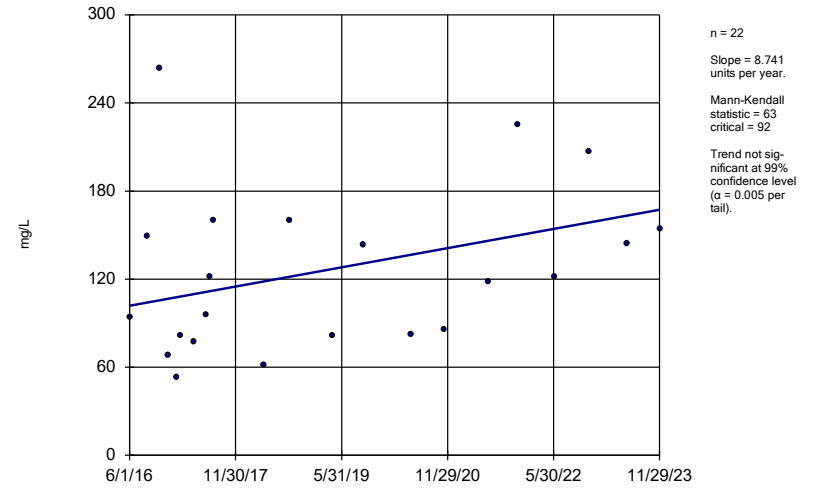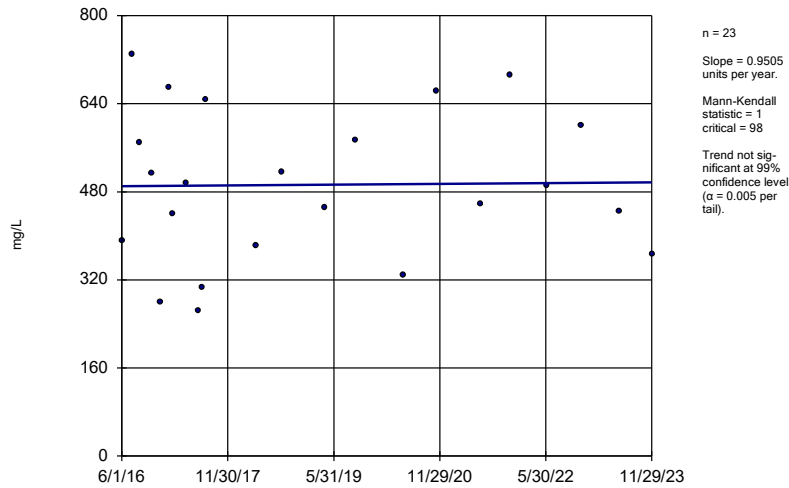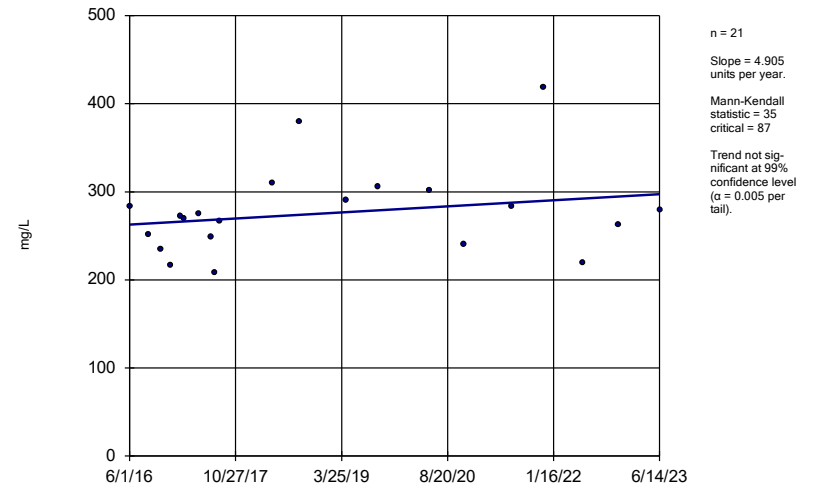Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Calcium   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-2

n = 23

Slope = 2.692 units per year.

Mann-Kendall statistic = 47 critical = 98

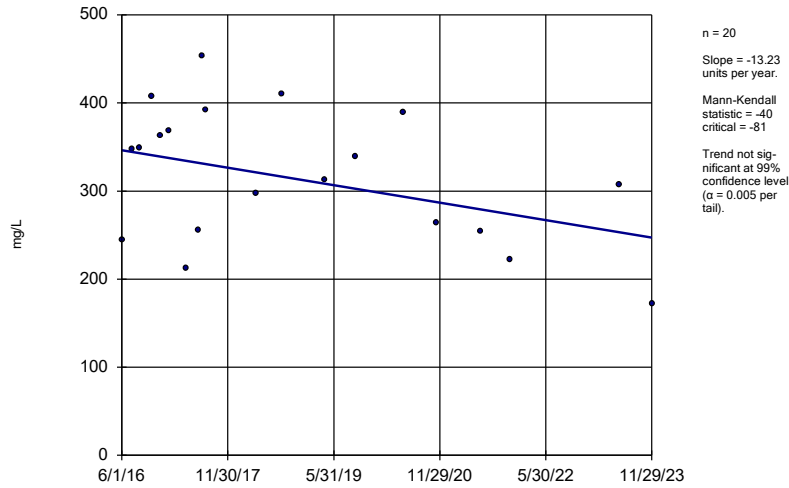Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Calcium   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-3

n = 22

Slope = 8.741 units per year.

Mann-Kendall statistic = 63 critical = 92

Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Calcium   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

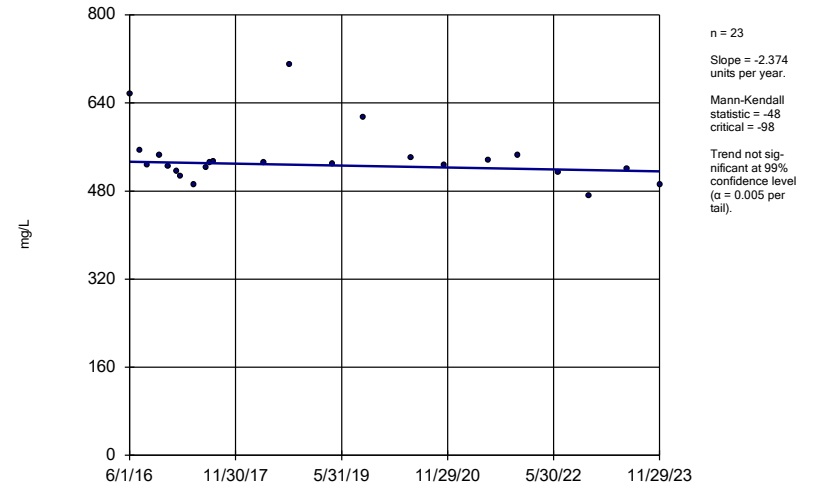Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-4

n = 23

Slope = 0.9505 units per year.

Mann-Kendall statistic = 1 critical = 98

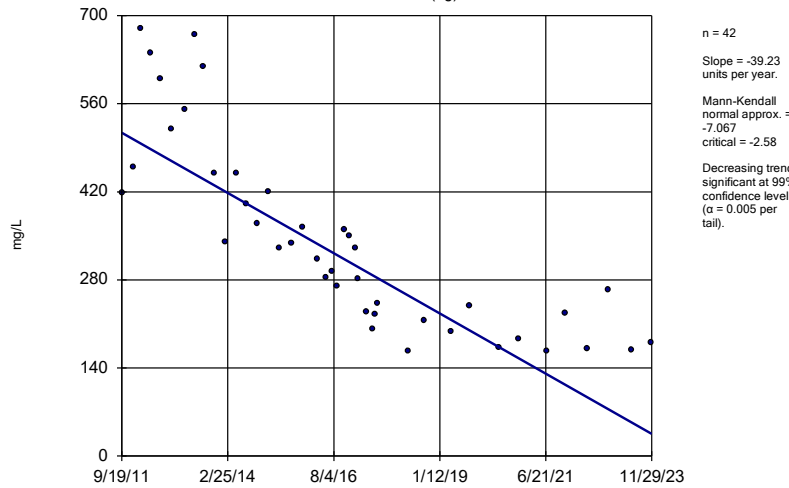Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Calcium   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-5

n = 21

Slope = 4.905 units per year.

Mann-Kendall statistic = 35 critical = 87

Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Calcium   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

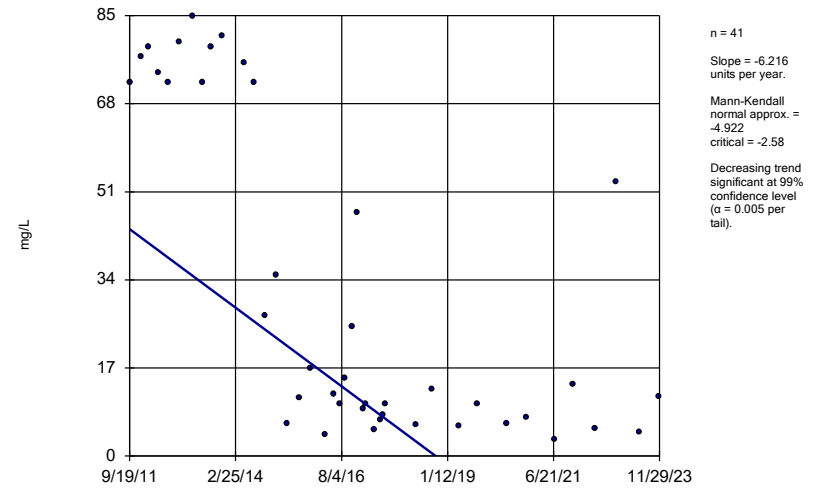Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-10

n = 20

Slope = -13.23
units per year.

Mann-Kendall
statistic = -40
critical = -81

Trend not sig-
nificant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Calcium   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
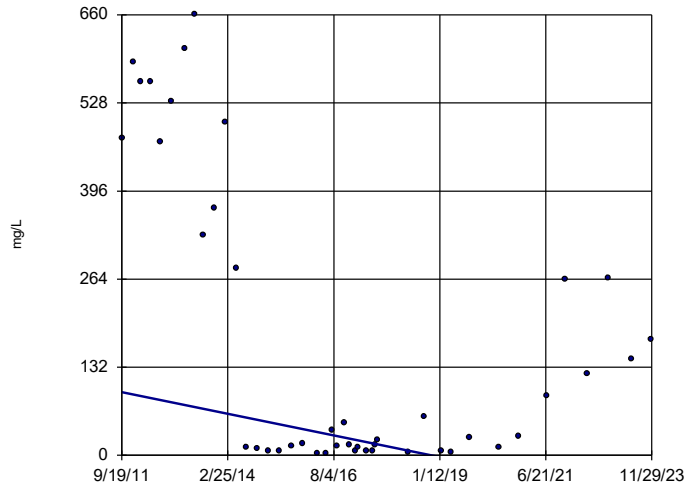
Sen's Slope Estimator
MW-11

n = 23

Slope = -2.374
units per year.

Mann-Kendall
statistic = -48
critical = -98

Trend not sig-
nificant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Calcium   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-1 (bg)

n = 42

Slope = -39.23
units per year.

Mann-Kendall
normal approx. =
-7.067
critical = -2.58

Decreasing trend
significant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Chloride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-2

n = 41

Slope = -6.216
units per year.

Mann-Kendall
normal approx. =
-4.922
critical = -2.58

Decreasing trend
significant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Chloride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-3
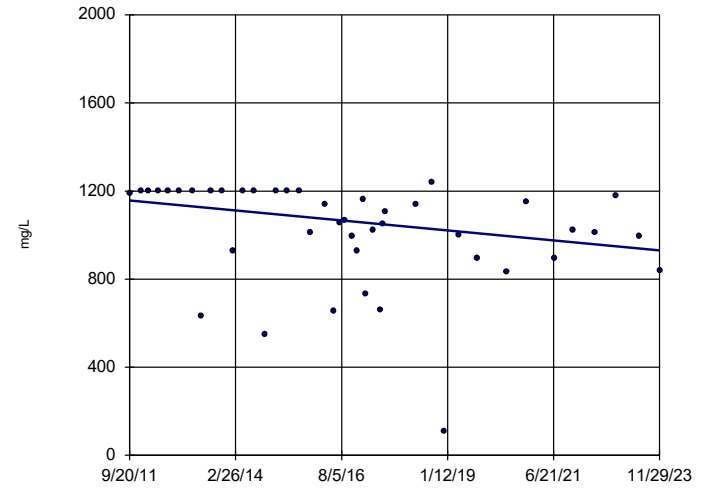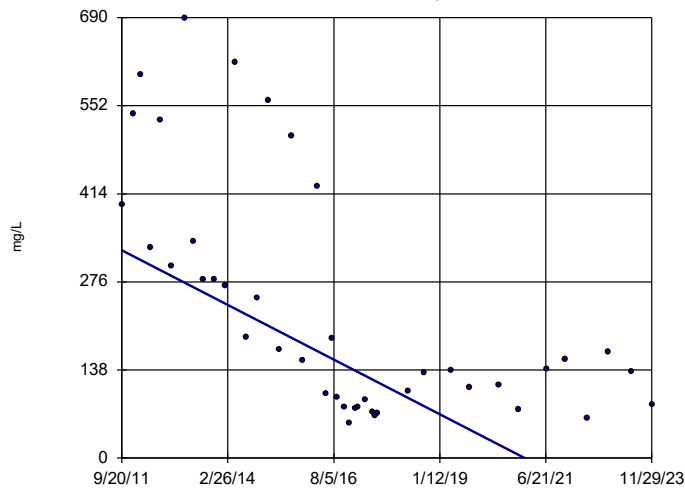

n = 43

Slope = -13.25 units per year.

Mann-Kendall normal approx. = -2.01 critical = -2.58

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-4

n = 43

Slope = -18.48 units per year.

Mann-Kendall normal approx. = -3.039 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
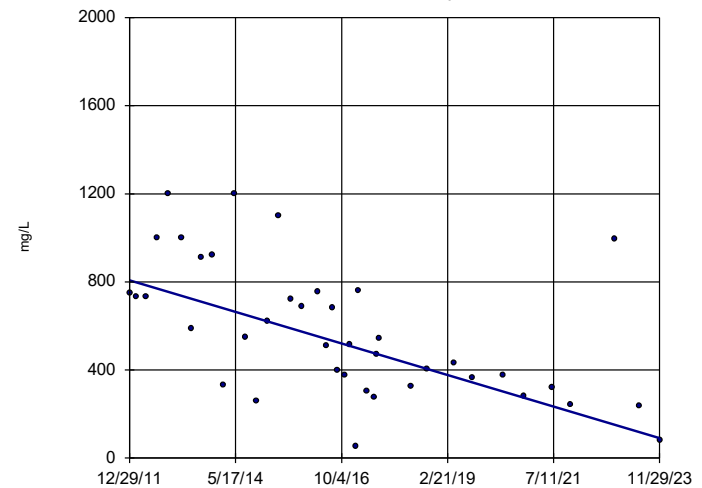
Sen's Slope Estimator

MW-5

n = 42

Slope = -35.08 units per year.

Mann-Kendall normal approx. = -4.747 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-10

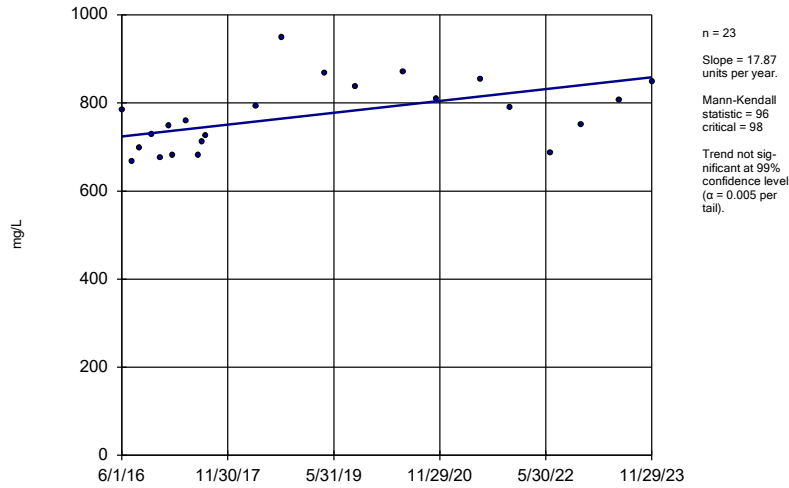
n = 40

Slope = -60.01 units per year.

Mann-Kendall statistic = -382 critical = -223

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

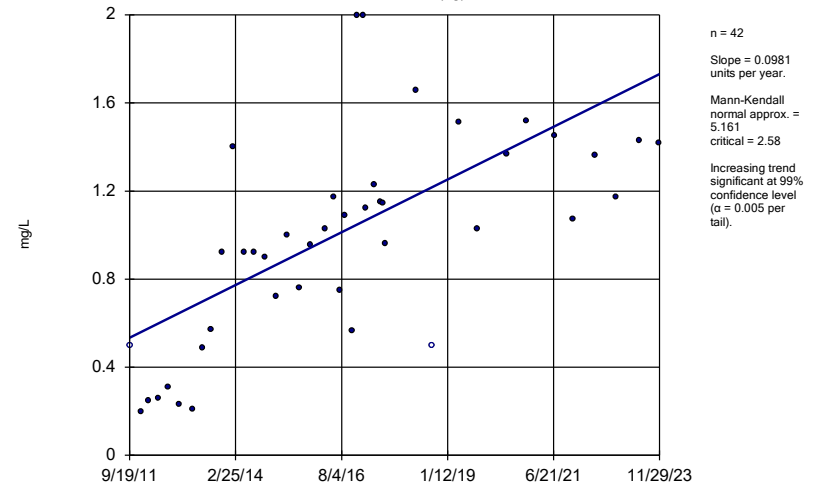Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-11

n = 23

Slope = 17.87 units per year.

Mann-Kendall statistic = 96 critical = 98

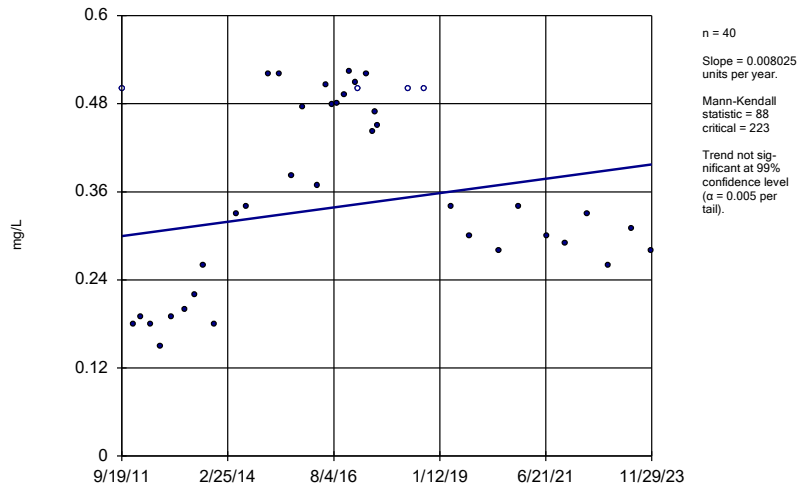Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Chloride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-1 (bg)

n = 42

Slope = 0.0981 units per year.

