Annual Groundwater Monitoring Report

Southwestern Electric Power Company

J. Robert Welsh Power Plant

Primary Bottom Ash Pond CCR Management Unit

1187 Country Road 4865

Titus County

Pittsburg, Texas

January 2020

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SOUTHWESTERN ELECTRIC POWER COMPANY

An AEP Company

BOUNDLESS ENERGY

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I. **Overview**

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year for an existing CCR unit at Southwestern Electric Power Company's, a wholly-owned subsidiary of American Electric Power Company (AEP), Welsh Power Plant. The USEPA's CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31, 2020.

In general, the following activities were completed:

- Groundwater samples were collected and analyzed for Appendix III and Appendix IV constituents, as specified in 40 CFR 257.95 *et seq.* and AEP's *Groundwater Sampling and Analysis Plan (2016)*;
- Semi-annual groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units;
- SSL for lithium was determined in AD-9 during the 2nd semi-annual 2018 groundwater monitoring event as well as during the 1st and 2nd semi-annual 2019 groundwater monitoring events;
- SSIs were also determined;
- Successful alternate source demonstrations (ASDs) were conducted for the lithium SSLs in AD-9;
- With regard to the SSL determined in AD-9 during the 2nd semi-annual groundwater monitoring event of 2019, either an ASD will be conducted to evaluate if the unit can remain in assessment monitoring or the unit will move to an assessment of corrective measures;
- Groundwater Monitoring Statistical Evaluation Reports to evaluate groundwater data were prepared in accordance with 40 CFR 257.93 and certified in accordance with 40 CFR 257.93. The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009).
- This CCR Unit remains in assessment monitoring throughout 2019.

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 CCR management unit(s), all groundwater monitoring wells and monitoring well identification numbers;

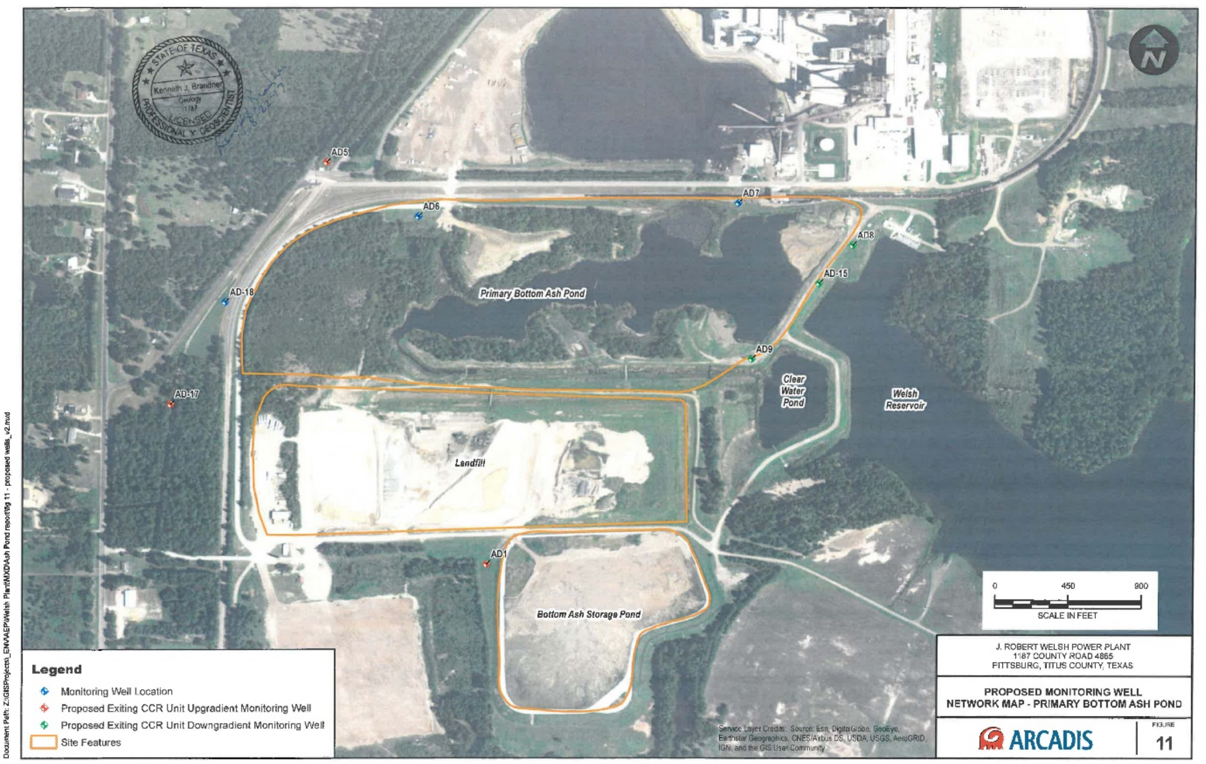
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened;
- All of the monitoring data collected, including the rate and direction of groundwater flow, plus a summary showing the number of samples collected per monitoring well, the dates the samples were collected and whether the sample was collected as part of detection monitoring or assessment monitoring programs is included in Appendix I;
- Statistical reports are located in Appendix II;
- Alternate source demonstrations are located in Appendix III;
- 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 at a statistically significant increase or statistically significant level over background concentrations (Appendix IV);
- 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.

Primary Bottom Ash Pond Monitoring Wells	
Up Gradient	Down Gradient
AD-1	AD-8
AD-5	AD-9
AD-17	AD-15



III. Monitoring Wells Installed or Decommissioned

During 2019, no monitoring wells were installed or decommissioned.

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

Appendix I contains tables showing the groundwater quality data collected under 40 CFR 257.90 through 257.98. Static water elevation data from each monitoring event also are shown in Appendix I, along with the groundwater velocity, groundwater flow direction and potentiometric maps developed after each sampling event.

The sampling event conducted 5/30/19 satisfies the requirement of 257.95(b).

V. Statistical Evaluations completed in 2018 and 2019

During the 2nd semi-annual 2018 event the following SSIs were determined:

- Boron concentration exceeded the interwell UPL of 0.765 mg/L at AD-8 (1.3 mg/L)
- pH value was below the interwell LPL of 4.84 SU at AD-15 (4.59 SU).

During the 1st semi-annual 2019 event, the following SSIs were determined:

- Boron concentrations exceeded the interwell UPL of 0.775 mg/L at AD-8 (1.27 mg/L and 1.21 mg/L).

During the 2nd semi-annual 2019 event, the following SSIs were determined:

- Boron concentrations exceeded the interwell UPL of 0.700 mg/L at AD-8 (1.21 mg/L).
- pH measurements were recorded below the interwell LPL of 4.8 SU at AD-15 (3.2 SU).

A SSL was determined for lithium in AD-9 during the 2nd semi-annual 2018 event, 1st and 2nd semi-annual 2019 events.

The statistical reports completed in 2019 are found in Appendix II.

VI. Alternate Source Demonstrations completed in 2019

ASDs were successfully conducted for the lithium SSLs which were determined during the 2nd semi-annual 2018 event and the 1st semi-annual 2019 event.

With regard to the lithium SSL in AD-9 determined during the 2nd semi-annual 2019 groundwater monitoring event, either an ASD will be conducted to evaluate if the unit can remain in assessment monitoring or the unit will move to an assessment of corrective measures.

The successful lithium ASDs are found in Appendix III.

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

This unit remained in assessment monitoring throughout 2019.

VIII. Other Information Required

As required by the CCR assessment monitoring rules in 40 CFR 257.95 (b) and (d 1), sampling all CCR wells for the required Appendix III and IV parameters was completed in 2019.

IX. Description of Any Problems Encountered in 2019 and Actions Taken

No significant problems were encountered.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2020 include:

- Assessment monitoring will continue;
- Either an ASD will be conducted to evaluate if the unit can remain in assessment monitoring or the unit will move to an assessment of corrective measures.
- Evaluation of the assessment monitoring results from a statistical analysis viewpoint, looking for SSIs as well as SSLs above GWPS;
- Responding to any new data received in light of CCR rule requirements;
- Preparation of the next annual groundwater report.

APPENDIX I

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.

Legend

- Groundwater Monitoring Well
- Approximate Groundwater Flow Direction
- Groundwater Elevation Contour
- CCR Units

Notes

- Monitoring well coordinates and water level data (collected on February 20-21, 2019) provided by AEP.
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluations (Arcadis, 2016).
- Groundwater elevation units are feet above mean sea level.
- AD-16 was replaced with AD-16R on 4/12/2017.

Groundwater Potentiometric Map
February 2019

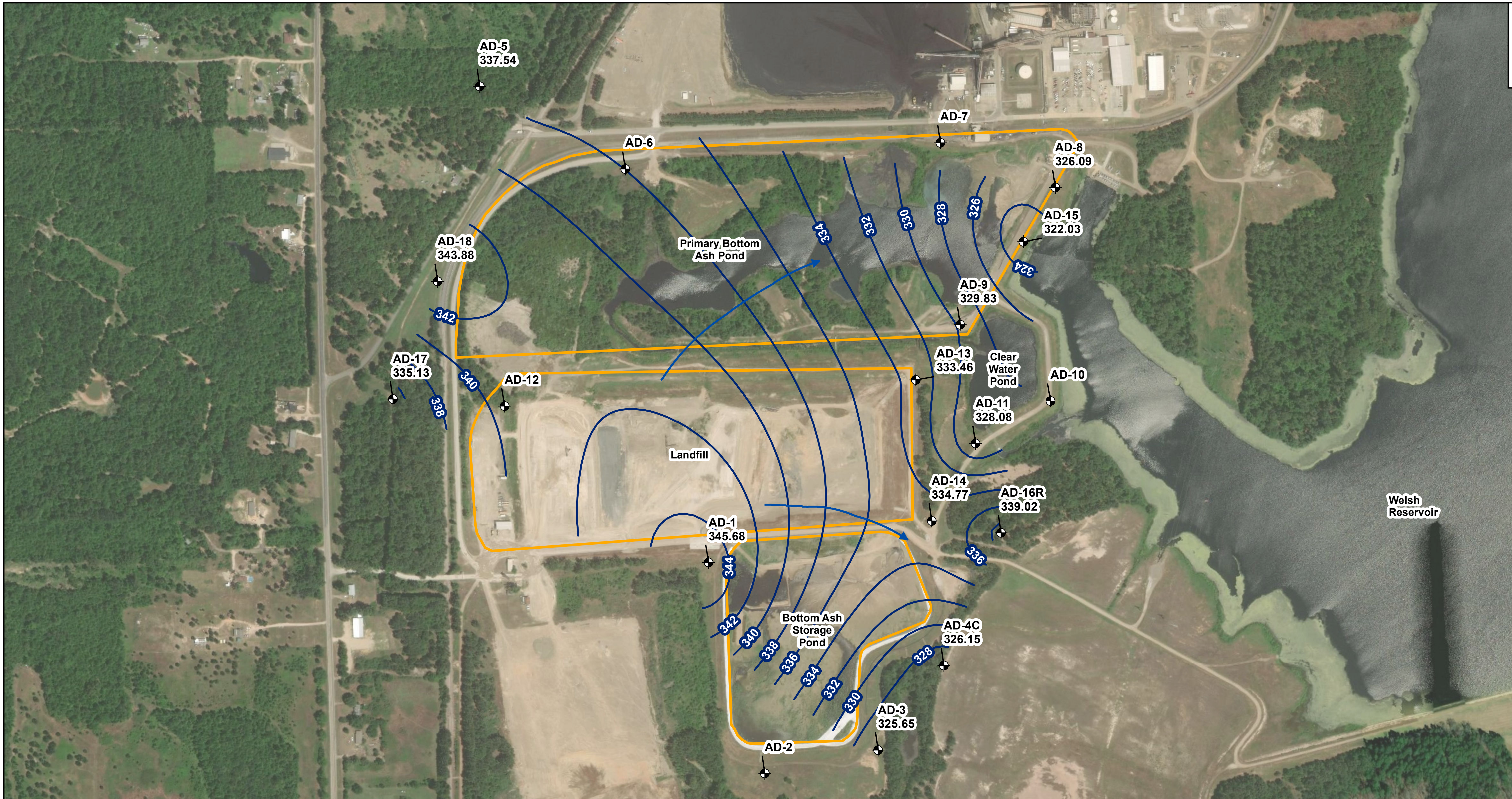
AEP Welsh Power Plant
Cason, Texas

Geosyntec consultants

Columbus, Ohio | 2020/01/22

Figure
1

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Welsh\2019\AEP-Welsh_GW_2019-20Feb.mxd. ARevezzo. 1/22/2020. CHA8423/14/08.



Legend

- Groundwater Monitoring Well
- Approximate Groundwater Flow Direction
- Groundwater Elevation Contour
- CCR Units

Notes

- Monitoring well coordinates and water level data (collected on May 29-30, 2019) provided by AEP.
- AD-10, AD-6, AD-7, AD-2, and AD-12 were not gauged during this event
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluations (Arcadis, 2016).
- Groundwater elevation units are feet above mean sea level.
- AD-16 was replaced with AD-16R on 4/12/2017.

750 375 0 750
Feet

Groundwater Potentiometric Map
May 2019

AEP Welsh Power Plant
Cason, Texas

Geosyntec
consultants

Columbus, Ohio	2019/12/12

Figure
2

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Legend

- Groundwater Monitoring Well
- Approximate Groundwater Flow Direction
- Groundwater Elevation Contour
- Groundwater Elevation Contour (Inferred)
- CCR Units

Notes

- Monitoring well coordinates and water level data (collected on July 23-24, 2019) provided by AEP.
-AD-12 and AD-6 were not gauged during this event.
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluations (Arcadis, 2016).
- Groundwater elevation units are feet above mean sea level.
- Inferred groundwater contours were ectrapolated from topographic and hydrographic information as well as previous monitoring events.

750 375 0 750 Feet

Groundwater Potentiometric Map
July 2019

AEP Welsh Power Plant
Cason, Texas

Geosyntec consultants

Columbus, Ohio | 2020/01/22

Figure
3

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Welsh\2019\AEP-Welsh_GW_2019-07July.mxd. ARevezzo. 1/22/2020. CHA8423/14/08.

Table 1: Residence Time Calculation Summary
Welsh Primary Bottom Ash Pond

			2019-02		2019-05		2019-07	
CCR Management Unit	Monitoring Well	Well Diameter (inches)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Primary Bottom Ash Pond	AD-1 [1]	2.0	2.7	22.4	5.3	11.5	4.1	14.9
	AD-5 [1]	2.0	1.5	40.2	2.4	25.4	2.1	29.2
	AD-8 [2]	2.0	4.1	14.7	4.1	14.8	5.3	11.5
	AD-9 [2]	2.0	4.8	12.8	4.5	13.6	5.1	12.0
	AD-15 [2]	2.0	6.4	9.5	5.5	11.1	7.0	8.7
	AD-17 [1]	2.0	8.9	6.9	4.7	13.0	3.5	17.5

Notes:
[1] - Upgradient Well
[2] - Downgradient Well

Table 1 - Groundwater Data Summary: AD-1
Welsh - PBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/26/2016	Background	0.346	36.5	5	<0.083 U	5.9	252	42
7/29/2016	Background	0.35	39.6	4	<0.083 U	5.3	239	36
9/30/2016	Background	0.332	15	5	<0.083 U	5.4	173	35
10/21/2016	Background	0.398	19.1	4	<0.083 U	5.2	192	42
12/14/2016	Background	0.394	8.74	4	<0.083 U	5.2	200	40
1/20/2017	Background	0.656	129	4	<0.083 U	7.1	538	68
2/24/2017	Background	0.7	147	9	<0.083 U	6.9	612	68
6/8/2017	Background	0.449	15.1	4	<0.083 U	5.1	176	42
10/6/2017	Detection	0.453	14.3	4	<0.083 U	5.3	160	40
5/24/2018	Assessment	0.345	10.2	4	<0.083 U	2.2	150	43
8/14/2018	Assessment	0.443	5.95	5	<0.083 U	5.2	160	44
2/20/2019	Assessment	0.504	142	2.82	0.24	7.3	522	49.2
5/30/2019	Assessment	0.689	138	1.59	0.29	6.7	588	43.3
7/24/2019	Assessment	0.644	62.7	2	0.106 J	6.0	180	58

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

Table 1 - Groundwater Data Summary: AD-1
Welsh - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/26/2016	Background	<0.93 U	1.39361 J	191	0.271453 J	0.213294 J	0.240267 J	1.15339 J	1.184	<0.083 U	<0.68 U	0.01	0.033	0.53149 J	1.74922 J	0.959865 J
7/29/2016	Background	<0.93 U	<1.05 U	191	0.315631 J	0.0940357 J	<0.23 U	0.615933 J	0.9952	<0.083 U	<0.68 U	0.019	0.00793 J	<0.29 U	1.81763 J	<0.86 U
9/30/2016	Background	<0.93 U	2.96797 J	141	0.382874 J	<0.07 U	5	0.850408 J	1.38	<0.083 U	3.38434 J	0.014	0.01773 J	<0.29 U	1.02629 J	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	114	0.311247 J	<0.07 U	0.412131 J	0.649606 J	1.141	<0.083 U	<0.68 U	0.008	0.00534 J	1.39872 J	2.03168 J	1.25062 J
12/14/2016	Background	<0.93 U	<1.05 U	72	0.34133 J	<0.07 U	<0.23 U	0.424105 J	0.719	<0.083 U	<0.68 U	0.008	0.01521 J	<0.29 U	1.85825 J	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	410	0.0366913 J	<0.07 U	<0.23 U	0.480125 J	3.009	<0.083 U	<0.68 U	0.000275956 J	<0.005 U	<0.29 U	4.04737 J	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	488	<0.02 U	<0.07 U	<0.23 U	0.765099 J	4.309	<0.083 U	<0.68 U	0.001	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	1.14 J	93.46	0.37 J	<0.07 U	0.66 J	0.77 J	0.676	<0.083 U	<0.68 U	0.00902	0.007 J	<0.29 U	2.1 J	<0.86 U
5/24/2018	Assessment	3.17 J	<1.05 U	79.9	0.39 J	<0.07 U	<0.23 U	0.35 J	1.983	<0.083 U	<0.68 U	0.00814	0.006 J	<0.29 U	1.38 J	<0.86 U
8/14/2018	Assessment	0.03 J	0.21	63	0.482	0.02	- -	- -	1.102	<0.083 U	0.238	0.00708	0.013 J	0.210	1.7	0.03 J
2/20/2019	Assessment	0.16	0.46	457	0.09 J	0.01 J	0.306	0.399	3.159	0.24	0.124	0.00155	<0.005 U	1 J	0.7	<0.1 U
5/30/2019	Assessment	0.16	0.60	512	0.244	0.01 J	0.1 J	0.756	2.717	0.29	0.197	<0.009 U	<0.005 U	2.43	1.4	<0.1 U
7/24/2019	Assessment	0.08 J	0.39	245	0.54	0.02 J	0.1 J	0.789	1.819	0.106 J	0.1 J	0.00557	<0.005 U	2 J	3.4	<0.1 U

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

Table 1 - Groundwater Data Summary: AD-5
Welsh - PBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	0.03	36.9	15	0.3469 J	6.4	337	123
7/29/2016	Background	0.04	44.7	16	<0.083 U	5.4	360	163
9/30/2016	Background	0.04	46.3	15	0.2436 J	5.3	416	190
10/21/2016	Background	0.05	50.7	14	<0.083 U	5.9	448	267
12/14/2016	Background	0.05	49.6	13	<0.083 U	6.2	484	233
1/20/2017	Background	0.04	49.8	14	<0.083 U	6.3	438	234
2/24/2017	Background	0.04	33	15	<0.083 U	5.5	286	127
6/8/2017	Background	0.05281	49.7	14	<0.083 U	6.0	300	82
10/6/2017	Detection	0.04322	33.1	16	<0.083 U	5.6	258	82
5/24/2018	Assessment	0.05007	28.1	22	<0.083 U	6.2	242	60
8/15/2018	Assessment	0.05	40.5	19	<0.083 U	6.2	428	240
2/21/2019	Assessment	0.033	33.9	24.7	0.21	5.4	220	46.5
5/30/2019	Assessment	0.03 J	30.0	22.3	0.29	6.3	238	51.3
7/24/2019	Assessment	0.04 J	41.1	18	0.112 J	6.3	354	90

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

Table 1 - Groundwater Data Summary: AD-5
Welsh - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	<1.05 U	57	0.149801 J	0.0765156 J	0.555038 J	14	1.634	0.3469 J	<0.68 U	0.135	0.01135 J	<0.29 U	<0.99 U	<0.86 U
7/29/2016	Background	2.05116 J	2.90819 J	93	0.518653 J	0.502155 J	0.411466 J	15	4.75	<0.083 U	<0.68 U	0.191	0.01516 J	<0.29 U	1.08901 J	<0.86 U
9/30/2016	Background	<0.93 U	4.7609 J	87	0.251584 J	<0.07 U	0.90676 J	14	3.33	0.2436 J	<0.68 U	0.186	<0.005 U	<0.29 U	<0.99 U	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	70	0.08781 J	0.107488 J	0.248085 J	9	2.319	<0.083 U	<0.68 U	0.225	<0.005 U	1.36984 J	<0.99 U	<0.86 U
12/14/2016	Background	<0.93 U	1.15381 J	53	0.164529 J	0.203546 J	0.747921 J	13	2.182	<0.083 U	<0.68 U	0.199	0.00802 J	<0.29 U	<0.99 U	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	47	0.0574718 J	0.180502 J	<0.23 U	12	1.023	<0.083 U	<0.68 U	0.239	<0.005 U	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	42	0.0306858 J	<0.07 U	<0.23 U	13	1.788	<0.083 U	<0.68 U	0.166	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	3.85 J	87.7	0.08 J	0.39 J	0.28 J	11.93	2.32	<0.083 U	<0.68 U	0.124	<0.005 U	<0.29 U	<0.99 U	<0.86 U
5/24/2018	Assessment	<0.93 U	<1.05 U	71.16	<0.02 U	0.23 J	0.8 J	14.24	1.946	<0.083 U	<0.68 U	0.121	<0.005 U	<0.29 U	<0.99 U	<0.86 U
8/15/2018	Assessment	0.01 J	1.69	63.7	0.055	0.008 J	0.072	11.4	0.316	<0.083 U	0.079	0.147	<0.005 U	0.13	0.08 J	<0.01 U
2/21/2019	Assessment	0.02 J	1.59	69.4	0.08 J	<0.01 U	0.432	8.58	1.267	0.21	0.147	0.0807	<0.005 U	<0.4 U	0.1 J	<0.1 U
5/30/2019	Assessment	<0.02 U	3.05	60.5	0.08 J	<0.01 U	0.06 J	11.8	1.431	0.29	0.05 J	0.104	0.006 J	<0.4 U	0.05 J	<0.1 U
7/24/2019	Assessment	<0.02 U	2.48	77.4	0.05 J	<0.01 U	0.05 J	8.38	2.533	0.112 J	<0.05 U	0.108	<0.005 U	<0.4 U	0.06 J	<0.1 U

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

Table 1 - Groundwater Data Summary: AD-8
Welsh - PBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	1.46	32.6	36	0.6507 J	6.9	524	217
7/29/2016	Background	1.44	25.9	26	0.485 J	5.4	469	202
9/30/2016	Background	1.51	24.3	28	0.4912 J	7.7	432	186
10/21/2016	Background	1.54	25.9	30	0.6234 J	6.1	424	184
12/14/2016	Background	1.53	23.6	27	0.5355 J	5.6	442	168
1/20/2017	Background	1.53	18.7	24	0.5574 J	6.2	352	153
2/24/2017	Background	1.67	19.3	22	<0.083 U	6.8	356	163
6/8/2017	Background	1.39	17.4	22	0.6628 J	5.6	368	151
10/6/2017	Detection	1.49	14.9	20	<0.083 U	6.7	284	128
1/4/2018	Detection	1.47	- -	- -	- -	- -	- -	- -
5/23/2018	Assessment	- -	- -	- -	0.501 J	6.2	- -	- -
8/15/2018	Assessment	- -	- -	- -	- -	6.8	- -	- -
9/17/2018	Assessment	1.3	15	24	- -	- -	288	122
2/5/2019	Assessment	2.55	19.7	22.8	0.72	5.4	- -	153
2/21/2019	Assessment	1.47	17.6	23.2	0.66	6.4	352	163
4/30/2019	Assessment	1.21	- -	- -	- -	6.9	- -	- -
5/29/2019	Assessment	1.07	16.9	19.5	0.89	5.5	324	150
7/23/2019	Assessment	1.21	20.8	15	0.559 J	6.6	392	145

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

Table 1 - Groundwater Data Summary: AD-8
Welsh - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	1.06251 J	34	0.114491 J	<0.07 U	2	7	1.046	0.6507 J	<0.68 U	0.122	0.02103 J	1.01326 J	1.37017 J	1.18455 J
7/29/2016	Background	1.46141 J	<1.05 U	26	0.171642 J	<0.07 U	0.751164 J	9	1.584	0.485 J	<0.68 U	0.098	0.00859 J	1.48301 J	1.96333 J	<0.86 U
9/30/2016	Background	<0.93 U	<1.05 U	23	<0.02 U	<0.07 U	0.51348 J	7	6.3	0.4912 J	<0.68 U	0.111	<0.005 U	<0.29 U	<0.99 U	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	24	0.028758 J	<0.07 U	0.617826 J	7	0.3449	0.6234 J	<0.68 U	0.135	<0.005 U	0.838863 J	<0.99 U	1.64377 J
12/14/2016	Background	<0.93 U	<1.05 U	21	<0.02 U	<0.07 U	<0.23 U	7	1.083	0.5355 J	<0.68 U	0.11	0.01007 J	<0.29 U	<0.99 U	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	20	<0.02 U	<0.07 U	<0.23 U	6	0.823	0.5574 J	<0.68 U	0.094	<0.005 U	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	19	<0.02 U	<0.07 U	<0.23 U	6	0.536	<0.083 U	<0.68 U	0.092	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	<1.05 U	19.08	<0.02 U	<0.07 U	<0.23 U	3.86 J	1.0735	0.6628 J	<0.68 U	0.09491	0.008 J	<0.29 U	<0.99 U	<0.86 U
5/23/2018	Assessment	3.19 J	<1.05 U	22.12	<0.02 U	<0.07 U	<0.23 U	3.19 J	0.3366	0.501 J	<0.68 U	0.0956	<0.005 U	<0.29 U	1.75 J	<0.86 U
8/15/2018	Assessment	0.01 J	0.31	21.2	0.008 J	0.02 J	0.05	5.36	3.44	- -	0.039	0.0555	0.007	0.16	0.07 J	0.129
2/21/2019	Assessment	<0.02 U	0.57	28.1	0.03 J	0.03 J	0.456	2.88	0.417	0.66	0.223	0.0911	<0.005 U	<0.4 U	0.1 J	<0.1 U
5/29/2019	Assessment	<0.02 U	0.37	30.3	<0.02 U	0.02 J	0.1 J	6.03	0.911	0.89	0.07 J	0.067	<0.005 U	<0.4 U	0.06 J	0.1 J
7/23/2019	Assessment	<0.02 U	0.41	31.0	<0.02 U	0.02 J	0.09 J	7.07	0.72	0.559 J	0.08 J	0.0641	<0.005 U	<0.4 U	0.08 J	0.1 J

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

Table 1 - Groundwater Data Summary: AD-9
Welsh - PBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	0.120	229	88	0.4191 J	6.3	2541	1352
7/29/2016	Background	0.105	255	98	0.4339 J	5.0	2564	1464
9/30/2016	Background	0.115	220	86	0.304 J	4.7	2448	1301
10/21/2016	Background	0.109	228	76	0.6227 J	5.2	2494	1350
12/14/2016	Background	0.108	250	92	<0.083 U	5.7	2667	1639
1/20/2017	Background	0.312	91.1	54	<0.083 U	5.4	1360	884
2/24/2017	Background	0.1	258	86	<0.083 U	5.8	2662	1774
6/8/2017	Background	0.146	191	19	<0.083 U	4.6	308	105
10/6/2017	Detection	0.129	9.64	20	<0.083 U	5.8	248	86
5/23/2018	Assessment	- -	- -	- -	<0.083 U	5.3	- -	- -
8/15/2018	Assessment	- -	- -	- -	- -	5.0	- -	- -
9/17/2018	Assessment	0.198	230	103	- -	- -	2694	1910
2/5/2019	Assessment	0.096	133	27.9	0.16	4.2	- -	181
2/21/2019	Assessment	1.39	211	89	0.19	5.0	2240	1350
4/30/2019	Assessment	0.07	- -	- -	- -	4.5	- -	- -
5/29/2019	Assessment	0.06 J	10.1	44.0	0.16	3.6	1758	503
7/23/2019	Assessment	0.081	222	77	0.5736 J	6.3	2460	1701

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

Table 1 - Groundwater Data Summary: AD-9
Welsh - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	<1.05 U	51	0.999439 J	1	<0.23 U	27	2.945	0.4191 J	<0.68 U	1.32	0.0194 J	<0.29 U	1.04175 J	<0.86 U
7/29/2016	Background	<0.93 U	<1.05 U	31	0.726564 J	2	0.262163 J	22	1.447	0.4339 J	<0.68 U	1.38	0.045	<0.29 U	8.00	<0.86 U
9/30/2016	Background	<0.93 U	<1.05 U	33	0.582852 J	0.187457 J	<0.23 U	12	3.199	0.304 J	<0.68 U	1.17	0.00739 J	<0.29 U	3.52832 J	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	26	0.478576 J	0.965032 J	<0.23 U	16	1.311	0.6227 J	<0.68 U	1.44	<0.005 U	<0.29 U	3.09028 J	<0.86 U
12/14/2016	Background	<0.93 U	<1.05 U	27	0.481339 J	2	<0.23 U	24	3	<0.083 U	<0.68 U	1.33	0.02123 J	<0.29 U	<0.99 U	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	98	2	0.693618 J	<0.23 U	42	2.349	<0.083 U	<0.68 U	0.634	0.00717 J	<0.29 U	<0.99 U	1.7755 J
2/24/2017	Background	<0.93 U	<1.05 U	22	0.301057 J	0.680144 J	<0.23 U	24	2.32	<0.083 U	<0.68 U	1.41	<0.005 U	<0.29 U	1.06022 J	1.45295 J
6/8/2017	Background	<0.93 U	<1.05 U	42.27	0.77 J	2.22	<0.23 U	24.16	1.586	<0.083 U	<0.68 U	1	0.006 J	<0.29 U	<0.99 U	<0.86 U
5/23/2018	Assessment	<0.93 U	<1.05 U	30.45	0.32 J	2.88	<0.23 U	26.7	2.556	<0.083 U	<0.68 U	1.2	<0.005 U	<0.29 U	<0.99 U	8.46
8/15/2018	Assessment	<10 U	1.68	24.2	0.268	0.06	0.42	11.1	1.864	- -	0.262	0.851	0.013	0.11	0.3	0.062
2/21/2019	Assessment	<0.02 U	1.18	52.4	0.474	0.09	0.313	14.8	2.51	0.19	0.08 J	1.12	0.01 J	<0.4 U	0.3	0.1 J
5/29/2019	Assessment	<0.02 U	0.20	49.7	0.941	0.21	0.346	15.9	1.360	0.16	0.07 J	0.225	<0.005 U	<0.4 U	0.2	0.2 J
7/23/2019	Assessment	<0.02 U	1.39	32.1	0.361	0.06	0.2 J	12.7	1.689	0.5736 J	0.2 J	1.11	<0.005 U	<0.4 U	0.4	<0.1 U

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

Table 1 - Groundwater Data Summary: AD-15
Welsh - PBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	0.329	5.09	30	<0.083 U	5.6	188	24
7/29/2016	Background	0.407	3.83	34	<0.083 U	4.8	196	28
9/30/2016	Background	0.360	13.7	28	0.2621 J	4.6	367	23
10/21/2016	Background	0.152	4.57	26	<0.083 U	4.4	152	17
12/14/2016	Background	0.334	3.6	26	<0.083 U	4.7	204	19
1/20/2017	Background	0.413	3.35	32	<0.083 U	5.8	176	25
2/24/2017	Background	0.1	4.21	20	<0.083 U	4.6	88	8
6/8/2017	Background	0.321	3.57	27	<0.083 U	4.8	184	19
10/6/2017	Detection	0.395	3.08	30	<0.083 U	5.9	200	21
5/23/2018	Assessment	- -	- -	- -	<0.083 U	4.8	- -	- -
8/15/2018	Assessment	- -	- -	- -	- -	4.6	- -	- -
9/17/2018	Assessment	0.341	3.04	37	- -	- -	174	24
2/5/2019	Assessment	0.03 J	2.18	20.6	0.06	3.9	- -	0.2 J
2/21/2019	Assessment	0.169	2.67	28.2	0.09	5.0	150	10.6
5/29/2019	Assessment	<0.02 U	2.97	21.4	0.06 J	4.9	34	2.1
7/23/2019	Assessment	0.306	3.45	28	0.086 J	3.2	214	18

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

Table 1 - Groundwater Data Summary: AD-15
Welsh - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	12	215	0.959793 J	0.351465 J	17	11	2.284	<0.083 U	7	0.017	0.054	1.77432 J	3.46337 J	<0.86 U
7/29/2016	Background	<0.93 U	6	124	0.362598 J	0.111427 J	4	6	1.322	<0.083 U	<0.68 U	0.021	0.01646 J	0.586779 J	1.19442 J	<0.86 U
9/30/2016	Background	<0.93 U	131	1930	15	7.00	280	134	9.92	0.2621 J	161	0.149	0.707	3.60313 J	14.0	<0.86 U
10/21/2016	Background	<0.93 U	23	415	2	0.575938 J	54	19	3.567	<0.083 U	22	0.036	0.1	1.54555 J	1.17613 J	1.55993 J
12/14/2016	Background	<0.93 U	6	184	0.695316 J	0.246456 J	15	10	3.36	<0.083 U	3.96087 J	0.013	0.026	0.463544 J	1.32943 J	<0.86 U
1/20/2017	Background	<0.93 U	6	153	0.449612 J	<0.07 U	9	7	2.386	<0.083 U	2.87518 J	0.008	0.01932 J	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	20	353	2	0.319406 J	49	20	2.261	<0.083 U	19	0.025	0.058	1.42695 J	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	8.54	166	0.61 J	0.48 J	12.35	8.44	2.491	<0.083 U	2.98 J	0.0108	0.022 J	<0.29 U	2.71 J	<0.86 U
5/23/2018	Assessment	<0.93 U	2.56 J	102	0.03 J	0.1 J	2.63	4.74 J	1.46	<0.083 U	<0.68 U	0.00562	<0.005 U	<0.29 U	1.54 J	1.37 J
8/15/2018	Assessment	0.03 J	3.26	85.2	0.116	0.01 J	0.481	3.71	1.076	- -	0.438	0.00338	- -	0.05 J	0.9	0.09
2/21/2019	Assessment	<0.02 U	2.21	76.6	0.208	0.01 J	0.225	2.90	0.841	0.090	0.104	0.00294	<0.005 U	<0.4 U	0.4	<0.1 U
5/29/2019	Assessment	0.05 J	2.95	203	1.50	0.08	9.31	5.49	3.55	0.06 J	9.85	0.01 J	0.081	<0.4 U	5.1	0.1 J
7/23/2019	Assessment	0.03 J	2.10	113	0.573	0.04 J	2.26	5.41	2.245	0.086 J	2.87	0.00414	0.025	<0.4 U	1.6	<0.1 U

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

Table 1 - Groundwater Data Summary: AD-17
Welsh - PBAP
Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/26/2016	Background	0.121	200	43	0.4023 J	7.2	1810	1166
7/29/2016	Background	0.119	195	32	0.4135 J	5.7	1576	1005
9/30/2016	Background	0.111	191	36	0.3055 J	6.2	1663	1055
10/21/2016	Background	0.124	194	32	0.583 J	6.1	1612	1163
12/14/2016	Background	0.135	196	31	0.5399 J	6.0	1560	1096
1/20/2017	Background	0.101	196	33	<0.083 U	5.9	1686	1445
2/24/2017	Background	0.135	189	30	<0.083 U	5.7	1628	1055
6/8/2017	Background	0.121	188	30	<0.083 U	5.8	1578	1105
10/6/2017	Detection	0.183	183	31	<0.083 U	5.9	1548	1090
5/24/2018	Assessment	0.239	193	39	<0.083 U	6.3	1836	1067
8/15/2018	Assessment	0.118	187	40	<0.083 U	5.6	1748	1168
2/21/2019	Assessment	0.151	207	43.2	0.18	6.9	1722	1060
5/30/2019	Assessment	0.158	202	41.7	<0.04 U	6.1	1546	1120
7/24/2019	Assessment	0.113	216	37	0.085 J	6.0	1864	1127

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

Table 1 - Groundwater Data Summary: AD-17
Welsh - PBAP
Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
5/26/2016	Background	<0.93 U	1.37501 J	21	0.173275 J	2	1	63	1.525	0.4023 J	<0.68 U	0.37	0.032	<0.29 U	<0.99 U	<0.86 U
7/29/2016	Background	1.13716 J	<1.05 U	20	0.307264 J	4	1	68	2.78	0.4135 J	<0.68 U	0.374	0.02133 J	1.04115 J	4.56733 J	<0.86 U
9/30/2016	Background	<0.93 U	<1.05 U	31	0.175474 J	0.848199 J	3	58	2.358	0.3055 J	<0.68 U	0.354	<0.005 U	<0.29 U	<0.99 U	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	34	0.200656 J	2	4	65	2.224	0.583 J	<0.68 U	0.394	<0.005 U	0.322249 J	3.34422 J	<0.86 U
12/14/2016	Background	<0.93 U	<1.05 U	17	0.0498325 J	3	0.816224 J	68	2.384	0.5399 J	<0.68 U	0.323	0.01485 J	<0.29 U	<0.99 U	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	14	0.0319852 J	3	68	68	2.436	<0.083 U	<0.68 U	0.341	<0.005 U	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	20	0.0665729 J	2	1	73	2.288	<0.083 U	<0.68 U	0.331	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	<1.05 U	10.3	<0.02 U	6.06	<0.23 U	74.8	1.598	<0.083 U	<0.68 U	0.329	0.013 J	<0.29 U	<0.99 U	<0.86 U

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

APPENDIX II

Where applicable, show in this appendix the results from statistical analyses, and a description of the statistical analysis method chosen. These statistical analyses are to be conducted separately for each constituent in each monitoring well.