Mann-Kendall normal approx. = 5.161 critical = 2.58

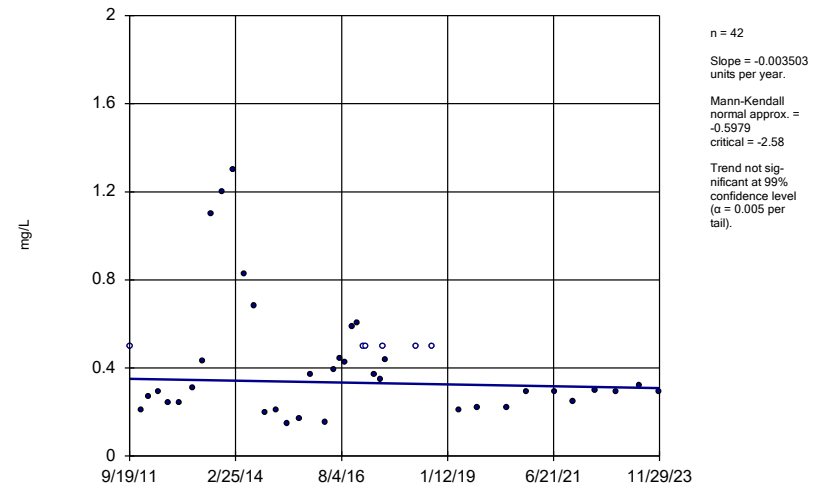Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-2

n = 40

Slope = 0.008025 units per year.

Mann-Kendall statistic = 88 critical = 223
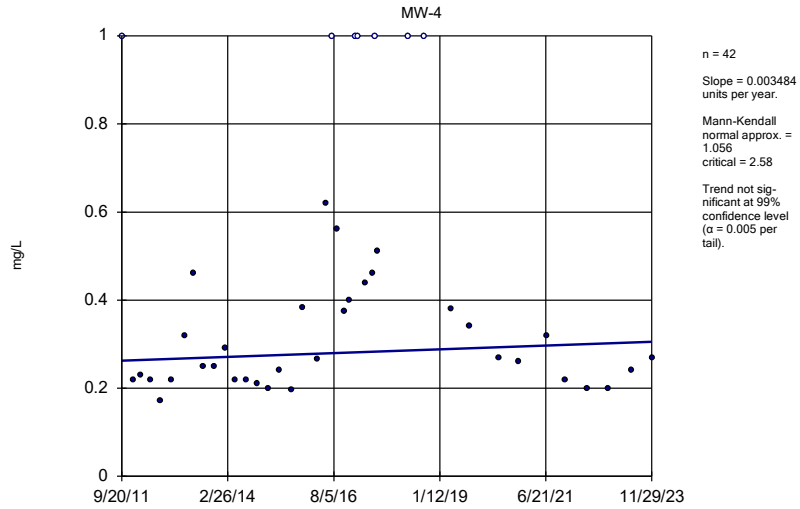
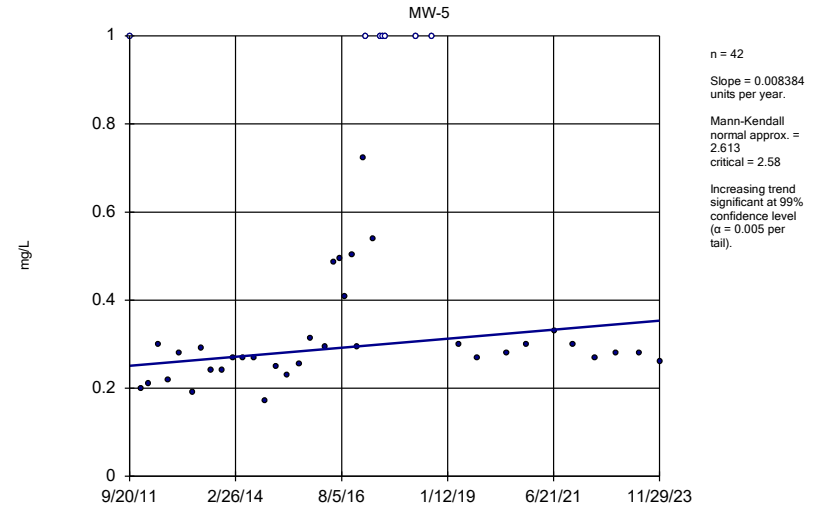Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-3

n = 42

Slope = -0.003503 units per year.

Mann-Kendall normal approx. = -0.5979 critical = -2.58

Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).
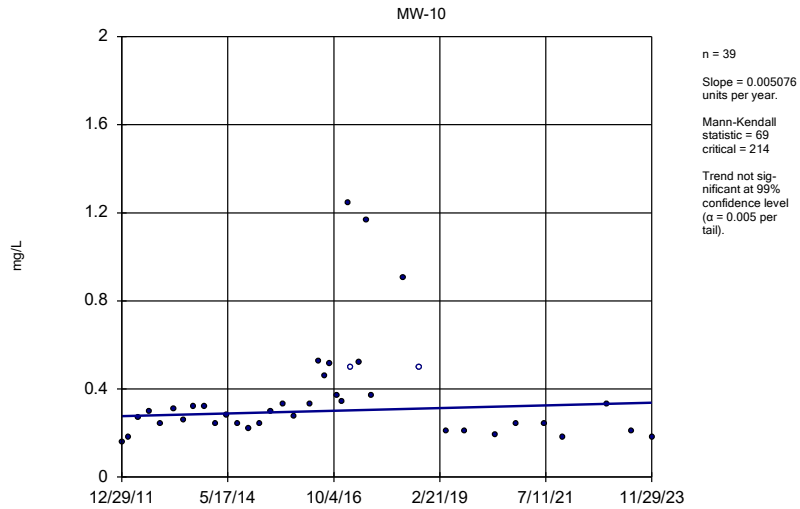
Constituent: Fluoride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-4

mg/L

n = 42

Slope = 0.003484 units per year.

Mann-Kendall normal approx. = 1.056 critical = 2.58

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

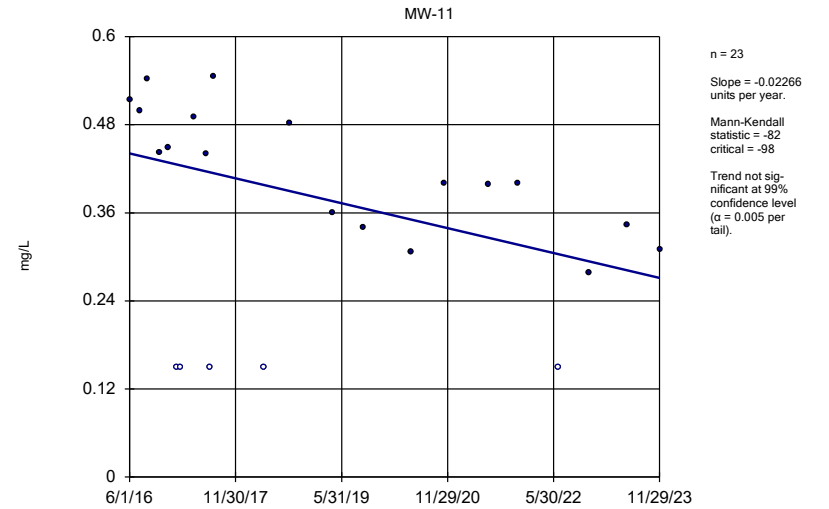Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-5

mg/L

n = 42

Slope = 0.008384 units per year.

Mann-Kendall normal approx. = 2.613 critical = 2.58

Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-10

mg/L

n = 39

Slope = 0.005076 units per year.

Mann-Kendall statistic = 69 critical = 214

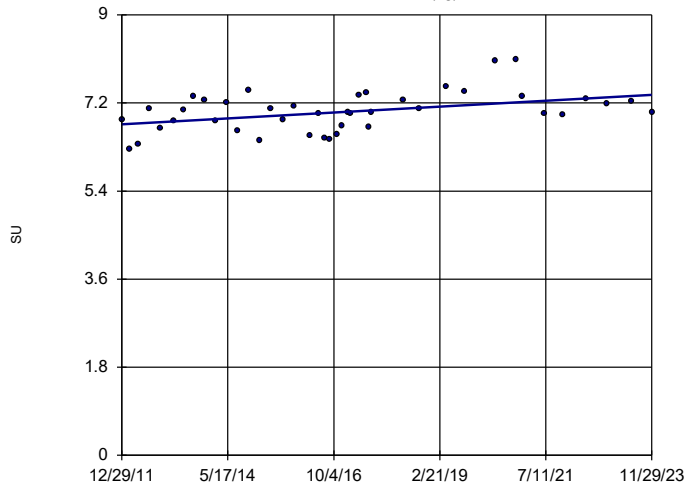Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

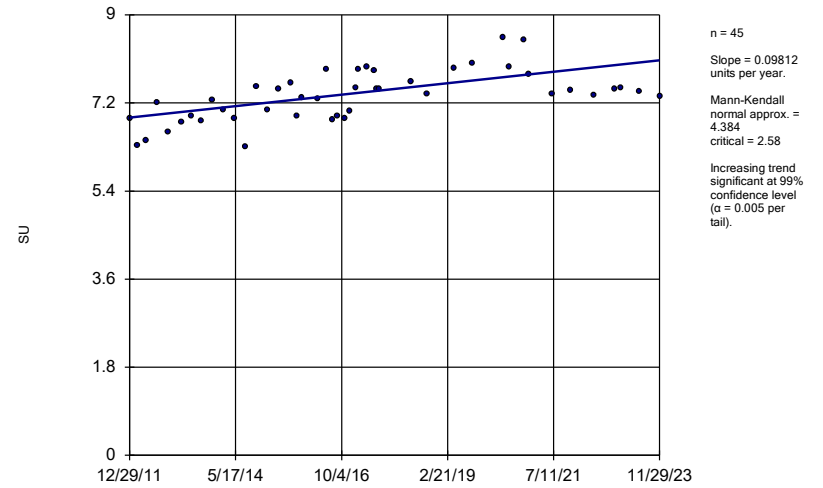Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-11

mg/L

n = 23

Slope = -0.02266 units per year.

Mann-Kendall statistic = -82 critical = -98

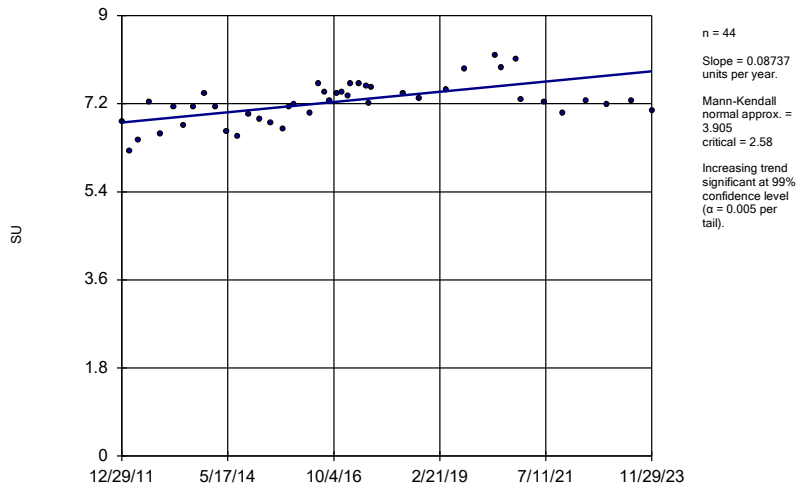Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Fluoride   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-1 (bg)

n = 42

Slope = 0.05069 units per year.

Mann-Kendall normal approx. = 2.743 critical = 2.58

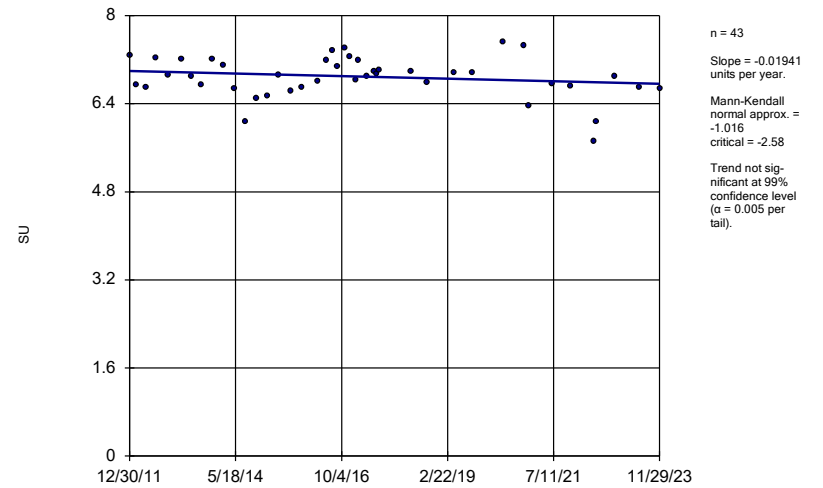Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-2

n = 45

Slope = 0.09812 units per year.

Mann-Kendall normal approx. = 4.384 critical = 2.58

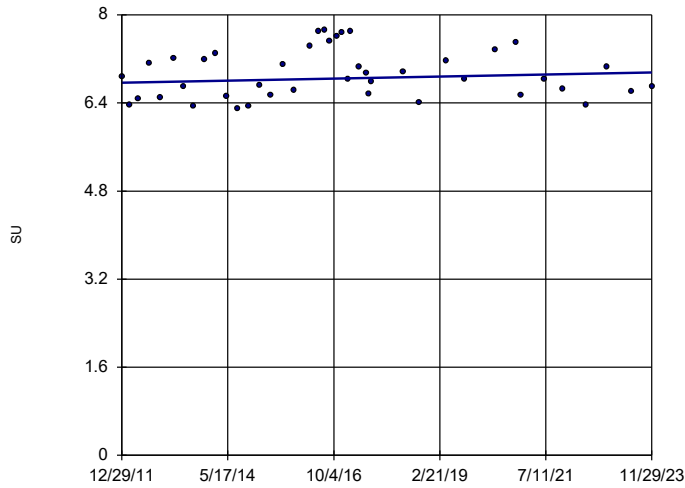Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-3

n = 44

Slope = 0.08737 units per year.

Mann-Kendall normal approx. = 3.905 critical = 2.58

Increasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-4

n = 43

Slope = -0.01941 units per year.

Mann-Kendall normal approx. = -1.016 critical = -2.58

Trend not sig-nificant at 99% confidence level (α = 0.005 per tail).

Constituent: pH   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
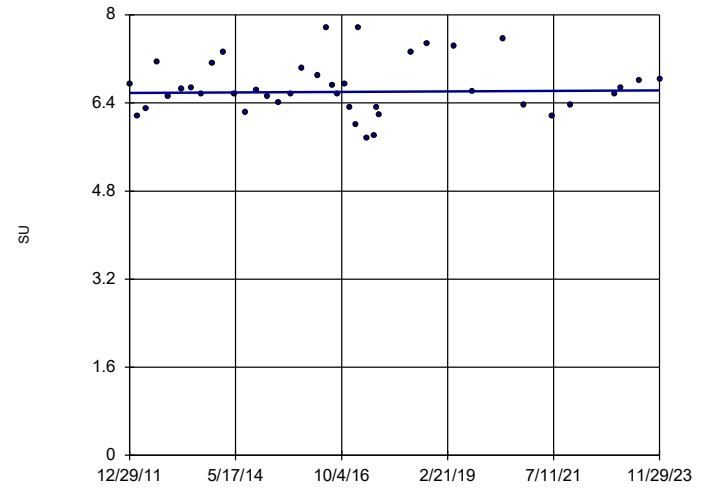
Sen's Slope Estimator
MW-5

n = 42

Slope = 0.01558
units per year.

Mann-Kendall
normal approx. =
0.6287
critical = 2.58

Trend not sig-
nificant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: pH   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
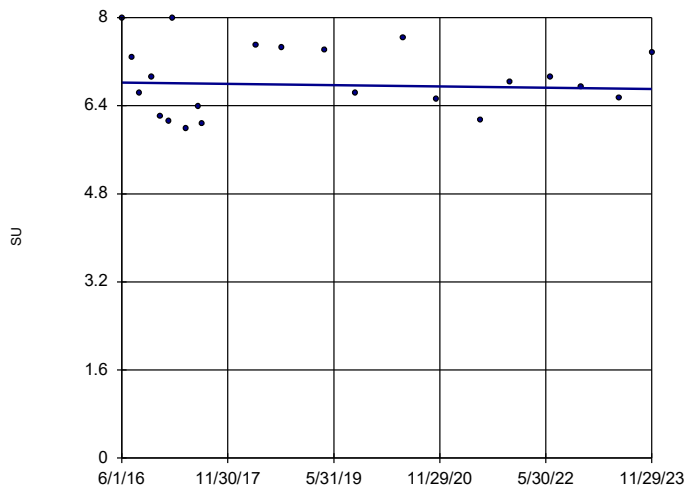### MW-10

n = 41

Slope = 0.003896
units per year.

Mann-Kendall
normal approx. =
0.2587
critical = 2.58

Trend not sig-
nificant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: pH   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

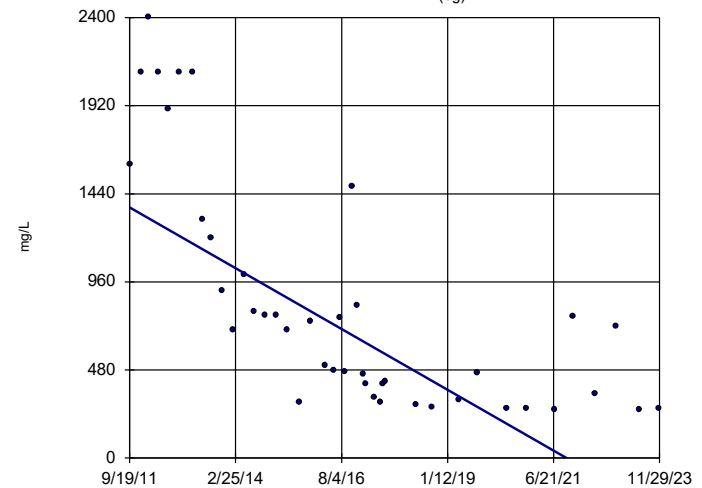Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-11

n = 22

Slope = -0.01576
units per year.

Mann-Kendall
statistic = -10
critical = -92

Trend not sig-
nificant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: pH   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-1 (bg)

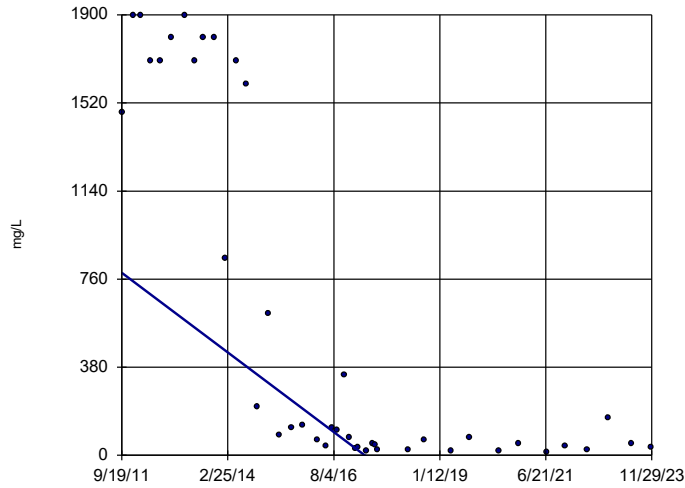
n = 42

Slope = -135.8
units per year.