STATISTICAL ANALYSIS SUMMARY
PRIMARY BOTTOM ASH POND
J. Robert Welsh Plant
Pittsburg, Texas

Submitted to

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

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January 8, 2019

CHA8473

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LIST OF ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LFB	Laboratory Fortified Blanks
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
PBAP	Primary Bottom Ash Pond
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Level
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Primary Bottom Ash Pond (PBAP), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas.

Based on detection monitoring conducted in 2017 and 2018, a statistically significant increase (SSI) over background was concluded for boron at the PBAP. An alternate source was not identified at the time, so two assessment monitoring events were conducted at the PBAP in 2018, in accordance with 40 CFR 257.95.

Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. An SSL was identified for lithium. Thus, either the unit will move to an assessment of corrective measures or an alternative source demonstration (ASD) will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

PRIMARY BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, samples were collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(b) and 257.95(d)(1). Samples collected from background wells for the May and August 2018 sampling events were analyzed for both Appendix III and Appendix IV parameters, whereas samples collected from downgradient wells were analyzed for Appendix IV parameters only. Lead and molybdenum values for the August 2018 event are not reported as they were not detected in any wells during the first event. Additional samples were collected from downgradient wells for Appendix III parameters in September 2018. A summary of data collected during assessment monitoring may be found in Table 1.

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

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.5 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the PBAP were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained to meet the requirements of 40 CFR 257.95(b) and 257.95(d)(1) were screened for potential outliers. Outliers for the Appendix III parameters identified from the background and detection monitoring events conducted through January 2018 were summarized in a previous report (Geosyntec, 2018). The reported chromium value of 0.068 milligrams per liter (mg/L) for the January 20, 2017 sampling event at background well AD-17 was removed as an outlier. No other outliers were identified.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with 40 CFR 257.95(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or regional screening level (RSL) for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for barium, beryllium, and combined radium. Non-parametric tolerance limits were calculated for arsenic, chromium, cobalt, lithium, mercury, molybdenum and selenium due to apparent non-normal distributions; for antimony, fluoride, lead, and thallium due to a high non-detect frequency; and for cadmium due to both an apparent non-normal distribution and a high non-detect frequency. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

The following SSL was identified at the Welsh PBAP:

- The LCL for lithium exceeded the GWPS of 0.390 mg/L at AD-9 (0.935 mg/L).

As a result, the Welsh PBAP will either move to an assessment of corrective measures or an alternative source demonstration will be conducted to evaluate if the unit can remain in assessment monitoring.

2.3 Conclusions

Three assessment monitoring events were conducted in 2018 in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the 2018 data. GWPSs were established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. An SSL for lithium was identified.

Based on this evaluation, the Welsh PBAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – Welsh Plant. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Primary Bottom Ash Pond, J Robert Welsh Plant, Pittsburg, Texas. January 15, 2018.

TABLES

Table 1 – Groundwater Data Summary
Welsh – Primary Bottom Ash Pond

Parameter	Unit	AD-1		AD-5		AD-8			AD-9			AD-15			AD-17	
		5/24/2018	8/14/2018	5/24/2018	8/15/2018	5/23/2018	8/15/2018	9/17/2018	5/23/2018	8/15/2018	9/17/2018	5/23/2018	8/15/2018	9/17/2018	5/24/2018	8/15/2018
Antimony	mg/L	0.00317 J	0.0000300 J	0.005 U	0.0000100 J	0.00319 J	0.0000100 J	-	0.005 U	0.00005 U	-	0.005 U	0.0000300 J	-	0.005 U	0.0000200 J
Arsenic	mg/L	0.005 U	0.000210	0.005 U	0.00169	0.005 U	0.000310	-	0.005 U	0.00168	-	0.00256 J	0.00326	-	0.005 U	0.00183
Barium	mg/L	0.0799	0.0630	0.0712	0.0637	0.0221	0.0212	-	0.0305	0.0242	-	0.102	0.0852	-	0.00965	0.0128
Beryllium	mg/L	0.000390 J	0.000482	0.001 U	0.0000550	0.001 U	0.00000800 J	-	0.000320 J	0.000268	-	0.0000300 J	0.000116	-	0.001 U	0.0000690
Boron	mg/L	0.345	0.443	0.0501	0.0500	-	-	1.30	-	-	0.198	-	-	0.341	0.239	0.118
Cadmium	mg/L	0.001 U	0.0000200	0.000230 J	0.00000800 J	0.001 U	0.0000200 J	-	0.00288	0.0000600	-	0.000100 J	0.0000100 J	-	0.00646	0.000250
Calcium	mg/L	10.2	5.95	28.1	40.5	-	-	15.0	-	-	230	-	-	3.04	193	187
Chloride	mg/L	4.00	5.00	22.0	19.0	-	-	24.0	-	-	103	-	-	37.0	39.0	40.0
Chromium	mg/L	0.001 U	0.000160	0.000800 J	0.0000720	0.001 U	0.0000500	-	0.001 U	0.000420	-	0.00263	0.000481	-	0.001 U	0.000604
Cobalt	mg/L	0.000350 J	0.000797	0.0142	0.0114	0.00319 J	0.00536	-	0.0267	0.0111	-	0.00474 J	0.00371	-	0.0717	0.0435
Combined Radium	pCi/L	1.98	1.10	1.95	0.316	0.337	3.44	-	2.56	1.86	-	1.46	1.08	-	1.94	2.35
Fluoride	mg/L	1 U	1 U	1 U	1 U	0.501 J	0.615	-	1 U	1 U	-	1 U	1 U	-	1 U	1 U
Lead	mg/L	0.005 U	NR	0.005 U	NR	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR
Lithium	mg/L	0.00814	0.00708	0.121	0.147	0.0956	0.0555	-	1.20	0.851	-	0.00562	0.00338	-	0.308	0.243
Mercury	mg/L	0.00000600 J	0.0000130 J	0.000025 U	0.000025 U	0.000025 U	0.00000700 J	-	0.000025 U	0.000013 J	-	0.000025 U	0.000008 J	-	0.000025 U	0.0000110 J
Molybdenum	mg/L	0.005 U	NR	0.005 U	NR	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR
Selenium	mg/L	0.00138 J	0.00170	0.005 U	0.0000800 J	0.00175 J	0.0000700 J	-	0.005 U	0.000300	-	0.00154 J	0.000900	-	0.005 U	0.000300
Total Dissolved Solids	mg/L	150	160	242	428	-	-	288	-	-	2690	-	-	174	1840	1750
Sulfate	mg/L	43.0	44.0	60.0	240	-	-	122	-	-	1910	-	-	24.0	1070	1170
Thallium	mg/L	0.002 U	0.0000300 J	0.002 U	0.00005 U	0.002 U	0.000129	-	0.00846	0.0000620	-	0.00137 J	0.0000900	-	0.002 U	0.0000740
pH	SU	5.19	5.18	6.22	6.23	6.20	6.77	-	5.30	4.96	-	4.76	4.59	-	6.28	5.60

Notes:
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Parameter was not present in concentrations above method detection limit and is reported as the reporting limit
J: Estimated value. Parameter was detected in concentrations below the reporting limit
-: Not sampled
NR: Values are not reported as this parameter was not detected during the May 2018 event at any wells
The fluoride and pH values collected on 8/15/2018 were also used in Appendix III analyses.

Table 2: Groundwater Protection Standards
Welsh Plant - Primary Bottom Ash Pond

Constituent Name	MCL	Rule Specified	Background Limit
Antimony, Total (mg/L)	0.006		0.005
Arsenic, Total (mg/L)	0.01		0.005
Barium, Total (mg/L)	2		0.36
Beryllium, Total (mg/L)	0.004		0.00077
Cadmium, Total (mg/L)	0.005		0.0065
Chromium, Total (mg/L)	0.1		0.004
Cobalt, Total (mg/L)	n/a	0.006	0.075
Combined Radium, Total (pCi/L)	5		4.21
Fluoride, Total (mg/L)	4		1
Lead, Total (mg/L)	n/a	0.015	0.005
Lithium, Total (mg/L)	n/a	0.04	0.39
Mercury, Total (mg/L)	0.002		0.000033
Molybdenum, Total (mg/L)	n/a	0.1	0.005
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.0013

Notes:
Grey cell indicates calculated UTL is higher than MCL.
MCL = Maximum Contaminant Level
RSL = Regional Screening Level
Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
The higher of the calculated UTL or MCL/RSL is used as the GWPS.

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Welsh Primary Bottom Ash Pond 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

STATE OF TEXAS
DAVID ANTHONY MILLER
112498
LICENSED
PROFESSIONAL ENGINEER

112498	TEXAS	01.08.19
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

December 16, 2018

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

Re: Welsh PBAP
Assessment Monitoring Event – September 2018

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis of September 2018 groundwater data for American Electric Power Inc.'s Welsh PBAP. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-1, AD-5, and AD-17; and
- **Downgradient wells:** AD-8, AD-9, and AD-15.

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC.

The CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

- **Appendix IV** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium.

Time series plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record. Values previously flagged during the screening as outliers may be seen in a lighter font and disconnected symbol on the time series graphs.

Evaluation of Appendix III Parameters

Interwell prediction limits combined with a 1-of-2 verification strategy were constructed for boron and pH; and intrawell prediction limits combined with a 1-of-2 verification strategy were constructed for calcium, chloride, fluoride, sulfate and TDS. The statistical method selected for each parameter was determined based on the results of the screening analysis performed in December 2017.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one 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 a false positive result and, therefore, no further action is necessary. No SSIs were noted for any of the Appendix III parameters in downgradient wells except for boron in well AD-8 and pH (lower limit) in well AD-15. Chloride in upgradient well AD-5 exceeded its intrawell prediction limit which may be an indication that groundwater is changing naturally upgradient of the facility. Concentrations will continue to be monitored over the next sampling events. The results of those findings may be found in the Prediction Limit Summary tables following this letter.

When a statistically significant increase is identified, the data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing or stable. Upgradient wells are included in the trend analyses to identify whether similar patters exist upgradient of the site which is an indication of natural variability in groundwater unrelated to practices at the site.

No statistically significant increasing or decreasing trends were found for any of the downgradient well/parameter pairs. A Trend Test summary table follows this letter.

Evaluation of Appendix IV Parameters

Parametric tolerance limits were used to calculate background limits from pooled upgradient well data for Appendix IV parameters with a target of 95% confidence and 95% coverage to determine the Alternate Contaminant Level (ACL). The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and Regional Screening Levels (RSLs) in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons.

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters using the highest limit of either the MCL, RSL, or ACL as discussed above. Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence intervals exceedances were found except for lithium in well AD-9. A summary of the confidence interval results follows this letter.

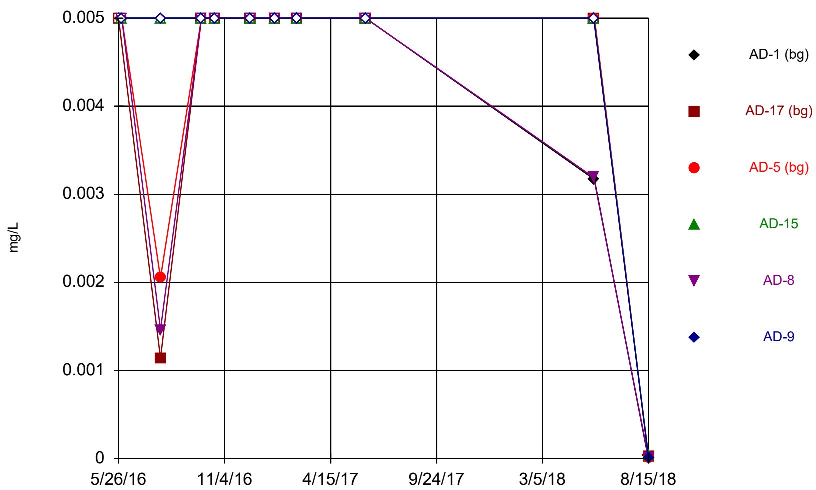
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Welsh PBAP. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

Kristina L. Rayner
Groundwater Statistician

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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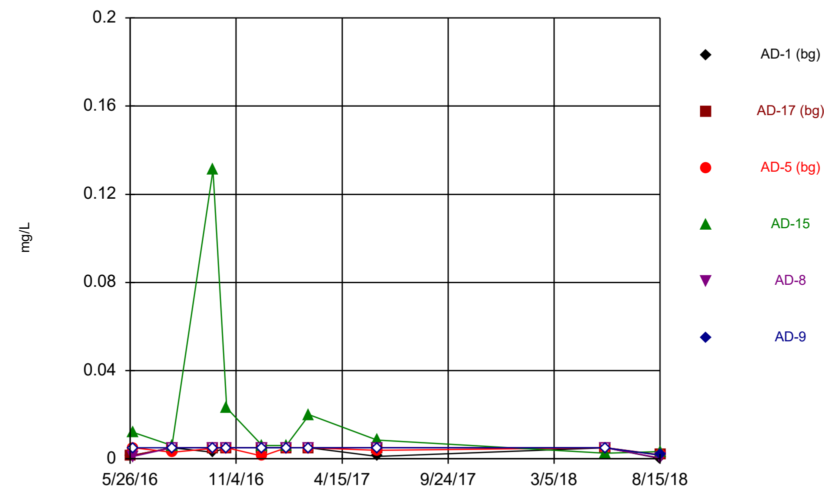
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Arsenic, total   Analysis Run 12/16/2018 8:11 AM   View: Descriptive
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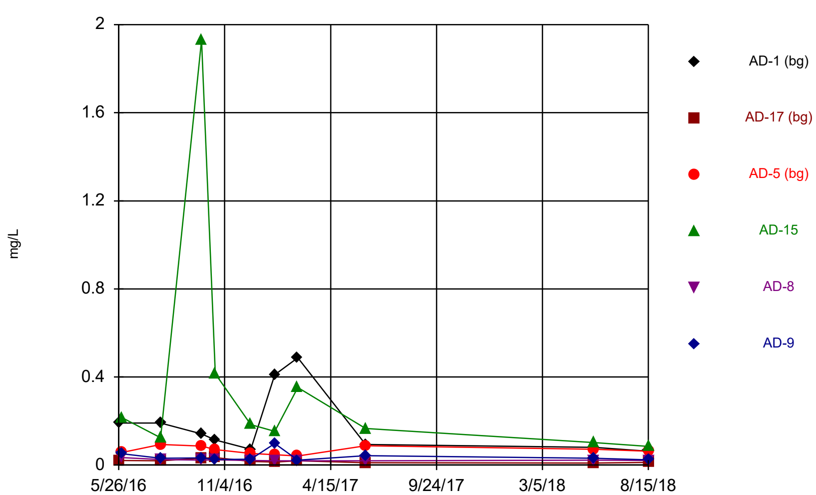
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Barium, total   Analysis Run 12/16/2018 8:11 AM   View: Descriptive
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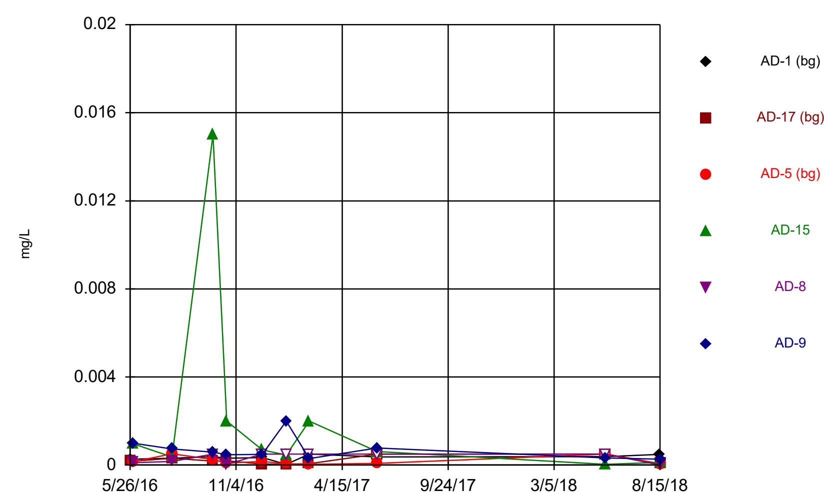
Hollow symbols indicate censored values.

Time Series



Constituent: Beryllium, total   Analysis Run 12/16/2018 8:11 AM   View: Descriptive
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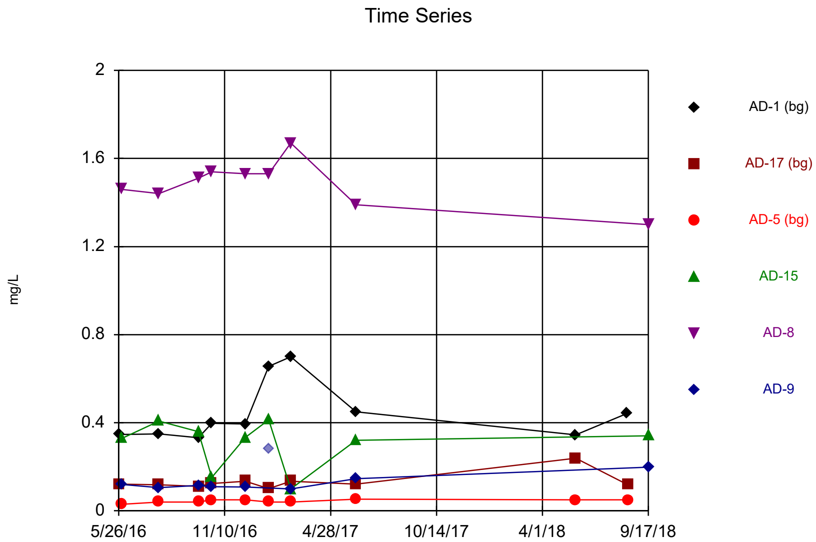

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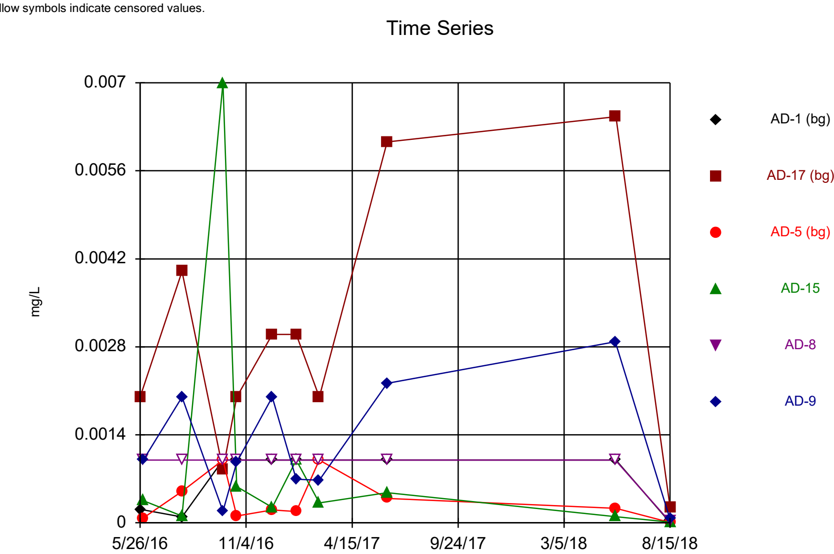
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



Constituent: Cadmium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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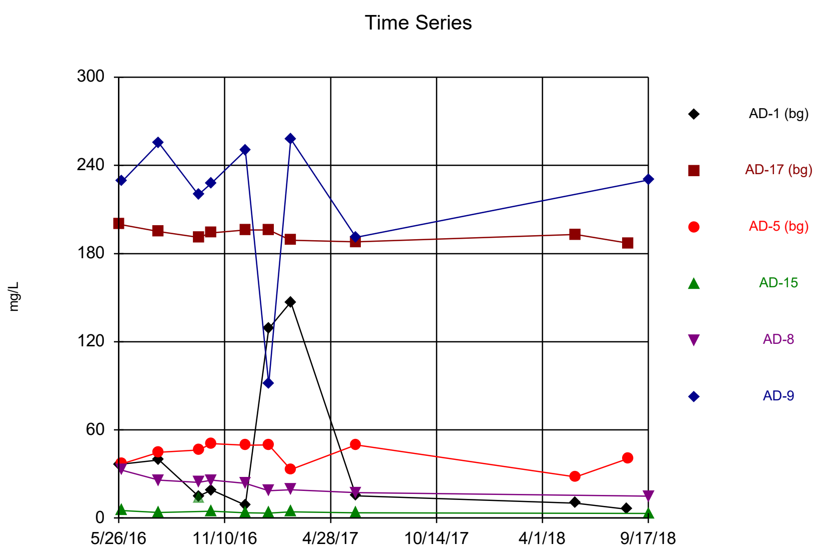

Constituent: Calcium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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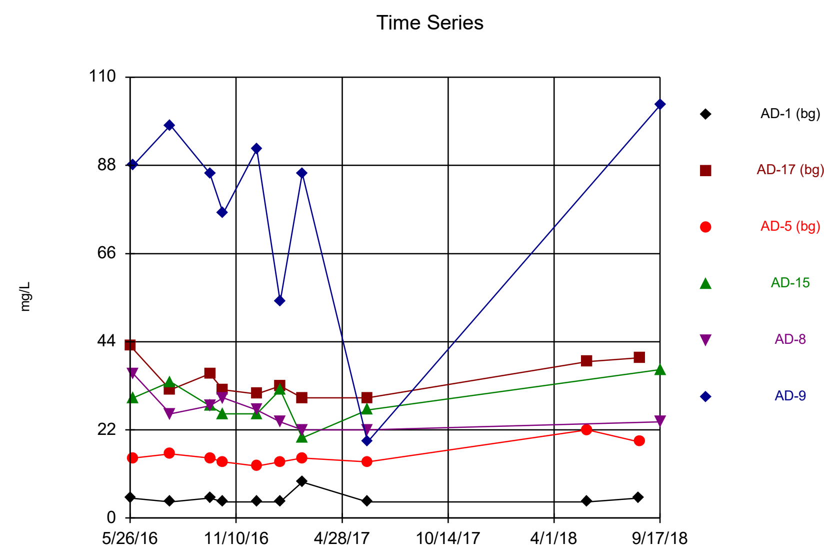
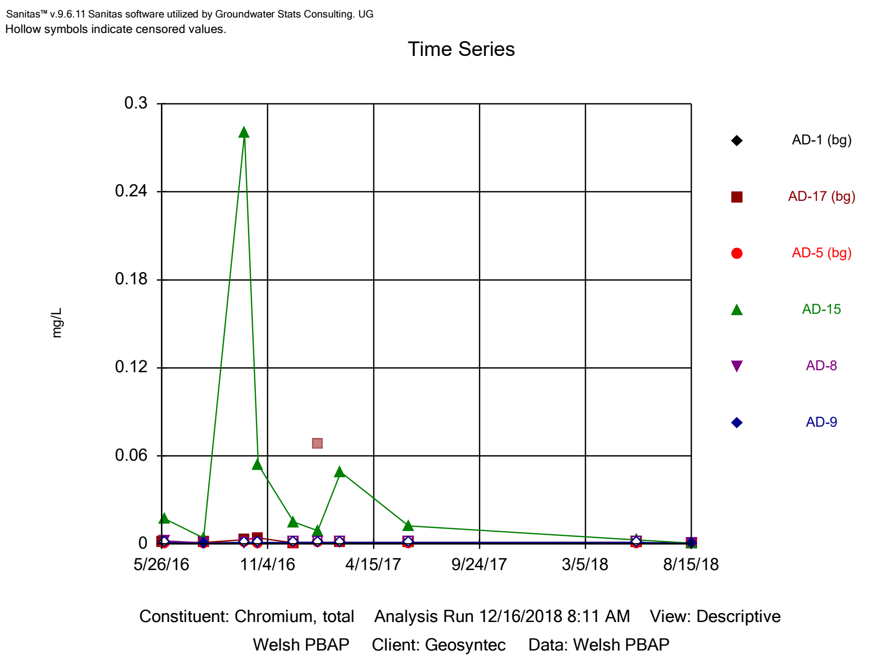


Constituent: Chloride, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.3
0.24
0.18
0.12
0.06
0
5/26/16
11/4/16
4/15/17
9/24/17
3/5/18
8/15/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Chromium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Time Series
mg/L
0.2
0.16
0.12
0.08
0.04
0
5/26/16
11/4/16
4/15/17
9/24/17
3/5/18
8/15/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Cobalt, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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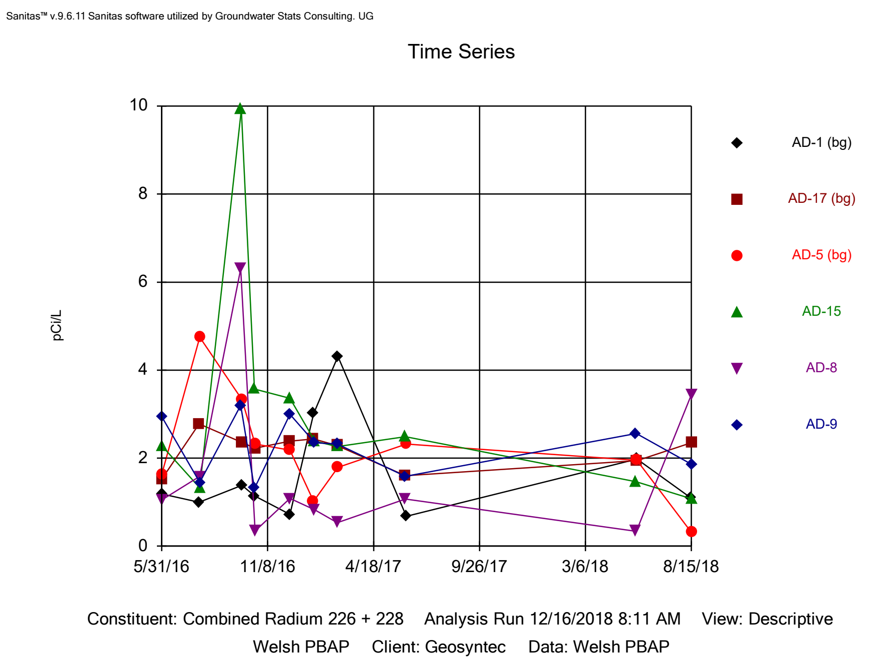
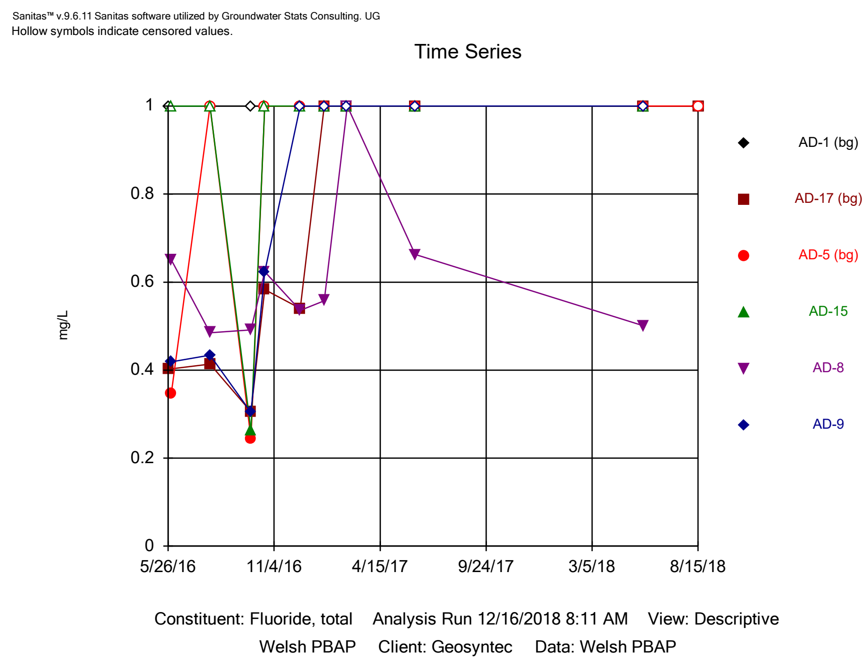


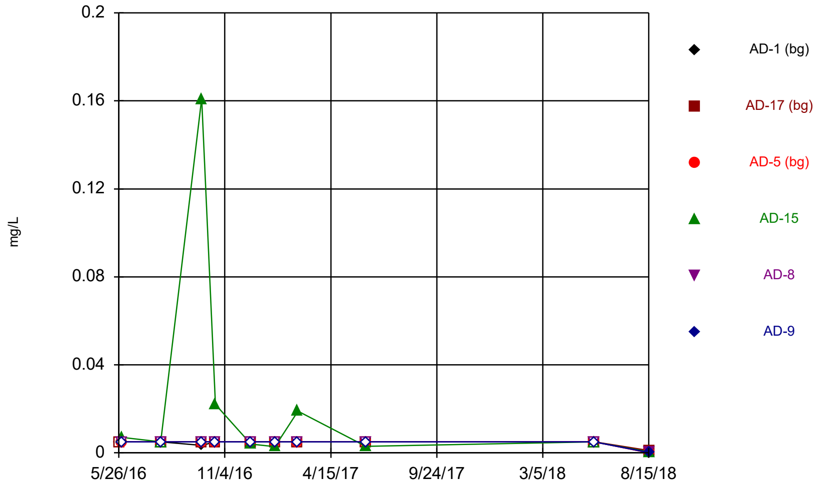
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Time Series
pCi/L
10
8
6
4
2
0
5/31/16
11/8/16
4/18/17
9/26/17
3/6/18
8/15/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Combined Radium 226 + 228 Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
1
0.8
0.6
0.4
0.2
0
5/26/16
11/4/16
4/15/17
9/24/17
3/5/18
8/15/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Fluoride, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Lead, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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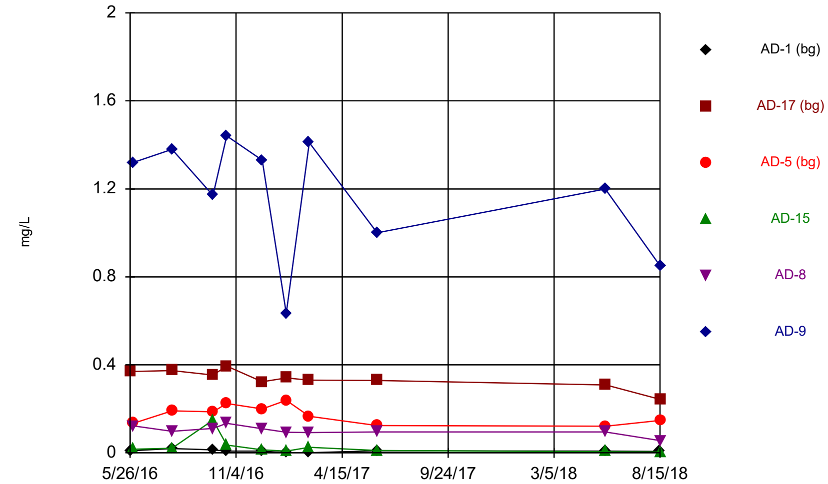
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Lithium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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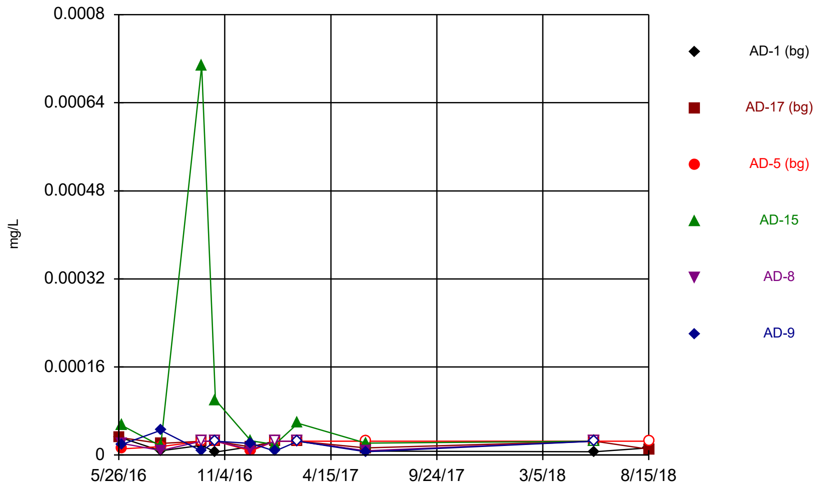
Time Series



Constituent: Mercury, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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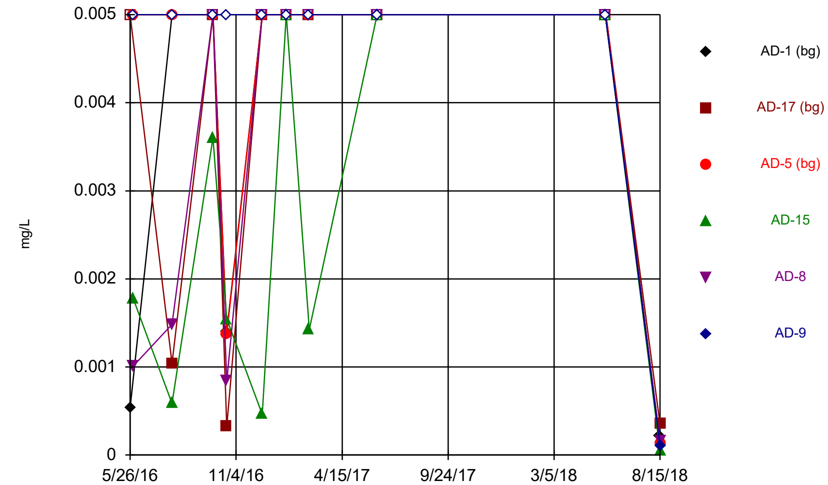
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Molybdenum, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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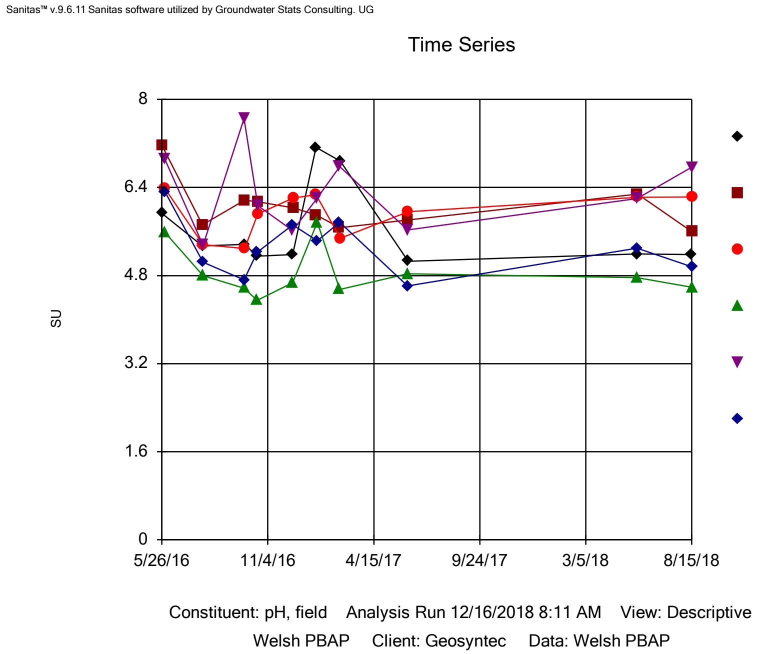
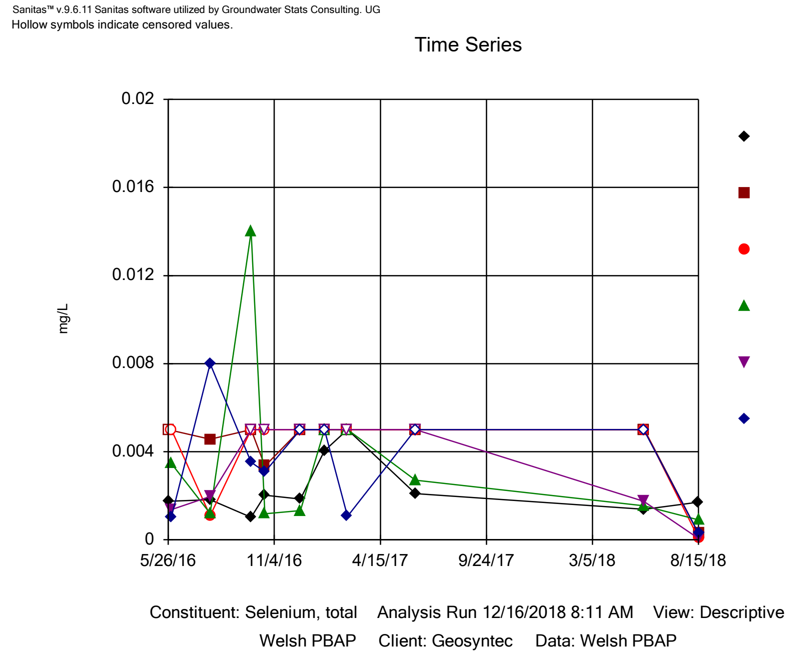
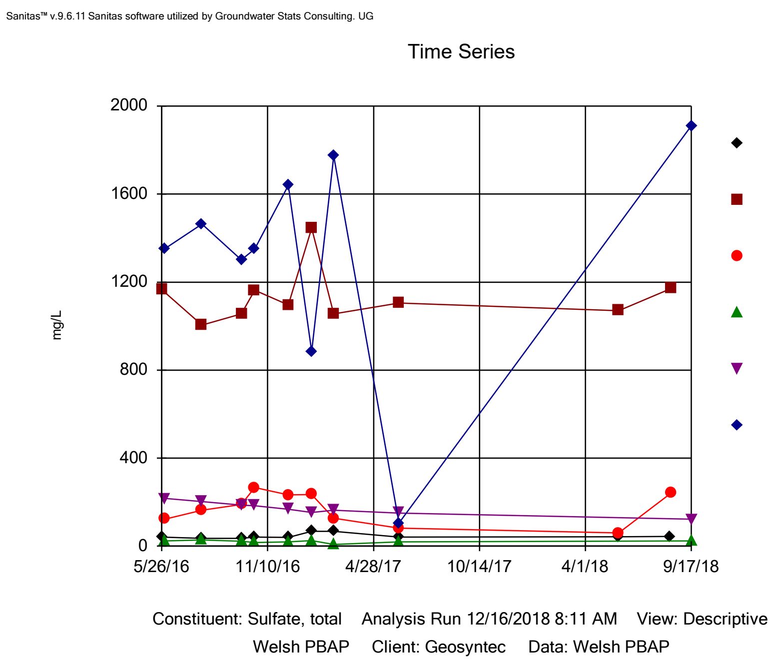
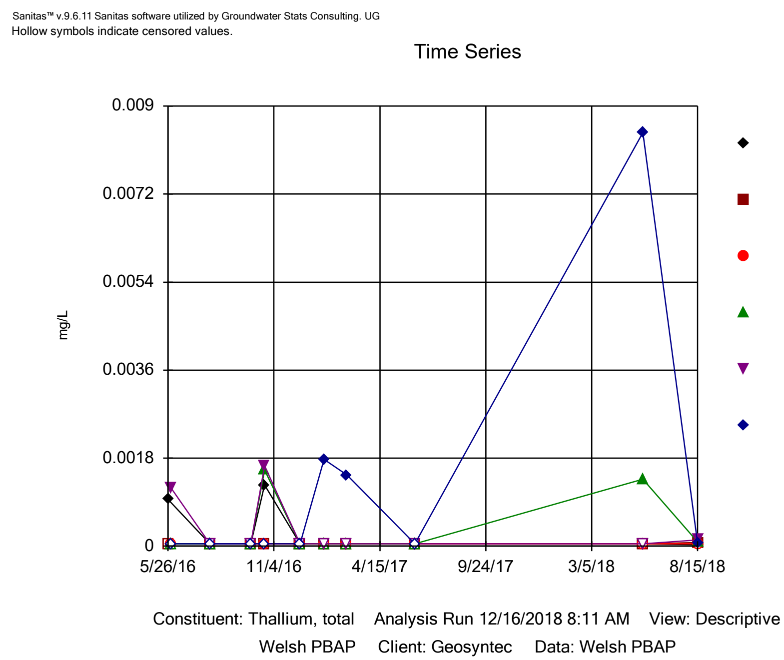
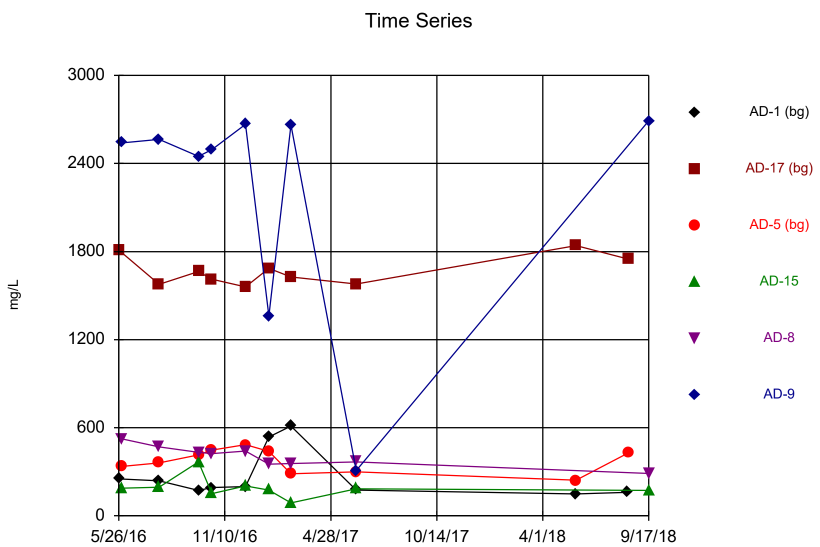

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Time Series
SU
8
6.4
4.8
3.2
1.6
0
5/26/16
11/4/16
4/15/17
9/24/17
3/5/18
8/15/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: pH, field Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.02
0.016
0.012
0.008
0.004
0
5/26/16
11/4/16
4/15/17
9/24/17
3/5/18
8/15/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Selenium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Time Series
mg/L
2000
1600
1200
800
400
0
5/26/16
11/10/16
4/28/17
10/14/17
4/1/18
9/17/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Sulfate, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.009
0.0072
0.0054
0.0036
0.0018
0
5/26/16
11/4/16
4/15/17
9/24/17
3/5/18
8/15/18
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Thallium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Constituent: Total Dissolved Solids   Analysis Run 12/16/2018 8:11 AM   View: Descriptive
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Interwell Prediction Limit Summary Table - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/16/2018, 8:10 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	**AD-8**	**0.765**	**n/a**	**9/17/2018**	**1.3**	**Yes**	**30**	**-2.011**	**0.9717**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**
pH, field (SU)	**AD-15**	**6.899**	**4.849**	**8/15/2018**	**4.59**	**Yes**	**30**	**5.874**	**0.5713**	**0**	**None**	**No**	**0.001253**	**Param Inter 1 of 2**

Interwell Prediction Limit Summary Table - All Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/16/2018, 8:10 AM

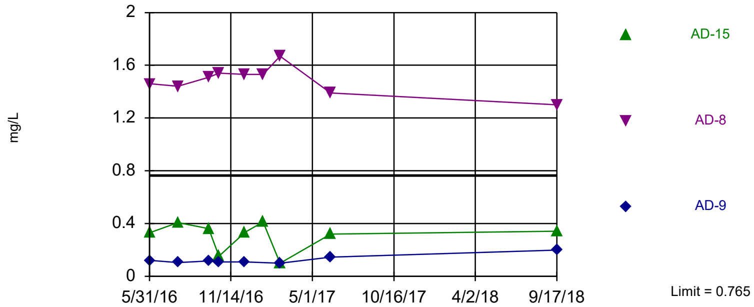
Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	AD-15	0.765	n/a	9/17/2018	0.341	No	30	-2.011	0.9717	0	None	ln(x)	0.002505	Param Inter 1 of 2
Boron, total (mg/L)	**AD-8**	**0.765**	**n/a**	**9/17/2018**	**1.3**	**Yes**	**30**	**-2.011**	**0.9717**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**
Boron, total (mg/L)	AD-9	0.765	n/a	9/17/2018	0.198	No	30	-2.011	0.9717	0	None	ln(x)	0.002505	Param Inter 1 of 2
pH, field (SU)	**AD-15**	**6.899**	**4.849**	**8/15/2018**	**4.59**	**Yes**	**30**	**5.874**	**0.5713**	**0**	**None**	**No**	**0.001253**	**Param Inter 1 of 2**
pH, field (SU)	AD-8	6.899	4.849	8/15/2018	6.77	No	30	5.874	0.5713	0	None	No	0.001253	Param Inter 1 of 2
pH, field (SU)	AD-9	6.899	4.849	8/15/2018	4.96	No	30	5.874	0.5713	0	None	No	0.001253	Param Inter 1 of 2

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Exceeds Limit: AD-8

Prediction Limit

Interwell Parametric



Background Data Summary (based on natural log transformation): Mean=-2.011, Std. Dev.=0.9717, n=30. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9108, critical = 0.9. Kappa = 1.794 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Comparing 3 points to limit.

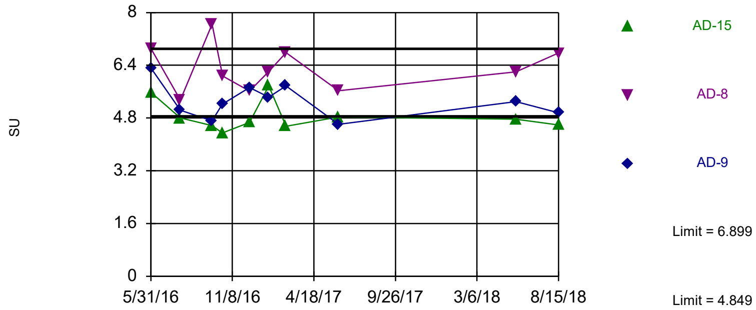
Constituent: Boron, total Analysis Run 12/16/2018 8:00 AM View: PL's - Interwell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Exceeds Limits: AD-15

Prediction Limit

Interwell Parametric



Background Data Summary: Mean=5.874, Std. Dev.=0.5713, n=30. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9326, critical = 0.9. Kappa = 1.794 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.001253. Comparing 3 points to limit.

Constituent: pH, field Analysis Run 12/16/2018 8:00 AM View: PL's - Interwell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Intrawell Prediction Limit Summary Table - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/9/2018, 2:22 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Chloride, total (mg/L)	**AD-5**	**16.78**	**n/a**	**8/15/2018**	**19**	**Yes**	**8**	**14.5**	**0.9258**	**0**	**None**	**No**	**0.002505**	Param 1 of 2

Intrawell Prediction Limit Summary Table - All Results

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/9/2018, 2:22 PM

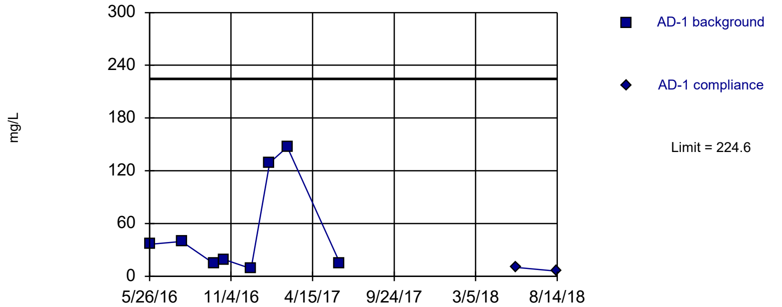
Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium, total (mg/L)	AD-1	224.6	n/a	8/14/2018	5.95	No	8	6.363	3.508	0	None	sqrt(x)	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-15	5.711	n/a	9/17/2018	3.04	No	7	4.031	0.6254	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-17	203.5	n/a	8/15/2018	187	No	8	193.6	4.033	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-5	61.45	n/a	8/15/2018	40.5	No	8	45.09	6.656	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-8	35.68	n/a	9/17/2018	15	No	8	23.46	4.969	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-9	349.9	n/a	9/17/2018	230	No	8	215.3	54.76	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	AD-1	9	n/a	8/14/2018	5	No	8	n/a	n/a	0	n/a	n/a	0.02144	NP (normality) 1 of 2
Chloride, total (mg/L)	AD-15	38.42	n/a	9/17/2018	37	No	8	27.88	4.291	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	AD-17	44.04	n/a	8/15/2018	40	No	8	33.38	4.34	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	**AD-5**	**16.78**	**n/a**	**8/15/2018**	**19**	**Yes**	**8**	**14.5**	**0.9258**	**0**	**None**	**No**	**0.002505**	Param 1 of 2
Chloride, total (mg/L)	AD-8	38.29	n/a	9/17/2018	24	No	8	26.88	4.643	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	AD-9	139.3	n/a	9/17/2018	103	No	8	74.88	26.2	0	None	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-1	1	n/a	8/14/2018	1ND	No	8	n/a	n/a	100	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-15	1	n/a	5/23/2018	1ND	No	8	n/a	n/a	87.5	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-17	0.6953	n/a	8/15/2018	1ND	No	8	0.4488	0.1003	37.5	Kapla...	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-5	1	n/a	8/15/2018	1ND	No	8	n/a	n/a	75	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-8	1.034	n/a	5/23/2018	0.501	No	8	0.6258	0.166	12.5	None	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-9	0.7259	n/a	5/23/2018	1ND	No	8	0.4449	0.1143	50	Kapla...	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-1	82.3	n/a	8/14/2018	44	No	8	6.772	0.9358	0	None	sqrt(x)	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-15	35.58	n/a	9/17/2018	24	No	8	20.38	6.186	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-17	1471	n/a	8/15/2018	1170	No	8	1136	136.3	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-5	336.4	n/a	8/15/2018	240	No	8	177.4	64.69	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-8	235.8	n/a	9/17/2018	122	No	8	178	23.53	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-9	2527	n/a	9/17/2018	1910	No	8	1234	526.1	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-1	784.8	n/a	8/14/2018	160	No	8	16.71	4.598	0	None	sqrt(x)	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-15	388.1	n/a	9/17/2018	174	No	8	194.4	78.82	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-17	1840	n/a	8/15/2018	1750	No	8	1639	81.77	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-5	563.5	n/a	8/15/2018	428	No	8	383.6	73.17	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-8	568.6	n/a	9/17/2018	288	No	8	420.9	60.09	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-9	3147	n/a	9/17/2018	2690	No	8	1.3e10	7.4e9	0	None	x^3	0.002505	Param 1 of 2

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=6.363, Std. Dev.=3.508, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8248, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

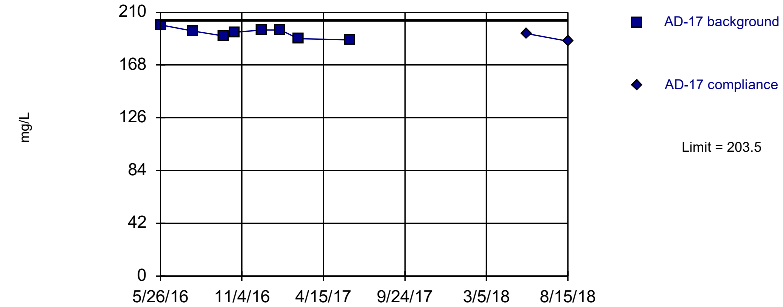
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=193.6, Std. Dev.=4.033, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9507, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

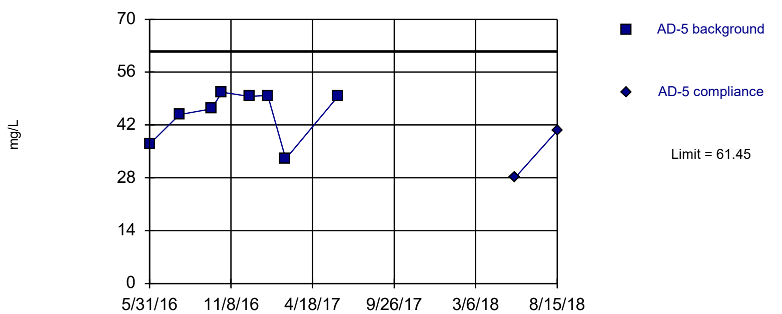
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=45.09, Std. Dev.=6.656, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8101, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

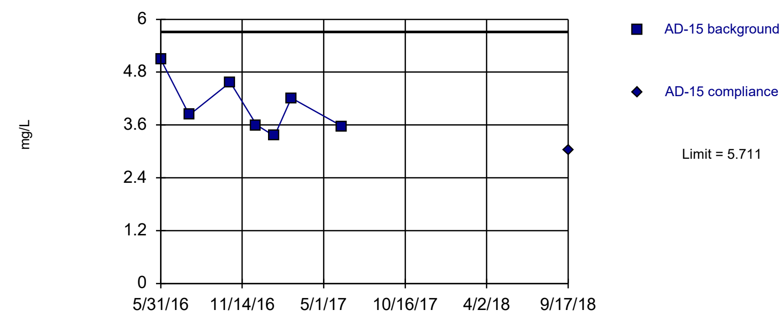
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=4.031, Std. Dev.=0.6254, n=7. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9248, critical = 0.73. Kappa = 2.685 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

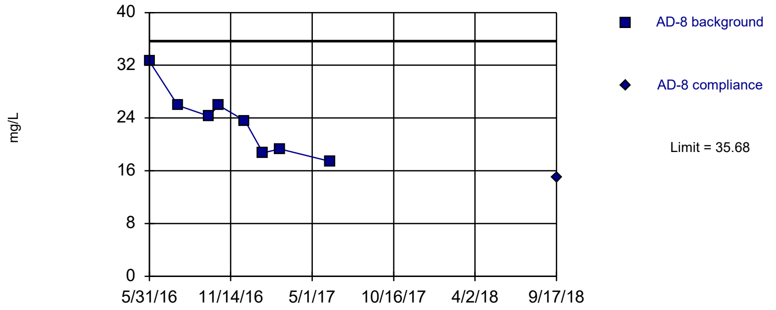
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=23.46, Std. Dev.=4.969, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9282, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

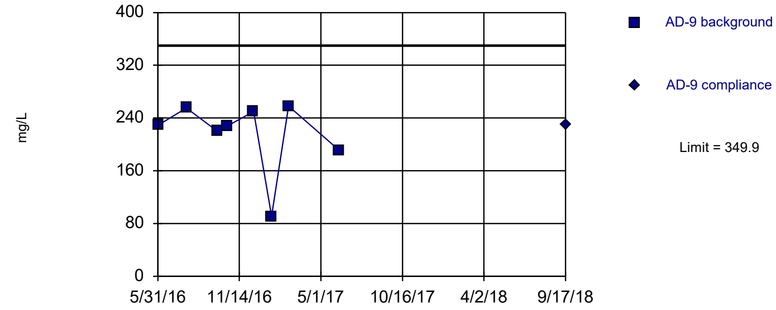
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=215.3, Std. Dev.=54.76, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7629, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

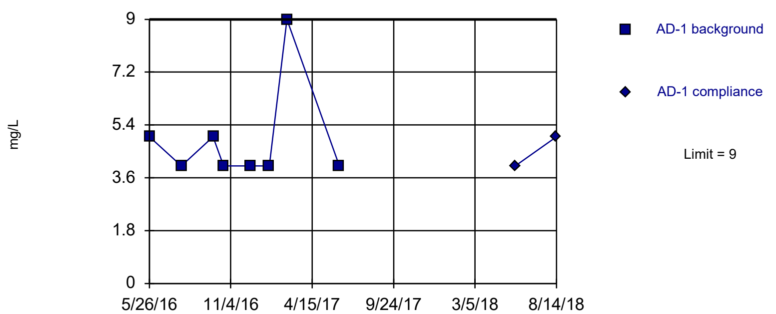
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 8 background values. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

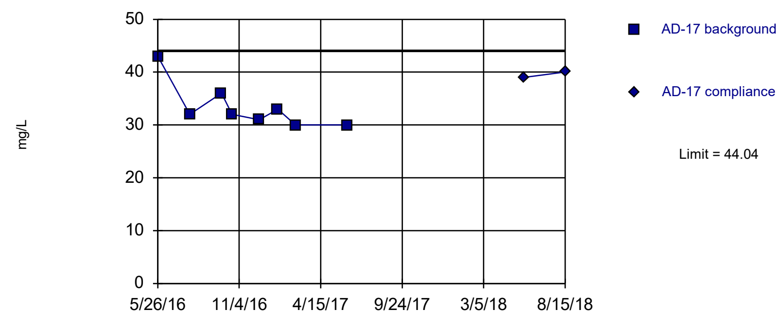
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=33.38, Std. Dev.=4.34, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7758, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

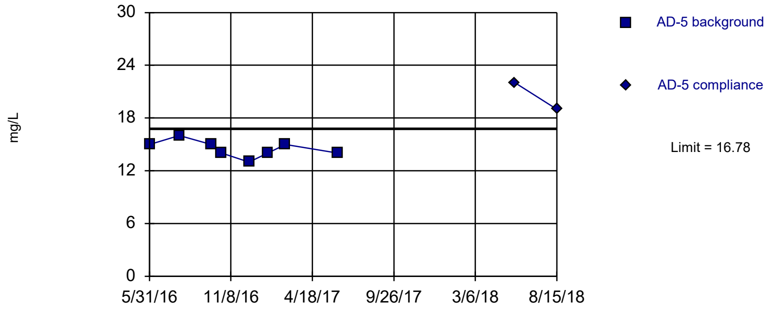
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Exceeds Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=14.5, Std. Dev.=0.9258, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9302, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

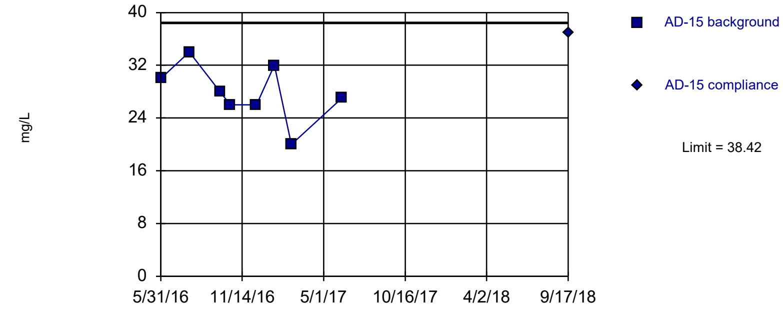
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=27.88, Std. Dev.=4.291, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9603, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

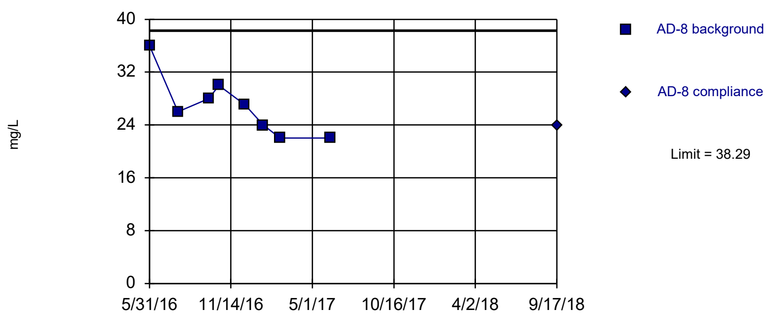
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=26.88, Std. Dev.=4.643, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9162, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

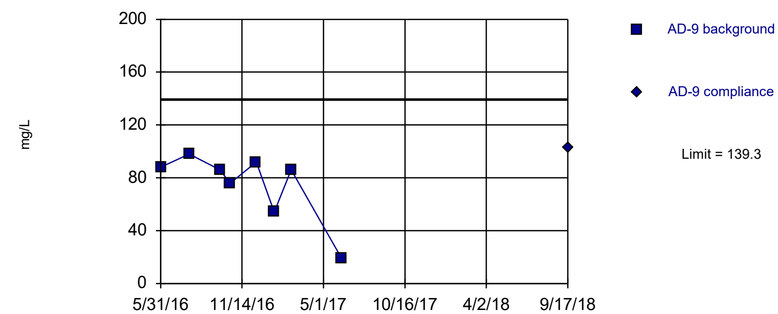
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=74.88, Std. Dev.=26.2, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7978, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

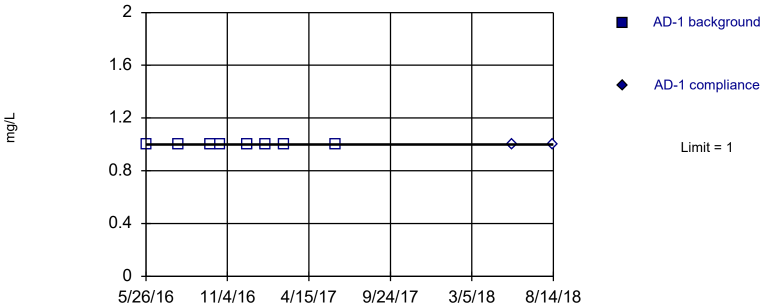
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. All background values (n = 8) were censored; limit is most recent reporting limit. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

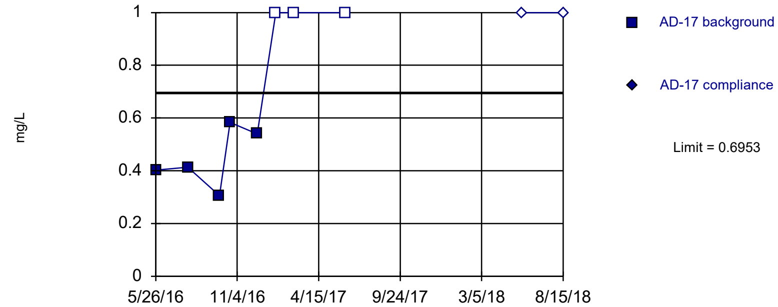
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.4488, Std. Dev.=0.1003, n=8, 37.5% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8226, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

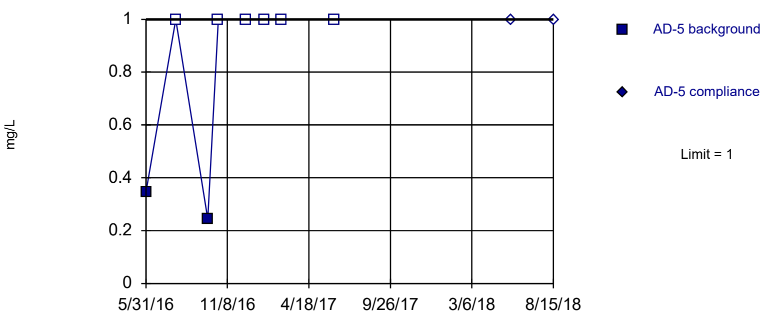
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 8 background values. 75% NDs. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

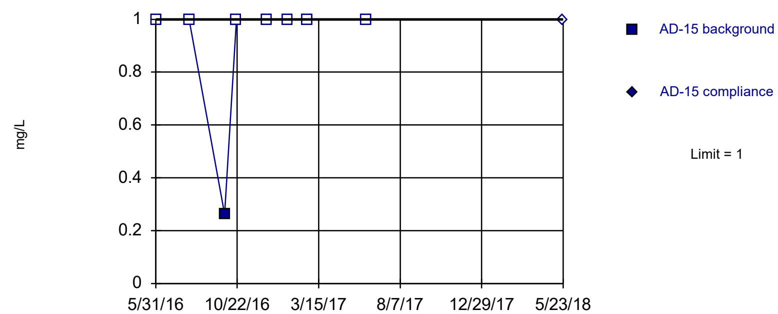
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 8 background values. 87.5% NDs. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

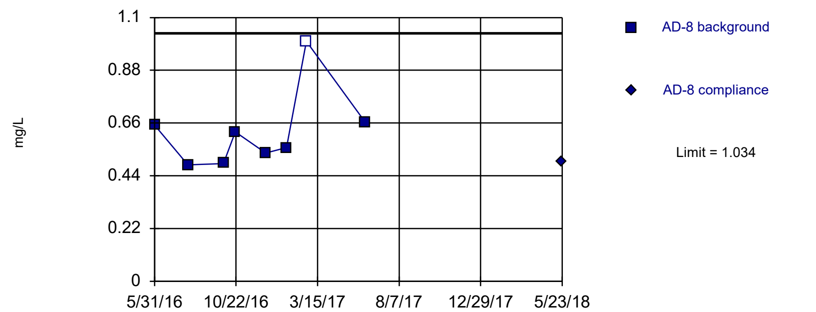
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.6258, Std. Dev.=0.166, n=8, 12.5% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7879, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

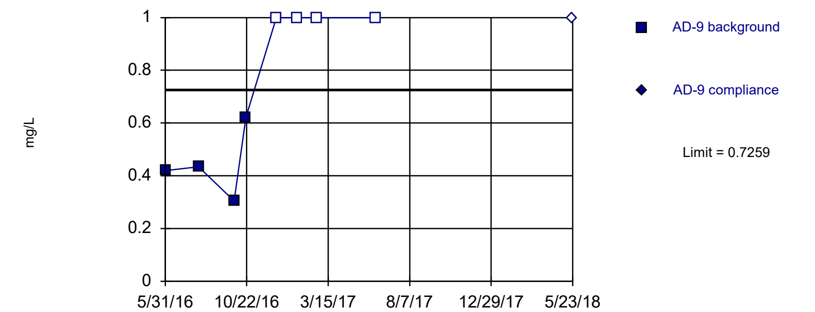
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.4449, Std. Dev.=0.1143, n=8, 50% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.786, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

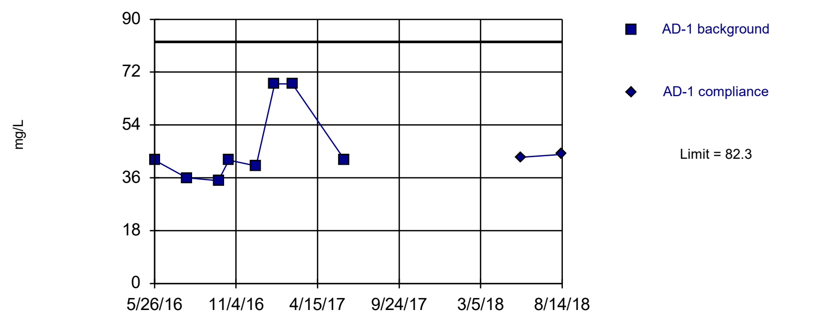
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=6.772, Std. Dev.=0.9358, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7528, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

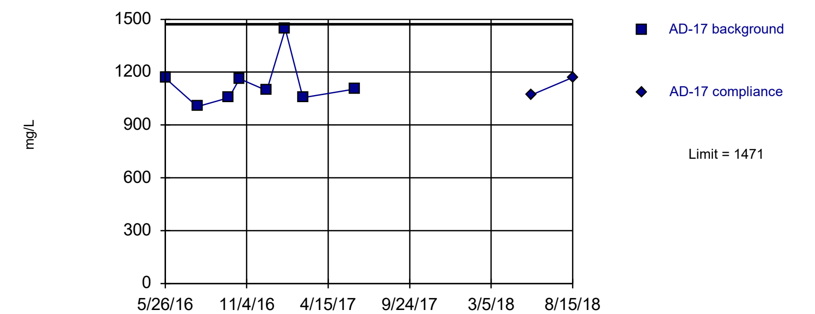
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1136, Std. Dev.=136.3, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7916, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

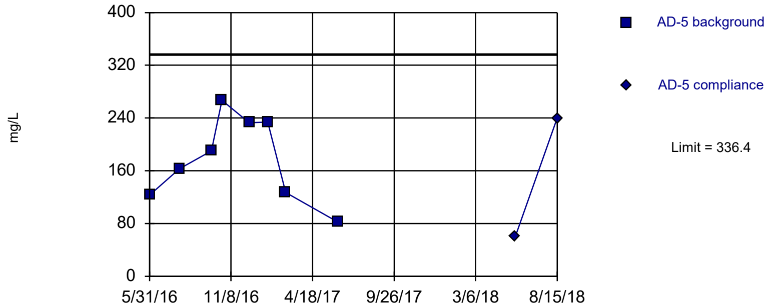
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=177.4, Std. Dev.=64.69, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.953, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