Mann-Kendall
normal approx. =
-6.366
critical = -2.58

Decreasing trend
significant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Sulfate   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
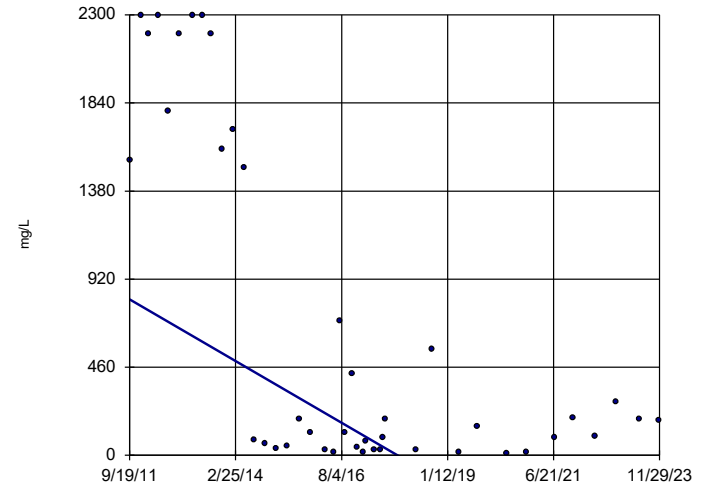
Sen's Slope Estimator

MW-2

n = 42

Slope = -140.7 units per year.

Mann-Kendall normal approx. = -6.096 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

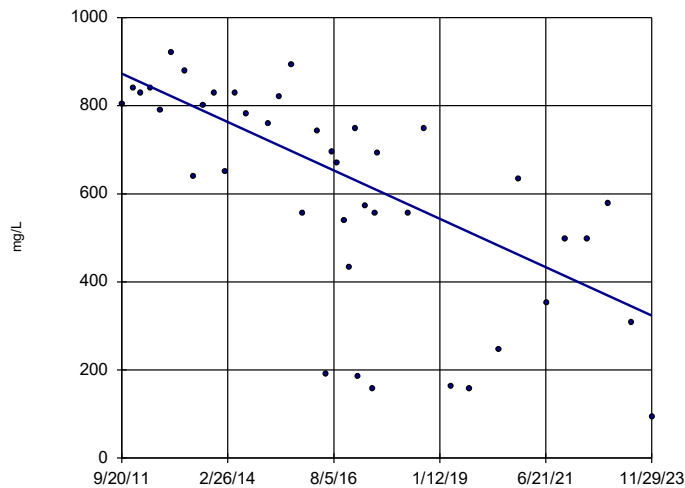## Sen's Slope Estimator

MW-3

n = 42

Slope = -132 units per year.

Mann-Kendall normal approx. = -3.763 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate   Analysis Run 8/30/2024 12:26 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
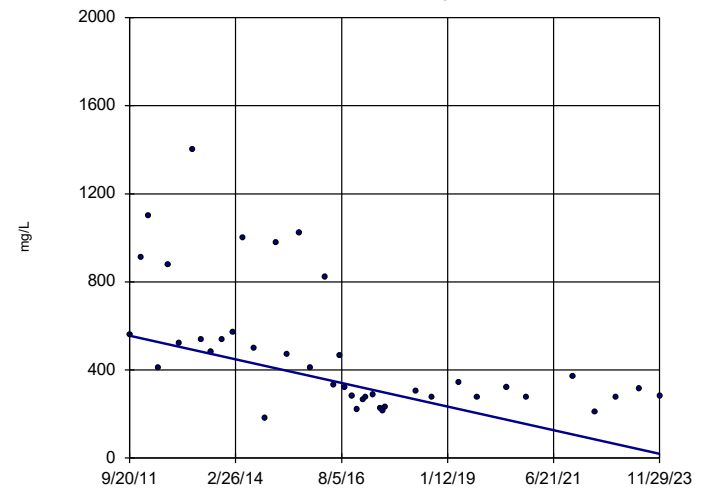
Sen's Slope Estimator

MW-4

n = 41

Slope = -45.06 units per year.

Mann-Kendall normal approx. = -5.136 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-5

n = 41

Slope = -43.94 units per year.

Mann-Kendall normal approx. = -4.474 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-10

n = 40

Slope = -109.5
units per year.

Mann-Kendall
statistic = -393
critical = -223

Decreasing trend
significant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Sulfate   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

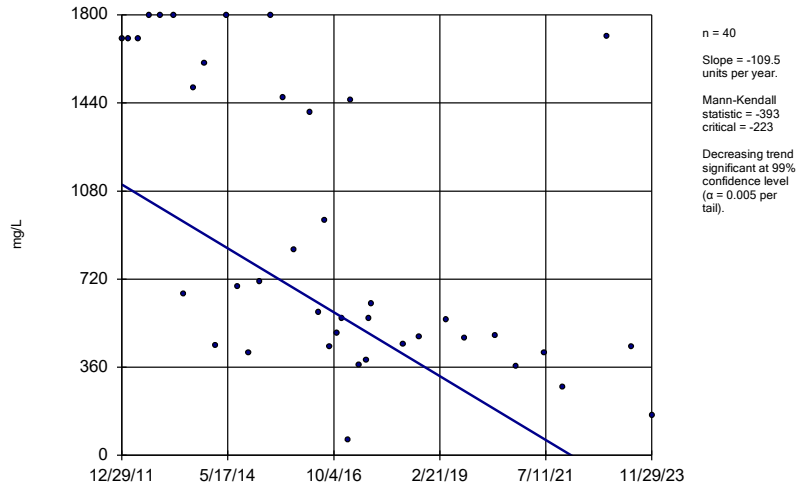## Sen's Slope Estimator
MW-11

n = 23

Slope = 5.69
units per year.

Mann-Kendall
statistic = 27
critical = 98

Trend not sig-
nificant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Sulfate   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
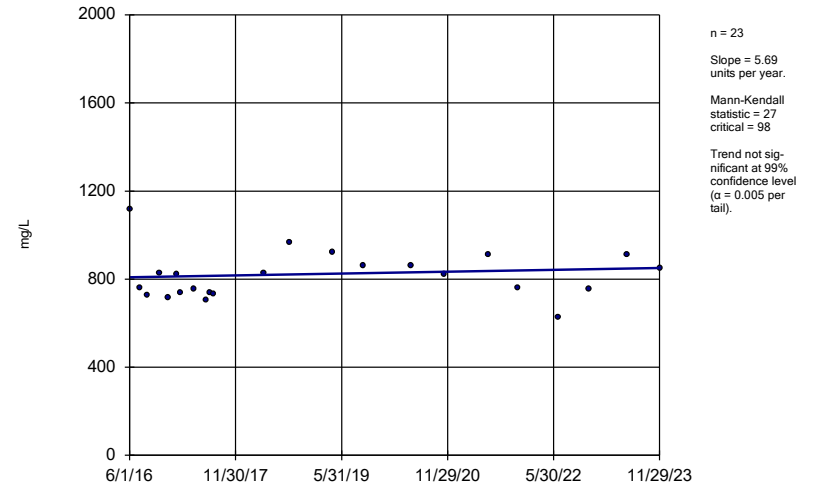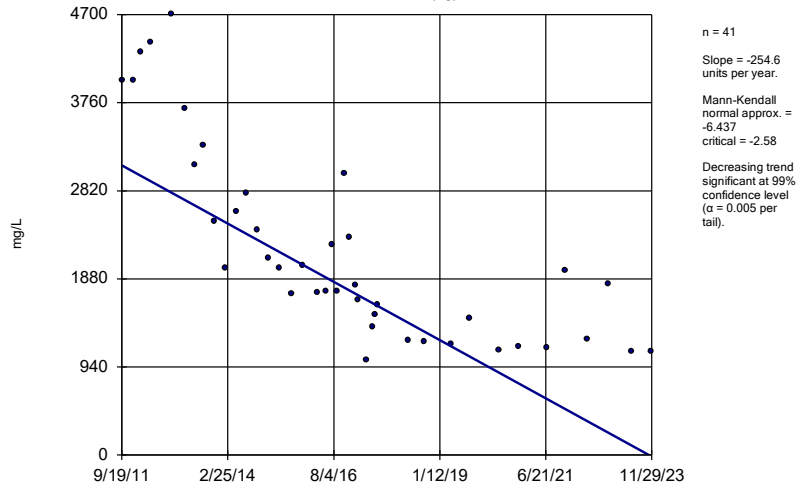
Sen's Slope Estimator
MW-1 (bg)

n = 41

Slope = -254.6
units per year.

Mann-Kendall
normal approx. =
-6.437
critical = -2.58

Decreasing trend
significant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-2

n = 42

Slope = -246.5
units per year.

Mann-Kendall
normal approx. =
-5.479
critical = -2.58

Decreasing trend
significant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-3

n = 42

Slope = -246.5 units per year.

Mann-Kendall normal approx. = -3.176 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).
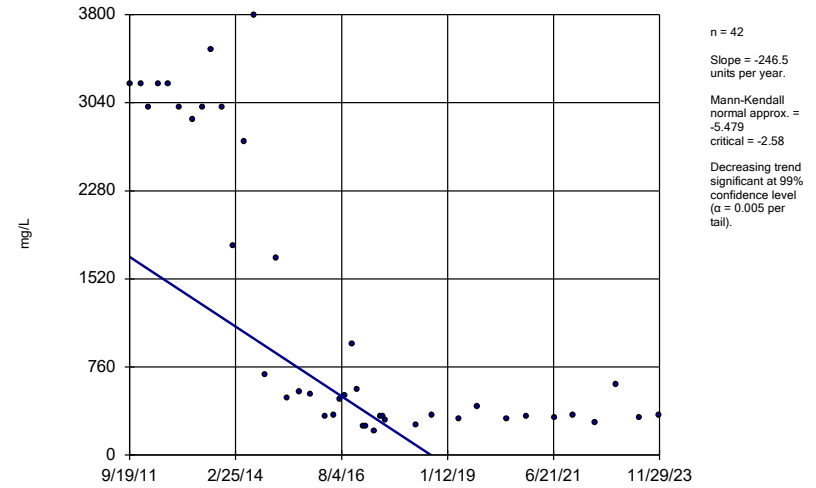
Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-4

n = 43

Slope = -95.76 units per year.

Mann-Kendall normal approx. = -2.701 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
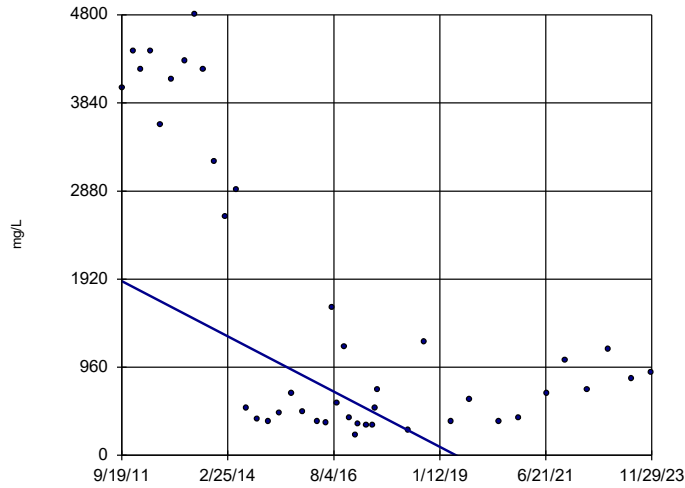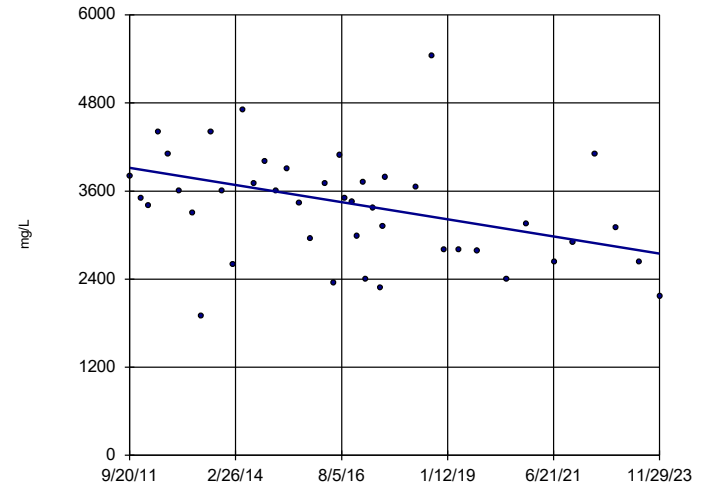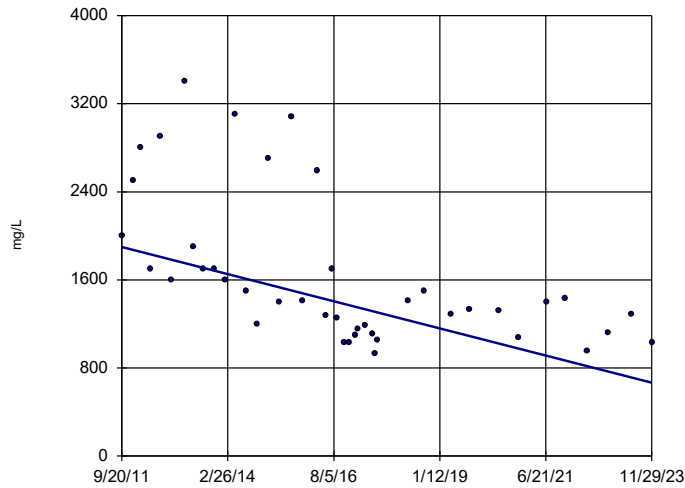
Sen's Slope Estimator
MW-5

n = 42

Slope = -101.1 units per year.

Mann-Kendall normal approx. = -4.586 critical = -2.58

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator
MW-10

n = 40

Slope = -226 units per year.

Mann-Kendall statistic = -396 critical = -223

Decreasing trend significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Sen's Slope Estimator

MW-11

n = 22

Slope = -45.97
units per year.

Mann-Kendall
statistic = -53
critical = -92

Trend not sig-
nificant at 99%
confidence level
(α = 0.005 per
tail).

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:27 PM   View: Trend Tests

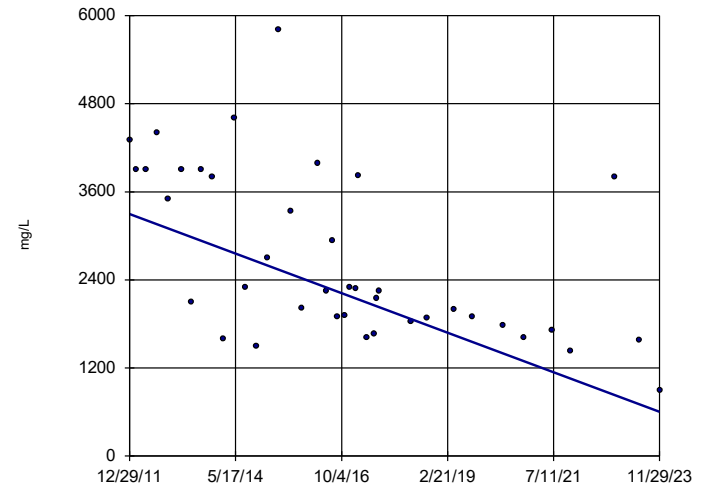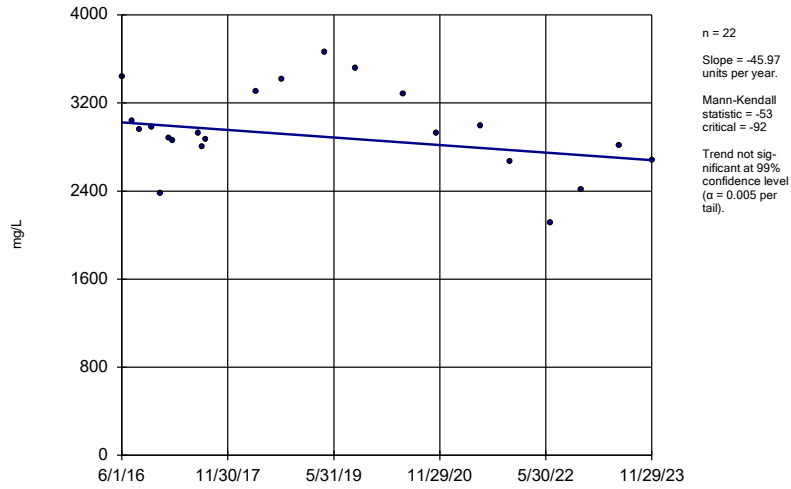Turk Landfill   Client: Geosyntec   Data: Turk Landfill

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

Constituent	Well	Calc.	0.01	Alpha	Sig.	Method
Boron (mg/L)	MW-1 (bg)	-5.329	Yes	0.01	Yes	Mann-W
Boron (mg/L)	MW-2	-5.316	Yes	0.01	Yes	Mann-W
Boron (mg/L)	MW-3	-5.064	Yes	0.01	Yes	Mann-W
Boron (mg/L)	MW-4	-5.183	Yes	0.01	Yes	Mann-W
Boron (mg/L)	MW-5	-5.448	Yes	0.01	Yes	Mann-W
Boron (mg/L)	MW-10	-4.644	Yes	0.01	Yes	Mann-W
Chloride (mg/L)	MW-1 (bg)	-5.351	Yes	0.01	Yes	Mann-W
Chloride (mg/L)	MW-2	-5.002	Yes	0.01	Yes	Mann-W
Chloride (mg/L)	MW-3	-4.914	Yes	0.01	Yes	Mann-W
Chloride (mg/L)	MW-5	-5.434	Yes	0.01	Yes	Mann-W
Chloride (mg/L)	MW-10	-3.991	Yes	0.01	Yes	Mann-W
Fluoride (mg/L)	MW-1 (bg)	4.431	Yes	0.01	Yes	Mann-W
Sulfate (mg/L)	MW-1 (bg)	-4.703	Yes	0.01	Yes	Mann-W
Sulfate (mg/L)	MW-2	-5.146	Yes	0.01	Yes	Mann-W
Sulfate (mg/L)	MW-3	-5.028	Yes	0.01	Yes	Mann-W
Sulfate (mg/L)	MW-4	-5.04	Yes	0.01	Yes	Mann-W
Sulfate (mg/L)	MW-5	-4.853	Yes	0.01	Yes	Mann-W
Sulfate (mg/L)	MW-10	-4.198	Yes	0.01	Yes	Mann-W
Total Dissolved Solids (mg/L)	MW-1 (bg)	-5.136	Yes	0.01	Yes	Mann-W
Total Dissolved Solids (mg/L)	MW-2	-5.307	Yes	0.01	Yes	Mann-W
Total Dissolved Solids (mg/L)	MW-3	-5.026	Yes	0.01	Yes	Mann-W
Total Dissolved Solids (mg/L)	MW-5	-4.967	Yes	0.01	Yes	Mann-W
Total Dissolved Solids (mg/L)	MW-10	-3.173	Yes	0.01	Yes	Mann-W

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

Constituent	Well	Calc.	0.01	Alpha	Sig.	Method
Boron (mg/L)	**MW-1 (bg)**	**-5.329**	**Yes**	**0.01**	**Yes**	**Mann-W**
Boron (mg/L)	**MW-2**	**-5.316**	**Yes**	**0.01**	**Yes**	**Mann-W**
Boron (mg/L)	**MW-3**	**-5.064**	**Yes**	**0.01**	**Yes**	**Mann-W**
Boron (mg/L)	**MW-4**	**-5.183**	**Yes**	**0.01**	**Yes**	**Mann-W**
Boron (mg/L)	**MW-5**	**-5.448**	**Yes**	**0.01**	**Yes**	**Mann-W**
Boron (mg/L)	**MW-10**	**-4.644**	**Yes**	**0.01**	**Yes**	**Mann-W**
Chloride (mg/L)	**MW-1 (bg)**	**-5.351**	**Yes**	**0.01**	**Yes**	**Mann-W**
Chloride (mg/L)	**MW-2**	**-5.002**	**Yes**	**0.01**	**Yes**	**Mann-W**
Chloride (mg/L)	**MW-3**	**-4.914**	**Yes**	**0.01**	**Yes**	**Mann-W**
Chloride (mg/L)	MW-4	-2.099	No	0.01	No	Mann-W
Chloride (mg/L)	**MW-5**	**-5.434**	**Yes**	**0.01**	**Yes**	**Mann-W**
Chloride (mg/L)	**MW-10**	**-3.991**	**Yes**	**0.01**	**Yes**	**Mann-W**
Fluoride (mg/L)	**MW-1 (bg)**	**4.431**	**Yes**	**0.01**	**Yes**	**Mann-W**
Sulfate (mg/L)	**MW-1 (bg)**	**-4.703**	**Yes**	**0.01**	**Yes**	**Mann-W**
Sulfate (mg/L)	**MW-2**	**-5.146**	**Yes**	**0.01**	**Yes**	**Mann-W**
Sulfate (mg/L)	**MW-3**	**-5.028**	**Yes**	**0.01**	**Yes**	**Mann-W**
Sulfate (mg/L)	**MW-4**	**-5.04**	**Yes**	**0.01**	**Yes**	**Mann-W**
Sulfate (mg/L)	**MW-5**	**-4.853**	**Yes**	**0.01**	**Yes**	**Mann-W**
Sulfate (mg/L)	**MW-10**	**-4.198**	**Yes**	**0.01**	**Yes**	**Mann-W**
Total Dissolved Solids (mg/L)	**MW-1 (bg)**	**-5.136**	**Yes**	**0.01**	**Yes**	**Mann-W**
Total Dissolved Solids (mg/L)	**MW-2**	**-5.307**	**Yes**	**0.01**	**Yes**	**Mann-W**
Total Dissolved Solids (mg/L)	**MW-3**	**-5.026**	**Yes**	**0.01**	**Yes**	**Mann-W**
Total Dissolved Solids (mg/L)	**MW-5**	**-4.967**	**Yes**	**0.01**	**Yes**	**Mann-W**
Total Dissolved Solids (mg/L)	**MW-10**	**-3.173**	**Yes**	**0.01**	**Yes**	**Mann-W**

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)

mg/L

- ■ MW-1 background
- ◆ MW-1 compliance

background median = 0.77

compliance median = 0.184

```
Z = -5.329 (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
```
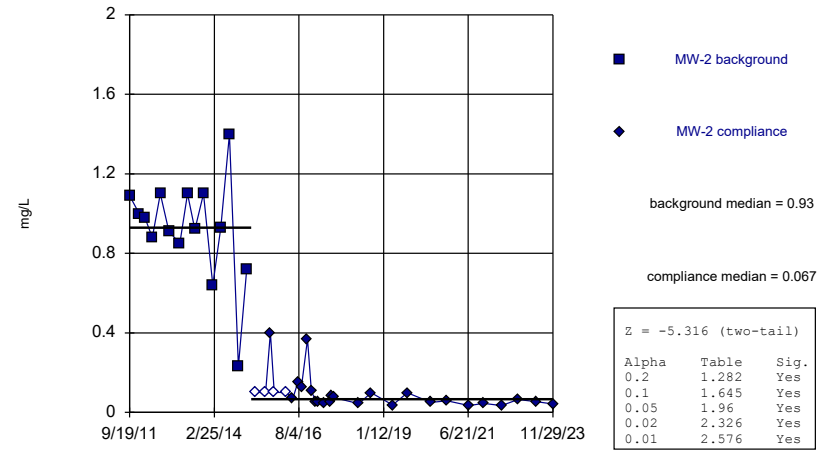
Constituent: Boron   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-2

mg/L

- ■ MW-2 background
- ◆ MW-2 compliance

background median = 0.93

compliance median = 0.067

```
Z = -5.316 (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
```

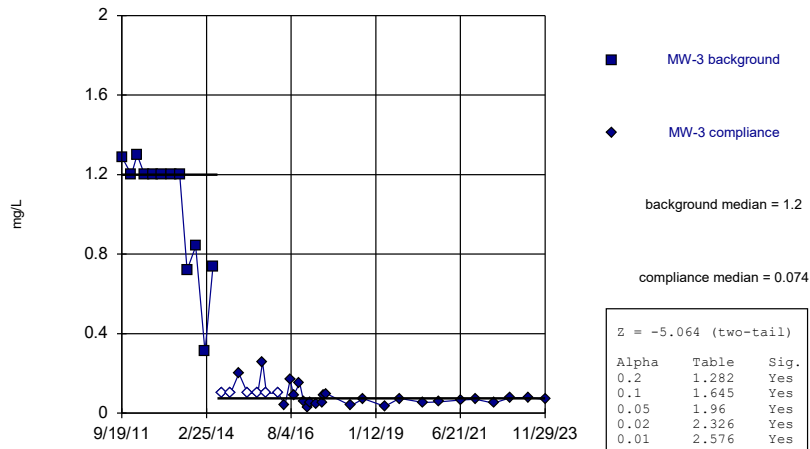Constituent: Boron   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-3

mg/L

- ■ MW-3 background
- ◆ MW-3 compliance

background median = 1.2

compliance median = 0.074

```
Z = -5.064 (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
```
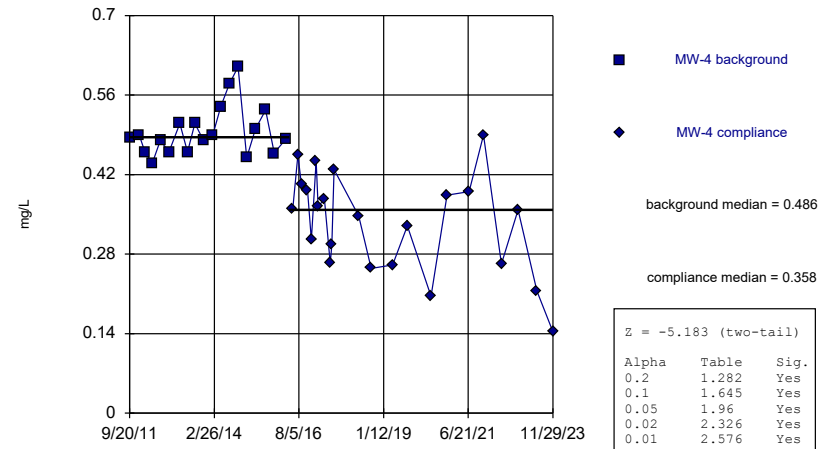
Constituent: Boron   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
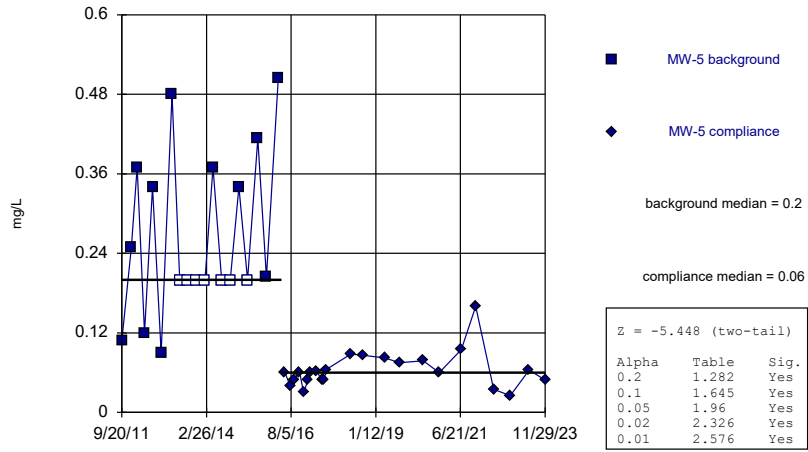
Mann-Whitney (Wilcoxon Rank Sum)

MW-4

mg/L

- ■ MW-4 background
- ◆ MW-4 compliance

background median = 0.486

compliance median = 0.358

```
Z = -5.183 (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: Boron   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
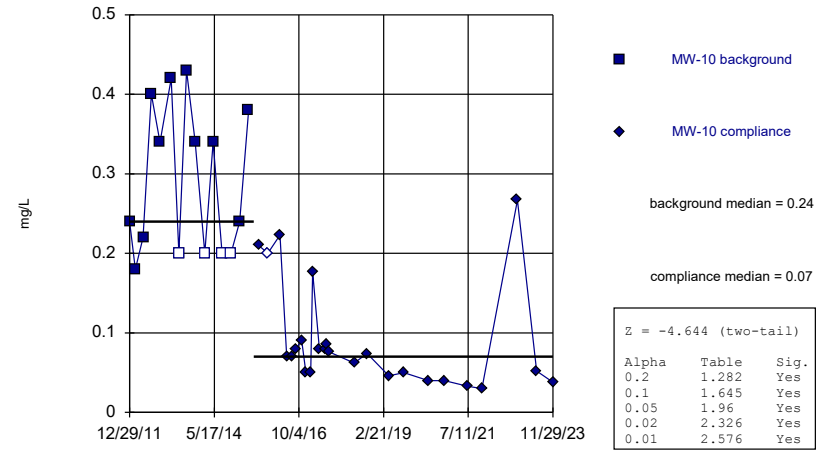
Mann-Whitney (Wilcoxon Rank Sum)

MW-5

■ MW-5 background

◆ MW-5 compliance

background median = 0.2

compliance median = 0.06

```
Z = -5.448 (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: Boron   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
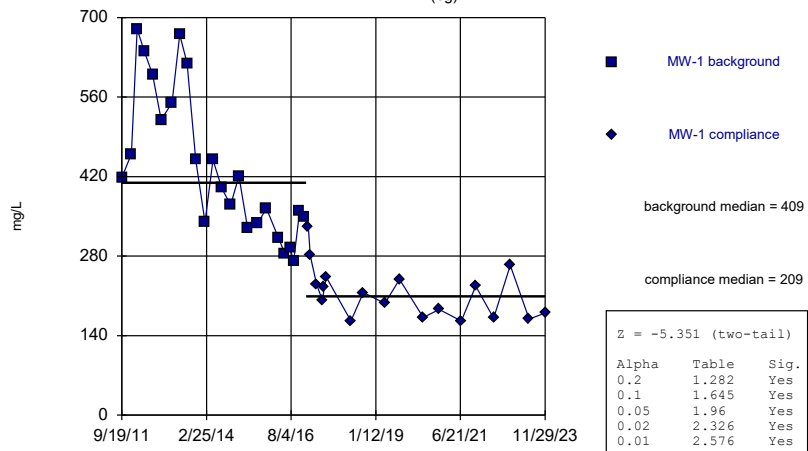
Mann-Whitney (Wilcoxon Rank Sum)

MW-10

■ MW-10 background

◆ MW-10 compliance

background median = 0.24

compliance median = 0.07

```
Z = -4.644 (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: Boron   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
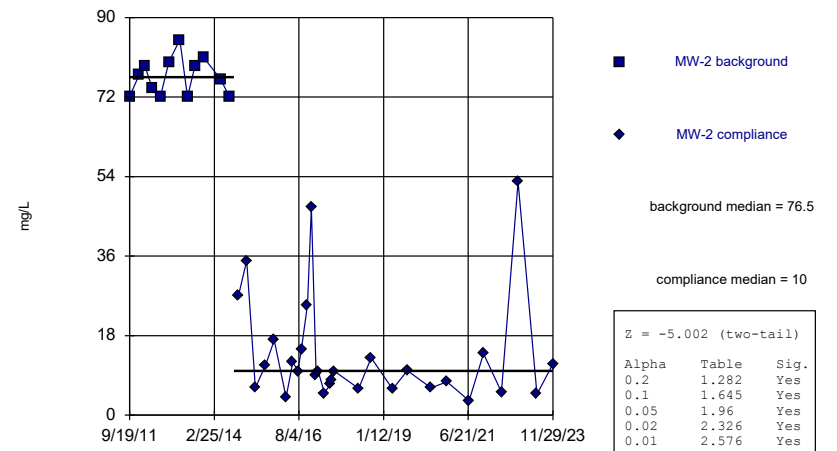
Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)

■ MW-1 background

◆ MW-1 compliance

background median = 409

compliance median = 209

```
Z = -5.351 (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
```
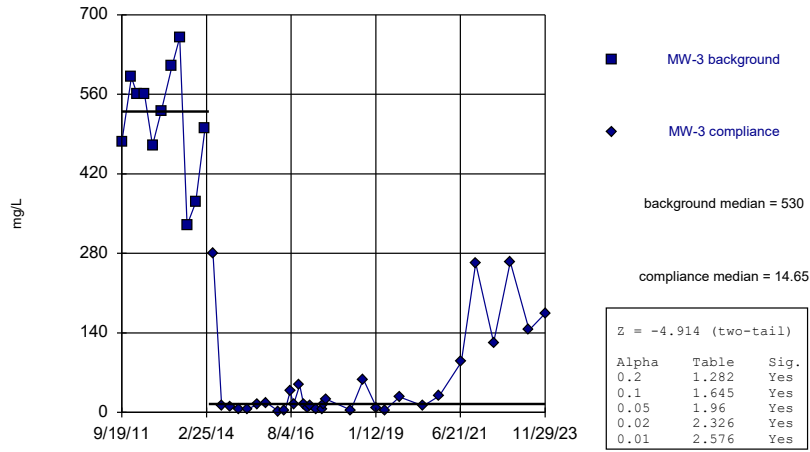
Constituent: Chloride   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

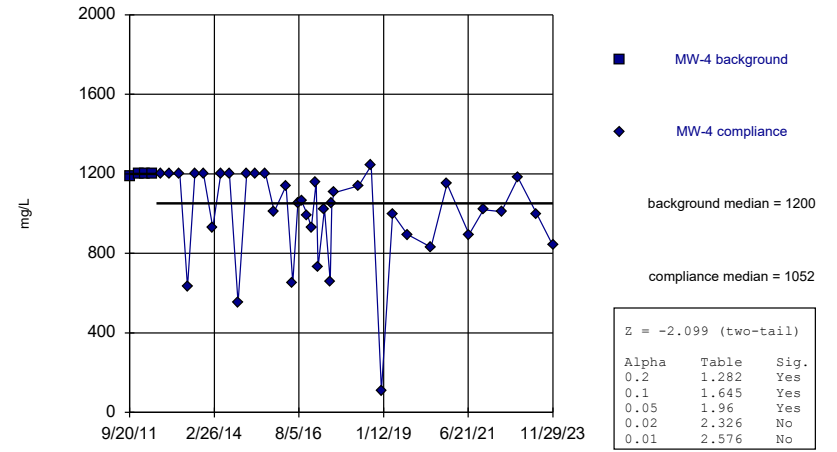## Mann-Whitney (Wilcoxon Rank Sum)

MW-2

■ MW-2 background

◆ MW-2 compliance

background median = 76.5

compliance median = 10

```
Z = -5.002 (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 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
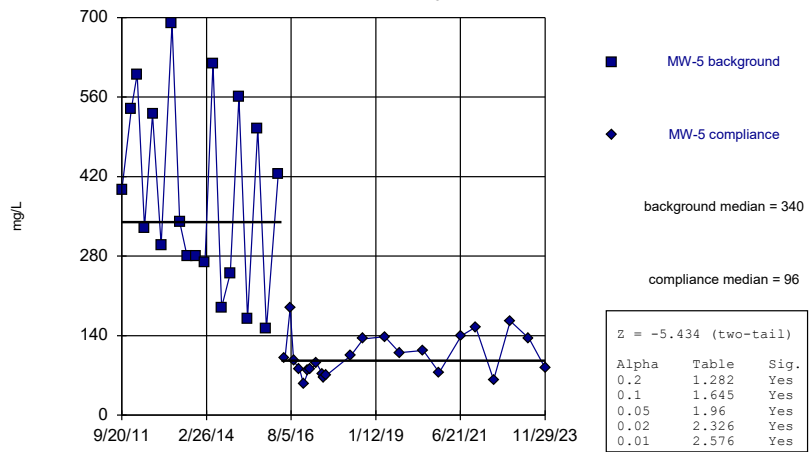
Mann-Whitney (Wilcoxon Rank Sum)
MW-3

■ MW-3 background

◆ MW-3 compliance

background median = 530

compliance median = 14.65

```
Z = -4.914 (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 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
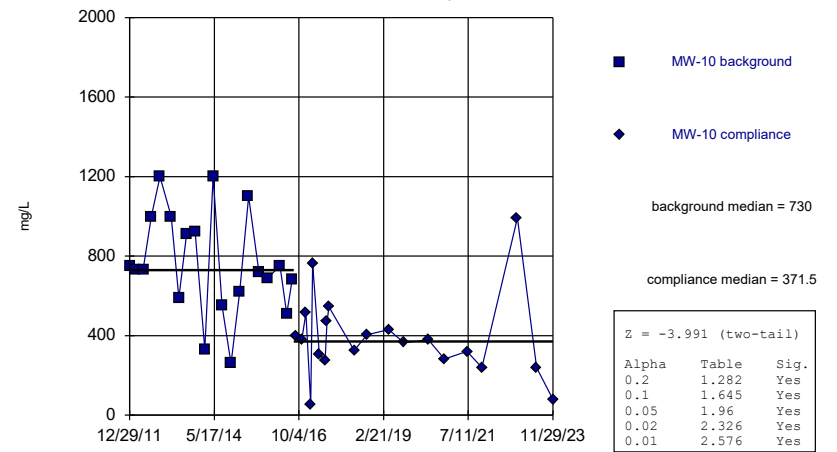
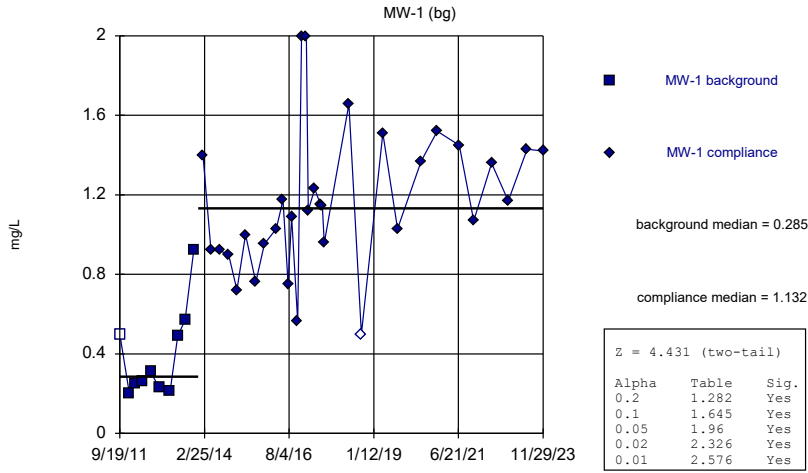## Mann-Whitney (Wilcoxon Rank Sum)
MW-4

■ MW-4 background

◆ MW-4 compliance

background median = 1200

compliance median = 1052

```
Z = -2.099 (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
```
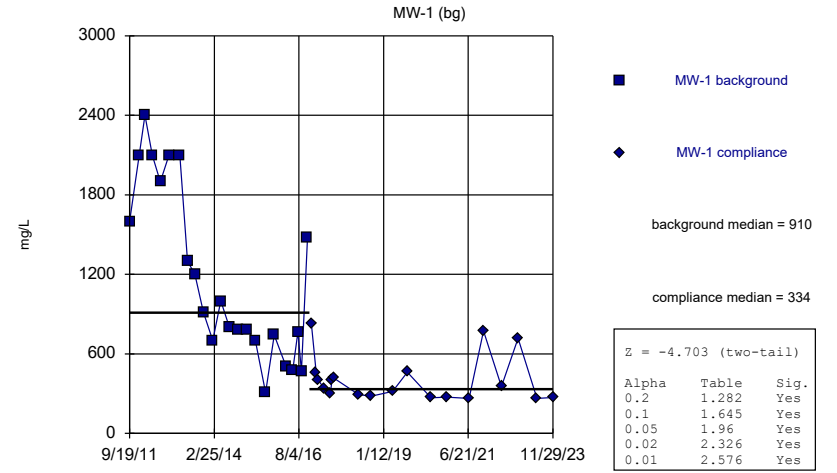
Constituent: Chloride   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)
MW-5

■ MW-5 background

◆ MW-5 compliance

background median = 340

compliance median = 96