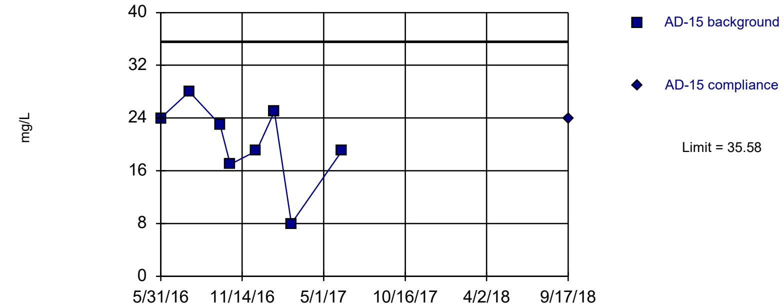
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=20.38, Std. Dev.=6.186, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9238, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

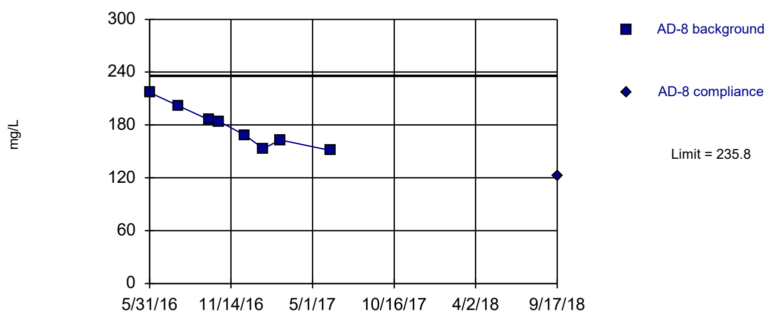
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=178, Std. Dev.=23.53, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9398, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

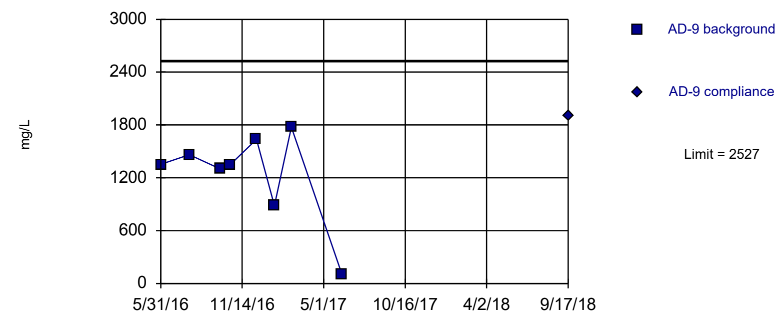
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1234, Std. Dev.=526.1, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8423, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

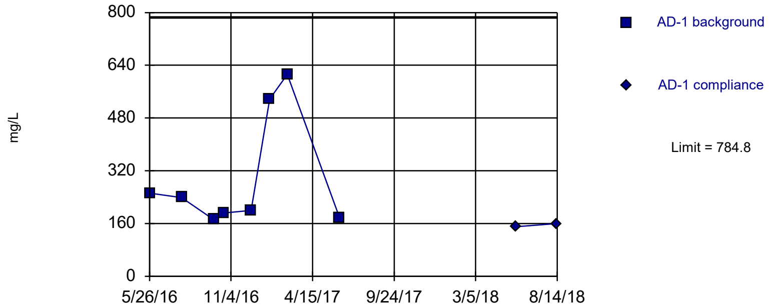
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=16.71, Std. Dev.=4.598, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.756, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

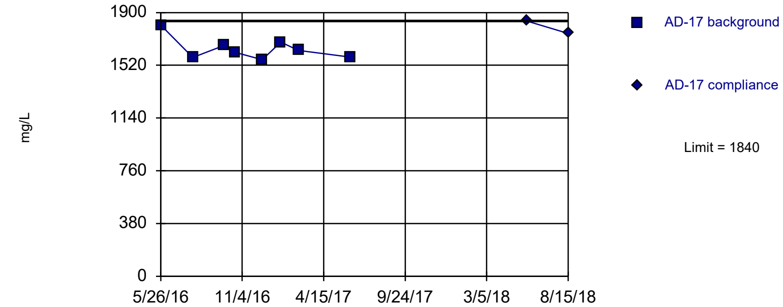
Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1639, Std. Dev.=81.77, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8702, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

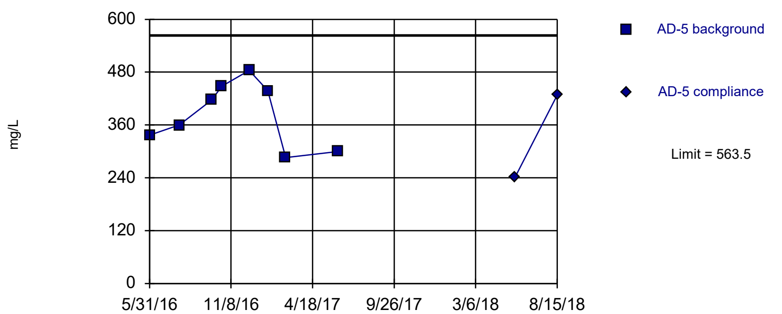
Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=383.6, Std. Dev.=73.17, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.937, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

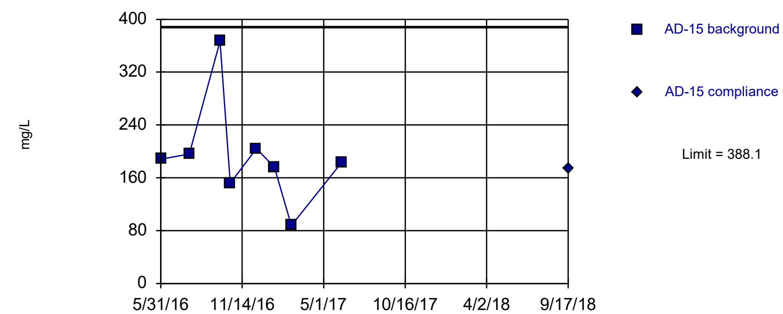
Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



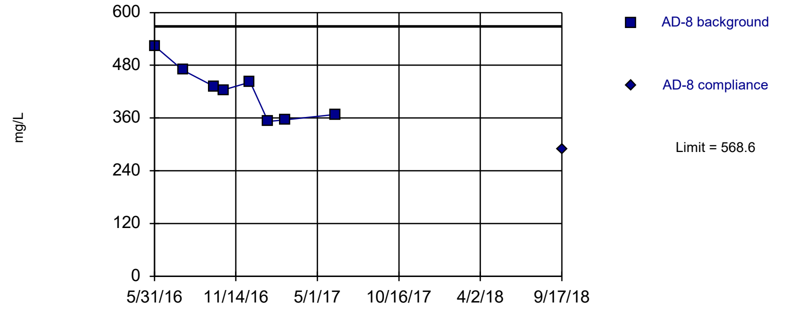
Background Data Summary: Mean=194.4, Std. Dev.=78.82, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8214, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limit

Prediction Limit

Intrawell Parametric



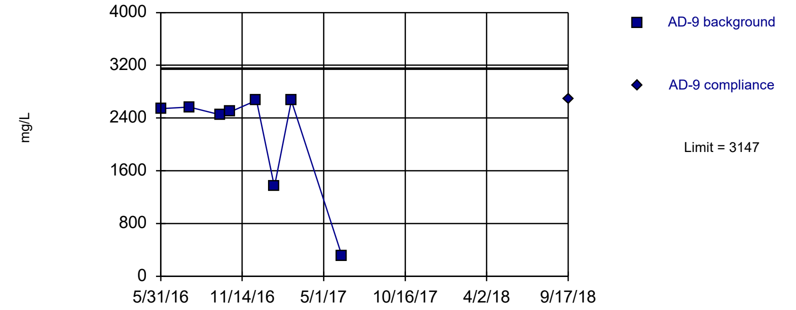
Background Data Summary: Mean=420.9, Std. Dev.=60.09, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9284, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on cube transformation): Mean=1.3e10, Std. Dev.=7.4e9, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.759, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Trend Test Summary Table - All Results (No Significant Results)

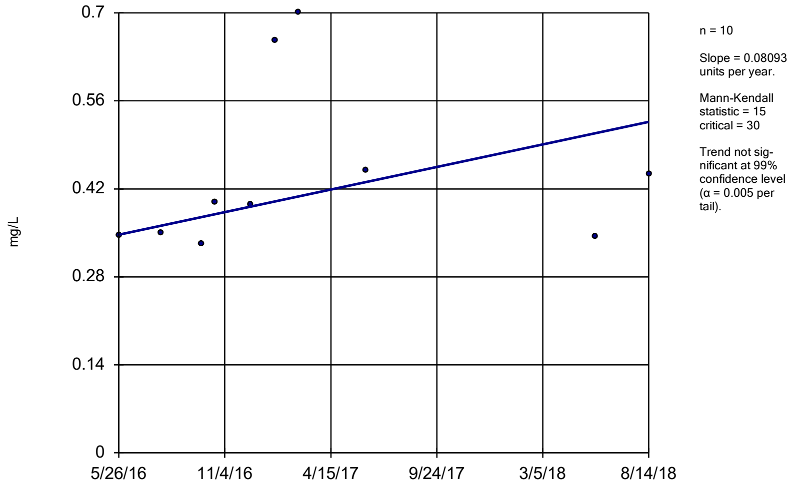
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/16/2018, 8:17 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron, total (mg/L)	AD-1 (bg)	0.08093	15	30	No	10	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-17 (bg)	0.007399	7	30	No	10	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-5 (bg)	0.005828	22	30	No	10	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-8	-0.02005	-1	-25	No	9	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-1 (bg)	-0.1093	-10	-30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-17 (bg)	-0.4462	-19	-30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-15	-0.05	-5	-30	No	10	0	n/a	n/a	0.01	NP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

AD-1 (bg)

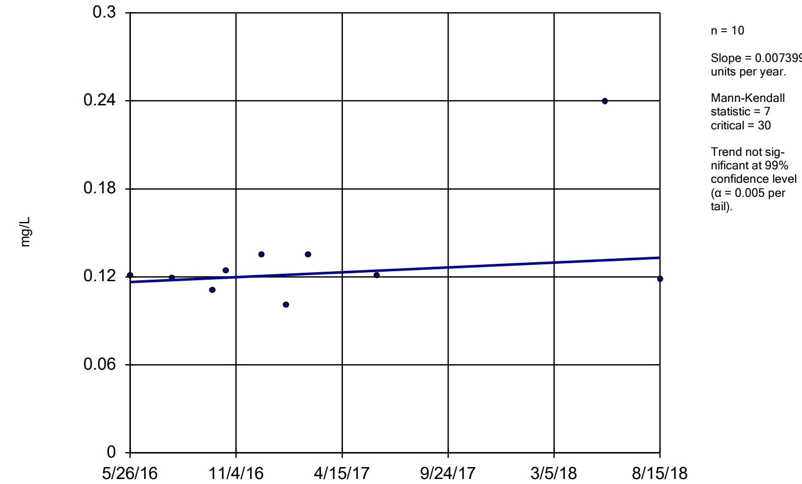


Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

AD-17 (bg)

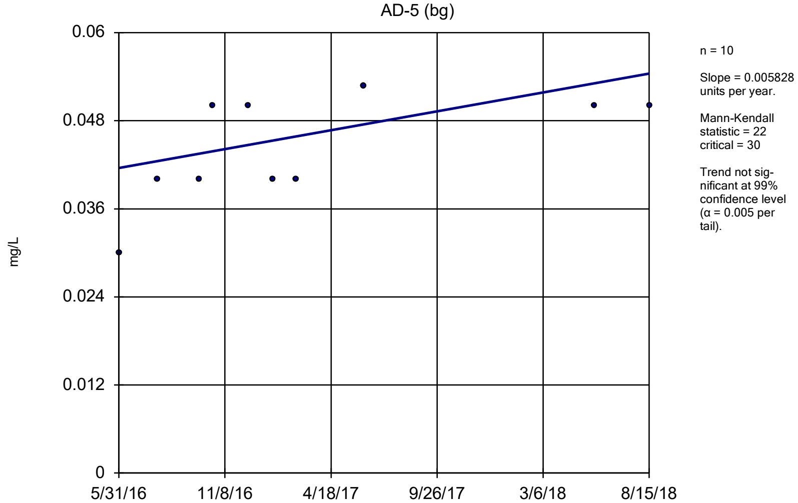


Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

AD-5 (bg)

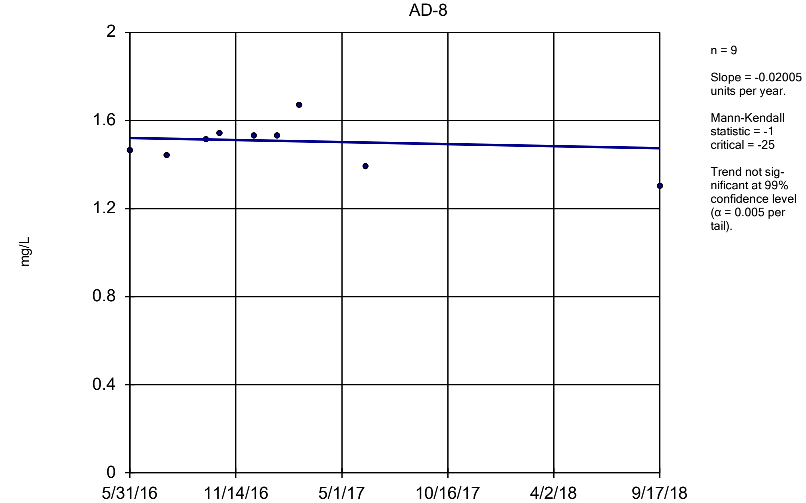


Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

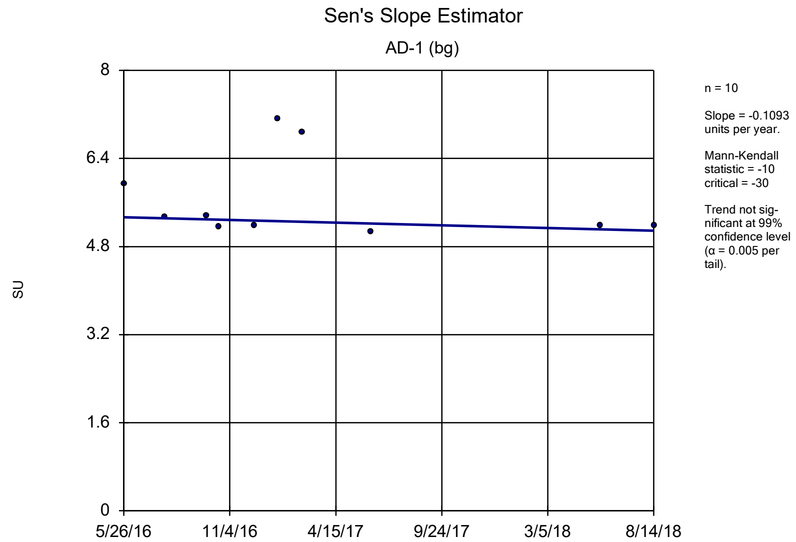
Sen's Slope Estimator

AD-8



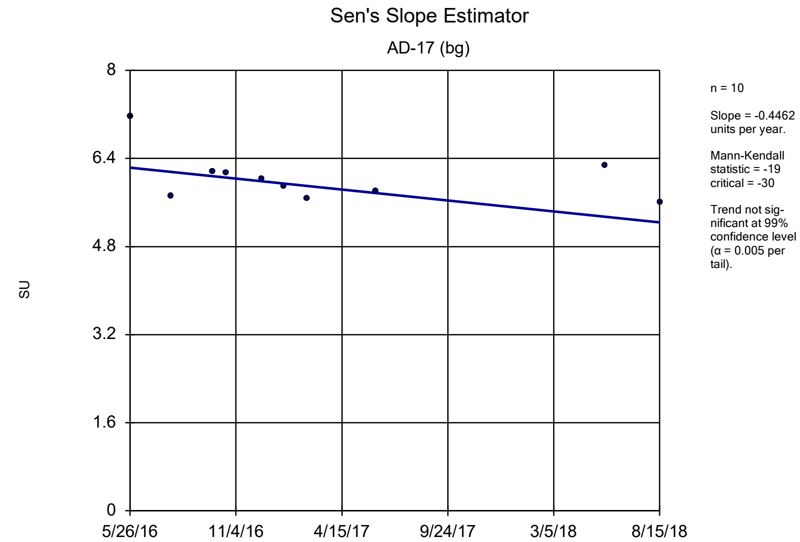
Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG



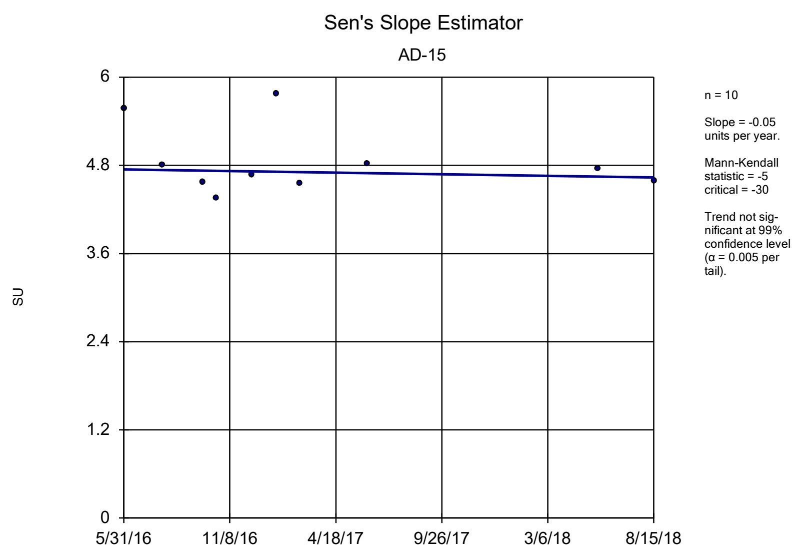
Constituent: pH, field Analysis Run 12/16/2018 8:16 AM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: pH, field Analysis Run 12/16/2018 8:16 AM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: pH, field Analysis Run 12/16/2018 8:16 AM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Upper Tolerance Limits - Appendix IV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/9/2018, 2:38 PM

Constituent	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	0.005	30	n/a	n/a	80	n/a	n/a	0.2146	NP Inter(NDs)
Arsenic, total (mg/L)	0.005	30	n/a	n/a	63.33	n/a	n/a	0.2146	NP Inter(normality)
Barium, total (mg/L)	0.362	30	0.4014	0.1402	0	None	x^(1/3)	0.05	Inter
Beryllium, total (mg/L)	0.0007706	30	0.01454	0.005955	13.33	None	sqrt(x)	0.05	Inter
Cadmium, total (mg/L)	0.00646	30	n/a	n/a	30	n/a	n/a	0.2146	NP Inter(Cohens/xform)
Chromium, total (mg/L)	0.004	29	n/a	n/a	31.03	n/a	n/a	0.2259	NP Inter(normality)
Cobalt, total (mg/L)	0.0748	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	4.205	30	2	0.9933	0	None	No	0.05	Inter
Fluoride, total (mg/L)	1	30	n/a	n/a	76.67	n/a	n/a	0.2146	NP Inter(NDs)
Lead, total (mg/L)	0.005	30	n/a	n/a	86.67	n/a	n/a	0.2146	NP Inter(NDs)
Lithium, total (mg/L)	0.394	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Mercury, total (mg/L)	0.000033	30	n/a	n/a	46.67	n/a	n/a	0.2146	NP Inter(normality)
Molybdenum, total (mg/L)	0.005	30	n/a	n/a	73.33	n/a	n/a	0.2146	NP Inter(normality)
Selenium, total (mg/L)	0.005	30	n/a	n/a	53.33	n/a	n/a	0.2146	NP Inter(normality)
Thallium, total (mg/L)	0.001251	30	n/a	n/a	86.67	n/a	n/a	0.2146	NP Inter(NDs)

Confidence Intervals - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/9/2018, 2:44 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Lithium, total (mg/L)	**AD-9**	**1.412**	**0.9353**	**0.39**	**Yes**	**10**	**0**	**No**	**0.01**	**Param.**

Confidence Intervals - All Results

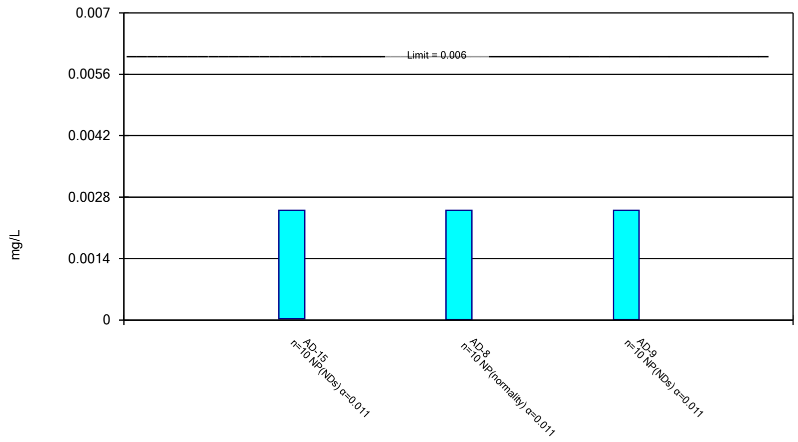
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/9/2018, 2:44 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	AD-15	0.0025	0.00003	0.006	No	10	90	No	0.011	NP (NDs)
Antimony, total (mg/L)	AD-8	0.0025	0.00001	0.006	No	10	70	No	0.011	NP (normality)
Antimony, total (mg/L)	AD-9	0.0025	0.00001	0.006	No	10	90	No	0.011	NP (NDs)
Arsenic, total (mg/L)	AD-15	0.02801	0.003648	0.01	No	10	0	ln(x)	0.01	Param.
Arsenic, total (mg/L)	AD-8	0.0025	0.00031	0.01	No	10	80	No	0.011	NP (NDs)
Arsenic, total (mg/L)	AD-9	0.0025	0.00168	0.01	No	10	90	No	0.011	NP (NDs)
Barium, total (mg/L)	AD-15	0.5012	0.09935	2	No	10	0	ln(x)	0.01	Param.
Barium, total (mg/L)	AD-8	0.02657	0.01924	2	No	10	0	x^(1/3)	0.01	Param.
Barium, total (mg/L)	AD-9	0.05147	0.02327	2	No	10	0	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-15	0.002922	0.0001454	0.004	No	10	0	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-8	0.0005	0.000008	0.004	No	10	60	No	0.011	NP (normality)
Beryllium, total (mg/L)	AD-9	0.001065	0.000306	0.004	No	10	0	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	AD-15	0.001225	0.00006409	0.0065	No	10	10	ln(x)	0.01	Param.
Cadmium, total (mg/L)	AD-8	0.0005	0.00002	0.0065	No	10	90	No	0.011	NP (NDs)
Cadmium, total (mg/L)	AD-9	0.002112	0.0004252	0.0065	No	10	0	No	0.01	Param.
Chromium, total (mg/L)	AD-15	0.07284	0.001981	0.1	No	10	0	x^(1/3)	0.01	Param.
Chromium, total (mg/L)	AD-8	0.0007512	0.00005	0.1	No	10	50	No	0.011	NP (normality)
Chromium, total (mg/L)	AD-9	0.0005	0.0002622	0.1	No	10	80	No	0.011	NP (NDs)
Cobalt, total (mg/L)	AD-15	0.02826	0.004545	0.075	No	10	0	ln(x)	0.01	Param.
Cobalt, total (mg/L)	AD-8	0.007648	0.004634	0.075	No	10	0	No	0.01	Param.
Cobalt, total (mg/L)	AD-9	0.0308	0.01499	0.075	No	10	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-15	4.273	1.398	5	No	10	0	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-8	2.718	0.4242	5	No	10	0	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-9	2.865	1.65	5	No	10	0	No	0.01	Param.
Fluoride, total (mg/L)	AD-15	0.5	0.2621	4	No	9	88.89	No	0.002	NP (NDs)
Fluoride, total (mg/L)	AD-8	0.6628	0.485	4	No	9	11.11	No	0.002	NP (normality)
Fluoride, total (mg/L)	AD-9	0.5584	0.3926	4	No	9	55.56	No	0.01	Param.
Lead, total (mg/L)	AD-15	0.022	0.000438	0.015	No	10	20	No	0.011	NP (Cohens/xfrm)
Lead, total (mg/L)	AD-8	0.0025	0.000039	0.015	No	10	90	No	0.011	NP (NDs)
Lead, total (mg/L)	AD-9	0.0025	0.000262	0.015	No	10	90	No	0.011	NP (NDs)
Lithium, total (mg/L)	AD-15	0.04766	0.005034	0.39	No	10	0	x^(1/3)	0.01	Param.
Lithium, total (mg/L)	AD-8	0.1197	0.08187	0.39	No	10	0	No	0.01	Param.
Lithium, total (mg/L)	**AD-9**	**1.412**	**0.9353**	**0.39**	**Yes**	**10**	**0**	**No**	**0.01**	**Param.**
Mercury, total (mg/L)	AD-15	0.000707	0.0000125	0.002	No	9	11.11	No	0.002	NP (normality)
Mercury, total (mg/L)	AD-8	0.00002103	0.000008	0.002	No	9	55.56	No	0.002	NP (normality)
Mercury, total (mg/L)	AD-9	0.000045	0.000006	0.002	No	9	33.33	No	0.002	NP (Cohens/xfrm)
Molybdenum, total (mg/L)	AD-15	0.005266	0.0005303	0.1	No	10	30	No	0.01	Param.
Molybdenum, total (mg/L)	AD-8	0.0025	0.00016	0.1	No	10	60	No	0.011	NP (normality)
Molybdenum, total (mg/L)	AD-9	0.0025	0.00011	0.1	No	10	90	No	0.011	NP (NDs)
Selenium, total (mg/L)	AD-15	0.003463	0.0009	0.05	No	10	20	No	0.011	NP (Cohens/xfrm)
Selenium, total (mg/L)	AD-8	0.0025	0.00007	0.05	No	10	60	No	0.011	NP (normality)
Selenium, total (mg/L)	AD-9	0.003528	0.0003	0.05	No	10	40	No	0.011	NP (Cohens/xfrm)
Thallium, total (mg/L)	AD-15	0.00137	0.00009	0.002	No	10	70	No	0.011	NP (normality)
Thallium, total (mg/L)	AD-8	0.001185	0.000129	0.002	No	10	70	No	0.011	NP (normality)
Thallium, total (mg/L)	AD-9	0.001776	0.000062	0.002	No	10	60	No	0.011	NP (normality)

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

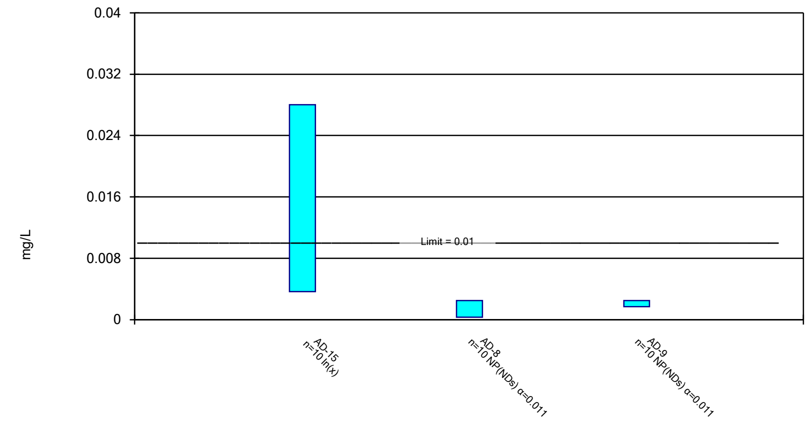


Constituent: Antimony, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

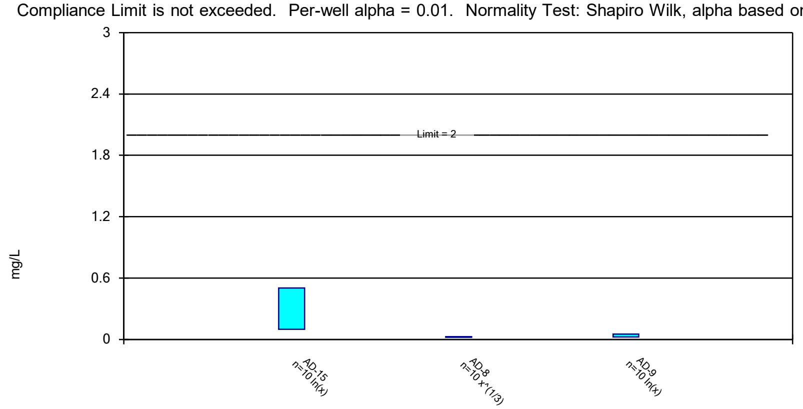


Constituent: Arsenic, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

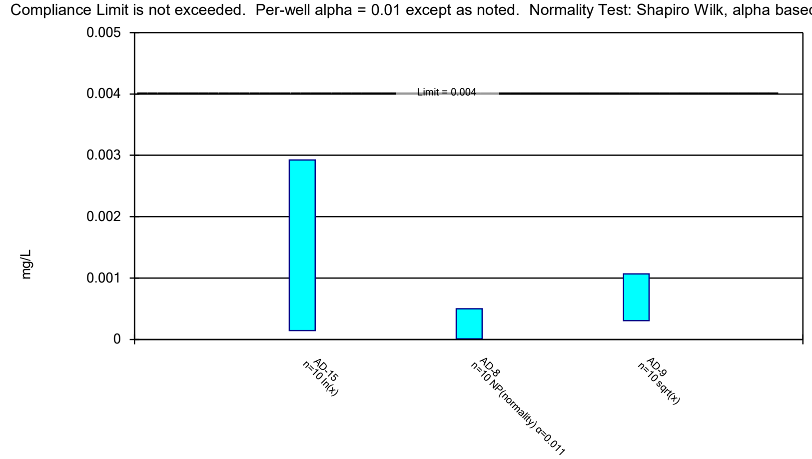


Constituent: Barium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

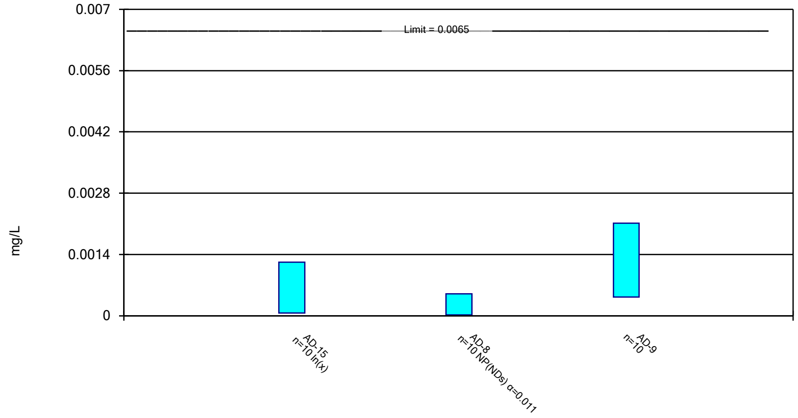


Constituent: Beryllium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

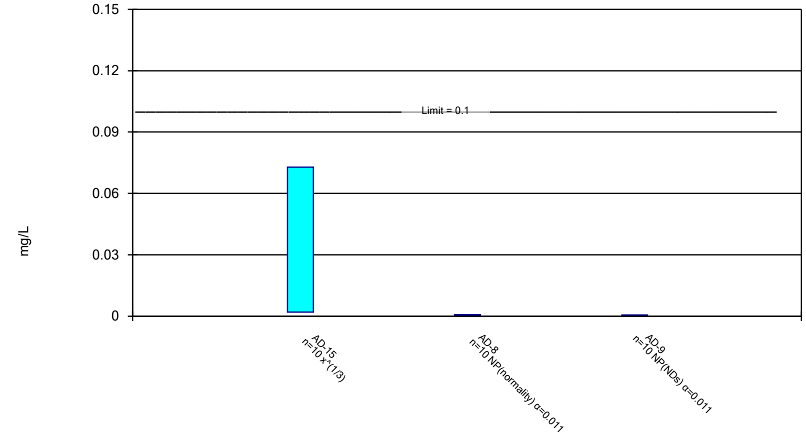


Constituent: Cadmium, total   Analysis Run 12/9/2018 2:41 PM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

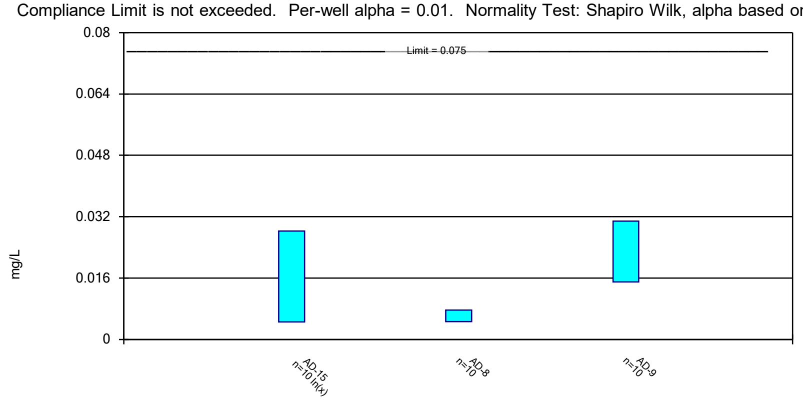


Constituent: Chromium, total   Analysis Run 12/9/2018 2:41 PM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

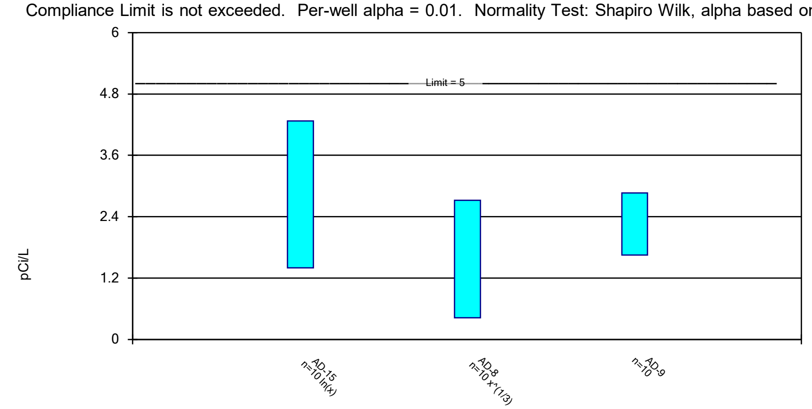


Constituent: Cobalt, total   Analysis Run 12/9/2018 2:41 PM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

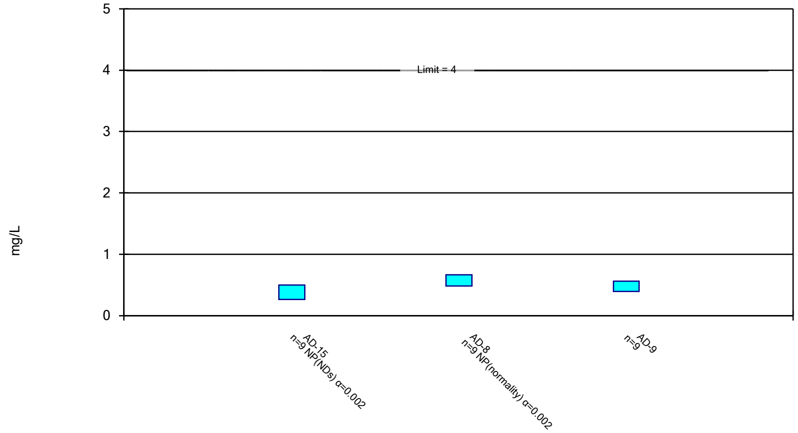


Constituent: Combined Radium 226 + 228   Analysis Run 12/9/2018 2:41 PM   View: Confidence Intervals -
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