```
Z = -5.434 (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 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

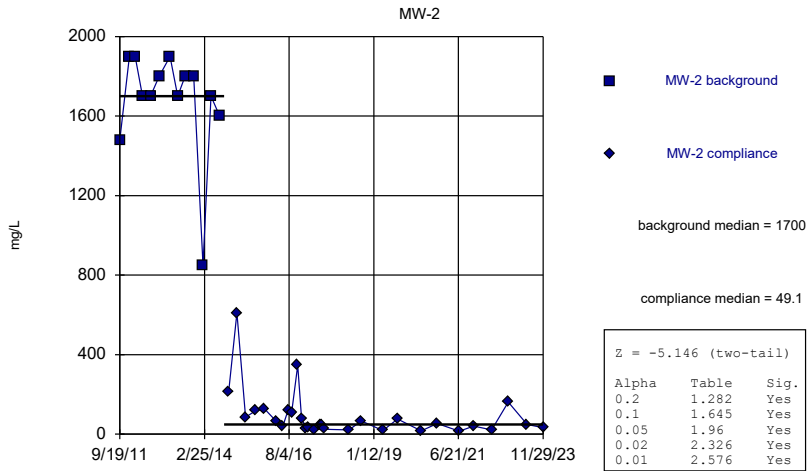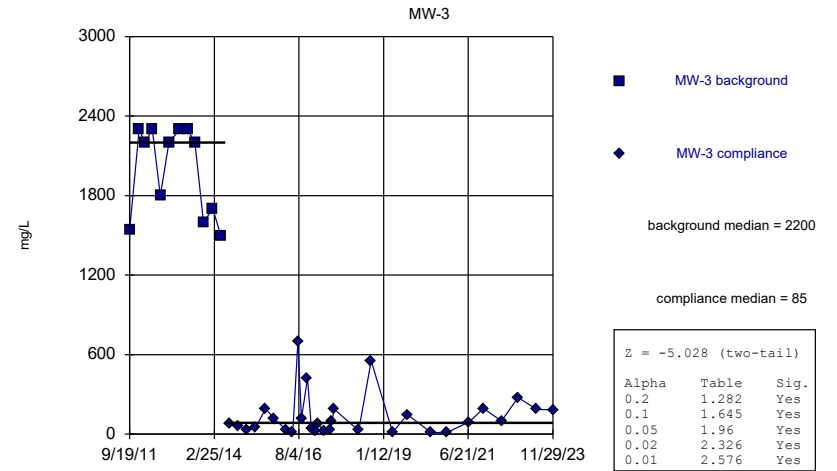## Mann-Whitney (Wilcoxon Rank Sum)
MW-10

■ MW-10 background

◆ MW-10 compliance

background median = 730

compliance median = 371.5

```
Z = -3.991 (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 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)

■ MW-1 background

◆ MW-1 compliance

background median = 0.285

compliance median = 1.132

```
Z = 4.431 (two-tail)

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

Constituent: Fluoride   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-1 (bg)

■ MW-1 background

◆ MW-1 compliance

background median = 910

compliance median = 334

```
Z = -4.703 (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: Sulfate   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

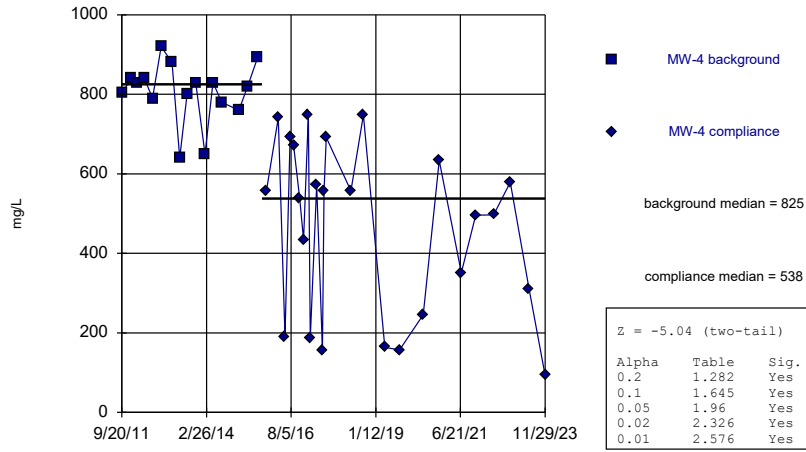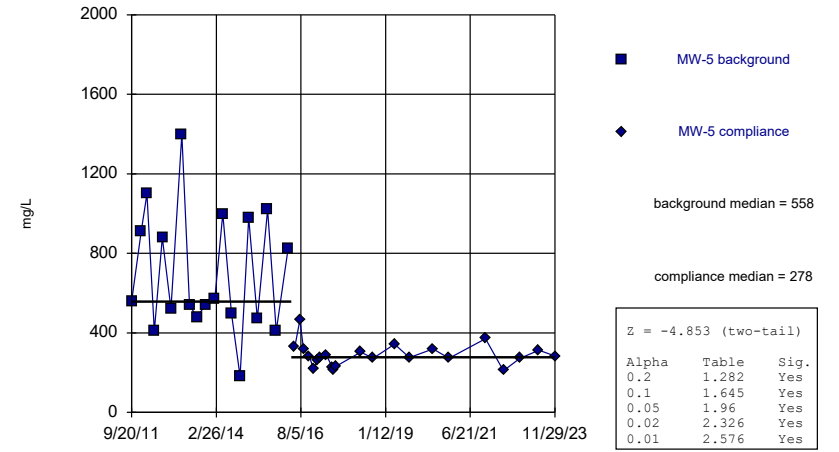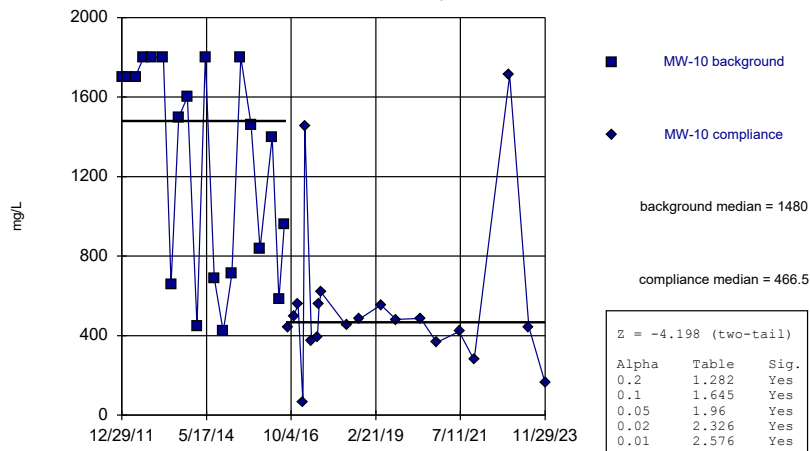## Mann-Whitney (Wilcoxon Rank Sum)

MW-2

■ MW-2 background

◆ MW-2 compliance

background median = 1700

compliance median = 49.1

```
Z = -5.146 (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: Sulfate   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
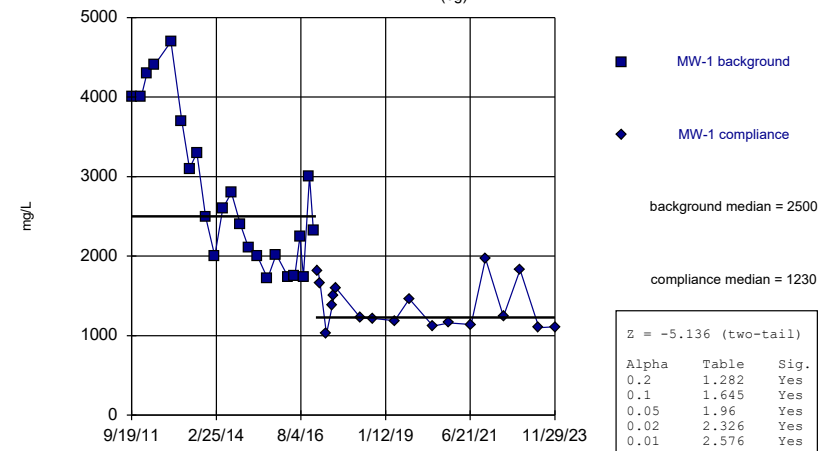
Mann-Whitney (Wilcoxon Rank Sum)

MW-3

■ MW-3 background

◆ MW-3 compliance

background median = 2200

compliance median = 85

```
Z = -5.028 (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: Sulfate   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill
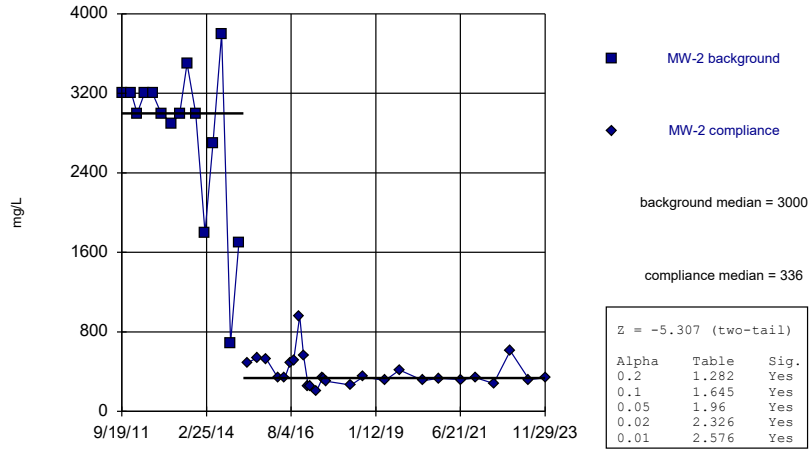
Mann-Whitney (Wilcoxon Rank Sum)
MW-4

■ MW-4 background

◆ MW-4 compliance

background median = 825

compliance median = 538

Z = -5.04 (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: Sulfate   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)
MW-5

■ MW-5 background

◆ MW-5 compliance

background median = 558

compliance median = 278

Z = -4.853 (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: Sulfate   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)
MW-10

■ MW-10 background

◆ MW-10 compliance

background median = 1480

compliance median = 466.5

Z = -4.198 (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: Sulfate   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)
MW-1 (bg)

■ MW-1 background

◆ MW-1 compliance

background median = 2500

compliance median = 1230

Z = -5.136 (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: Total Dissolved Solids   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

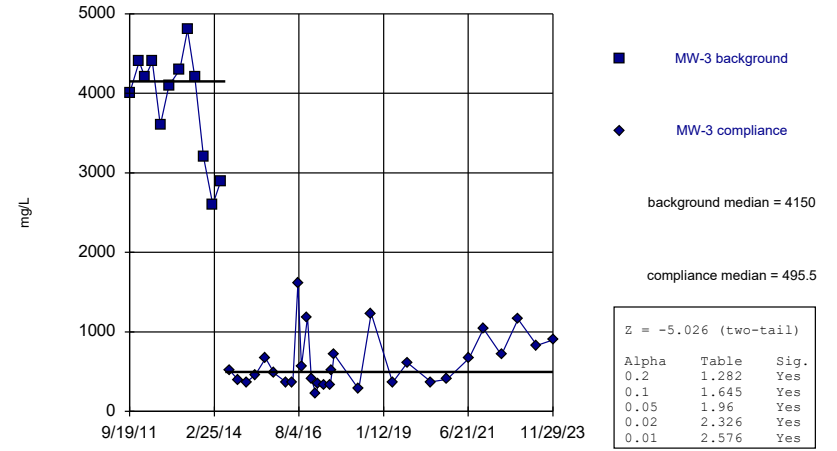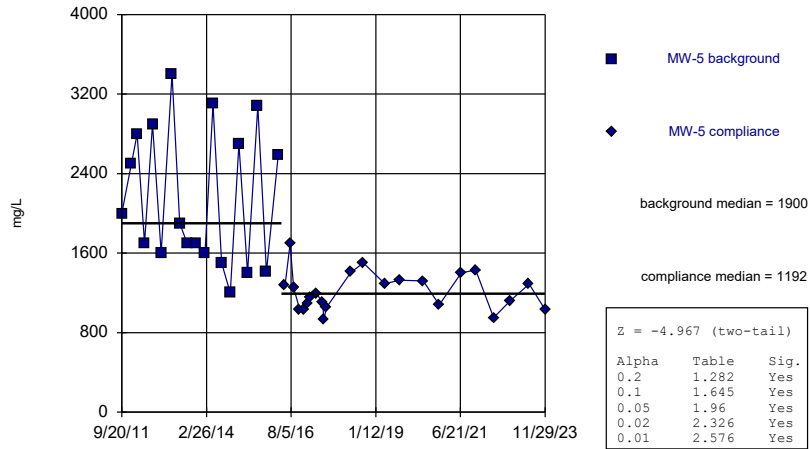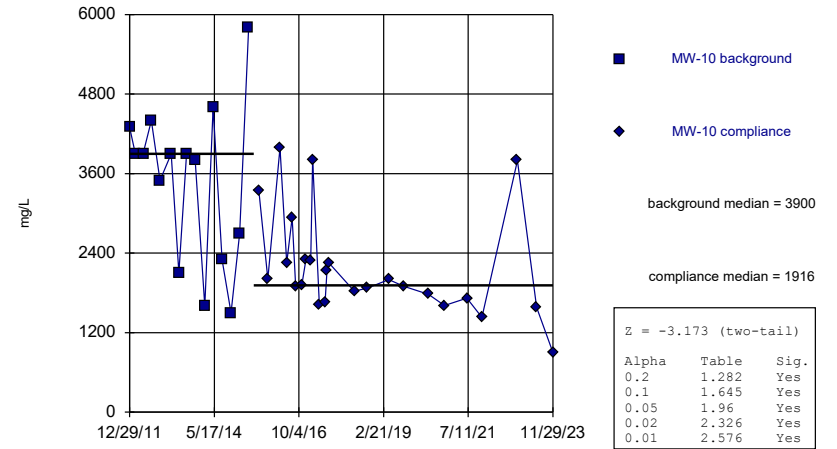## Mann-Whitney (Wilcoxon Rank Sum)

MW-2

- ■ MW-2 background
- ◆ MW-2 compliance

background median = 3000

compliance median = 336

```
Z = -5.307 (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
```

y-axis: mg/L — 4000, 3200, 2400, 1600, 800, 0
x-axis: 9/19/11, 2/25/14, 8/4/16, 1/12/19, 6/21/21, 11/29/23

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-3

- ■ MW-3 background
- ◆ MW-3 compliance

background median = 4150

compliance median = 495.5

```
Z = -5.026 (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
```

y-axis: mg/L — 5000, 4000, 3000, 2000, 1000, 0
x-axis: 9/19/11, 2/25/14, 8/4/16, 1/12/19, 6/21/21, 11/29/23

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:29 PM   View: Mann-Whitney
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-5

- ■ MW-5 background
- ◆ MW-5 compliance

background median = 1900

compliance median = 1192

```
Z = -4.967 (two-tail)

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

y-axis: mg/L — 4000, 3200, 2400, 1600, 800, 0
x-axis: 9/20/11, 2/26/14, 8/5/16, 1/12/19, 6/21/21, 11/29/23

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:30 PM   View: Mann-Whitney
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Mann-Whitney (Wilcoxon Rank Sum)

MW-10

- ■ MW-10 background
- ◆ MW-10 compliance

background median = 3900

compliance median = 1916

```
Z = -3.173 (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
```

y-axis: mg/L — 6000, 4800, 3600, 2400, 1200, 0
x-axis: 12/29/11, 5/17/14, 10/4/16, 2/21/19, 7/11/21, 11/29/23

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:30 PM   View: Mann-Whitney
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Intrawell Prediction Limits - All Results

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg	NBg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (mg/L)	MW-1	0.3975	n/a	n/a	1 future	n/a	27	0.2064	0.09691	0	None	No	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-2	0.401	n/a	n/a	1 future	n/a	28	n/a	n/a	14.29	n/a	n/a	0.002337	NP Intra (normality) 1 of 2
Boron (mg/L)	MW-3	0.1878	n/a	n/a	1 future	n/a	31	-2.715	0.5376	19.35	Kaplan-Meier	ln(x)	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-4	0.5169	n/a	n/a	1 future	n/a	22	0.3351	0.08953	0	None	No	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-5	0.1232	n/a	n/a	1 future	n/a	23	0.248	0.05105	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-10	0.2334	n/a	n/a	1 future	n/a	25	-2.631	0.5909	4	None	ln(x)	0.001504	Param Intra 1 of 2
Boron (mg/L)	MW-11	0.1873	n/a	n/a	1 future	n/a	23	0.5338	0.01899	30.43	Kaplan-Meier	x^(1/3)	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-1	310.1	n/a	n/a	1 future	n/a	23	207.1	51.04	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-2	132.6	n/a	n/a	1 future	n/a	23	78.98	26.58	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-3	237.4	n/a	n/a	1 future	n/a	22	124.9	55.42	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-4	765.7	n/a	n/a	1 future	n/a	23	490.1	136.6	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-5	379.5	n/a	n/a	1 future	n/a	21	277	50.15	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-10	475.2	n/a	n/a	1 future	n/a	20	318.2	76.3	0	None	No	0.001504	Param Intra 1 of 2
Calcium (mg/L)	MW-11	709	n/a	n/a	1 future	n/a	23	n/a	n/a	0	n/a	n/a	0.003415	NP Intra (normality) 1 of 2
Chloride (mg/L)	MW-1	310.7	n/a	n/a	1 future	n/a	18	214.8	45.58	0	None	No	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-2	41.65	n/a	n/a	1 future	n/a	29	2.347	0.7073	0	None	ln(x)	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-3	305.3	n/a	n/a	1 future	n/a	32	3.011	1.401	0	None	ln(x)	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-4	1241	n/a	n/a	1 future	n/a	43	n/a	n/a	0	n/a	n/a	0.001037	NP Intra (normality) 1 of 2
Chloride (mg/L)	MW-5	177.3	n/a	n/a	1 future	n/a	23	104.1	36.31	0	None	No	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-10	835.9	n/a	n/a	1 future	n/a	22	406.7	211.3	0	None	No	0.001504	Param Intra 1 of 2
Chloride (mg/L)	MW-11	924.3	n/a	n/a	1 future	n/a	23	770.6	76.18	0	None	No	0.001504	Param Intra 1 of 2
Fluoride (mg/L)	MW-1	1.854	n/a	n/a	1 future	n/a	32	1.165	0.3562	3.125	None	No	0.001504	Param Intra 1 of 2
Fluoride (mg/L)	MW-2	0.5233	n/a	n/a	1 future	n/a	40	n/a	n/a	10	n/a	n/a	0.001159	NP Intra (normality) 1 of 2
Fluoride (mg/L)	MW-3	0.9783	n/a	n/a	1 future	n/a	42	-1.016	0.5264	14.29	None	ln(x)	0.001504	Param Intra 1 of 2
Fluoride (mg/L)	MW-4	1	n/a	n/a	1 future	n/a	42	n/a	n/a	16.67	n/a	n/a	0.001077	NP Intra (normality) 1 of 2
Fluoride (mg/L)	MW-5	1	n/a	n/a	1 future	n/a	42	n/a	n/a	16.67	n/a	n/a	0.001077	NP Intra (normality) 1 of 2
Fluoride (mg/L)	MW-10	1.246	n/a	n/a	1 future	n/a	39	n/a	n/a	5.128	n/a	n/a	0.001226	NP Intra (normality) 1 of 2
Fluoride (mg/L)	MW-11	0.6263	n/a	n/a	1 future	n/a	23	0.3542	0.1349	21.74	Kaplan-Meier	No	0.001504	Param Intra 1 of 2
pH (SU)	MW-1	7.78	6.265	n/a	1 future	n/a	42	7.023	0.4013	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-2	8.287	6.384	n/a	1 future	n/a	45	7.336	0.507	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-3	8.009	6.418	n/a	1 future	n/a	44	7.213	0.4231	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-4	7.572	6.172	n/a	1 future	n/a	43	6.872	0.3716	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-5	7.751	6.092	n/a	1 future	n/a	42	6.922	0.4394	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-10	7.617	5.755	n/a	1 future	n/a	41	6.686	0.4921	0	None	No	0.000752	Param Intra 1 of 2
pH (SU)	MW-11	8.136	5.617	n/a	1 future	n/a	22	6.877	0.6202	0	None	No	0.000752	Param Intra 1 of 2
Sulfate (mg/L)	MW-1	830	n/a	n/a	1 future	n/a	19	n/a	n/a	0	n/a	n/a	0.004832	NP Intra (normality) 1 of 2
Sulfate (mg/L)	MW-2	347.1	n/a	n/a	1 future	n/a	29	4.05	0.9206	0	None	ln(x)	0.001504	Param Intra 1 of 2
Sulfate (mg/L)	MW-3	496.7	n/a	n/a	1 future	n/a	30	4.541	1.736	0	None	x^(1/3)	0.001504	Param Intra 1 of 2
Sulfate (mg/L)	MW-4	893.8	n/a	n/a	1 future	n/a	25	462.7	216.6	0	None	No	0.001504	Param Intra 1 of 2
Sulfate (mg/L)	MW-5	405.8	n/a	n/a	1 future	n/a	22	288.7	57.66	0	None	No	0.001504	Param Intra 1 of 2
Sulfate (mg/L)	MW-10	1710	n/a	n/a	1 future	n/a	20	n/a	n/a	0	n/a	n/a	0.004291	NP Intra (normality) 1 of 2
Sulfate (mg/L)	MW-11	1028	n/a	n/a	1 future	n/a	23	814	105.8	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-1	2020	n/a	n/a	1 future	n/a	18	36.87	3.837	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-2	718.6	n/a	n/a	1 future	n/a	27	5.916	0.3352	0	None	ln(x)	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-3	1317	n/a	n/a	1 future	n/a	30	23.97	6.333	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-4	4734	n/a	n/a	1 future	n/a	43	3353	733	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-5	1601	n/a	n/a	1 future	n/a	23	1216	191.1	0	None	No	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-10	3854	n/a	n/a	1 future	n/a	25	46.17	7.995	0	None	sqrt(x)	0.001504	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	MW-11	3724	n/a	n/a	1 future	n/a	22	2949	381.5	0	None	No	0.001504	Param Intra 1 of 2

Prediction Limit

Intrawell Parametric, MW-1 (bg)

■ MW-1 background

Limit = 0.3975
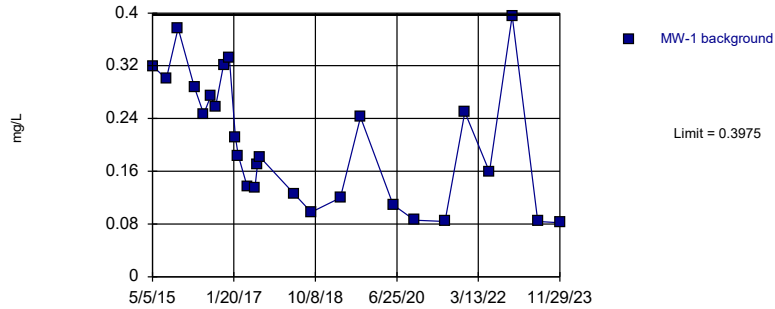
Background Data Summary: Mean=0.2064, Std. Dev.=0.09691, n=27.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.931, critical = 0.894.   Kappa = 1.972 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

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Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, MW-2

■ MW-2 background

Limit = 0.401
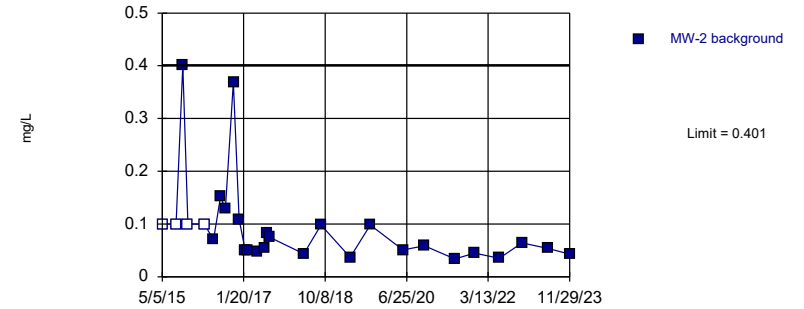
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 28 background values. 14.29% NDs. Well-constituent pair annual alpha = 0.004669. Individual comparison alpha = 0.002337 (1 of 2). Assumes 1 future value.

Constituent: Boron   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, MW-3

■ MW-3 background

Limit = 0.1878
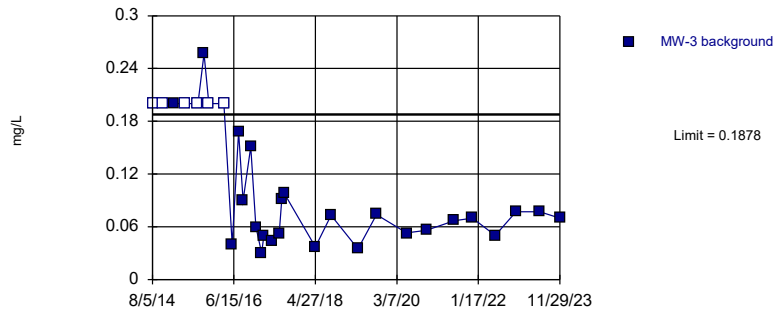
Background Data Summary (based on natural log transformation) (after Kaplan-Meier Adjustment): Mean=-2.715, Std. Dev.=0.5376, n=31, 19.35% NDs.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9094, critical = 0.902.   Kappa = 1.94 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron   Analysis Run 8/30/2024 12:32 PM
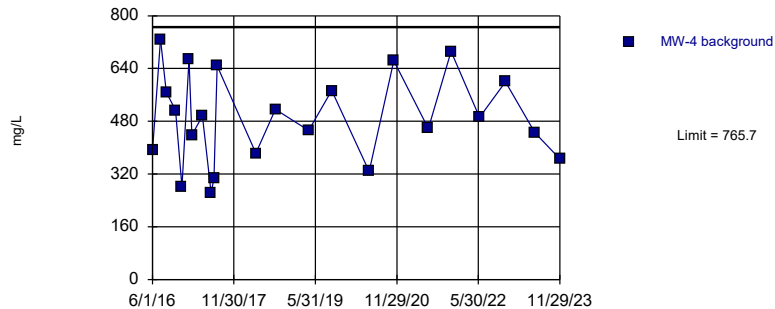
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4

■ MW-4 background

Limit = 0.5169
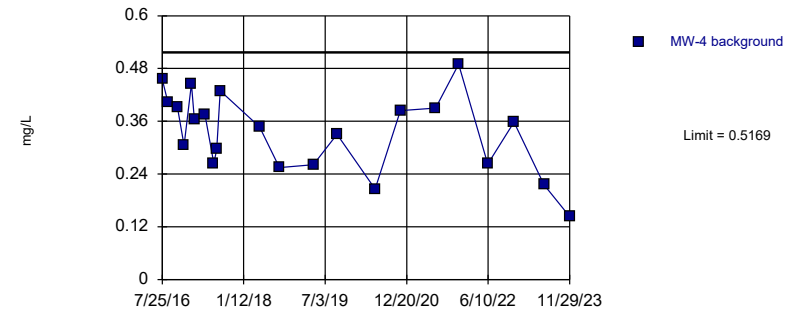
Background Data Summary: Mean=0.3351, Std. Dev.=0.08953, n=22.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9778, critical = 0.878.   Kappa = 2.031 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron   Analysis Run 8/30/2024 12:32 PM
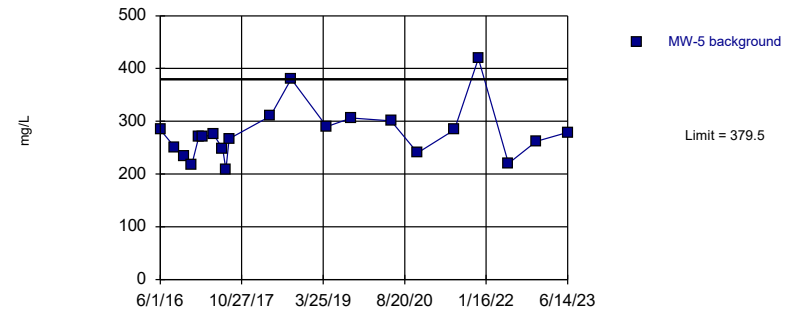
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-5

■ MW-5 background

Limit = 0.1232

mg/L

6/1/16   11/30/17   5/31/19   11/29/20   5/30/22   11/29/23
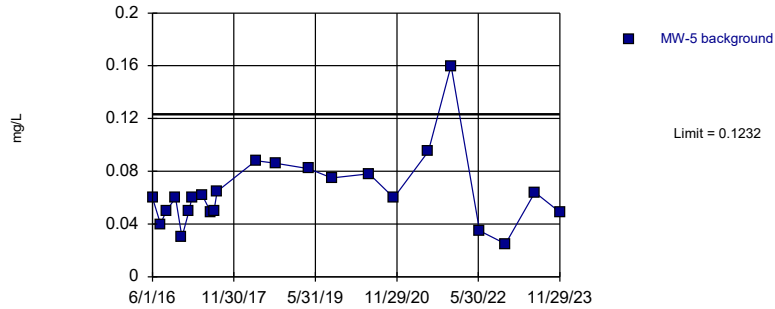
Background Data Summary (based on square root transformation): Mean=0.248, Std. Dev.=0.05105, n=23.
Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.936, critical = 0.881.   Kappa = 2.017 (c=7, w=5, 1 of 2,
event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-10

■ MW-10 background

Limit = 0.2334

mg/L

8/19/15   4/14/17   12/10/18   8/6/20   4/3/22   11/29/23
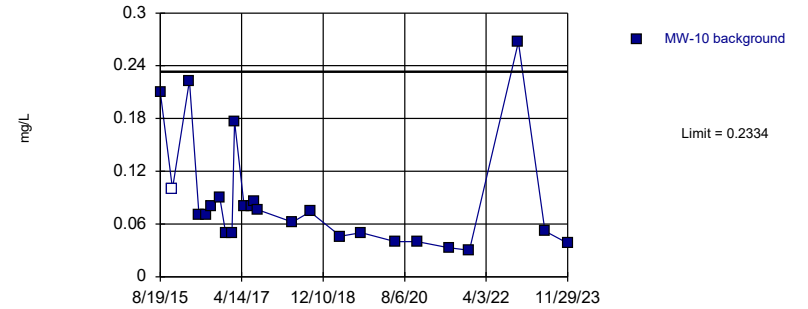
Background Data Summary (based on natural log transformation): Mean=-2.631, Std. Dev.=0.5909, n=25, 4% NDs.
Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9201, critical = 0.888.   Kappa = 1.99 (c=7, w=5, 1 of 2,
event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-11

■ MW-11 background

Limit = 0.1873

mg/L

6/1/16   11/30/17   5/31/19   11/29/20   5/30/22   11/29/23
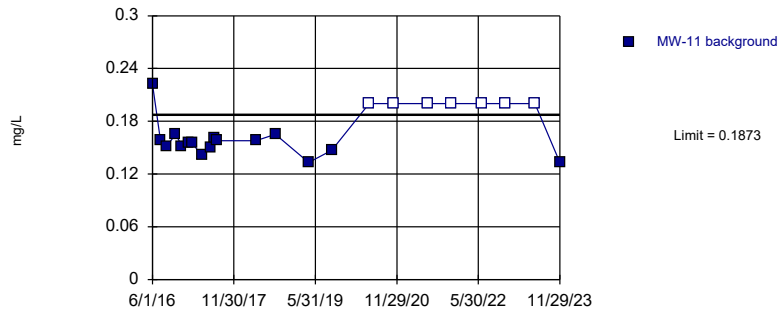
Background Data Summary (based on cube root transformation) (after Kaplan-Meier Adjustment): Mean=0.5338, Std.
Dev.=0.01899, n=23, 30.43% NDs.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8833, critical = 0.881.
Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Boron   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)

■ MW-1 background

Limit = 310.1

mg/L

6/1/16   11/30/17   5/31/19   11/29/20   5/30/22   11/29/23
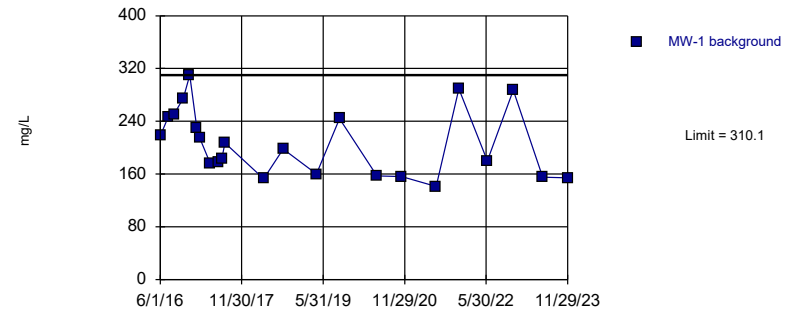
Background Data Summary: Mean=207.1, Std. Dev.=51.04, n=23.   Normality test: Shapiro Wilk @alpha = 0.01,
calculated = 0.9189, critical = 0.881.   Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha =
0.001504. Assumes 1 future value.

Constituent: Calcium   Analysis Run 8/30/2024 12:32 PM

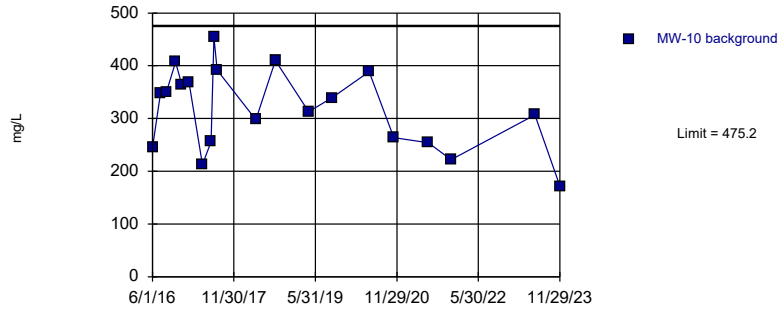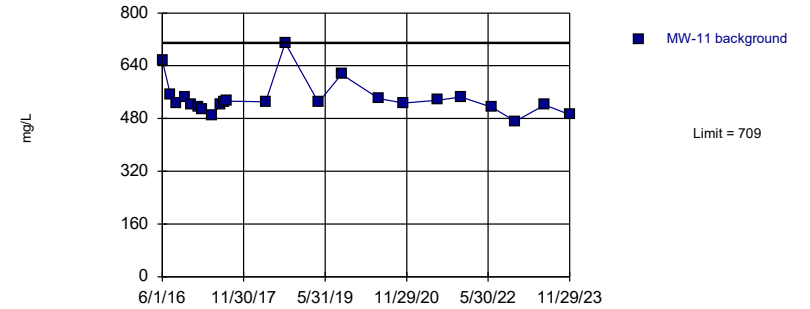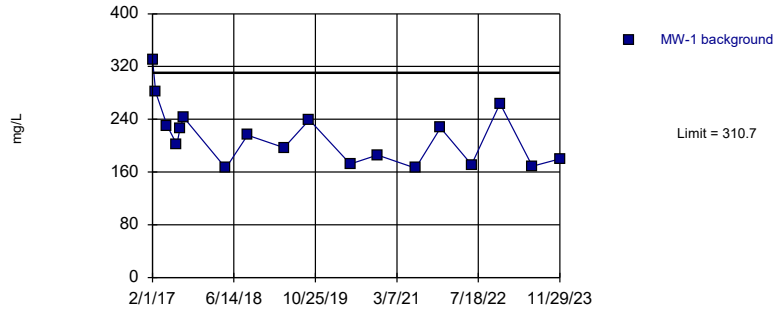Turk Landfill   Client: Geosyntec   Data: Turk Landfill
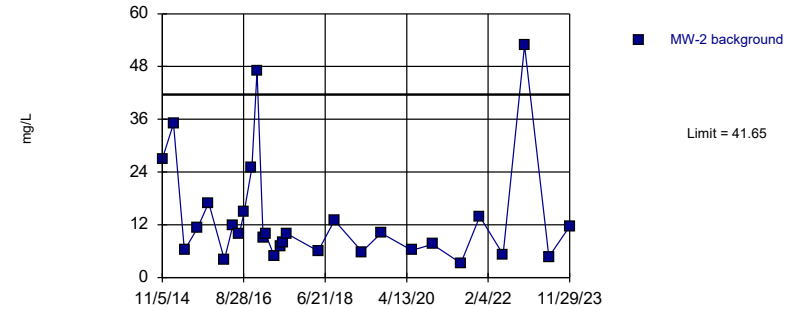
Prediction Limit

Intrawell Parametric, MW-2

MW-2 background

Limit = 132.6
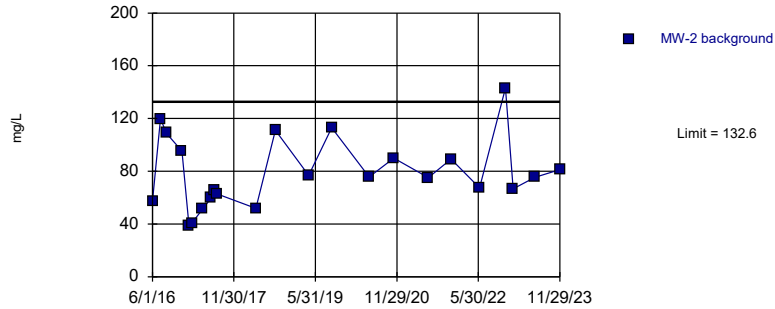
Background Data Summary: Mean=78.98, Std. Dev.=26.58, n=23.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.957, critical = 0.881.   Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium   Analysis Run 8/30/2024 12:32 PM

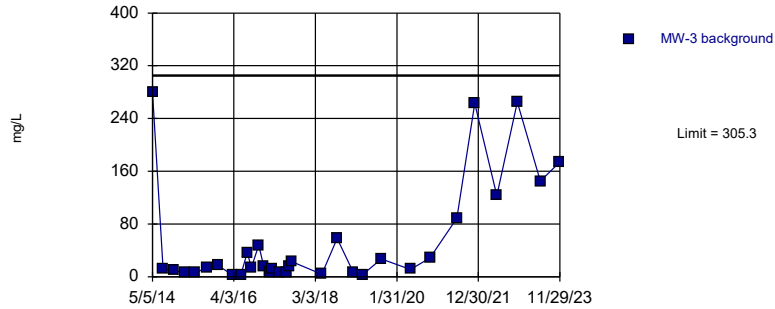Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-3