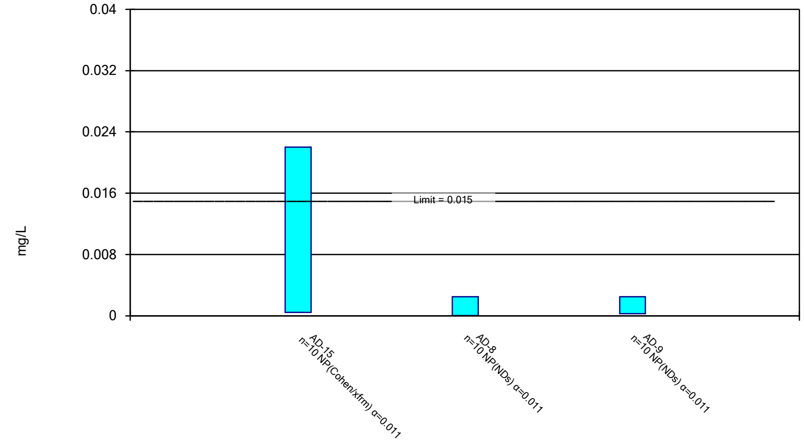


Constituent: Fluoride, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

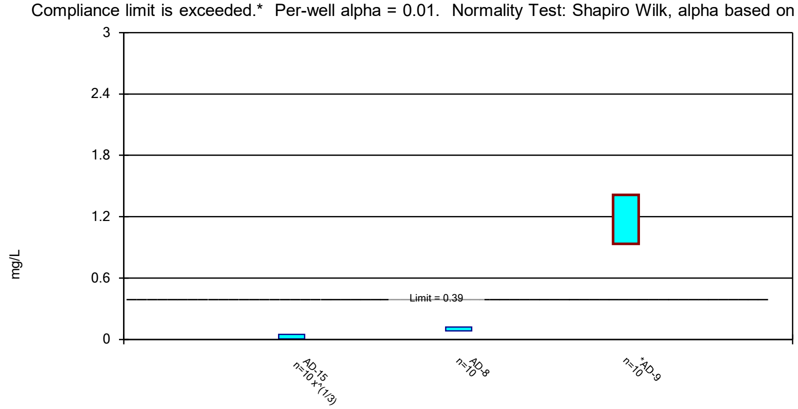


Constituent: Lead, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

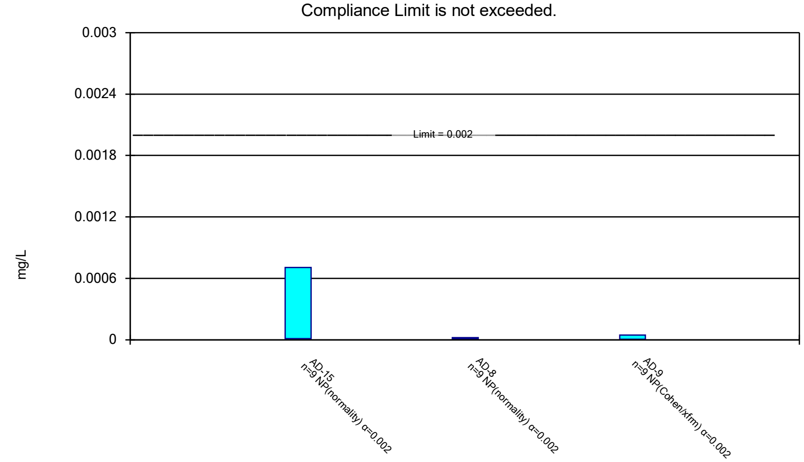


Constituent: Lithium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

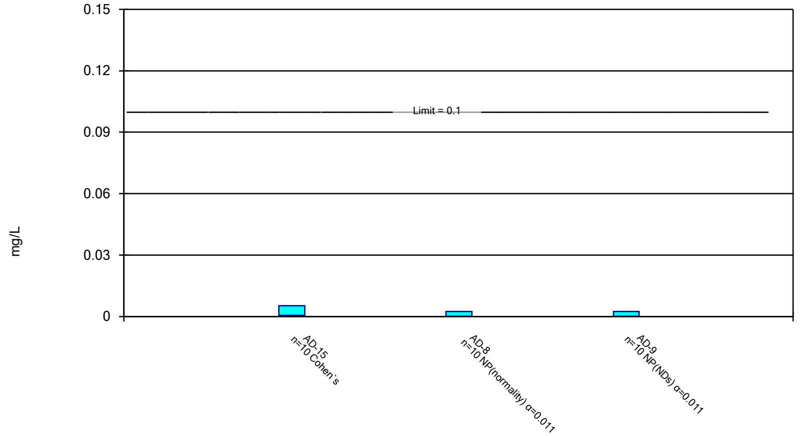


Constituent: Mercury, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

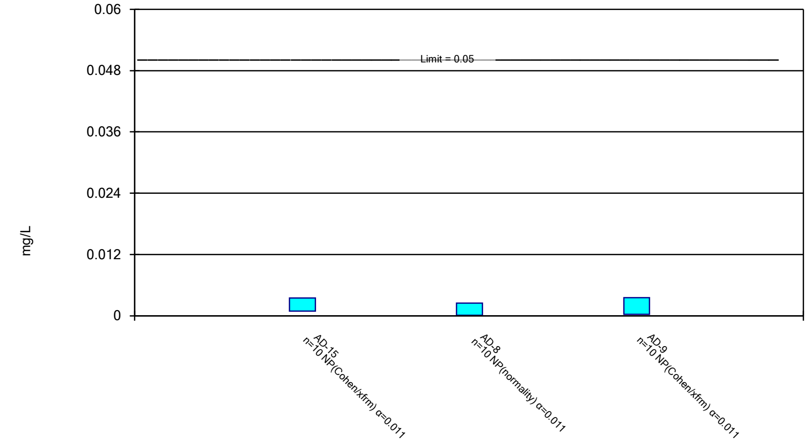


Constituent: Molybdenum, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

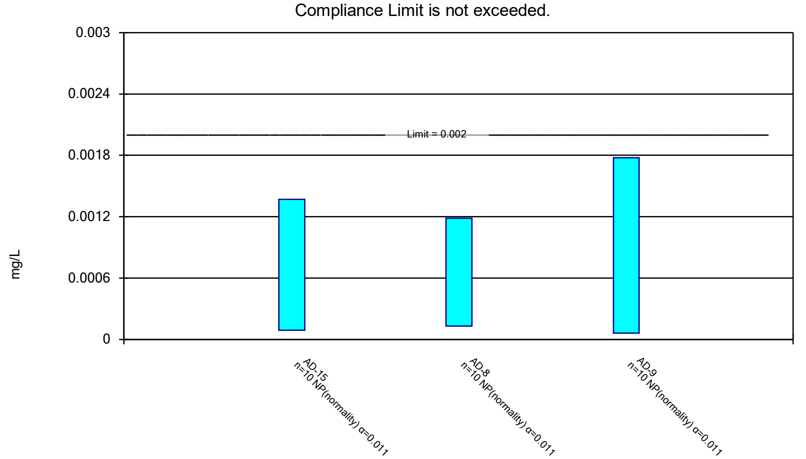


Constituent: Selenium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Thallium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

STATISTICAL ANALYSIS SUMMARY
PRIMARY BOTTOM ASH POND
J. Robert Welsh Plant
Pittsburg, Texas

Submitted to

AMERICAN ELECTRIC POWER

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

941 Chatham Lane
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July 11, 2019

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LFB	Laboratory Fortified Blanks
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
PBAP	Primary Bottom Ash Pond
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Level
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Primary Bottom Ash Pond (PBAP), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas.

Based on detection monitoring conducted in 2017 and 2018, a statistically significant increase (SSIs) over background was concluded for boron at the PBAP. An alternative source was not identified at the time, so two assessment monitoring events were conducted at the PBAP in 2018, in accordance with 40 CFR 257.95. An SSL was identified for lithium at well AD-9. An alternative source demonstration (ASD) was successfully completed and the unit remained in assessment monitoring (Arcadis, 2019). A semi-annual assessment monitoring event was also completed in February 2019, with the results of the February 2019 event documented in this report.

Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were re-established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. An SSL was identified for lithium. Appendix III concentrations for boron and pH remained above background. Thus, either the unit will remain in assessment monitoring or an ASD will be conducted to evaluate if the unit can return to detection monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

PRIMARY BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, one set of samples was collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(d)(1). Samples from the February 2019 semi-annual sampling event were analyzed for the Appendix III and Appendix IV parameters. A summary of data collected during this assessment monitoring event may be found in Table 1.

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

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.14 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the PBAP were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017). Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained to meet the requirements of 40 CFR 257.95(d)(1) were screened for potential outliers. No outliers were identified.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with 40 CFR 257.95(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in 40 CFR 257.95(h)(2) for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Generally, tolerance limits were calculated parametrically with 95% coverage and 95% confidence. Non-parametric tolerance limits were calculated for antimony, arsenic, cobalt, fluoride, lithium, mercury, molybdenum, and selenium due to apparent non-normal distributions and for lead and thallium due to a high non-detect frequency. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

The following SSL was identified identified at the Welsh PBAP:

- The LCL for lithium exceeded the GWPS of 0.39 mg/L at AD-9 (0.957 mg/L).

2.2.3 Evaluation of Potential Appendix III SSIs

While SSLs were identified, a review of the Appendix III results were also completed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations. Prediction limits were calculated for the Appendix III parameters to represent background values. As described in the January 2018 *Statistical Analysis Summary* report (Geosyntec, 2018), intrawell tests were used to evaluate potential SSIs for calcium, chloride, fluoride, sulfate, and TDS, whereas interwell tests were used to evaluate potential SSIs for boron and pH.

Prediction limits for the interwell tests were recalculated using data collected during the February 2019 assessment monitoring event. Three data points (i.e., one sample from three background wells) were added to the background dataset for each interwell test during the February 2019 event. New data were tested for outliers prior to being added to the background dataset. The updated prediction limits were calculated for a one-of-two retesting procedure, as during detection monitoring. The values of the updated prediction limits were similar to the values of the prediction limits calculated during detection monitoring. The revised interwell prediction limits were used to evaluate potential SSIs for boron and pH.

For the intrawell tests, limited data made it possible to add only one data point (i.e., one sample from each compliance well) to each background dataset. Because one sample result is insufficient to compare against the existing background dataset, the prediction limits were not updated for the intrawell tests at this time. The intrawell prediction limits calculated during detection monitoring were used to evaluate potential SSIs for calcium, chloride, fluoride, sulfate, and TDS.

Data collected during the February 2019 assessment monitoring event from each compliance well were compared to the prediction limits to evaluate if results were above background values. Verification sampling was completed in April 2019. The results from this event and the prediction limits are summarized in Table 3. The following exceedances of the upper prediction limits (UPLs) were noted:

- Boron concentrations exceeded the interwell UPL of 0.775 mg/L at AD-8 (1.27 mg/L and 1.21 mg/L).

Based on these results, concentrations of Appendix III parameters exceeded background levels at compliance wells at the Welsh PBAP during assessment monitoring.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the February 2019 data. GWPSs were re-established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. An SSL for lithium was identified. Appendix III parameters were also evaluated, with an exceedance of boron identified.

Based on this evaluation, the Welsh PBAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – Welsh Plant. January 2017.

Arcadis. 2019. Alternative Source Demonstration – Lithium. Primary Bottom Ash Pond, J. Robert. Welsh Plant. February 7, 2019.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Primary Bottom Ash Pond, J Robert Welsh Plant, Pittsburg, Texas. January 15, 2018.

TABLES

Table 1 - Groundwater Data Summary
Welsh - Primary Bottom Ash Pond

Parameter	Unit	AD-1	AD-5	AD-8	AD-9	AD-15	AD-17
		2/20/2019	2/21/2019	2/21/2019	2/21/2019	2/21/2019	2/21/2019
Antimony	µg/L	0.160	0.0200 J	0.100 U	0.100 U	0.100 U	0.0800 J
Arsenic	µg/L	0.460	1.59	0.570	1.18	2.21	2.51
Barium	µg/L	457	69.4	28.1	52.4	76.6	120
Beryllium	µg/L	0.0900 J	0.0800 J	0.0300 J	0.474	0.208	0.240
Boron	mg/L	0.504	0.0330	1.47	1.39	0.169	0.151
Cadmium	µg/L	0.0100 J	0.0500 U	0.0300 J	0.0900	0.0100 J	0.270
Calcium	mg/L	142	33.9	17.6	211	2.67	207
Chloride	mg/L	2.82	24.7	23.2	89.0	28.2	43.2
Chromium	µg/L	0.306	0.432	0.456	0.313	0.225	3.34
Cobalt	µg/L	0.399	8.58	2.88	14.8	2.90	64.5
Combined Radium	pCi/L	3.16	1.27	0.417	2.51	0.841	2.66
Fluoride	mg/L	0.240	0.210	0.660	0.190	0.0900	0.180
Lead	µg/L	0.124	0.147	0.223	0.0800 J	0.104	2.49
Lithium	mg/L	0.00155	0.0807	0.0911	1.12	0.00294	0.268
Mercury	mg/L	0.0000250 U	0.0000250 U	0.0000250 U	0.0000100 J	0.0000250 U	0.00000700 J
Molybdenum	µg/L	1.00 J	2.00 U	2.00 U	2.00 U	2.00 U	0.700 J
Selenium	µg/L	0.700	0.100 J	0.100 J	0.300	0.400	0.800
Total Dissolved Solids	mg/L	522	220	352	2240	150	1720
Sulfate	mg/L	49.2	46.5	163	1350	10.6	1060
Thallium	µg/L	0.500 U	0.500 U	0.500 U	0.100 J	0.500 U	0.500 U
pH	SU	7.31	5.38	6.40	4.98	4.98	6.93

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.
J: Estimated value. Parameter was detected in concentrations below the reporting limit.

Table 2: Groundwater Protection Standards
Welsh Plant - Primary Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Background Limit
Antimony, Total (mg/L)	0.006		0.005
Arsenic, Total (mg/L)	0.01		0.005
Barium, Total (mg/L)	2		0.58
Beryllium, Total (mg/L)	0.004		0.00073
Cadmium, Total (mg/L)	0.005		0.01
Chromium, Total (mg/L)	0.1		0.0036
Cobalt, Total (mg/L)	n/a	0.006	0.075
Combined Radium, Total (pCi/L)	5		4.18
Fluoride, Total (mg/L)	4		1
Lead, Total (mg/L)	n/a	0.015	0.005
Lithium, Total (mg/L)	n/a	0.04	0.39
Mercury, Total (mg/L)	0.002		0.000033
Molybdenum, Total (mg/L)	n/a	0.1	0.002
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.0013

Notes:
Grey cell indicates calculated UTL is higher than MCL.
MCL = Maximum Contaminant Level
RSL = Regional Screening Level
Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
The higher of the calculated UTL or MCL/Rule-Specified Level is used as the GWPS.

Table 3: Appendix III Data Summary
Welsh Plant - Primary Bottom Ash Pond

Parameter	Units	Description	AD-15	AD-8		AD-9	
			2/21/2019	2/21/2019	4/30/2019	2/21/2019	4/30/2019
Boron	mg/L	Interwell Background Value (UPL)	0.775				
		Detection Monitoring Result	0.169	**1.47**	**1.21**	**1.39**	0.07
Calcium	mg/L	Intrawell Background Value (UPL)	5.71	35.7		350	
		Detection Monitoring Result	2.67	17.6	--	211	--
Chloride	mg/L	Intrawell Background Value (UPL)	38.4	38.3		139	
		Detection Monitoring Result	28.2	23.2	--	89	--
Fluoride	mg/L	Intrawell Background Value (UPL)	1.00	1.03		0.73	
		Detection Monitoring Result	0.09	0.66	--	0.19	--
pH	SU	Interwell Background Value (UPL)	7.1				
		Interwell Background Value (LPL)	4.8				
		Detection Monitoring Result	5.0	6.4	6.9	5.0	**4.5**
Sulfate	mg/L	Intrawell Background Value (UPL)	35.6	236		2527	
		Detection Monitoring Result	10.6	163	--	1350	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	388	569		3147	
		Detection Monitoring Result	150	352	--	2240	--

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
-: Not Sampled
Bold values exceed the background value.
Background values are shaded gray.
Based on a 1-of-2 resampling, a statistically significant increase (SSI) is only identified when both samples in the detection monitoring period are above the calculated background value.

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Welsh Primary Bottom Ash Pond 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

112498	TEXAS	07.11.19
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS
CONSULTING

July 10, 2019

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

Re: Welsh PBAP
Assessment Monitoring Event – April 2019

Dear Ms. Kreinberg,

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

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-1, AD-5, and AD-17; and
- **Downgradient wells:** AD-8, AD-9, and AD-15.

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC.

The CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

- **Appendix IV** (Assessment Monitoring) **–** antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium.

Time series plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figure A). Values flagged as outliers may be seen in the Outlier Summary following this letter (Figure B), and are plotted in a lighter font and disconnected symbol on the time series graphs. Note that the measured concentrations of most metals for September 30, 2016 at well AD-15 are very high compared to the rest of the observations, which suggests a possible laboratory problem. These values are not currently flagged in the database pending verification.

Evaluation of Appendix III Parameters

Interwell prediction limits combined with a 1-of-2 verification strategy were constructed for boron and pH; and intrawell prediction limits combined with a 1-of-2 verification strategy were constructed for calcium, chloride, fluoride, sulfate and TDS (Figure C & D, respectively). The statistical method selected for each parameter was determined based on the results of the evaluation performed in December 2017; and all proposed background data were screened for outliers and trends at that time. The findings of those reports were submitted with that analysis.

Interwell prediction limits utilize all upgradient well data for construction of statistical limits. During each sample event, upgradient well data are screened for any newly suspected outliers or obvious trending patterns using time series plots. All values flagged as outliers may be seen on the Outlier Summary report following this letter. No obvious trending patterns were observed in the upgradient wells.

Intrawell prediction limits utilize the background data set that was originally screened in 2017. As recommended in the EPA Unified Guidance (2009), the background data set will be tested for the purpose of updating statistical limits using the Mann-Whitney two-sample test when an additional four to eight measurements are available.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one 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 a false positive result and, therefore, no further action is necessary.

No prediction limit exceedances were noted for any of the Appendix III parameters in downgradient wells except for boron in wells AD-8 and AD-9. Calcium in upgradient well AD-17 and chloride in upgradient well AD-5 exceeded their intrawell prediction limits which is typically an indication that groundwater is changing naturally upgradient of the facility. The results of the prediction limit analyses may be found in the Prediction Limit Summary tables following this letter.

When a statistically significant increase is identified, the data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing or stable (Figure D). Upgradient wells are included in the trend analyses to identify whether similar patterns exist upgradient of the site. Such patterns would be an indication of natural variability in groundwater quality unrelated to practices at the site. No statistically significant increasing or decreasing trends were found for any of the well/parameter pairs. A Trend Test summary table follows this letter.

Evaluation of Appendix IV Parameters

Upper tolerance limits were used to calculate background limits from all available pooled upgradient well data for Appendix IV parameters to determine the Alternate Contaminant Level (ACL) for each constituent (Figure F). Background data are screened for outliers and extreme trending patterns that would lead to artificially elevated statistical limits. Any flagged values may be seen on the Outlier Summary following this letter. Parametric tolerance limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure G).

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters and compared to the highest limit of the MCL, CCR-Rule specified level, or ACL as discussed above (Figure H). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence intervals exceedances were found except for lithium in well AD-9. A summary of the confidence interval results follows this letter.

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

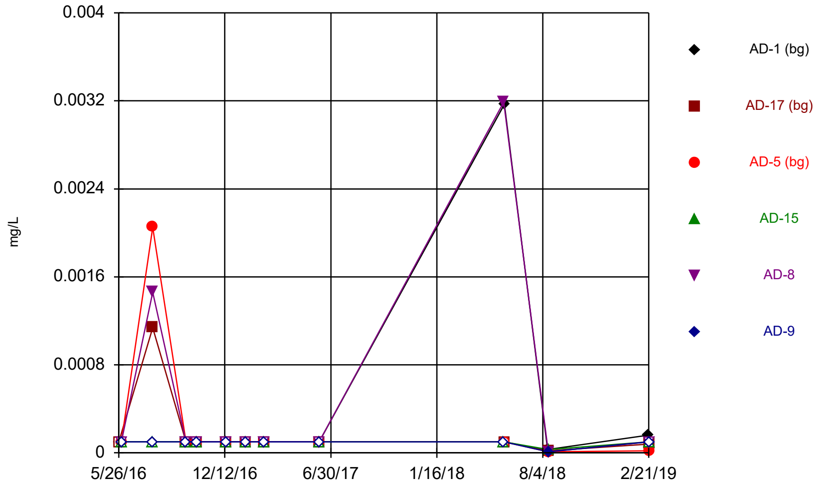
For Groundwater Stats Consulting,

Kristina Rayner

Kristina L. Rayner
Groundwater Statistician

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

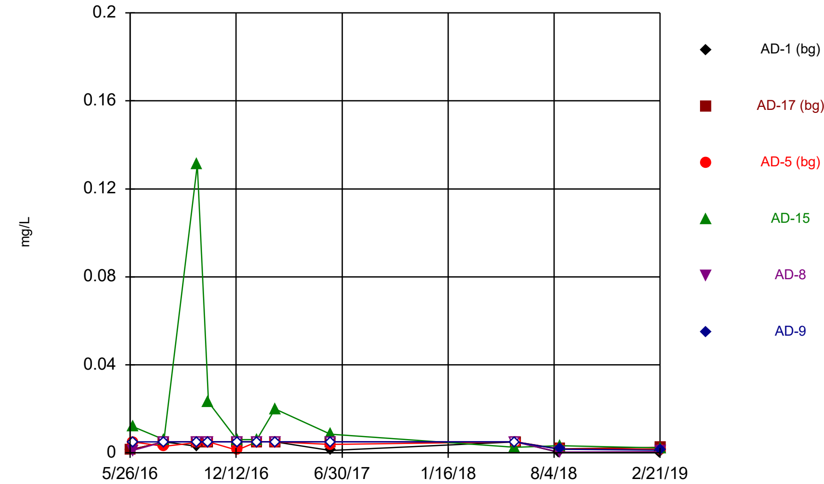
Time Series



Constituent: Antimony, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Arsenic, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
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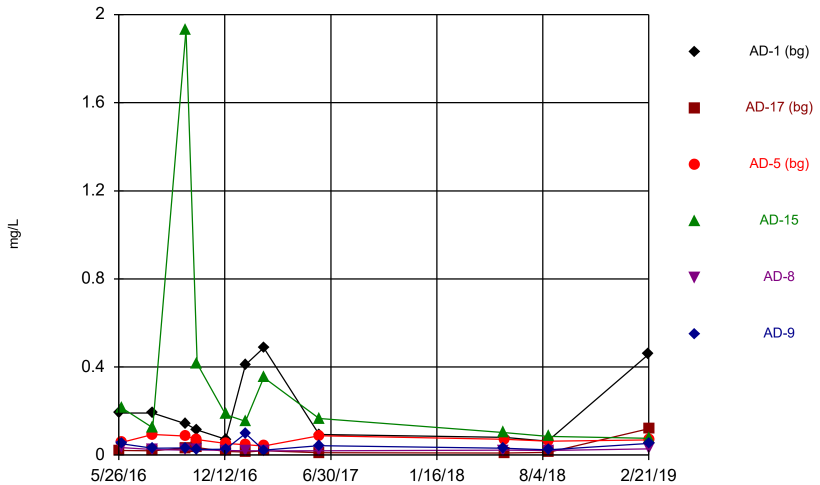
Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

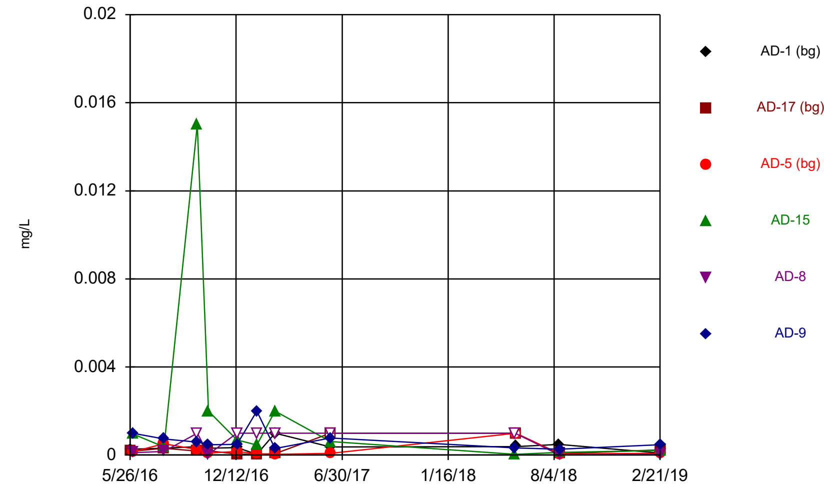
Time Series



Constituent: Barium, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

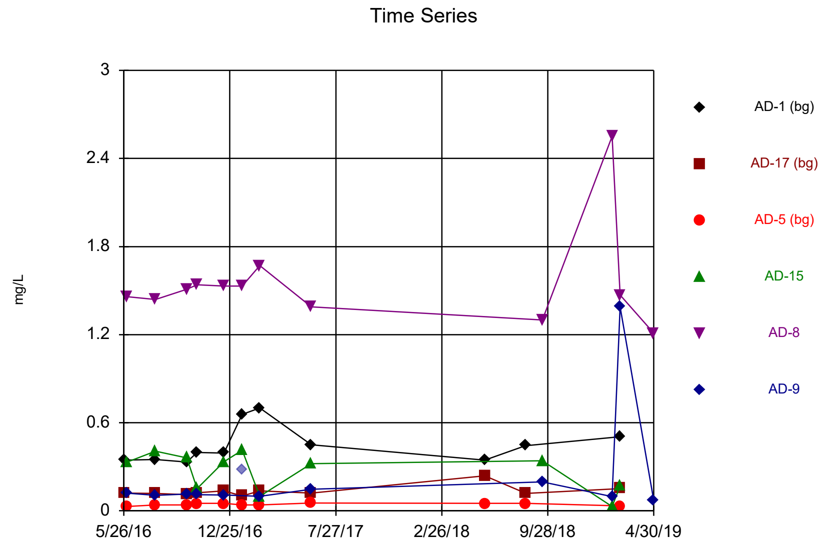
Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



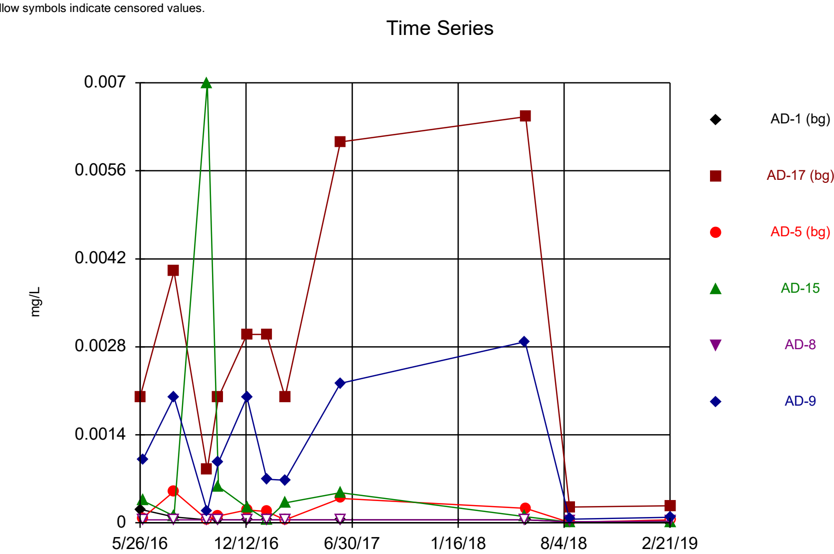
Constituent: Beryllium, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



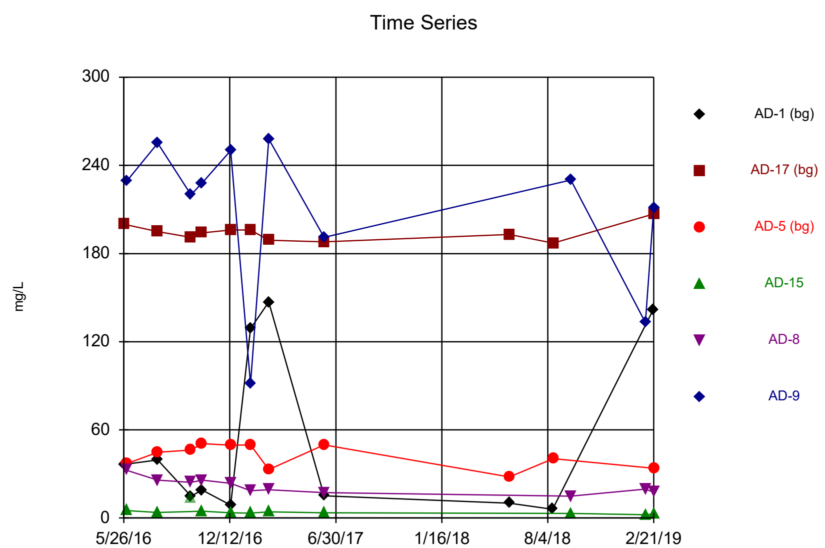
Constituent: Boron, total   Analysis Run 6/30/2019 6:49 PM   View: Descriptive
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



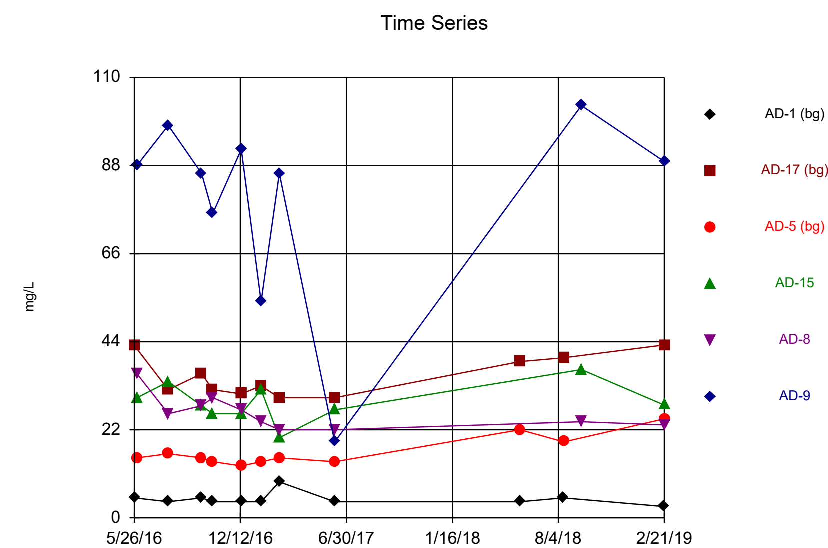
Constituent: Cadmium, total   Analysis Run 6/30/2019 6:49 PM   View: Descriptive
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



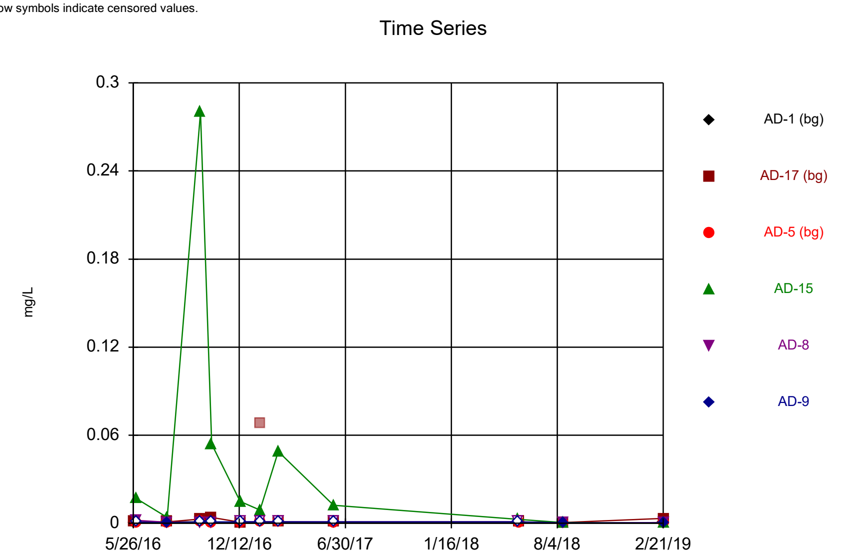
Constituent: Calcium, total   Analysis Run 6/30/2019 6:49 PM   View: Descriptive
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

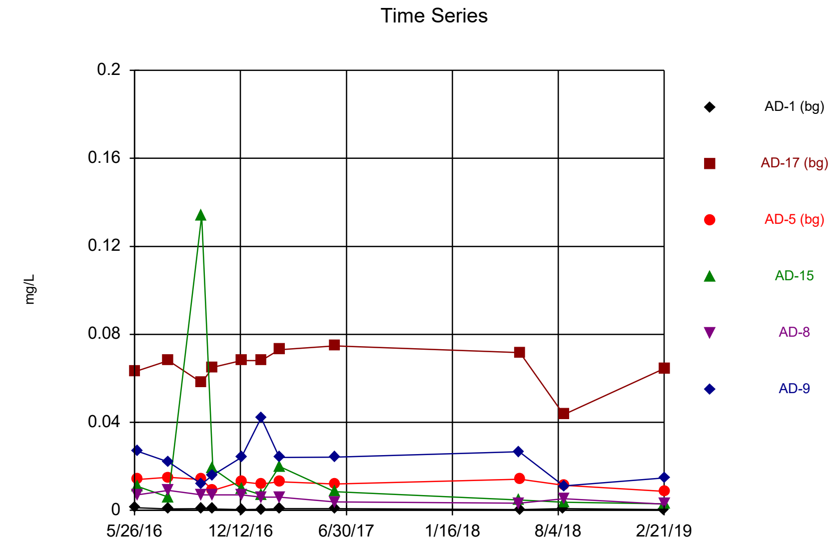


Constituent: Chloride, total   Analysis Run 6/30/2019 6:49 PM   View: Descriptive
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

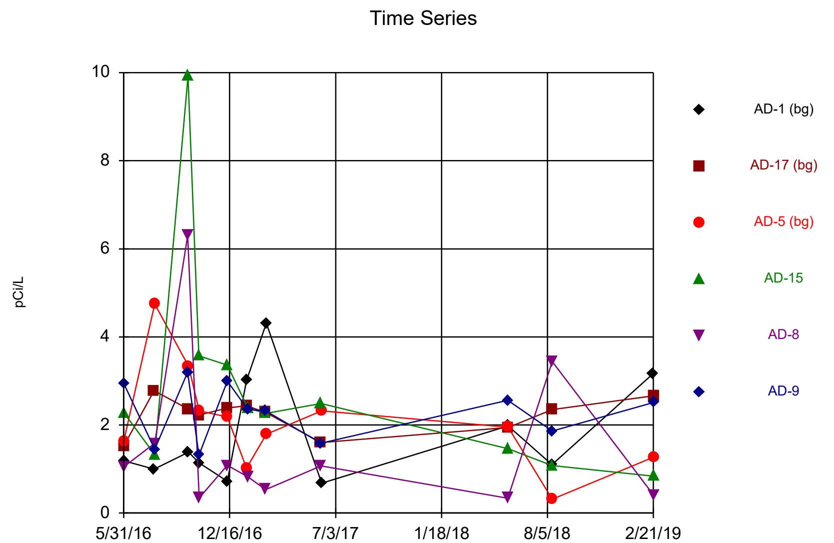
Hollow symbols indicate censored values.