MW-3 background

Limit = 237.4
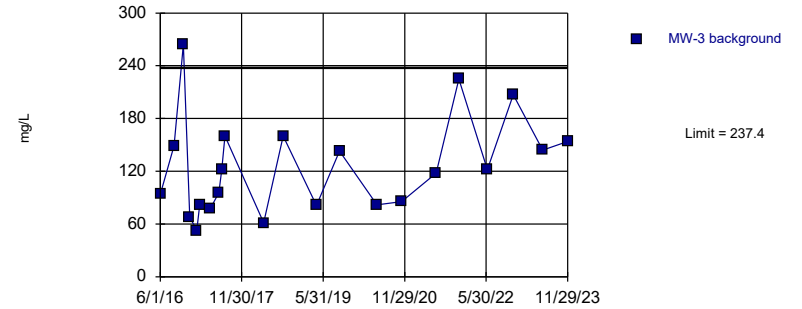
Background Data Summary: Mean=124.9, Std. Dev.=55.42, n=22.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9169, critical = 0.878.   Kappa = 2.031 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4

MW-4 background

Limit = 765.7

Background Data Summary: Mean=490.1, Std. Dev.=136.6, n=23.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9668, critical = 0.881.   Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium   Analysis Run 8/30/2024 12:32 PM

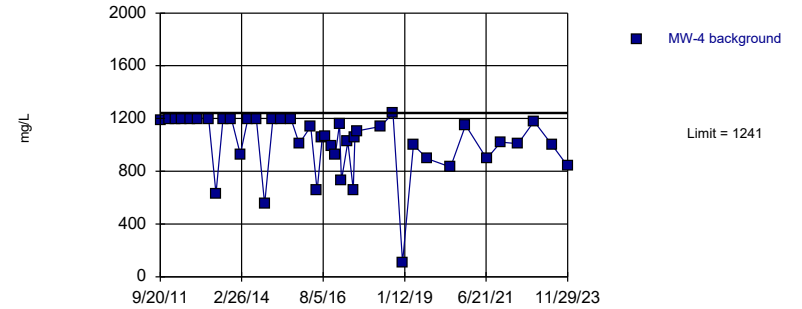Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-5

MW-5 background

Limit = 379.5

Background Data Summary: Mean=277, Std. Dev.=50.15, n=21.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8847, critical = 0.873.   Kappa = 2.044 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium   Analysis Run 8/30/2024 12:32 PM

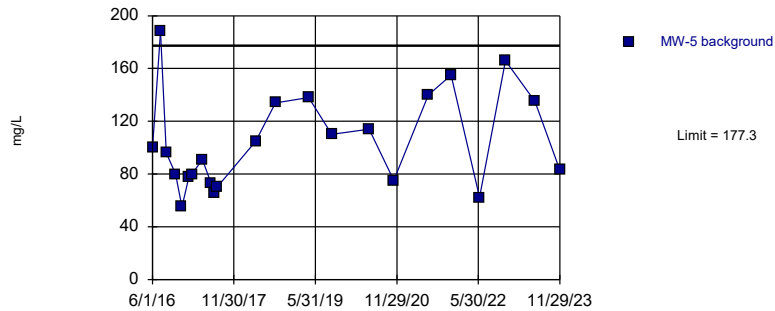Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-10

- ■ MW-10 background

Limit = 475.2

Background Data Summary: Mean=318.2, Std. Dev.=76.3, n=20.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9752, critical = 0.868.   Kappa = 2.058 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Calcium   Analysis Run 8/30/2024 12:32 PM
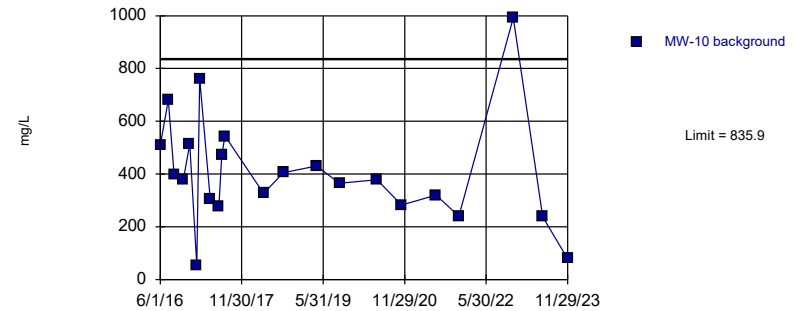
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-11

- ■ MW-11 background

Limit = 709

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 23 background values. Well-constituent pair annual alpha = 0.006819. Individual comparison alpha = 0.003415 (1 of 2). Assumes 1 future value.

Constituent: Calcium   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)

- ■ MW-1 background

Limit = 310.7

Background Data Summary: Mean=214.8, Std. Dev.=45.58, n=18.   Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9029, critical = 0.897.   Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride   Analysis Run 8/30/2024 12:32 PM

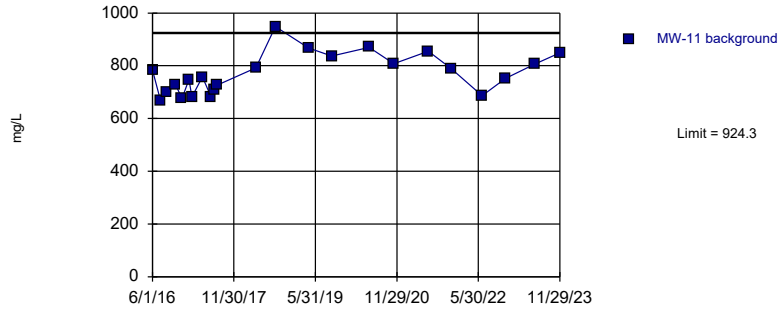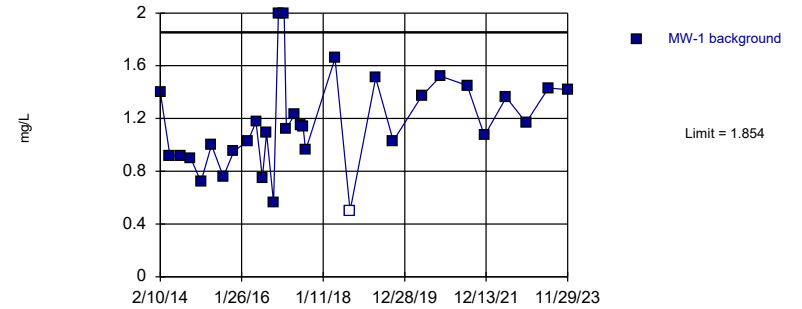Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-2

- ■ MW-2 background

Limit = 41.65

Background Data Summary (based on natural log transformation): Mean=2.347, Std. Dev.=0.7073, n=29.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9463, critical = 0.898.   Kappa = 1.955 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-3

■ MW-3 background

Limit = 305.3

Background Data Summary (based on natural log transformation): Mean=3.011, Std. Dev.=1.401, n=32.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9321, critical = 0.904.   Kappa = 1.934 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride   Analysis Run 8/30/2024 12:32 PM
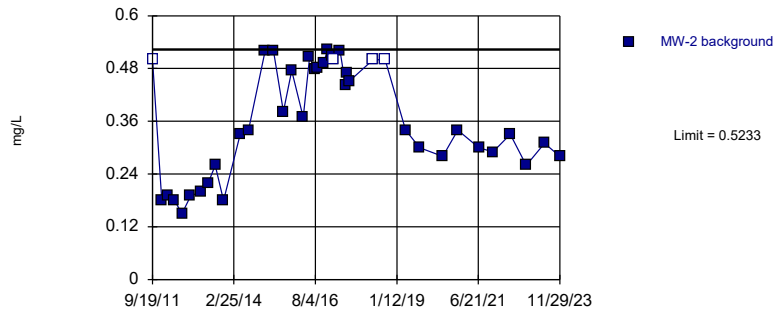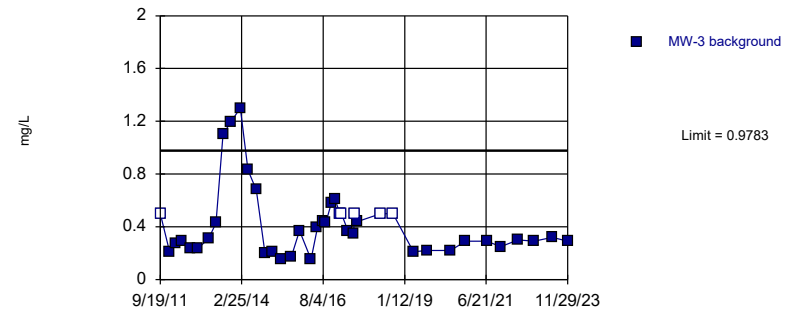
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-4

■ MW-4 background

Limit = 1241

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 43 background values. Well-constituent pair annual alpha = 0.002073. Individual comparison alpha = 0.001037 (1 of 2). Assumes 1 future value.

Constituent: Chloride   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-5

■ MW-5 background

Limit = 177.3

Background Data Summary: Mean=104.1, Std. Dev.=36.31, n=23.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9308, critical = 0.881.   Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-10

■ MW-10 background

Limit = 835.9

Background Data Summary: Mean=406.7, Std. Dev.=211.3, n=22.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.931, critical = 0.878.   Kappa = 2.031 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride   Analysis Run 8/30/2024 12:32 PM
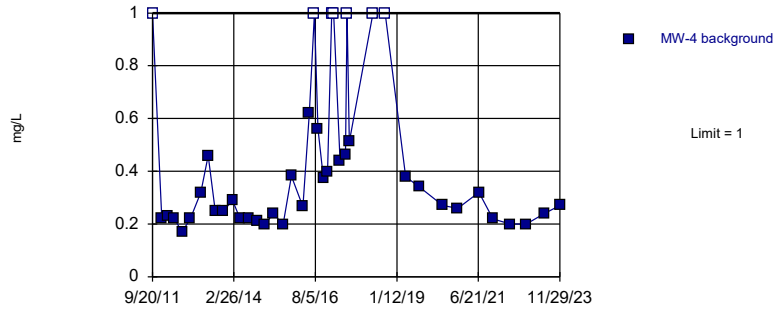
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-11

■ MW-11 background

Limit = 924.3

Background Data Summary: Mean=770.6, Std. Dev.=76.18, n=23. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9489, critical = 0.881. Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Chloride   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)

■ MW-1 background

Limit = 1.854

Background Data Summary: Mean=1.165, Std. Dev.=0.3562, n=32, 3.125% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9648, critical = 0.904. Kappa = 1.934 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Fluoride   Analysis Run 8/30/2024 12:32 PM
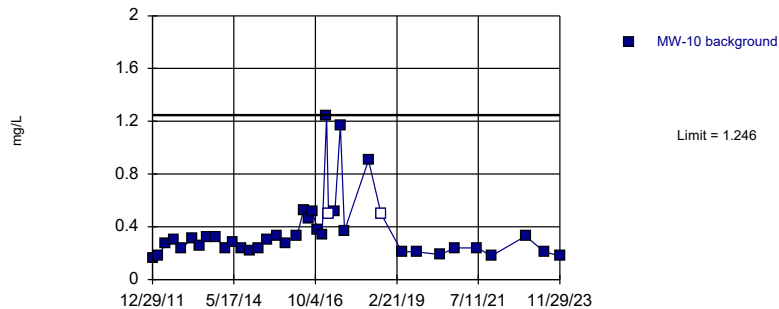
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-2

■ MW-2 background

Limit = 0.5233

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 40 background values. 10% NDs. Well-constituent pair annual alpha = 0.002316. Individual comparison alpha = 0.001159 (1 of 2). Assumes 1 future value.

Constituent: Fluoride   Analysis Run 8/30/2024 12:32 PM

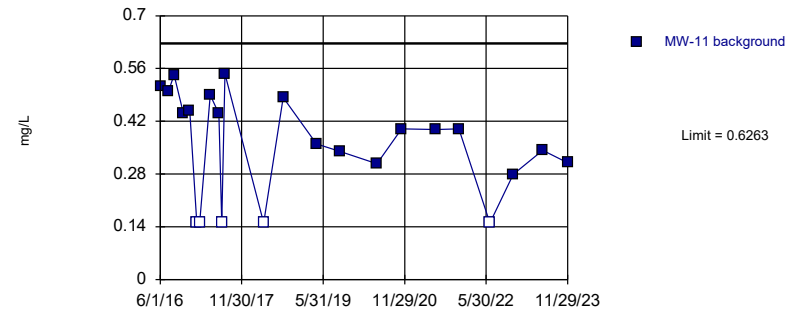Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-3

■ MW-3 background

Limit = 0.9783

Background Data Summary (based on natural log transformation): Mean=-1.016, Std. Dev.=0.5264, n=42, 14.29% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9522, critical = 0.922. Kappa = 1.888 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Fluoride   Analysis Run 8/30/2024 12:32 PM
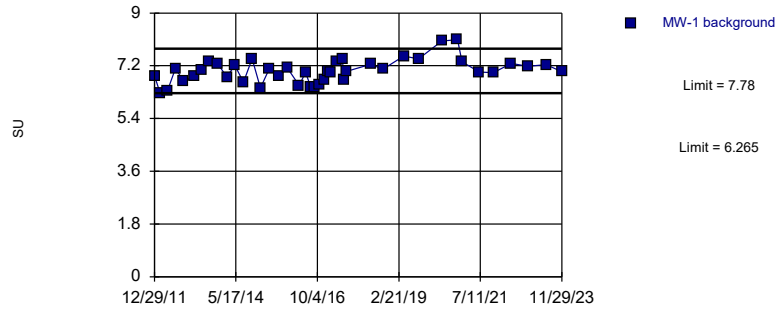
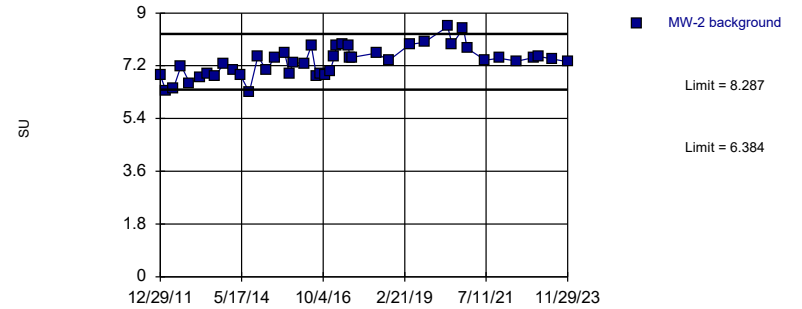Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-4

■ MW-4 background

Limit = 1

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 42 background values. 16.67% NDs. Well-constituent pair annual alpha = 0.002154. Individual comparison alpha = 0.001077 (1 of 2). Assumes 1 future value.

Constituent: Fluoride   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-5

■ MW-5 background

Limit = 1

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 42 background values. 16.67% NDs. Well-constituent pair annual alpha = 0.002154. Individual comparison alpha = 0.001077 (1 of 2). Assumes 1 future value.

Constituent: Fluoride   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-10

■ MW-10 background

Limit = 1.246

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 39 background values. 5.128% NDs. Well-constituent pair annual alpha = 0.002451. Individual comparison alpha = 0.001226 (1 of 2). Assumes 1 future value.

Constituent: Fluoride   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-11

■ MW-11 background

Limit = 0.6263

Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.3542, Std. Dev.=0.1349, n=23, 21.74% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9005, critical = 0.881. Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Fluoride   Analysis Run 8/30/2024 12:32 PM
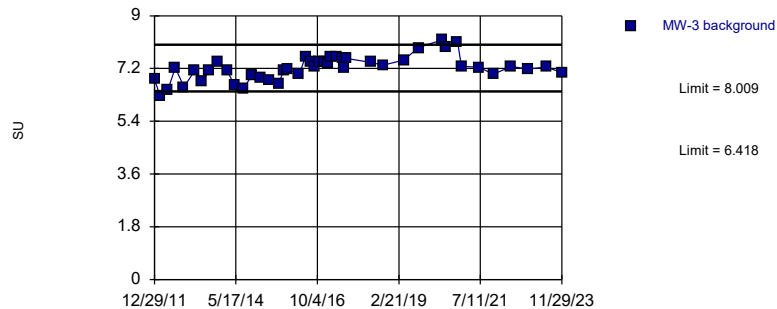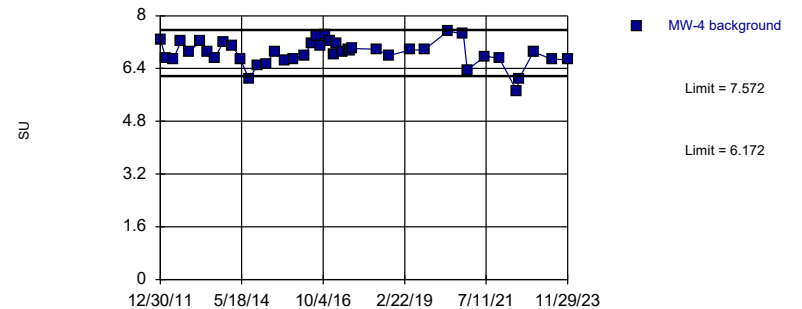
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)

■ MW-1 background

Limit = 7.78

Limit = 6.265

Background Data Summary: Mean=7.023, Std. Dev.=0.4013, n=42.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9635, critical = 0.922.   Kappa = 1.888 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH   Analysis Run 8/30/2024 12:32 PM

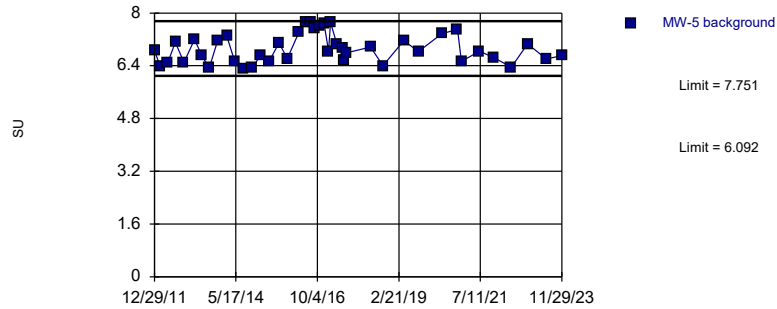Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-2

■ MW-2 background

Limit = 8.287

Limit = 6.384

Background Data Summary: Mean=7.336, Std. Dev.=0.507, n=45.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9723, critical = 0.926.   Kappa = 1.876 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH   Analysis Run 8/30/2024 12:32 PM

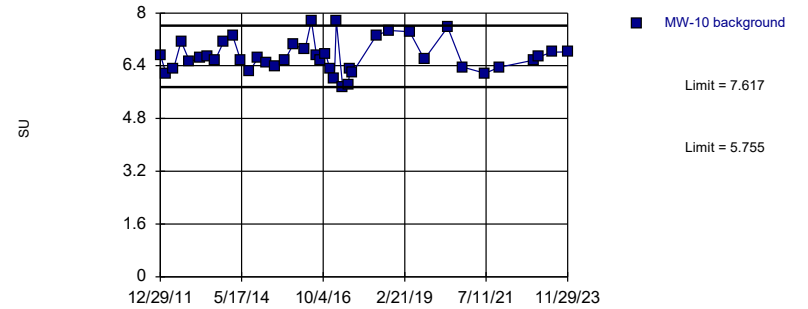Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-3

■ MW-3 background

Limit = 8.009

Limit = 6.418

Background Data Summary: Mean=7.213, Std. Dev.=0.4231, n=44.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9799, critical = 0.924.   Kappa = 1.88 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH   Analysis Run 8/30/2024 12:32 PM