Constituent: Chromium, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

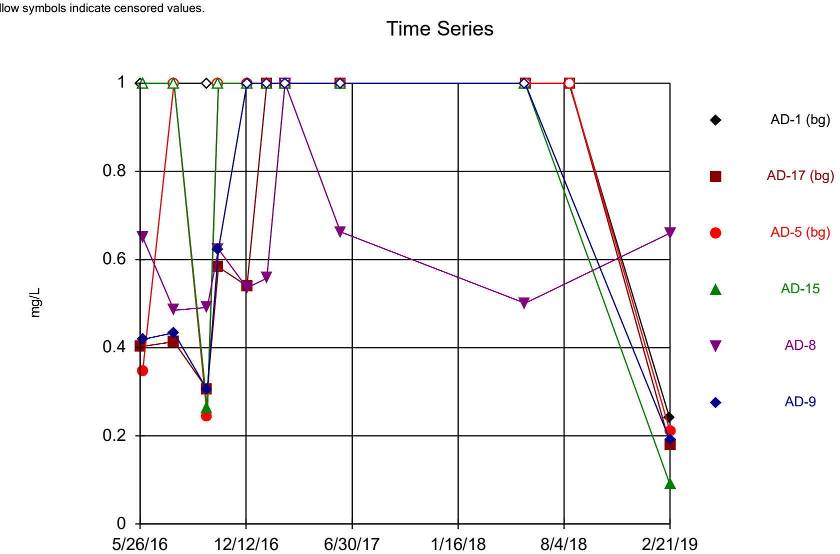


Constituent: Cobalt, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



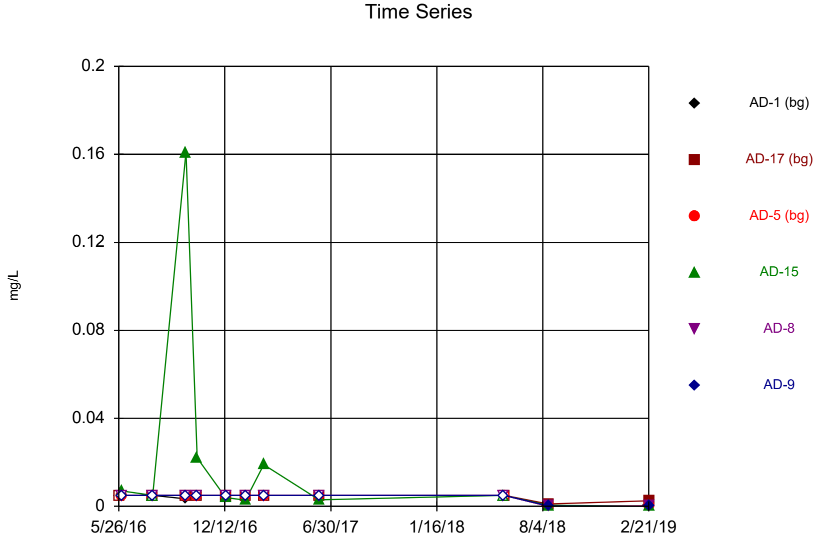
Constituent: Combined Radium 226 + 228 Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Hollow symbols indicate censored values.



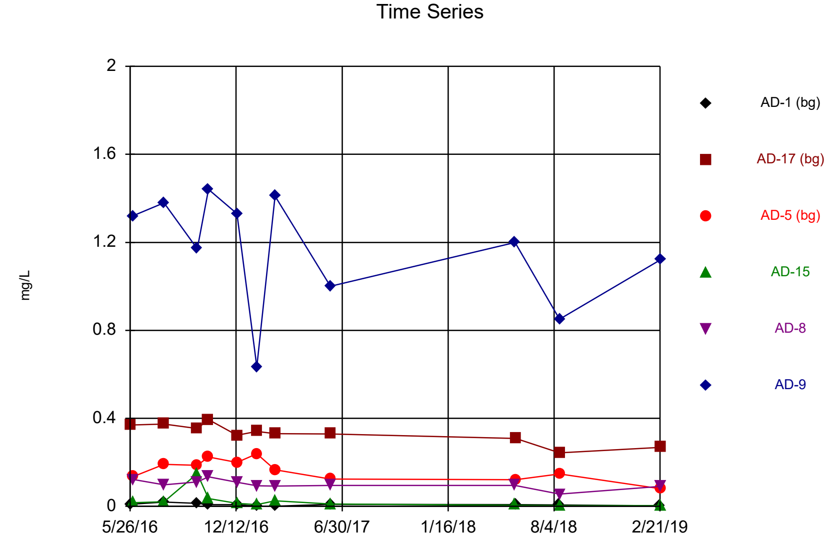
Constituent: Fluoride, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



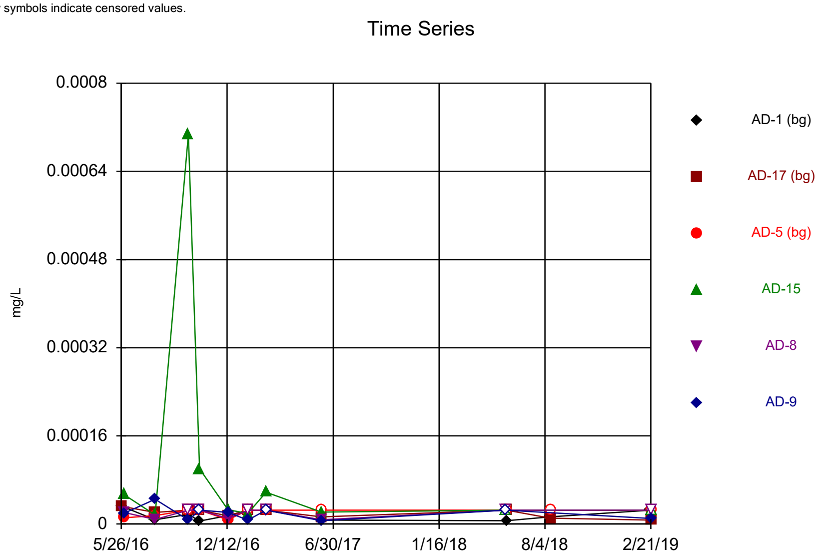
Constituent: Lead, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



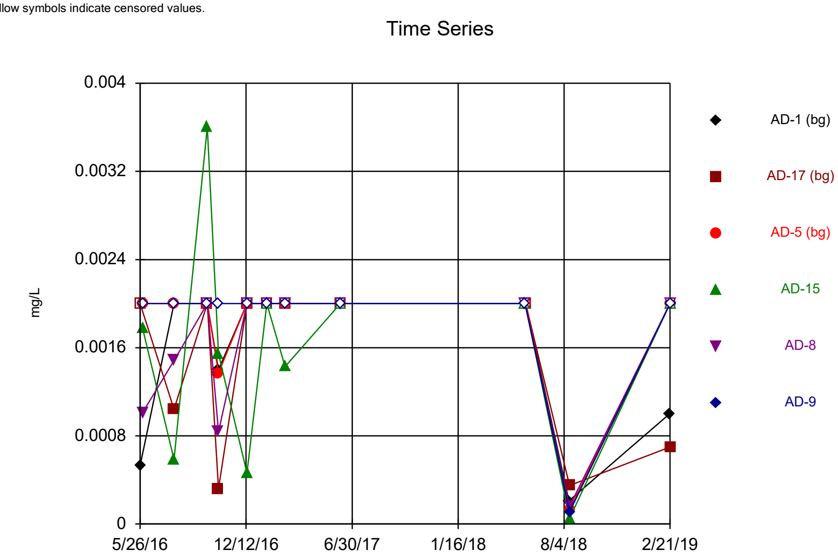
Constituent: Lithium, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

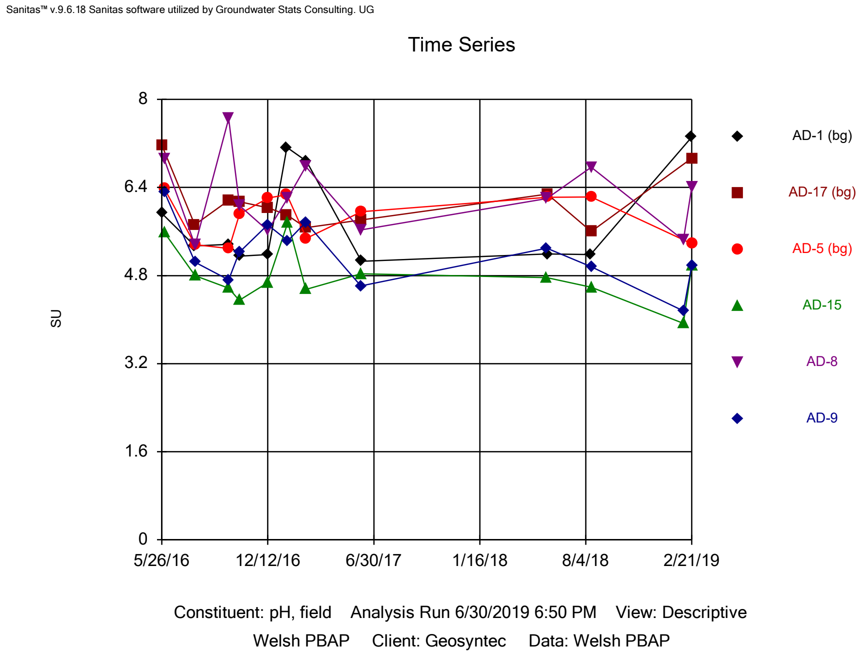


Constituent: Mercury, total Analysis Run 6/30/2019 6:49 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

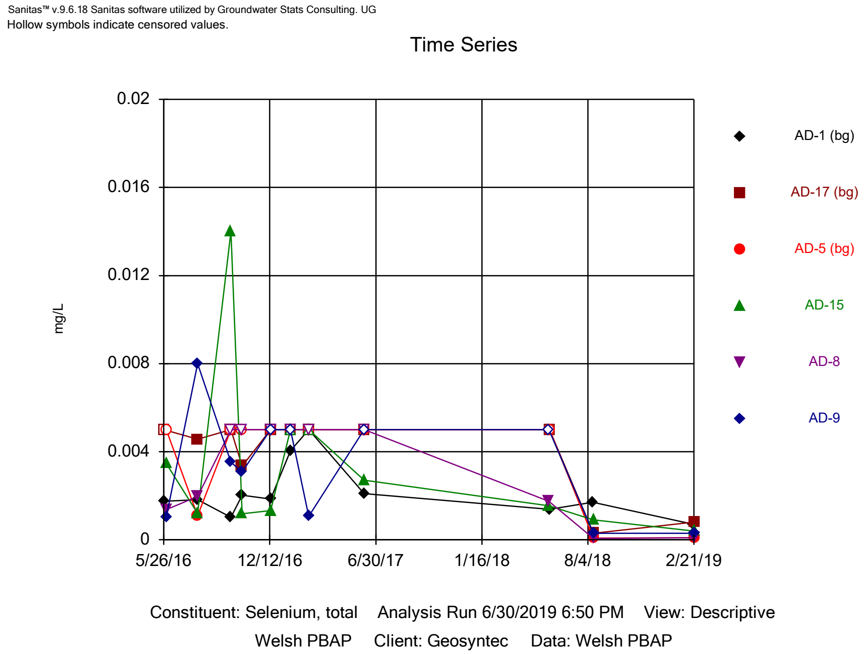
Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



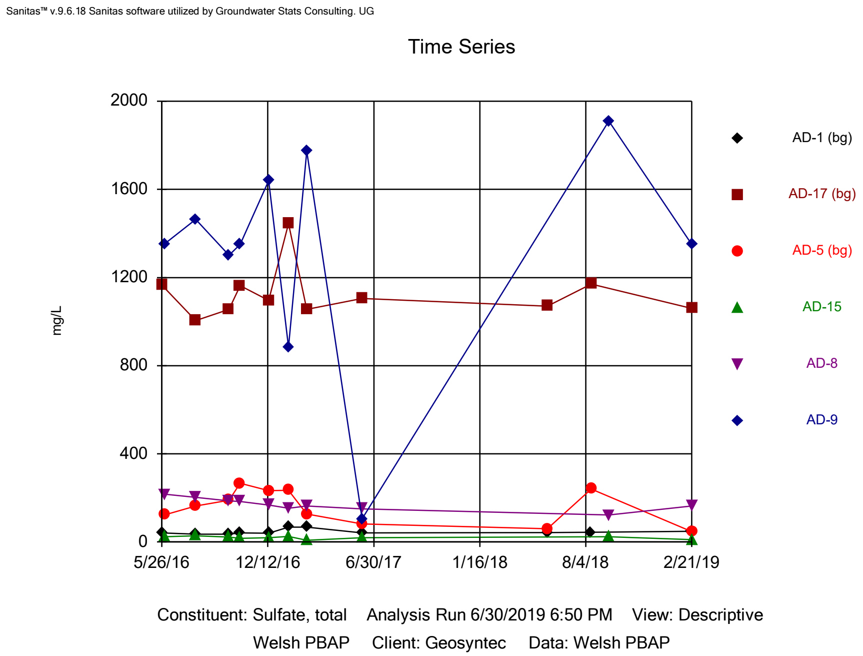
Constituent: Molybdenum, total Analysis Run 6/30/2019 6:50 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



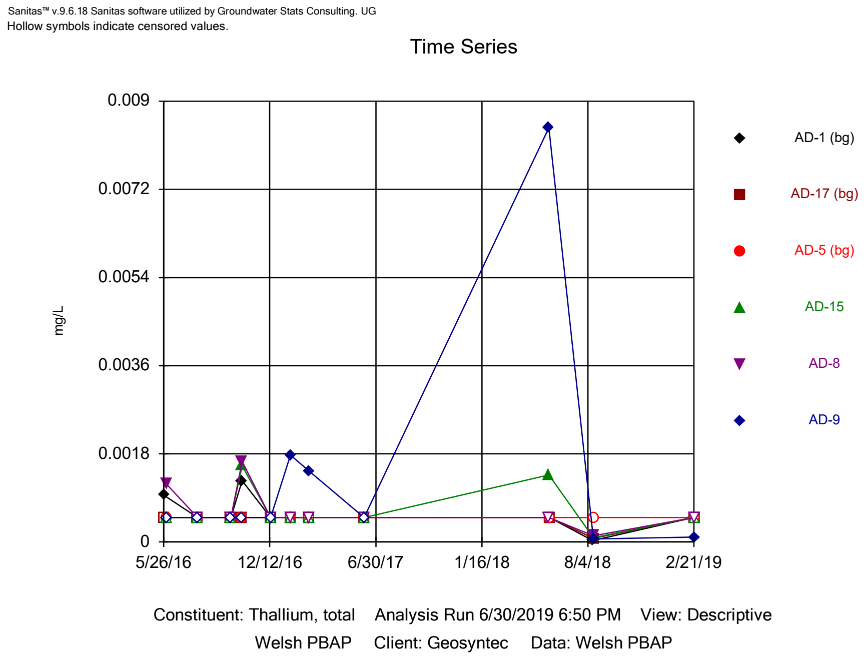
Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Time Series
8
6.4
4.8
3.2
1.6
0
SU
5/26/16
12/12/16
6/30/17
1/16/18
8/4/18
2/21/19
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: pH, field Analysis Run 6/30/2019 6:50 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.02
0.016
0.012
0.008
0.004
0
mg/L
5/26/16
12/12/16
6/30/17
1/16/18
8/4/18
2/21/19
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Selenium, total Analysis Run 6/30/2019 6:50 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

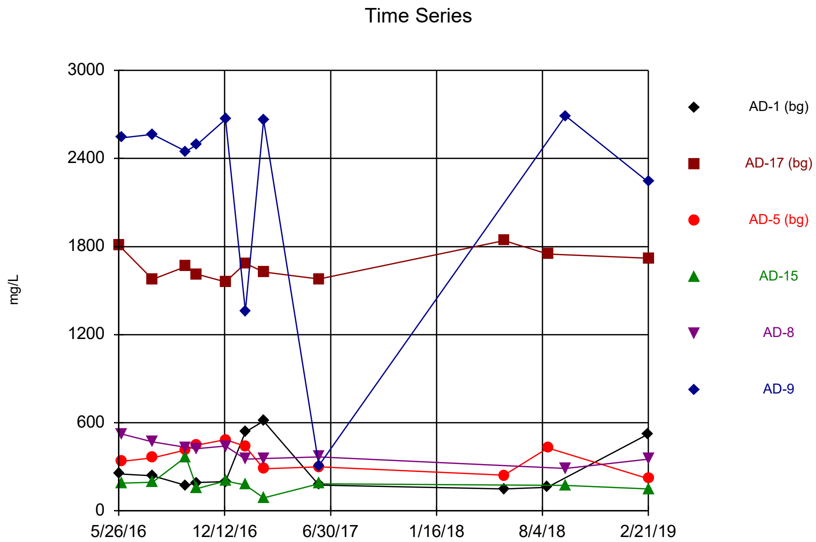


Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Time Series
2000
1600
1200
800
400
0
mg/L
5/26/16
12/12/16
6/30/17
1/16/18
8/4/18
2/21/19
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Sulfate, total Analysis Run 6/30/2019 6:50 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.
Time Series
0.009
0.0072
0.0054
0.0036
0.0018
0
mg/L
5/26/16
12/12/16
6/30/17
1/16/18
8/4/18
2/21/19
AD-1 (bg)
AD-17 (bg)
AD-5 (bg)
AD-15
AD-8
AD-9
Constituent: Thallium, total Analysis Run 6/30/2019 6:50 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: Total Dissolved Solids Analysis Run 6/30/2019 6:50 PM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Outlier Summary Table

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 07/05/2019, 1:19 PM

	AD-9 Boron, total (mg/L)	AD-15 Calcium, total (mg/L)	AD-17 Chromium, total (mg/L)
9/30/2016		13.7 (o)	
1/20/2017	0.283 (o)		0.068 (o)

Interwell Prediction Limit Summary - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 6/30/2019, 7:00 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	**AD-8**	**0.775**	**n/a**	**2/21/2019**	**1.47**	**Yes**	**33**	**-2.01**	**0.986**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**
Boron, total (mg/L)	**AD-9**	**0.775**	**n/a**	**2/21/2019**	**1.39**	**Yes**	**33**	**-2.01**	**0.986**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**

Interwell Prediction Limit Summary - All Results

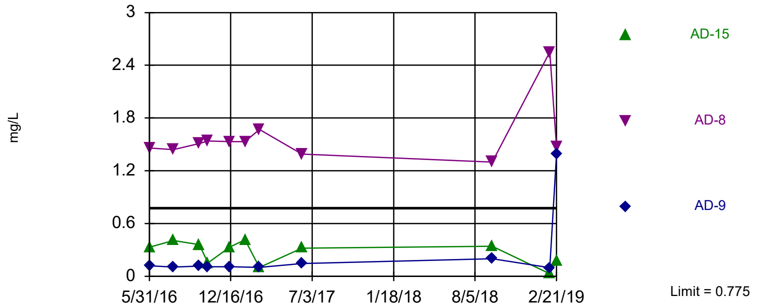
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 6/30/2019, 7:00 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	AD-15	0.775	n/a	2/21/2019	0.169	No	33	-2.01	0.986	0	None	ln(x)	0.002505	Param Inter 1 of 2
Boron, total (mg/L)	**AD-8**	**0.775**	**n/a**	**2/21/2019**	**1.47**	**Yes**	**33**	**-2.01**	**0.986**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**
Boron, total (mg/L)	**AD-9**	**0.775**	**n/a**	**2/21/2019**	**1.39**	**Yes**	**33**	**-2.01**	**0.986**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**
pH, field (SU)	AD-15	7.059	4.811	2/21/2019	4.98	No	33	5.935	0.6316	0	None	No	0.001253	Param Inter 1 of 2
pH, field (SU)	AD-8	7.059	4.811	2/21/2019	6.4	No	33	5.935	0.6316	0	None	No	0.001253	Param Inter 1 of 2
pH, field (SU)	AD-9	7.059	4.811	2/21/2019	4.98	No	33	5.935	0.6316	0	None	No	0.001253	Param Inter 1 of 2

Exceeds Limit: AD-8, AD-9

Prediction Limit

Interwell Parametric



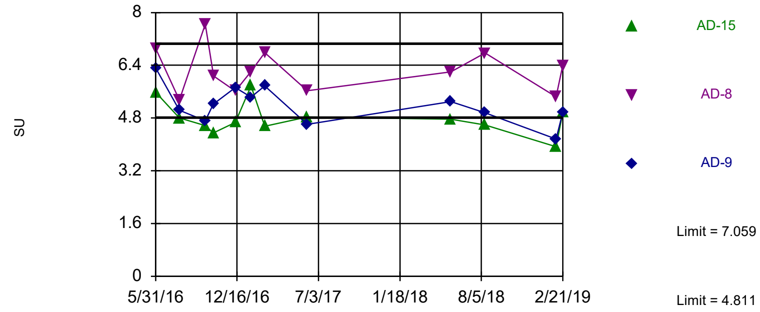
Background Data Summary (based on natural log transformation): Mean=-2.01, Std. Dev.=0.986, n=33. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9116, critical = 0.906. Kappa = 1.78 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Comparing 3 points to limit.

Constituent: Boron, total Analysis Run 6/30/2019 6:58 PM View: PL's - Interwell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limits

Prediction Limit

Interwell Parametric



Background Data Summary: Mean=5.935, Std. Dev.=0.6316, n=33. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9252, critical = 0.906. Kappa = 1.78 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.001253. Comparing 3 points to limit.

Constituent: pH, field Analysis Run 6/30/2019 6:58 PM View: PL's - Interwell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Intrawell Prediction Limit Summary - Significant Results

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 6/30/2019, 7:06 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium, total (mg/L)	**AD-17**	**203.5**	**n/a**	**2/21/2019**	**207**	**Yes**	**8**	**193.6**	**4.033**	**0**	**None**	**No**	**0.002505**	Param 1 of 2
Chloride, total (mg/L)	**AD-5**	**16.78**	**n/a**	**2/21/2019**	**24.7**	**Yes**	**8**	**14.5**	**0.9258**	**0**	**None**	**No**	**0.002505**	Param 1 of 2

Intrawell Prediction Limit Summary - All Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 6/30/2019, 7:06 PM

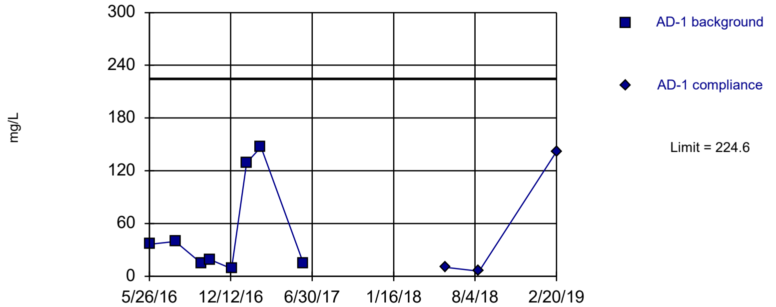
Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium, total (mg/L)	AD-1	224.6	n/a	2/20/2019	142	No	8	6.363	3.508	0	None	sqrt(x)	0.002505	Param 1 of 2
Calcium, total (mg/L)	**AD-17**	**203.5**	**n/a**	**2/21/2019**	**207**	**Yes**	**8**	**193.6**	**4.033**	**0**	**None**	**No**	**0.002505**	Param 1 of 2
Calcium, total (mg/L)	AD-5	61.45	n/a	2/21/2019	33.9	No	8	45.09	6.656	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-15	5.711	n/a	2/21/2019	2.67	No	7	4.031	0.6254	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-8	35.68	n/a	2/21/2019	17.6	No	8	23.46	4.969	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-9	349.9	n/a	2/21/2019	211	No	8	215.3	54.76	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	AD-1	9	n/a	2/20/2019	2.82	No	8	n/a	n/a	0	n/a	n/a	0.02144	NP (normality) 1 of 2
Chloride, total (mg/L)	AD-17	44.04	n/a	2/21/2019	43.2	No	8	33.38	4.34	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	**AD-5**	**16.78**	**n/a**	**2/21/2019**	**24.7**	**Yes**	**8**	**14.5**	**0.9258**	**0**	**None**	**No**	**0.002505**	Param 1 of 2
Chloride, total (mg/L)	AD-15	38.42	n/a	2/21/2019	28.2	No	8	27.88	4.291	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	AD-8	38.29	n/a	2/21/2019	23.2	No	8	26.88	4.643	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	AD-9	139.3	n/a	2/21/2019	89	No	8	74.88	26.2	0	None	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-1	1	n/a	2/20/2019	0.24	No	8	n/a	n/a	100	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-17	0.6953	n/a	2/21/2019	0.18	No	8	0.4488	0.1003	37.5	Kaplan-Meier	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-5	1	n/a	2/21/2019	0.21	No	8	n/a	n/a	75	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-15	1	n/a	2/21/2019	0.09	No	8	n/a	n/a	87.5	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-8	1.034	n/a	2/21/2019	0.66	No	8	0.6258	0.166	12.5	None	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-9	0.7259	n/a	2/21/2019	0.19	No	8	0.4449	0.1143	50	Kaplan-Meier	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-1	82.3	n/a	2/20/2019	49.2	No	8	6.772	0.9358	0	None	sqrt(x)	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-17	1471	n/a	2/21/2019	1060	No	8	1136	136.3	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-5	336.4	n/a	2/21/2019	46.5	No	8	177.4	64.69	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-15	35.58	n/a	2/21/2019	10.6	No	8	20.38	6.186	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-8	235.8	n/a	2/21/2019	163	No	8	178	23.53	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-9	2527	n/a	2/21/2019	1350	No	8	1234	526.1	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-1	784.8	n/a	2/20/2019	522	No	8	16.71	4.598	0	None	sqrt(x)	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-17	1840	n/a	2/21/2019	1720	No	8	1639	81.77	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-5	563.5	n/a	2/21/2019	220	No	8	383.6	73.17	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-15	388.1	n/a	2/21/2019	150	No	8	194.4	78.82	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-8	568.6	n/a	2/21/2019	352	No	8	420.9	60.09	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-9	3147	n/a	2/21/2019	2240	No	8	1.3e10	7.4e9	0	None	x^3	0.002505	Param 1 of 2

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=6.363, Std. Dev.=3.508, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8248, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

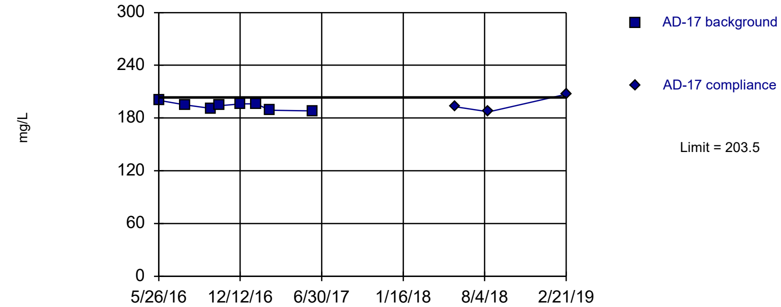
Constituent: Calcium, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Exceeds Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=193.6, Std. Dev.=4.033, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9507, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

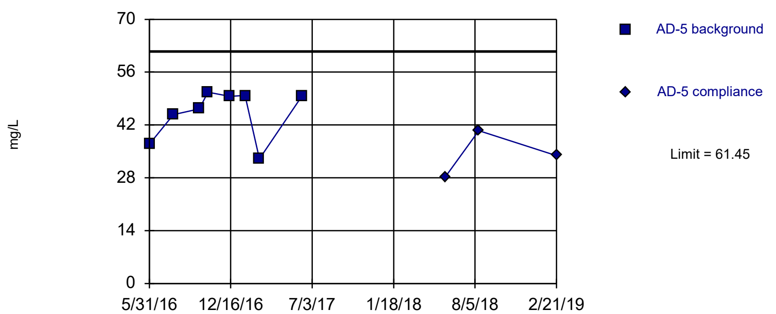
Constituent: Calcium, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=45.09, Std. Dev.=6.656, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8101, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

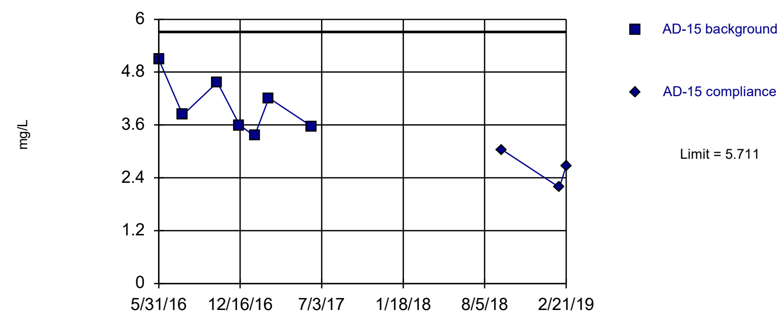
Constituent: Calcium, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=4.031, Std. Dev.=0.6254, n=7. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9248, critical = 0.73. Kappa = 2.685 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

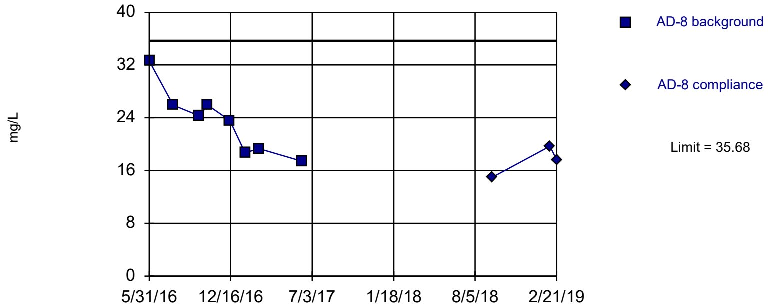
Constituent: Calcium, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=23.46, Std. Dev.=4.969, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9282, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

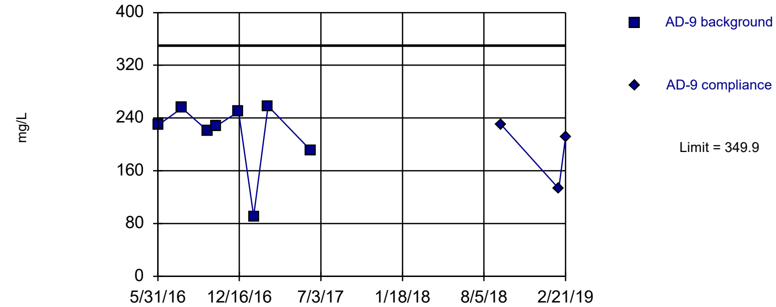
Constituent: Calcium, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=215.3, Std. Dev.=54.76, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7629, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

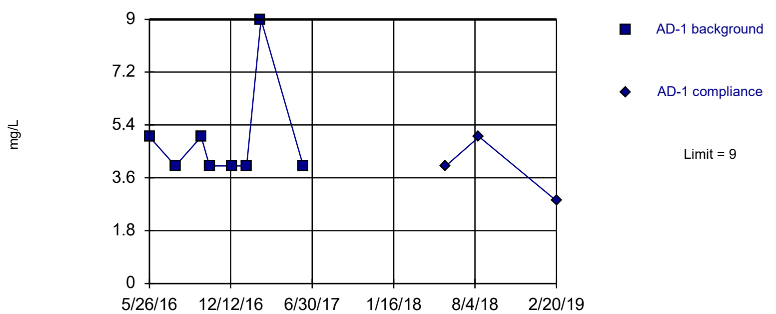
Constituent: Calcium, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 8 background values. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

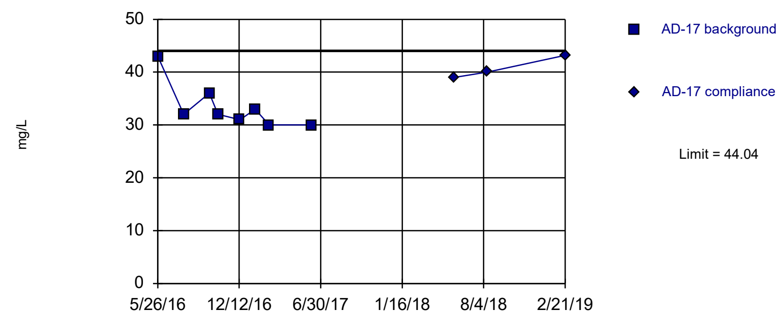
Constituent: Chloride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=33.38, Std. Dev.=4.34, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7758, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

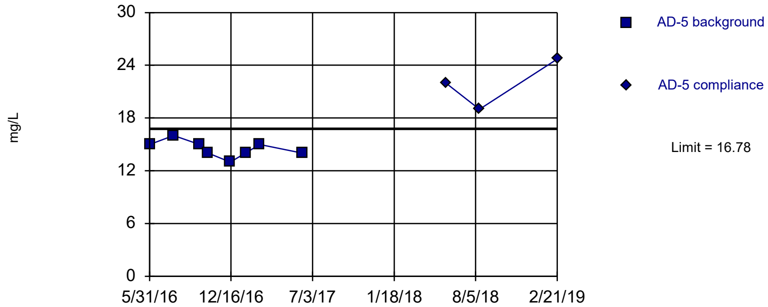
Constituent: Chloride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Exceeds Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=14.5, Std. Dev.=0.9258, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9302, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

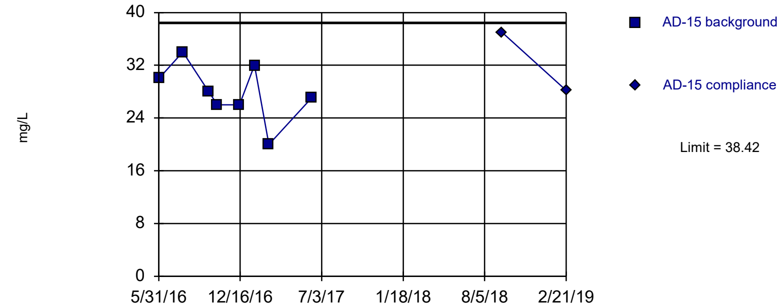
Constituent: Chloride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=27.88, Std. Dev.=4.291, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9603, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

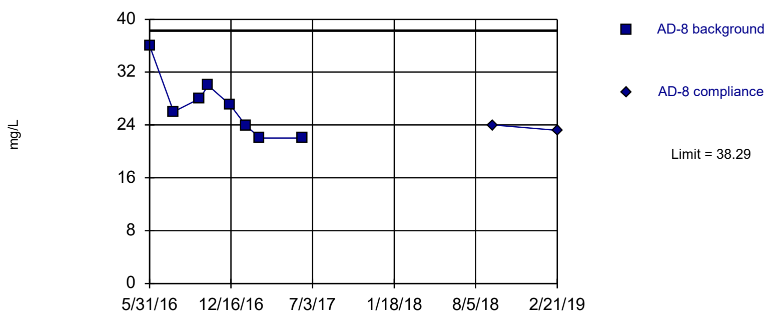
Constituent: Chloride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=26.88, Std. Dev.=4.643, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9162, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

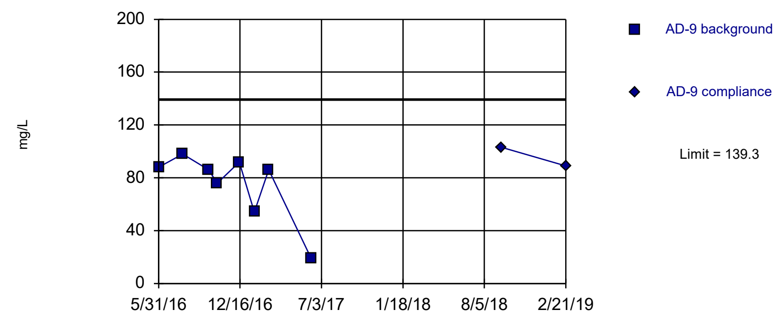
Constituent: Chloride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=74.88, Std. Dev.=26.2, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7978, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

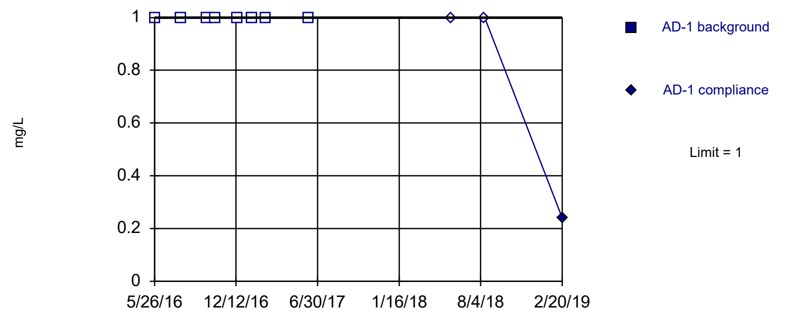
Constituent: Chloride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. All background values (n = 8) were censored; limit is most recent reporting limit. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

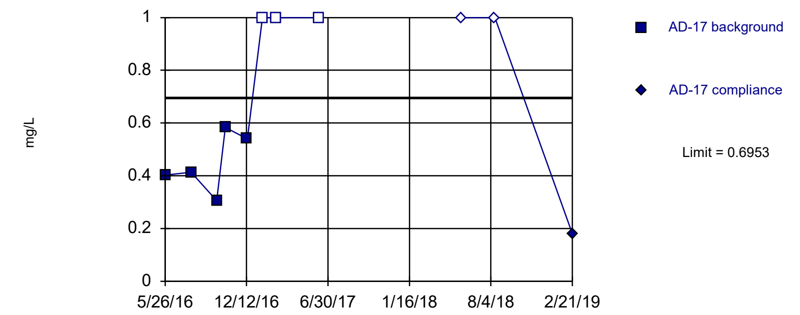
Constituent: Fluoride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.4488, Std. Dev.=0.1003, n=8, 37.5% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8226, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

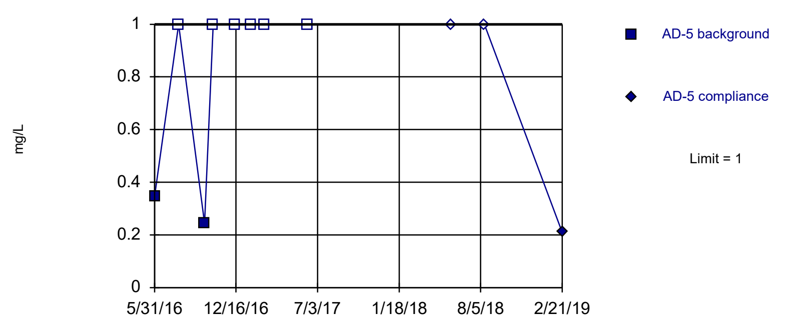
Constituent: Fluoride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 8 background values. 75% NDs. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

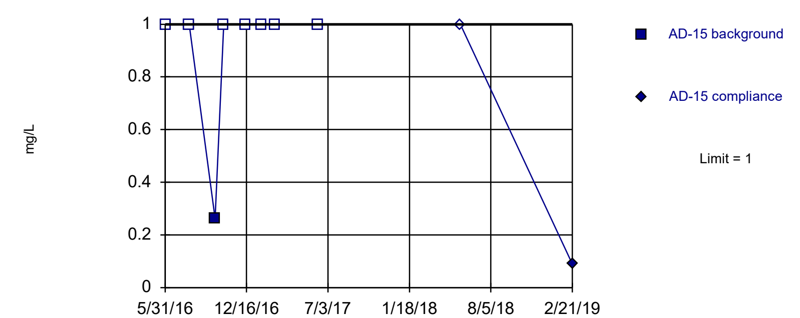
Constituent: Fluoride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 8 background values. 87.5% NDs. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

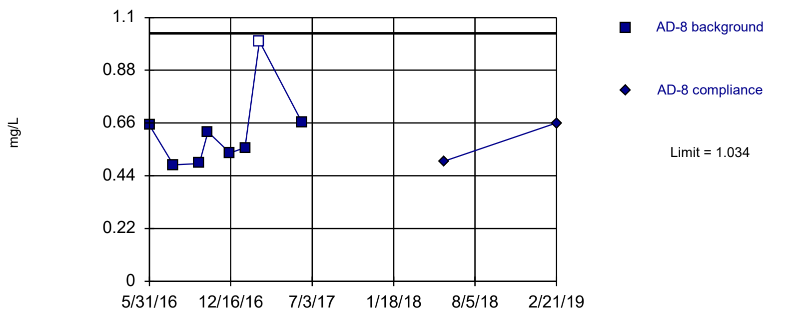
Constituent: Fluoride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.6258, Std. Dev.=0.166, n=8, 12.5% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7879, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

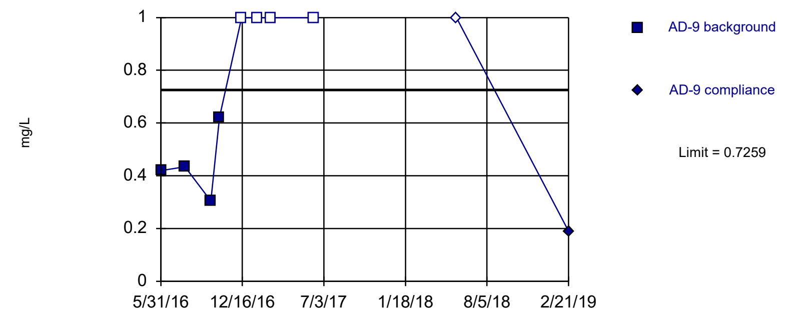
Constituent: Fluoride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.4449, Std. Dev.=0.1143, n=8, 50% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.786, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

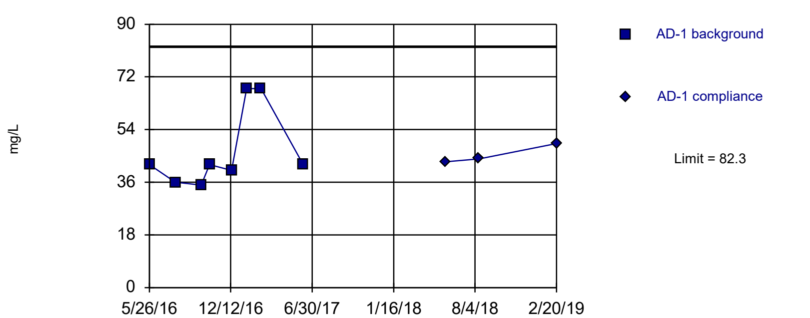
Constituent: Fluoride, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=6.772, Std. Dev.=0.9358, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7528, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

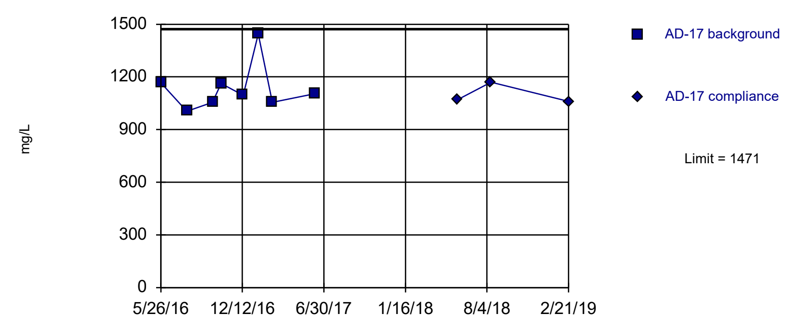
Constituent: Sulfate, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1136, Std. Dev.=136.3, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7916, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

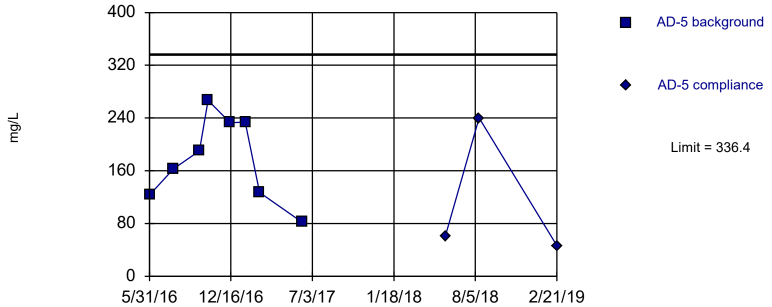
Constituent: Sulfate, total Analysis Run 6/30/2019 7:02 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=177.4, Std. Dev.=64.69, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.953, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

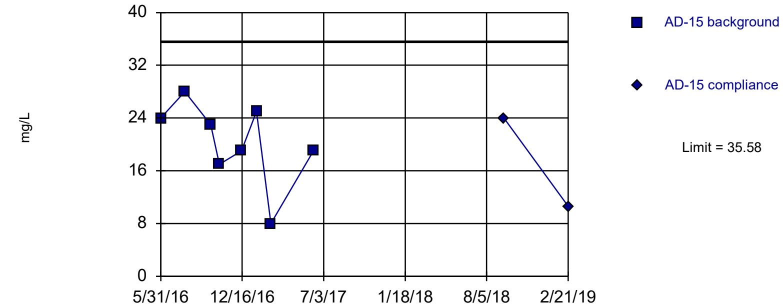
Constituent: Sulfate, total Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=20.38, Std. Dev.=6.186, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9238, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

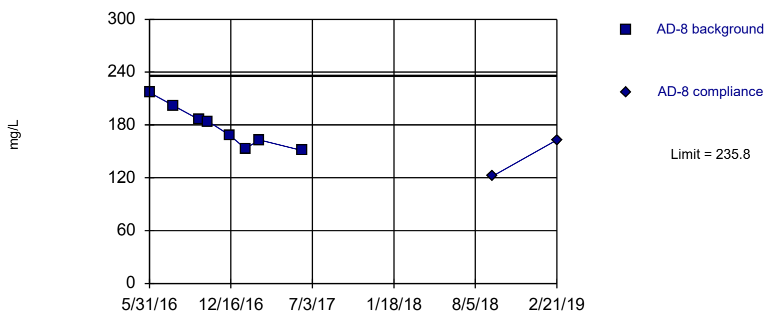
Constituent: Sulfate, total Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=178, Std. Dev.=23.53, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9398, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

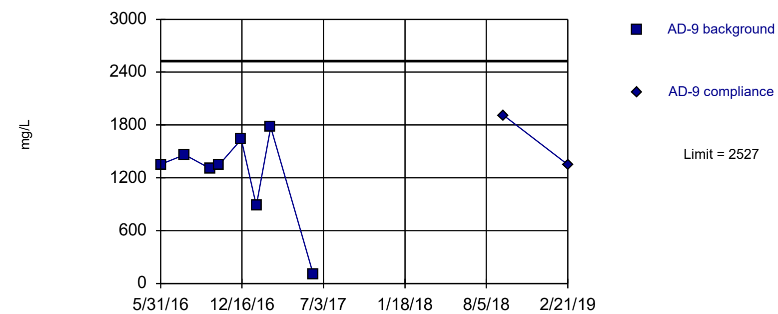
Constituent: Sulfate, total Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1234, Std. Dev.=526.1, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8423, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

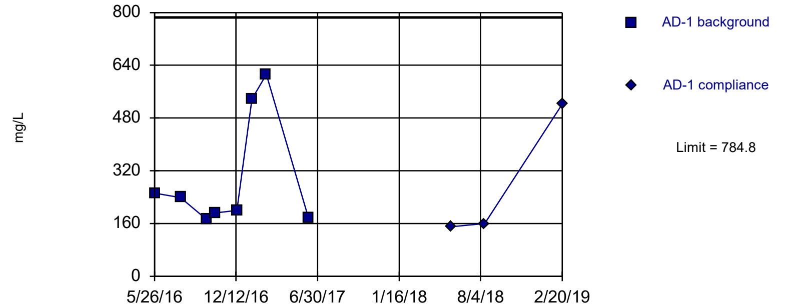
Constituent: Sulfate, total Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=16.71, Std. Dev.=4.598, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.756, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

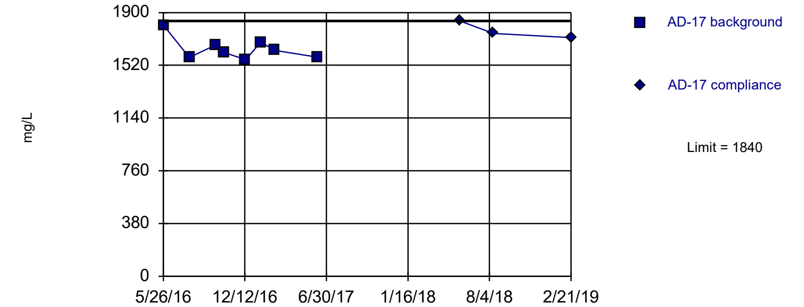
Constituent: Total Dissolved Solids Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1639, Std. Dev.=81.77, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8702, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

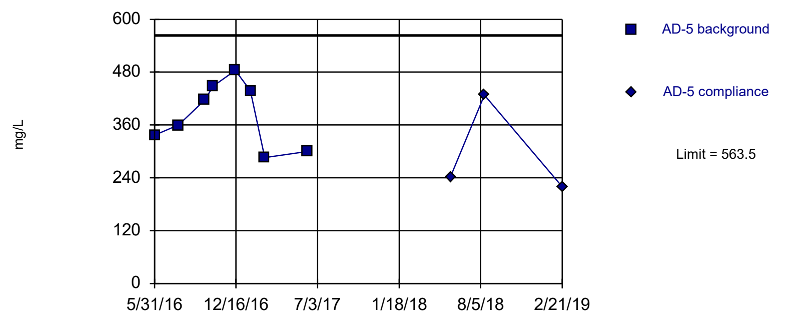
Constituent: Total Dissolved Solids Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=383.6, Std. Dev.=73.17, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.937, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

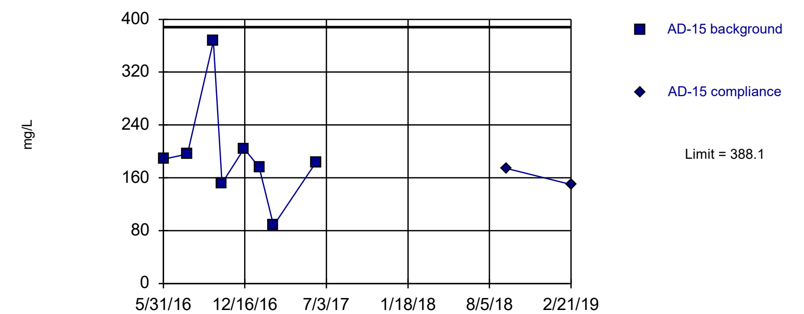
Constituent: Total Dissolved Solids Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=194.4, Std. Dev.=78.82, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8214, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

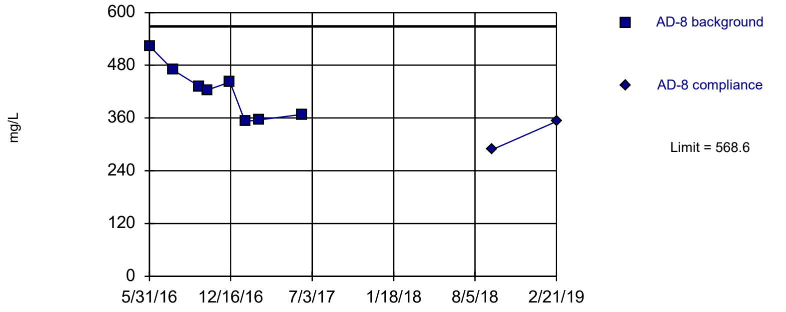
Constituent: Total Dissolved Solids Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=420.9, Std. Dev.=60.09, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9284, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

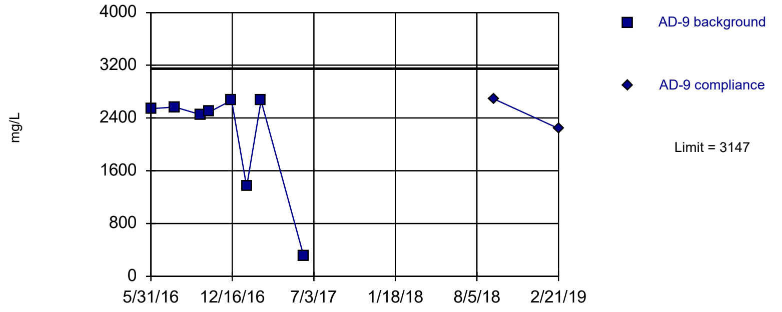
Constituent: Total Dissolved Solids Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on cube transformation): Mean=1.3e10, Std. Dev.=7.4e9, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.759, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

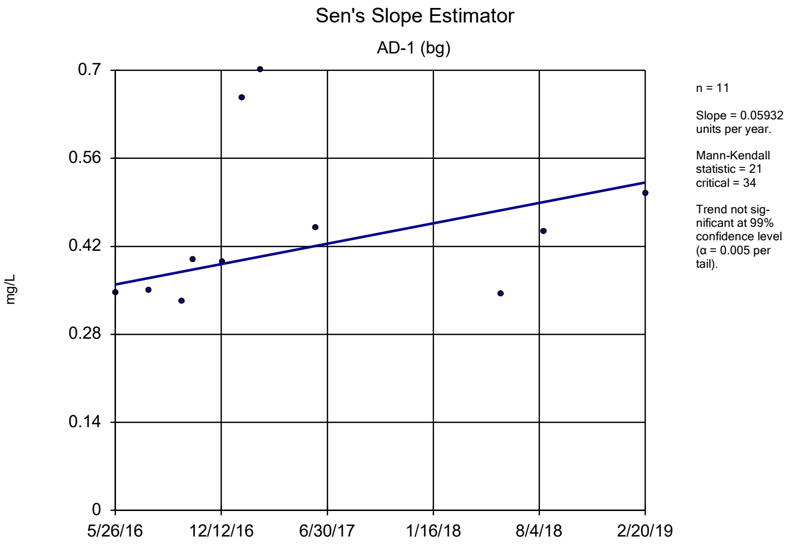
Constituent: Total Dissolved Solids Analysis Run 6/30/2019 7:03 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Trend Test Summary Table - All Results (No Significant)

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 7/5/2019, 3:38 PM

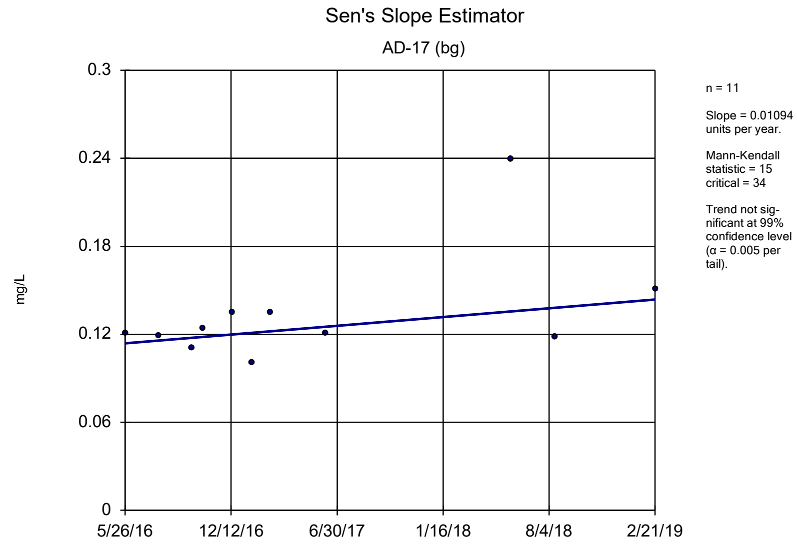
Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron, total (mg/L)	AD-1 (bg)	0.05932	21	34	No	11	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-17 (bg)	0.01094	15	34	No	11	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-5 (bg)	0.001099	14	34	No	11	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-8	-0.02807	-5	-38	No	12	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-9	-0.005594	-5	-34	No	11	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	AD-1 (bg)	-2.915	-5	-34	No	11	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	AD-17 (bg)	-2.239	-14	-34	No	11	0	n/a	n/a	0.01	NP
Calcium, total (mg/L)	AD-5 (bg)	-3.095	-9	-34	No	11	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-1 (bg)	0	-11	-34	No	11	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-17 (bg)	1.822	5	34	No	11	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-5 (bg)	2.719	15	34	No	11	0	n/a	n/a	0.01	NP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



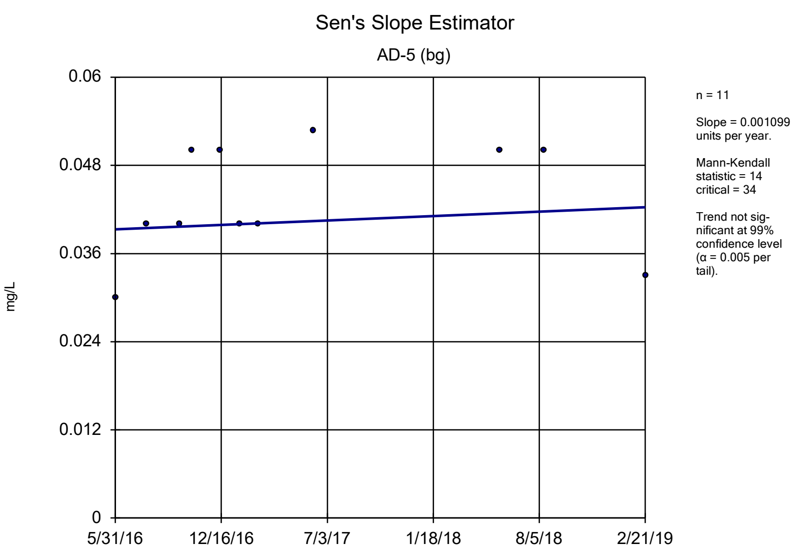
Constituent: Boron, total   Analysis Run 7/5/2019 3:37 PM   View: Trend Tests
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



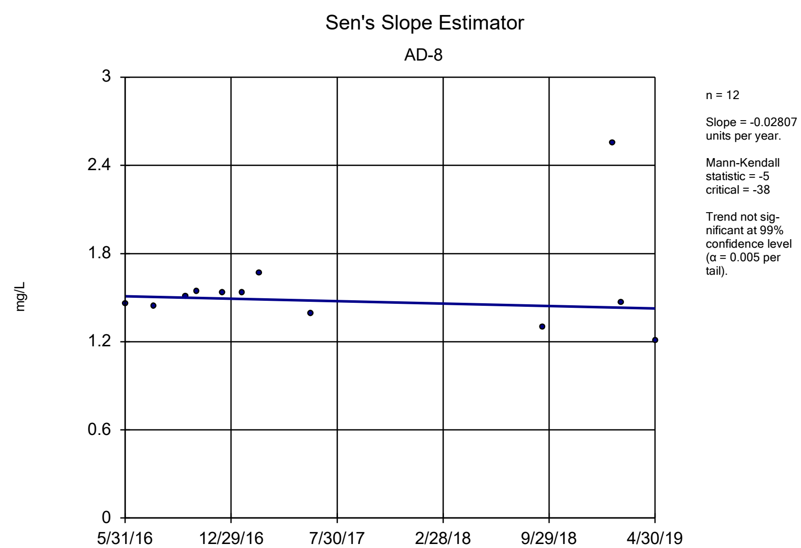
Constituent: Boron, total   Analysis Run 7/5/2019 3:37 PM   View: Trend Tests
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

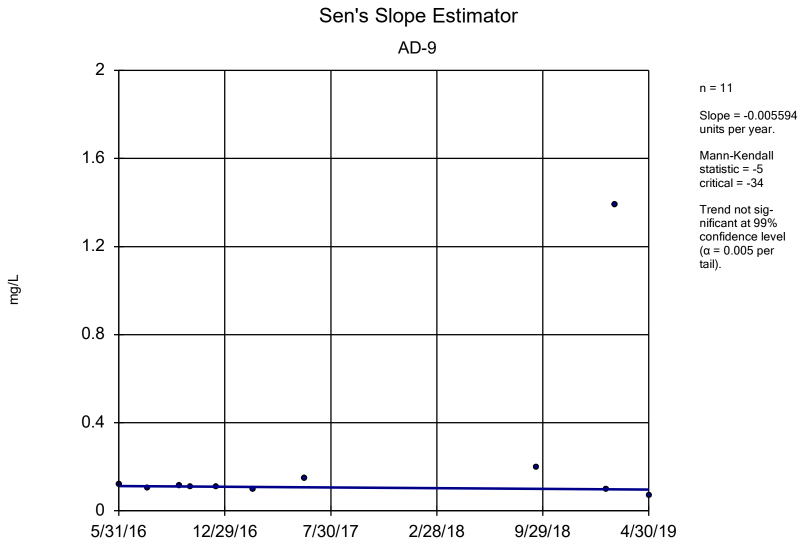


Constituent: Boron, total   Analysis Run 7/5/2019 3:37 PM   View: Trend Tests
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

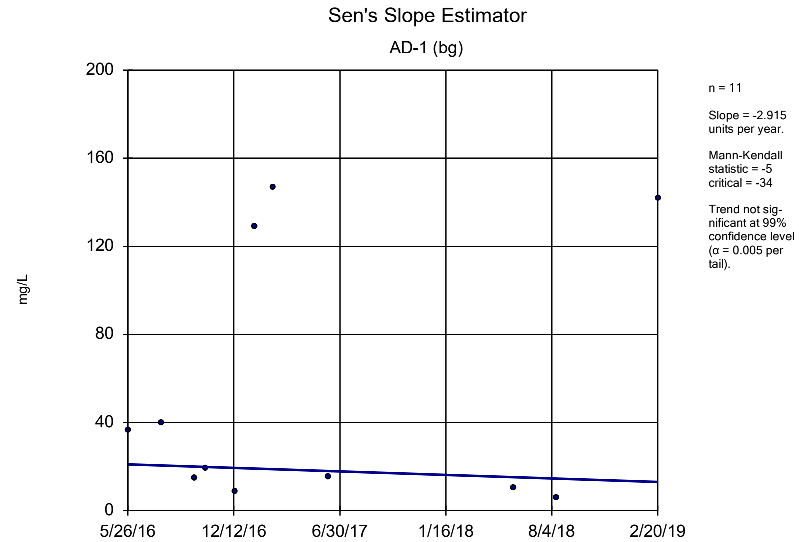
Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



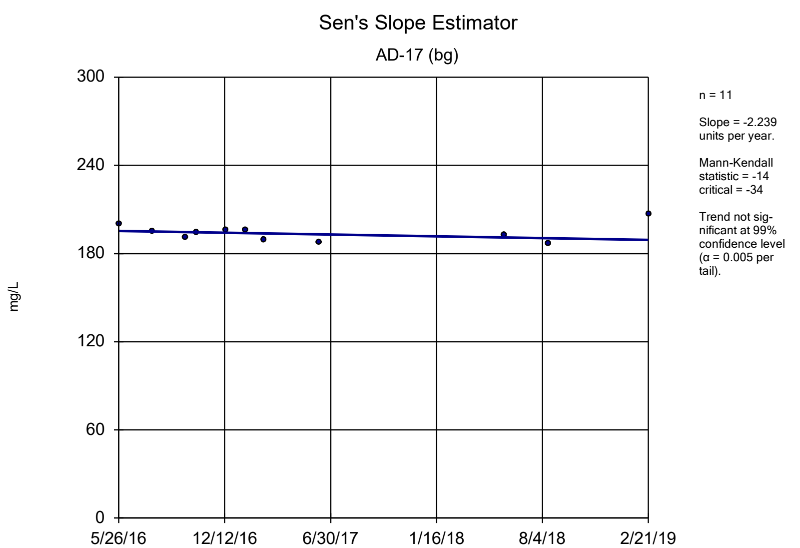
Constituent: Boron, total   Analysis Run 7/5/2019 3:37 PM   View: Trend Tests
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP



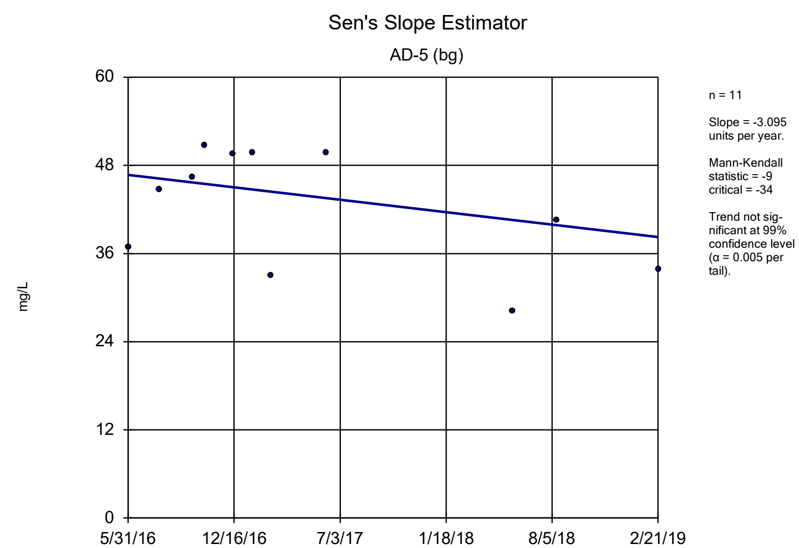
Constituent: Boron, total Analysis Run 7/5/2019 3:37 PM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



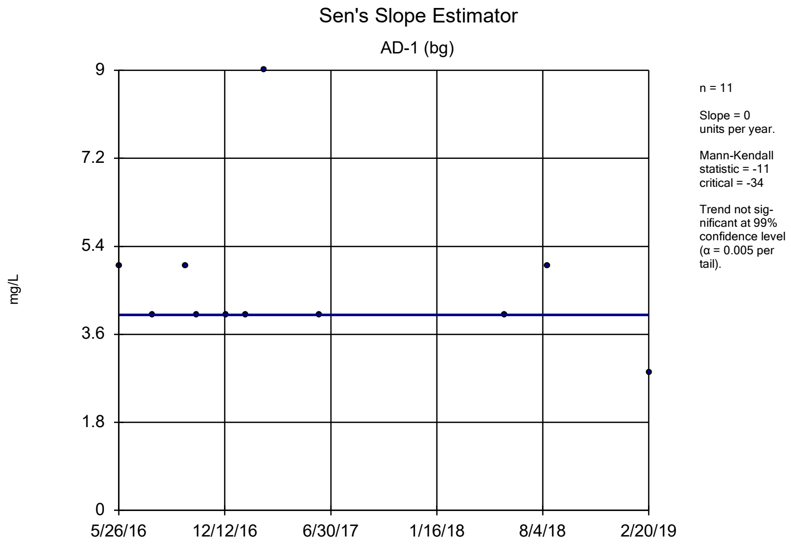
Constituent: Calcium, total Analysis Run 7/5/2019 3:37 PM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Constituent: Calcium, total Analysis Run 7/5/2019 3:38 PM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

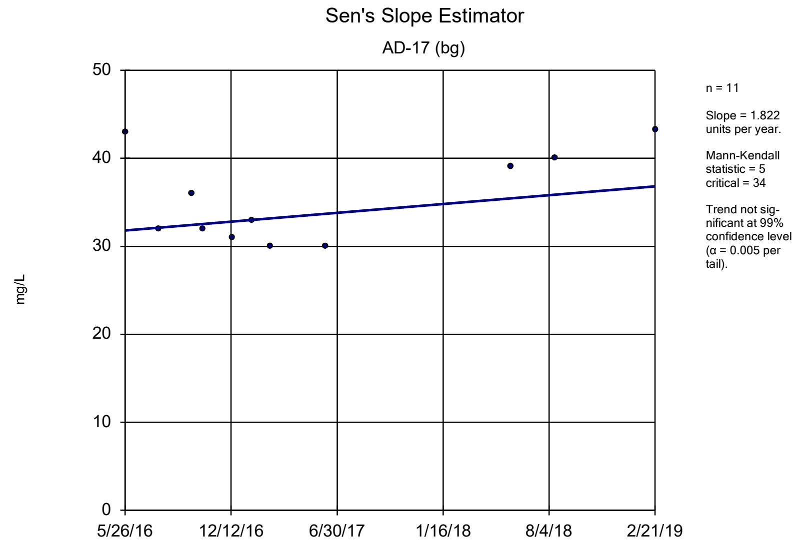


Constituent: Calcium, total Analysis Run 7/5/2019 3:38 PM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



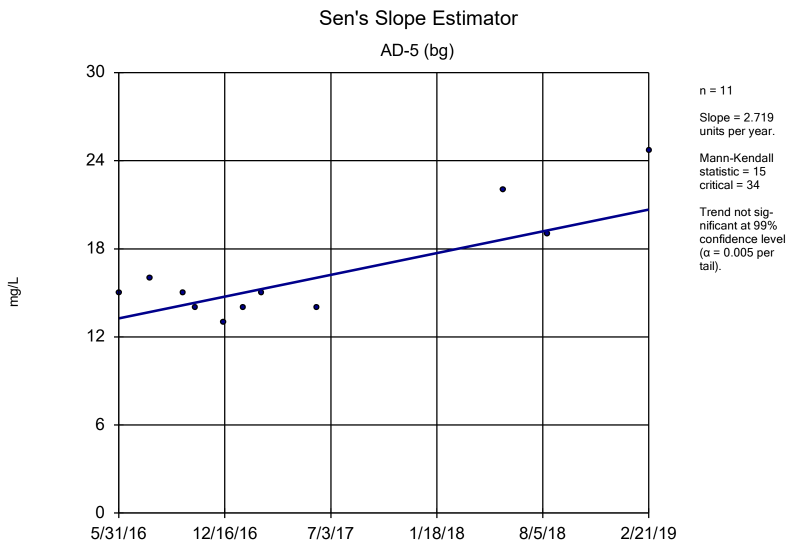
Constituent: Chloride, total Analysis Run 7/5/2019 3:38 PM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: Chloride, total Analysis Run 7/5/2019 3:38 PM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG



Constituent: Chloride, total Analysis Run 7/5/2019 3:38 PM View: Trend Tests
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Tolerance Limit Summary Table

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 6/25/2019, 9:04 AM

Constituent	Well	Upper Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	n/a	0.005	33	n/a	n/a	72.73	n/a	n/a	0.184	NP Inter(normality)
Arsenic, total (mg/L)	n/a	0.005	33	n/a	n/a	57.58	n/a	n/a	0.184	NP Inter(normality)
Barium, total (mg/L)	n/a	0.5818	33	-2.809	1.037	0	None	ln(x)	0.05	Inter
Beryllium, total (mg/L)	n/a	0.0007276	33	0.01425	0.005818	12.12	None	sqrt(x)	0.05	Inter
Cadmium, total (mg/L)	n/a	0.01047	33	-8.594	1.844	30.3	Kaplan-Meier	ln(x)	0.05	Inter
Chromium, total (mg/L)	n/a	0.003606	32	-7.582	0.8902	28.13	Kaplan-Meier	ln(x)	0.05	Inter
Cobalt, total (mg/L)	n/a	0.0748	33	n/a	n/a	0	n/a	n/a	0.184	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	n/a	4.182	33	2.033	0.9825	0	None	No	0.05	Inter
Fluoride, total (mg/L)	n/a	1	33	n/a	n/a	69.7	n/a	n/a	0.184	NP Inter(normality)
Lead, total (mg/L)	n/a	0.005	33	n/a	n/a	78.79	n/a	n/a	0.184	NP Inter(NDs)
Lithium, total (mg/L)	n/a	0.394	33	n/a	n/a	0	n/a	n/a	0.184	NP Inter(normality)
Mercury, total (mg/L)	n/a	0.000033	33	n/a	n/a	48.48	n/a	n/a	0.184	NP Inter(normality)
Molybdenum, total (mg/L)	n/a	0.002	33	n/a	n/a	69.7	n/a	n/a	0.184	NP Inter(normality)
Selenium, total (mg/L)	n/a	0.005	33	n/a	n/a	48.48	n/a	n/a	0.184	NP Inter(normality)
Thallium, total (mg/L)	n/a	0.001251	33	n/a	n/a	87.88	n/a	n/a	0.184	NP Inter(NDs)