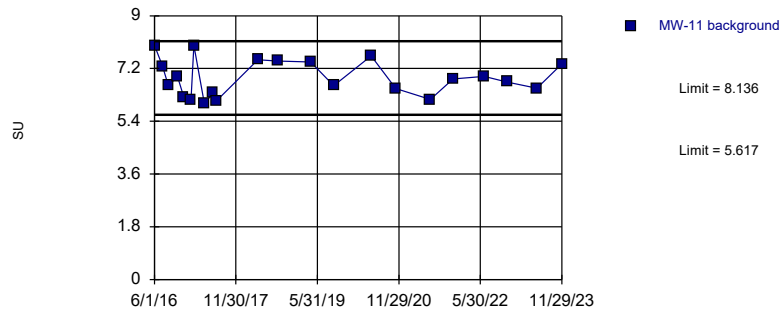Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4

■ MW-4 background

Limit = 7.572

Limit = 6.172

Background Data Summary: Mean=6.872, Std. Dev.=0.3716, n=43.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9482, critical = 0.923.   Kappa = 1.884 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH   Analysis Run 8/30/2024 12:32 PM

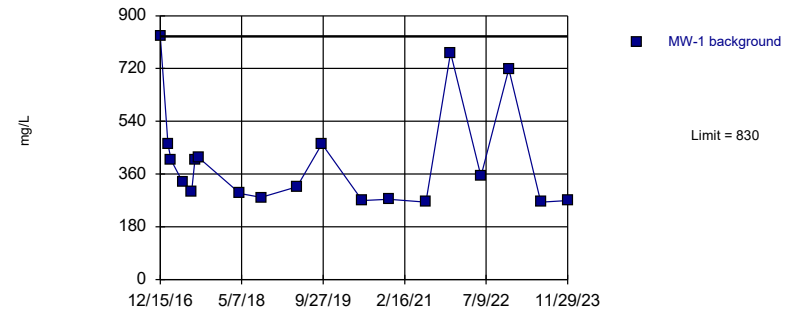Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-5

■ MW-5 background

Limit = 7.751

Limit = 6.092

SU

Background Data Summary: Mean=6.922, Std. Dev.=0.4394, n=42.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.926, critical = 0.922.   Kappa = 1.888 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH   Analysis Run 8/30/2024 12:32 PM

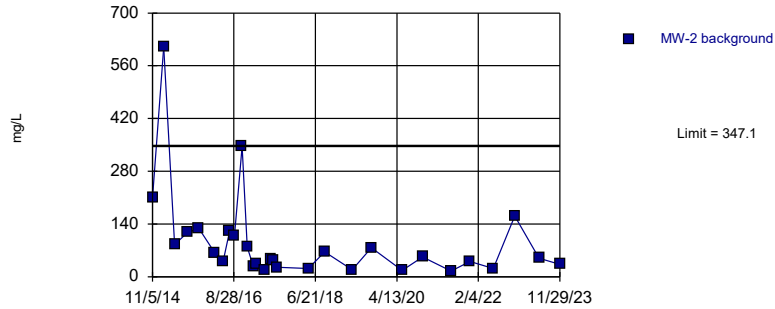Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-10

■ MW-10 background

Limit = 7.617

Limit = 5.755

SU

Background Data Summary: Mean=6.686, Std. Dev.=0.4921, n=41.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.953, critical = 0.92.   Kappa = 1.892 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-11

■ MW-11 background

Limit = 8.136

Limit = 5.617

SU

Background Data Summary: Mean=6.877, Std. Dev.=0.6202, n=22.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9435, critical = 0.878.   Kappa = 2.031 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: pH   Analysis Run 8/30/2024 12:32 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-1 (bg)

■ MW-1 background

Limit = 830

mg/L

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 0.05 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: Sulfate   Analysis Run 8/30/2024 12:32 PM

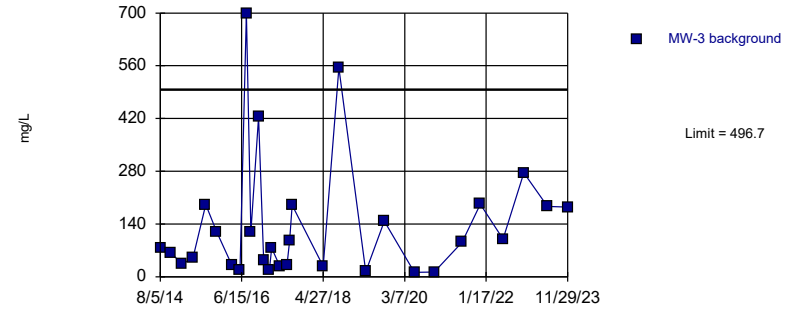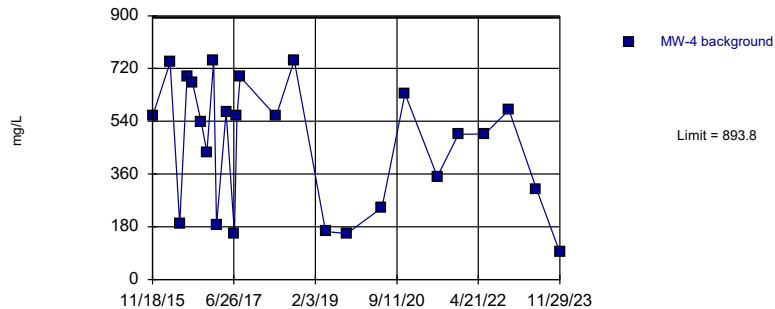Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-2

■ MW-2 background

Limit = 347.1

Background Data Summary (based on natural log transformation): Mean=4.05, Std. Dev.=0.9206, n=29.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9541, critical = 0.898.   Kappa = 1.955 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate   Analysis Run 8/30/2024 12:33 PM
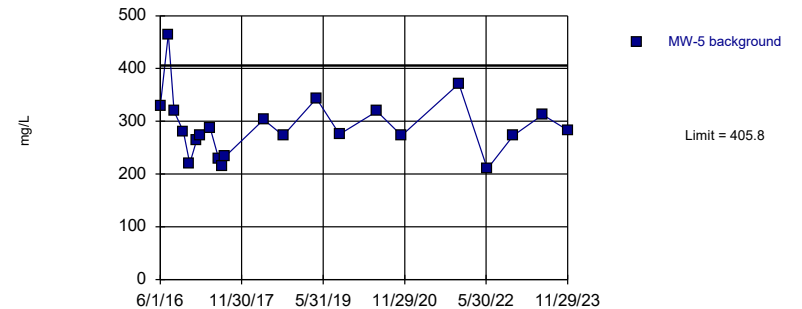
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-3

■ MW-3 background

Limit = 496.7

Background Data Summary (based on cube root transformation): Mean=4.541, Std. Dev.=1.736, n=30.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9312, critical = 0.9.   Kappa = 1.946 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate   Analysis Run 8/30/2024 12:33 PM

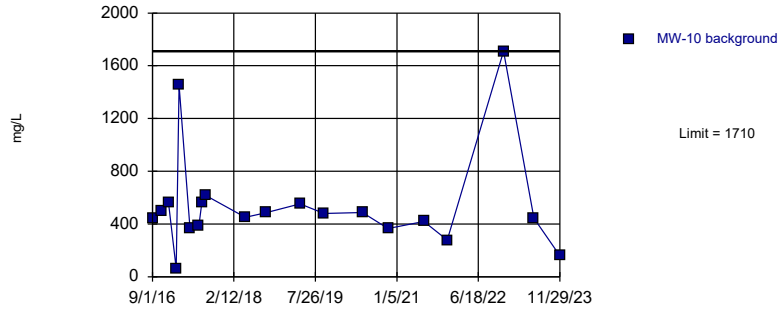Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4

■ MW-4 background

Limit = 893.8

Background Data Summary: Mean=462.7, Std. Dev.=216.6, n=25.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9031, critical = 0.888.   Kappa = 1.99 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate   Analysis Run 8/30/2024 12:33 PM

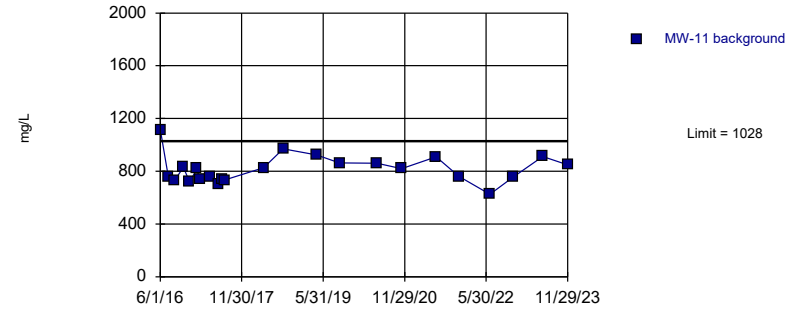Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-5

■ MW-5 background

Limit = 405.8

Background Data Summary: Mean=288.7, Std. Dev.=57.66, n=22.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8986, critical = 0.878.   Kappa = 2.031 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate   Analysis Run 8/30/2024 12:33 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Non-parametric, MW-10

■ MW-10 background

Limit = 1710

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: Sulfate   Analysis Run 8/30/2024 12:33 PM
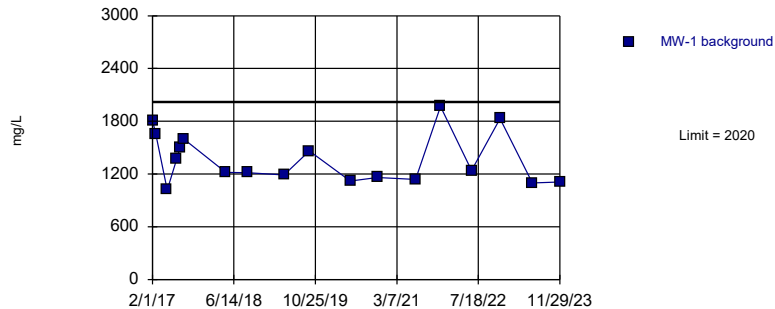
Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-11

■ MW-11 background

Limit = 1028

Background Data Summary: Mean=814, Std. Dev.=105.8, n=23.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9367, critical = 0.881.   Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Sulfate   Analysis Run 8/30/2024 12:33 PM

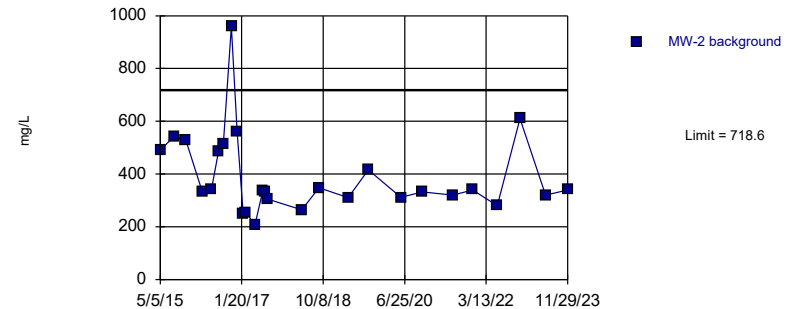Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-1 (bg)

■ MW-1 background

Limit = 2020

Background Data Summary (based on square root transformation): Mean=36.87, Std. Dev.=3.837, n=18.   Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9025, critical = 0.897.   Kappa = 2.104 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:33 PM

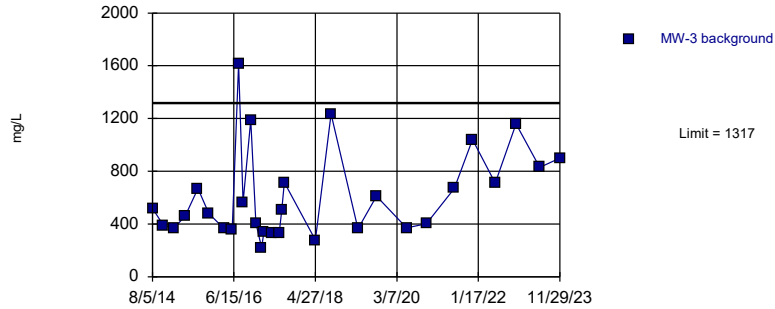Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-2

■ MW-2 background

Limit = 718.6

Background Data Summary (based on natural log transformation): Mean=5.916, Std. Dev.=0.3352, n=27.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9232, critical = 0.894.   Kappa = 1.972 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:33 PM

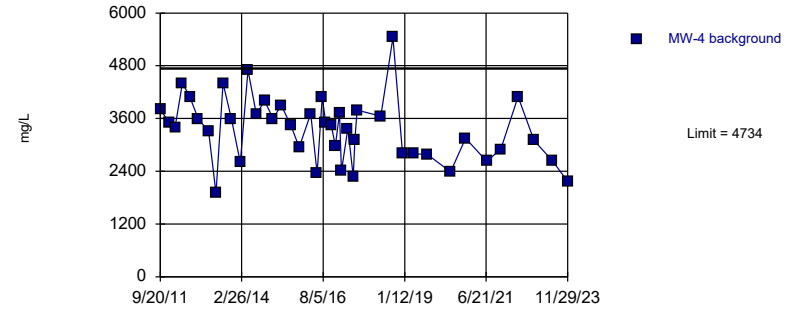Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-3

MW-3 background

Limit = 1317

Background Data Summary (based on square root transformation): Mean=23.97, Std. Dev.=6.333, n=30.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9115, critical = 0.9.   Kappa = 1.946 (c=7, w=5, 1 of 2, event alpha = 0.05132).   Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:33 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-4

MW-4 background

Limit = 4734

Background Data Summary: Mean=3353, Std. Dev.=733, n=43.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9821, critical = 0.923.   Kappa = 1.884 (c=7, w=5, 1 of 2, event alpha = 0.05132).   Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:33 PM

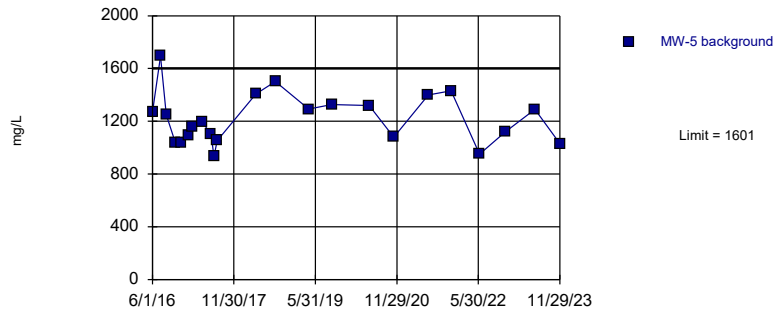Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-5

MW-5 background

Limit = 1601

Background Data Summary: Mean=1216, Std. Dev.=191.1, n=23.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9561, critical = 0.881.   Kappa = 2.017 (c=7, w=5, 1 of 2, event alpha = 0.05132).   Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:33 PM

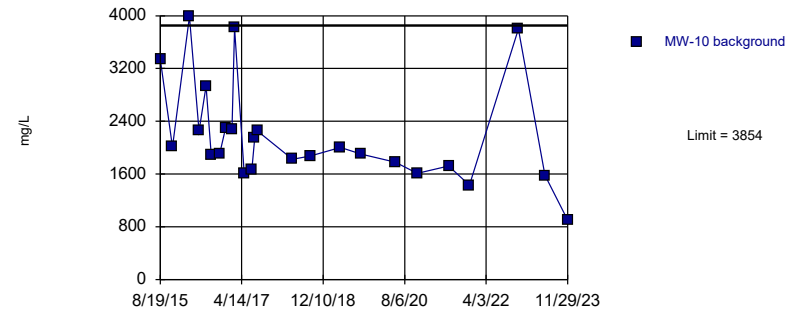Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-10

MW-10 background

Limit = 3854

Background Data Summary (based on square root transformation): Mean=46.17, Std. Dev.=7.995, n=25.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8981, critical = 0.888.   Kappa = 1.99 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:33 PM

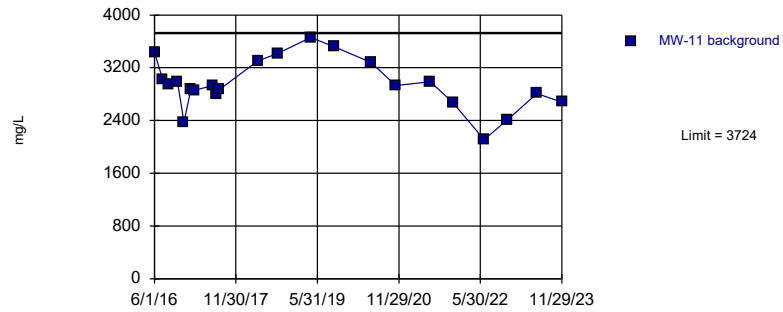Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Prediction Limit

Intrawell Parametric, MW-11

Background Data Summary: Mean=2949, Std. Dev.=381.5, n=22.   Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9658, critical = 0.878.   Kappa = 2.031 (c=7, w=5, 1 of 2, event alpha = 0.05132). Report alpha = 0.001504. Assumes 1 future value.

Constituent: Total Dissolved Solids   Analysis Run 8/30/2024 12:33 PM

Turk Landfill   Client: Geosyntec   Data: Turk Landfill

Memorandum

Date:	October 10, 2024
To:	David Miller (AEP)
Copies to:	Leslie Fuershbach (AEP)
From:	Allison Kreinberg (Geosyntec)
Subject:	Evaluation of Detection Monitoring Data at Turk Plant's Landfill (LF)

In accordance with United States Environmental Protection Agency (USEPA) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the first semiannual detection monitoring event of 2024 at the Landfill (LF), an existing CCR unit at the Turk Power Plant located in Fulton, Arkansas, was completed on June 25, 2024.

Background values for the Turk LF were originally calculated in December 2017 and have been periodically updated as sufficient data becomes available. After a minimum of four additional detection monitoring events, the results of those events were compared to the existing background, and the background 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 most recent calculation of the revised background values are described in Geosyntec's *Statistical Analysis Summary* report, dated October 4, 2024.

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 only concluded if both samples in a series of two exceeds the UPL (or are below the LPL for pH).

Detection monitoring results and the relevant background values are compared in Table 1. No SSIs were observed at the Turk LF CCR unit, and as a result the Turk 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.

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CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the October 4, 2024 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Turk 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

15296	Arkansas	10.14.2024
License Number	Licensing State	Date

Analyte	Unit	Description	MW-2 6/25/2024	MW-3 6/25/2024	MW-4 6/25/2024	MW-5 6/25/2024	MW-10 6/25/2024	MW-11 6/25/2024
Boron	mg/L	Intrawell Background Value (UPL)	0.401	0.188	0.517	0.123	0.233	0.187
		Analytical Result	0.031	0.063	0.214	0.062	0.038	0.129
Calcium	mg/L	Intrawell Background Value (UPL)	133	237	766	380	475	709
		Analytical Result	70.8	191	444	270	273	505
Chloride	mg/L	Intrawell Background Value (UPL)	41.7	305	1241	177	836	924
		Analytical Result	5.75	246	881	103	226	819
Fluoride	mg/L	Intrawell Background Value (UPL)	0.523	0.978	1.00	1.00	1.25	0.626
		Analytical Result	0.31	0.29	0.26	0.30	0.23	0.36
pH	SU	Intrawell Background Value (UPL)	8.3	8.0	7.6	7.8	7.6	8.1
		Intrawell Background Value (LPL)	6.4	6.4	6.2	6.1	5.8	5.6
		Analytical Result	7.2	6.9	6.2	6.6	6.3	7.0
Sulfate	mg/L	Intrawell Background Value (UPL)	347	497	894	406	1710	1028
		Analytical Result	21.9	268	249	292	479	899
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	719	1317	4734	1601	3854	3724
		Analytical Result	300	1,080	2,640	1,160	1,580	2880

Notes:

1. Bold values exceed the background value.

2. Background values are shaded gray.

LPL: lower prediction limit

mg/L: milligrams per liter

SU: standard units

UPL: upper prediction limit