Confidence Interval Summary Table - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 6/25/2019, 9:18 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Lower Compl.	Sig.	N	%NDs	Transform	Alpha	Method
Lithium, total (mg/L)	**AD-9**	**1.38**	**0.9572**	**0.39**	**n/a**	**Yes**	**11**	**0**	**No**	**0.01**	**Param.**

Confidence Interval Summary Table - All Results

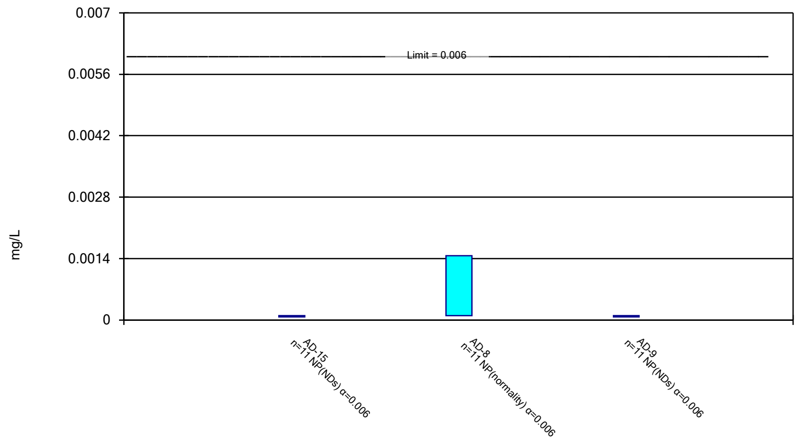
Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 6/25/2019, 9:18 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Lower Compl.	Sig.	N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	AD-15	0.0001	0.0001	0.006	n/a	No	11	90.91	No	0.006	NP (NDs)
Antimony, total (mg/L)	AD-8	0.001461	0.0001	0.006	n/a	No	11	72.73	No	0.006	NP (normality)
Antimony, total (mg/L)	AD-9	0.0001	0.0001	0.006	n/a	No	11	90.91	No	0.006	NP (NDs)
Arsenic, total (mg/L)	AD-15	0.02347	0.003302	0.01	n/a	No	11	0	ln(x)	0.01	Param.
Arsenic, total (mg/L)	AD-8	0.005	0.00057	0.01	n/a	No	11	72.73	No	0.006	NP (normality)
Arsenic, total (mg/L)	AD-9	0.005	0.00168	0.01	n/a	No	11	81.82	No	0.006	NP (NDs)
Barium, total (mg/L)	AD-15	0.4354	0.09415	2	n/a	No	11	0	ln(x)	0.01	Param.
Barium, total (mg/L)	AD-8	0.02717	0.01965	2	n/a	No	11	0	No	0.01	Param.
Barium, total (mg/L)	AD-9	0.05186	0.0249	2	n/a	No	11	0	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-15	0.002289	0.0001508	0.004	n/a	No	11	0	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-8	0.001	0.00002876	0.004	n/a	No	11	54.55	No	0.006	NP (normality)
Beryllium, total (mg/L)	AD-9	0.0009934	0.0003242	0.004	n/a	No	11	0	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	AD-15	0.00108	0.00004499	0.01	n/a	No	11	9.091	ln(x)	0.01	Param.
Cadmium, total (mg/L)	AD-8	0.001	0.00003	0.01	n/a	No	11	81.82	No	0.006	NP (NDs)
Cadmium, total (mg/L)	AD-9	0.001965	0.0003576	0.01	n/a	No	11	0	No	0.01	Param.
Chromium, total (mg/L)	AD-15	0.06035	0.00143	0.1	n/a	No	11	0	x^(1/3)	0.01	Param.
Chromium, total (mg/L)	AD-8	0.001262	0.0004447	0.1	n/a	No	11	45.45	No	0.01	Param.
Chromium, total (mg/L)	AD-9	0.001	0.000313	0.1	n/a	No	11	72.73	No	0.006	NP (normality)
Cobalt, total (mg/L)	AD-15	0.02411	0.004157	0.075	n/a	No	11	0	ln(x)	0.01	Param.
Cobalt, total (mg/L)	AD-8	0.007411	0.004278	0.075	n/a	No	11	0	No	0.01	Param.
Cobalt, total (mg/L)	AD-9	0.02945	0.01487	0.075	n/a	No	11	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-15	4.165	1.202	5	n/a	No	11	0	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-8	2.41	0.4166	5	n/a	No	11	0	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-9	2.823	1.738	5	n/a	No	11	0	No	0.01	Param.
Fluoride, total (mg/L)	AD-15	1	0.2621	4	n/a	No	9	88.89	No	0.002	NP (NDs)
Fluoride, total (mg/L)	AD-8	1	0.485	4	n/a	No	9	11.11	No	0.002	NP (normality)
Fluoride, total (mg/L)	AD-9	1	0.304	4	n/a	No	9	55.56	No	0.002	NP (normality)
Lead, total (mg/L)	AD-15	0.022	0.000438	0.015	n/a	No	11	18.18	No	0.006	NP (Cohens/xfrm)
Lead, total (mg/L)	AD-8	0.005	0.000223	0.015	n/a	No	11	81.82	No	0.006	NP (NDs)
Lead, total (mg/L)	AD-9	0.005	0.000262	0.015	n/a	No	11	81.82	No	0.006	NP (NDs)
Lithium, total (mg/L)	AD-15	0.04141	0.004534	0.39	n/a	No	11	0	x^(1/3)	0.01	Param.
Lithium, total (mg/L)	AD-8	0.1169	0.08297	0.39	n/a	No	11	0	No	0.01	Param.
Lithium, total (mg/L)	**AD-9**	**1.38**	**0.9572**	**0.39**	**n/a**	**Yes**	**11**	**0**	**No**	**0.01**	**Param.**
Mercury, total (mg/L)	AD-15	0.0001	0.00001932	0.002	n/a	No	10	20	No	0.011	NP (normality)
Mercury, total (mg/L)	AD-8	0.000025	0.00000859	0.002	n/a	No	10	60	No	0.011	NP (normality)
Mercury, total (mg/L)	AD-9	0.00003658	0.000008656	0.002	n/a	No	10	30	No	0.01	Param.
Molybdenum, total (mg/L)	AD-15	0.00309	0.0008551	0.1	n/a	No	11	36.36	No	0.01	Param.
Molybdenum, total (mg/L)	AD-8	0.002	0.0008389	0.1	n/a	No	11	63.64	No	0.006	NP (normality)
Molybdenum, total (mg/L)	AD-9	0.002	0.002	0.1	n/a	No	11	90.91	No	0.006	NP (NDs)
Selenium, total (mg/L)	AD-15	0.005	0.0009	0.05	n/a	No	11	18.18	No	0.006	NP (Cohens/xfrm)
Selenium, total (mg/L)	AD-8	0.005	0.0001	0.05	n/a	No	11	54.55	No	0.006	NP (normality)
Selenium, total (mg/L)	AD-9	0.007246	0.001409	0.05	n/a	No	11	36.36	No	0.01	Param.
Thallium, total (mg/L)	AD-15	0.00137	0.0005	0.002	n/a	No	11	72.73	No	0.006	NP (normality)
Thallium, total (mg/L)	AD-8	0.001185	0.0005	0.002	n/a	No	11	72.73	No	0.006	NP (normality)
Thallium, total (mg/L)	AD-9	0.001776	0.0001	0.002	n/a	No	11	54.55	No	0.006	NP (Cohens/xfrm)

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

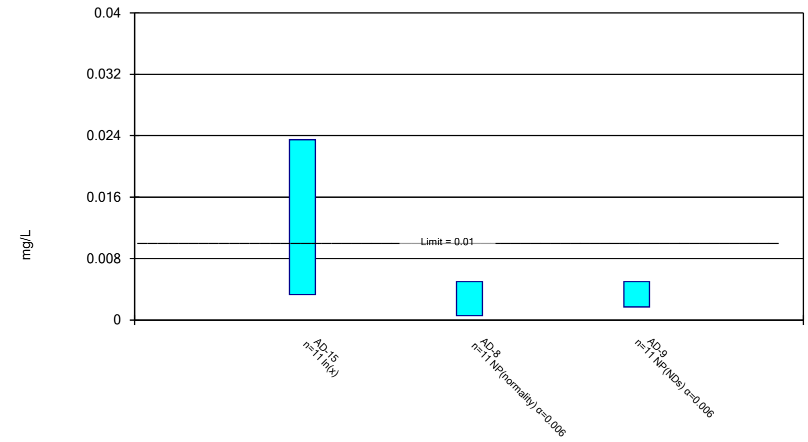


Constituent: Antimony, total   Analysis Run 6/25/2019 9:15 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

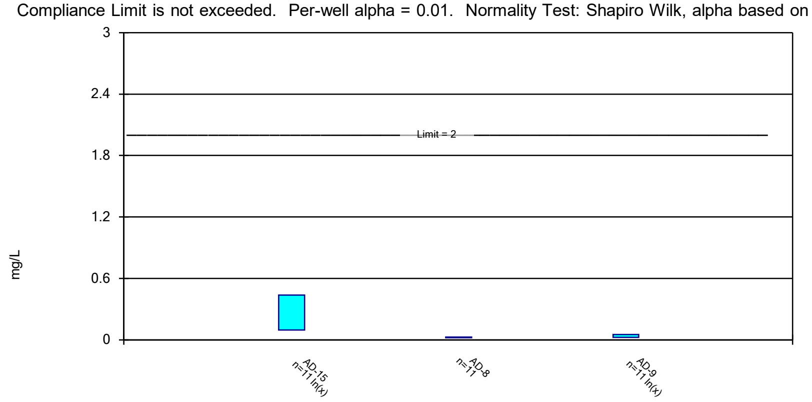


Constituent: Arsenic, total   Analysis Run 6/25/2019 9:15 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

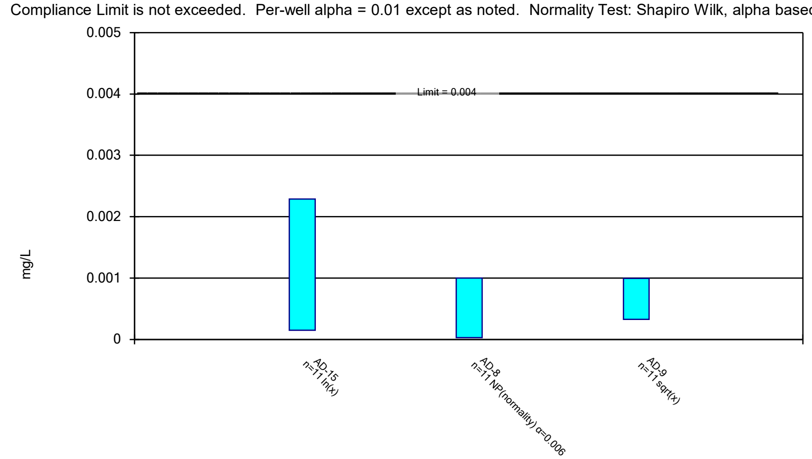


Constituent: Barium, total   Analysis Run 6/25/2019 9:15 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

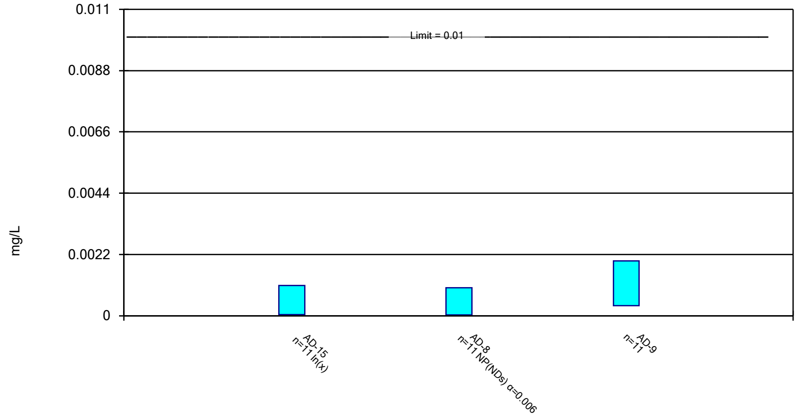


Constituent: Beryllium, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

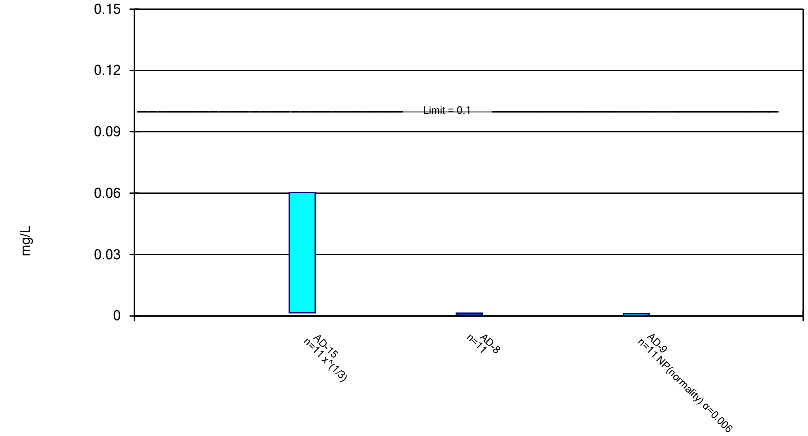


Constituent: Cadmium, total Analysis Run 6/25/2019 9:16 AM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

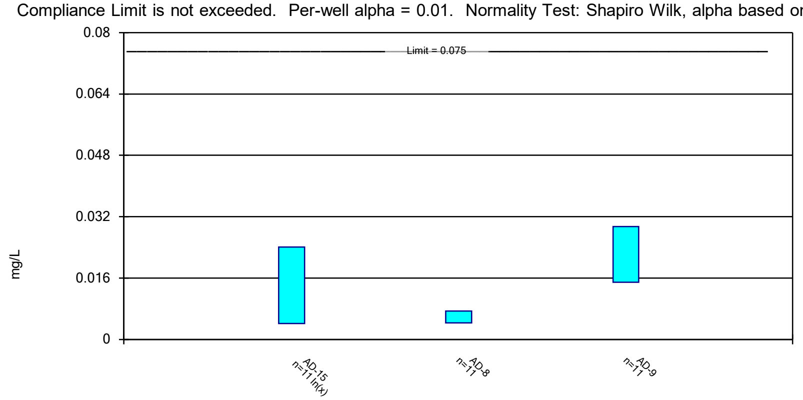


Constituent: Chromium, total Analysis Run 6/25/2019 9:16 AM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

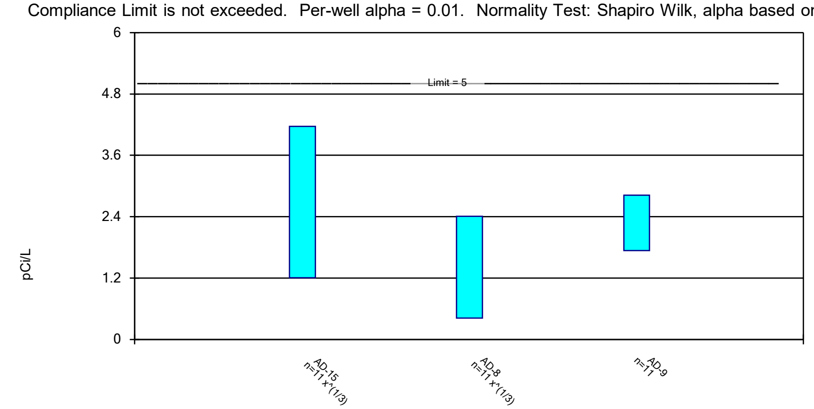


Constituent: Cobalt, total Analysis Run 6/25/2019 9:16 AM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

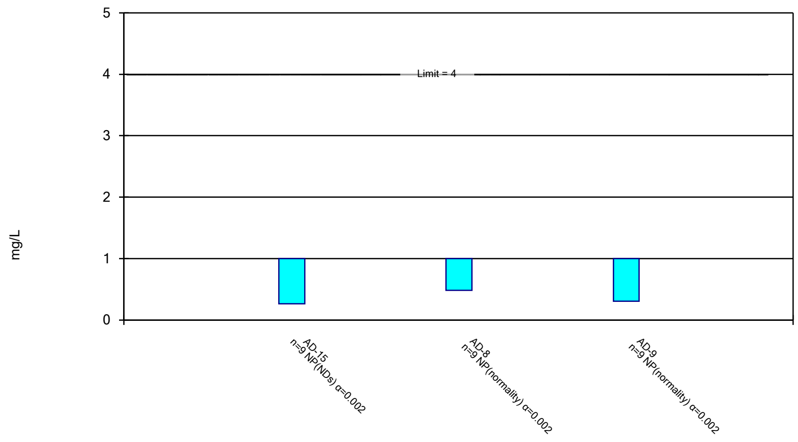


Constituent: Combined Radium 226 + 228 Analysis Run 6/25/2019 9:16 AM View: Confidence Intervals -
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

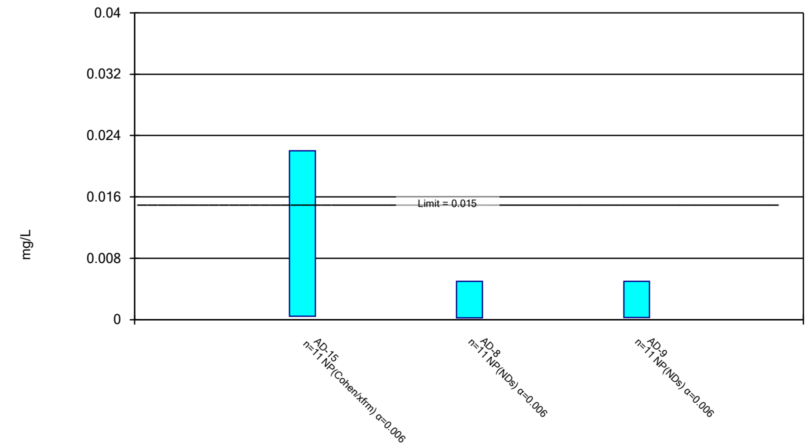


Constituent: Fluoride, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

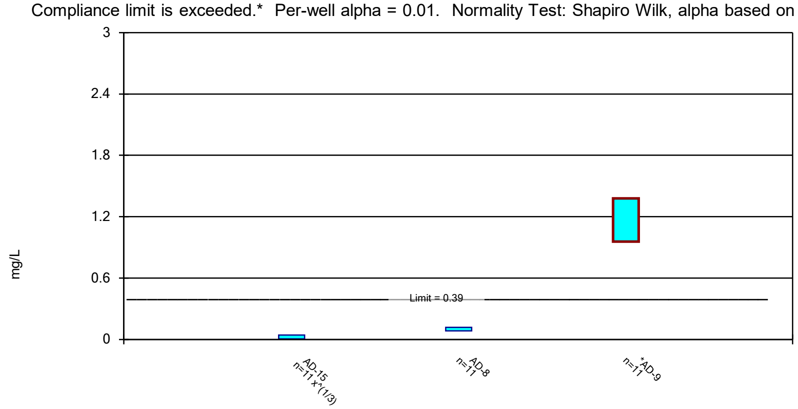


Constituent: Lead, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

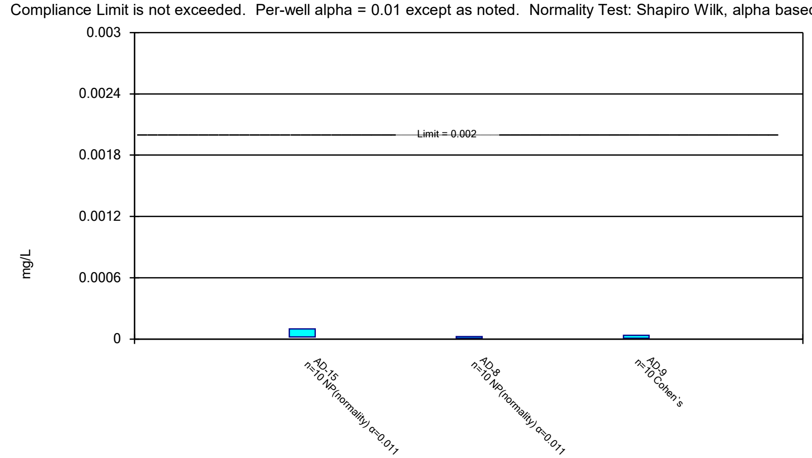


Constituent: Lithium, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

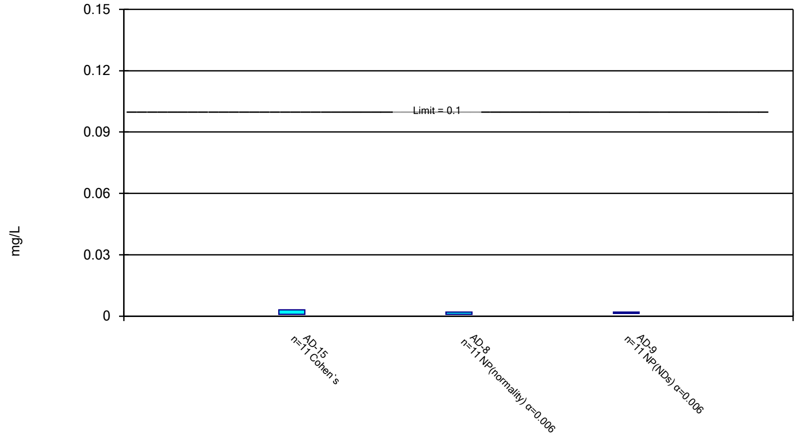


Constituent: Mercury, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



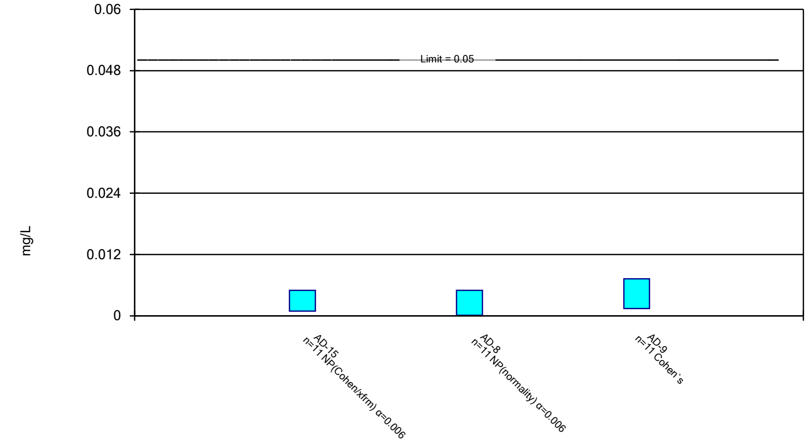
Constituent: Molybdenum, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



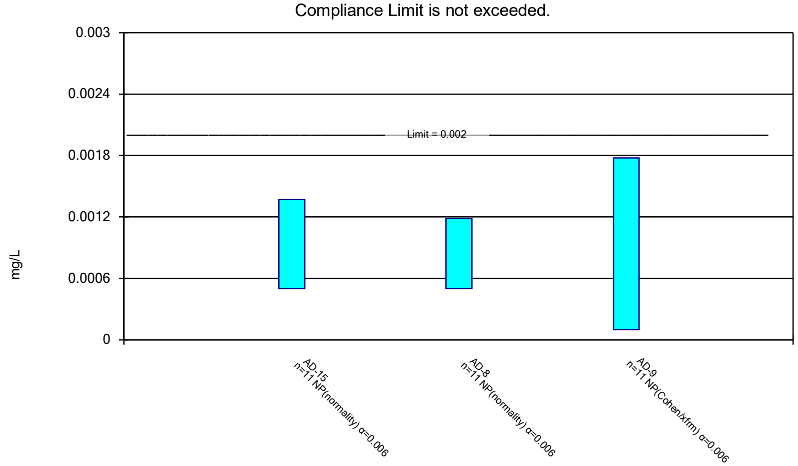
Constituent: Selenium, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.18 Sanitas software utilized by Groundwater Stats Consulting. UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Thallium, total   Analysis Run 6/25/2019 9:16 AM   View: Confidence Intervals - App IV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

STATISTICAL ANALYSIS SUMMARY
PRIMARY BOTTOM ASH POND
J. Robert Welsh Plant
Pittsburg, Texas

Submitted to

1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec consultants

engineers | scientists | innovators

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December 16, 2019

CHA8473

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LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LFB	Laboratory Fortified Blanks
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
PBAP	Primary Bottom Ash Pond
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Primary Bottom Ash Pond (PBAP), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron at the PBAP. An alternative source was not identified at the time, so the PBAP has been in assessment monitoring since. Groundwater protection standards (GWPS) were set in accordance with 40 CFR 257.95(d)(2) and a statistical evaluation of the assessment monitoring data was conducted. During the most recent assessment monitoring event, completed in February 2019, an SSL was identified for lithium at well AD-9. A successful alternative source demonstration (ASD) was completed per 40 CFR 257.95(g)(3); therefore, the PBAP remained in assessment monitoring. Two assessment monitoring events were conducted at the PBAP in May and July 2019, in accordance with 40 CFR 257.95(b) and (d) respectively. The results of these events are documented in this report.

Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were re-established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. An SSL was identified for lithium. Thus, either the unit will move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

PRIMARY BOTTOM ASH POND EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, two sets of samples were collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(b) (May 2019) and 257.95(d)(1) (July 2019). Samples from both sampling events were analyzed for the Appendix III and Appendix IV parameters. A summary of data collected during these assessment monitoring events may be found in Table 1.

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

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.23 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the PBAP were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained in May and July 2019 were screened for potential outliers. No outliers were identified.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with 40 CFR 257.95(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in 40 CFR 257.95(h)(2) for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for barium, beryllium, cadmium, and combined radium. Non-parametric tolerance limits were calculated for antimony, arsenic, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, and selenium due to apparent non-normal distributions and for thallium due to a high non-detect frequency. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

The following SSL was identified at the Welsh PBAP:

- The LCL for lithium exceeded the GWPS of 0.390 mg/L at AD-9 (0.916 mg/L).

As a result, the Welsh PBAP will either move to an assessment of corrective measures or an alternative source demonstration will be conducted to evaluate if the unit can remain in assessment monitoring.

2.2.3 Establishment of Appendix III Prediction Limits

Upper prediction limits (UPL) were previously established for all Appendix III parameters following the background monitoring period (Geosyntec, 2018). Intrawell tests were used to evaluate potential SSIs for calcium, chloride, fluoride, sulfate, and TDS, whereas interwell tests were used to evaluate potential SSIs for boron and pH. While interwell prediction limits have been updated periodically during the assessment monitoring period as sufficient data became available, this represents the first update to the background dataset for parameters evaluated using intrawell tests.

Mann-Whitney (Wilcoxon rank-sum) tests were performed to determine whether the newer data are affected by a release from the PBAP. Because the interwell Appendix III limits and the Appendix IV GWPSs are based on data from upgradient wells which we would not expect to have been impacted by a release, these tests were used for intrawell Appendix III tests only. Mann-Whitney tests were used to compare the medians of historical data (May 2016 - June 2017) to the new compliance samples (October 2017 – February 2019) for calcium, chloride, fluoride, sulfate, and TDS. Results were evaluated to determine if the medians of the two groups were similar at the 99% confidence level. Where no significant difference was found, the new compliance data were added to the background dataset. Where a statistically significant difference was found between the medians of the two groups, the data were reviewed to evaluate the cause of the difference and to determine if adding newer data to the background dataset, replacing the background dataset with the newer data, or continuing to use the existing background dataset was most appropriate. If the differences appeared to have been caused by a release, then the previous background dataset would have continued to be used.

The complete Mann-Whitney test results and a summary of the significant findings can be found in Attachment B. Significant differences were found between the two groups for chloride in upgradient well AD-5. However, because AD-5 is an upgradient monitoring well and more recent data are similar to background and better represent the groundwater quality upgradient of the facility, the background dataset was updated to include the compliance data for chloride at AD-5.

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

UPLs were updated using all the historical data through February 2019 to represent background values. LPLs were also updated for pH. The updated prediction limits are summarized in Table 3. Intrawell tests continued to be used to evaluate potential SSIs for calcium, chloride, fluoride, sulfate, and TDS, whereas interwell tests continued to be used to evaluate potential SSIs for boron and pH. The intrawell UPLs were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result did not exceed the UPL, a second sample was not collected. The retesting procedures allowed achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.2.4 Evaluation of Potential Appendix III SSIs

While SSLs were identified, a review of the Appendix III results were also completed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations.

Appendix III data collected during the July 2019 assessment monitoring event in accordance with 257.95(d) were compared to the prediction limits to evaluate results above background values. The results from the May and July 2019 events and the prediction limits are summarized in Table 4. The following exceedances of the upper prediction limits (UPLs) were noted:

- Boron concentrations exceeded the interwell UPL of 0.700 mg/L at AD-8 (1.21 mg/L).

- The pH measurements were recorded below the interwell LPL of 4.8 SU at AD-15 (3.2 SU).

Based on these results, concentrations of Appendix III parameters exceeded background levels at compliance wells at the Welsh PBAP during assessment monitoring.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the May and July 2019 data. GWPSs were re-established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. An SSL was identified for lithium. Appendix III parameters were compared to recalculated prediction limits, with exceedances identified for boron and pH measurements recorded below the LPL.

Based on this evaluation, the Welsh PBAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can remain in assessment monitoring.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – Welsh Plant. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Primary Bottom Ash Pond, J. Robert Welsh Plant, Pittsburg, Texas. January 15, 2018.

TABLES

Table 1 - Groundwater Data Summary
Welsh - Primary Bottom Ash Pond

Component	Unit	AD-1		AD-5		AD-8		AD-9		AD-15		AD-17	
		5/30/2019	7/24/2019	5/30/2019	7/24/2019	5/29/2019	7/23/2019	5/29/2019	7/23/2019	5/29/2019	7/23/2019	5/30/2019	7/24/2019
Antimony	µg/L	0.160	0.0800 J	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.0500 J	0.0300 J	0.100 U	0.100 U
Arsenic	µg/L	0.600	0.390	3.05	2.48	0.370	0.410	0.200	1.39	2.95	2.10	0.410	1.07
Barium	µg/L	512	245	60.5	77.4	30.3	31.0	49.7	32.1	203	113	19.6	14.3
Beryllium	µg/L	0.244	0.540	0.0800 J	0.0500 J	0.100 U	0.100 U	0.941	0.361	1.50	0.573	0.0200 J	0.130
Boron	mg/L	0.689	0.644	0.0300 J	0.0400 J	1.07	1.21	0.0600 J	0.0810	0.100 U	0.306	0.158	0.113
Cadmium	µg/L	0.0100 J	0.0200 J	0.0500 U	0.0500 U	0.0200 J	0.0200 J	0.210	0.0600	0.0800	0.0400 J	0.0300 J	0.0300 J
Calcium	mg/L	138	62.7	30.0	41.1	16.9	20.8	10.1	222	2.97	3.45	202	216
Chloride	mg/L	1.59	2.00	22.3	18.0	19.5	15.0	44.0	77.0	21.4	28.0	41.7	37.0
Chromium	µg/L	0.100 J	0.100 J	0.0600 J	0.0500 J	0.100 J	0.0900 J	0.346	0.200 J	9.31	2.26	0.246	0.228
Cobalt	µg/L	0.756	0.789	11.8	8.38	6.03	7.07	15.9	12.7	5.49	5.41	51.1	57.7
Combined Radium	pCi/L	2.72	1.82	1.43	2.53	0.911	0.720	1.36	1.69	3.55	2.25	2.51	3.45
Fluoride	mg/L	0.290	0.106 J	0.290	0.112 J	0.890	0.559 J	0.160	0.574 J	0.0600 J	0.0860 J	0.200 U	0.0850 J
Lead	µg/L	0.197	0.100 J	0.0500 J	0.200 U	0.0700 J	0.0800 J	0.0700 J	0.200 J	9.85	2.87	0.0300 J	0.263
Lithium	mg/L	0.0300 U	0.00557	0.104	0.108	0.0670	0.0641	0.225	1.11	0.0100 J	0.00414	0.341	0.283
Mercury	mg/L	0.0000250 U	0.0000250 U	0.00000600 J	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.0000810	0.0000250	0.0000250 U	0.0000250 U
Molybdenum	µg/L	2.43	2.00 J	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
Selenium	µg/L	1.40	3.40	0.0500 J	0.0600 J	0.0600 J	0.0800 J	0.200	0.400	5.10	1.60	0.0600 J	0.100 J
Total Dissolved Solids	mg/L	588	180	238	354	324	392	1760	2460	34.0	214	1550	1860
Sulfate	mg/L	43.3	58.0	51.3	90.0	150	145	503	1700	2.10	18.0	1120	1130
Thallium	µg/L	0.500 U	0.500 U	0.500 U	0.500 U	0.100 J	0.100 J	0.200 J	0.500 U	0.100 J	0.500 U	0.500 U	0.500 U
pH	SU	6.71	5.97	6.33	6.30	5.45	6.58	3.61	6.28	4.85	3.17	6.06	5.96

Notes:
µg/L: micrograms per liter
mg/L: milligrams per liter
pCi/L: picocuries per liter
SU: standard unit
U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit
J: Estimated value. Parameter was detected in concentrations below the reporting limit

Table 2: Groundwater Protection Standards
Welsh Plant - Primary Bottom Ash Pond

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL
Antimony, Total (mg/L)	0.006		0.005
Arsenic, Total (mg/L)	0.01		0.005
Barium, Total (mg/L)	2		0.62
Beryllium, Total (mg/L)	0.004		0.00079
Cadmium, Total (mg/L)	0.005		0.0037
Chromium, Total (mg/L)	0.1		0.004
Cobalt, Total (mg/L)	n/a	0.006	0.075
Combined Radium, Total (pCi/L)	5		4.11
Fluoride, Total (mg/L)	4		1
Lead, Total (mg/L)	n/a	0.015	0.005
Lithium, Total (mg/L)	n/a	0.04	0.39
Mercury, Total (mg/L)	0.002		0.000033
Molybdenum, Total (mg/L)	n/a	0.1	0.005
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.002

Notes:

Grey cell indicates calculated UTL is higher than MCL or CCR Rule-specified value.

MCL = Maximum Contaminant Level

Calculated UTL (Upper Tolerance Limit) represents site-specific background values.

The higher of the calculated UTL or MCL/Rule-Specified Level is used as the GWPS.

Table 3: Revised Prediction Limits
Welsh Plant - Primary Bottom Ash Pond

Parameter	Unit	Description	AD-8	AD-9	AD-15
Boron	mg/L	Interwell Background Value (UPL)	0.700		
Calcium	mg/L	Intrawell Background Value (UPL)	32.4	299	5.40
Chloride	mg/L	Intrawell Background Value (UPL)	35.5	138	38.8
Fluoride	mg/L	Intrawell Background Value (UPL)	0.737	1.00	1.00
pH	SU	Interwell Background Value (UPL)	7.0		
		Interwell Background Value (LPL)	4.8		
Sulfate	mg/L	Intrawell Background Value (UPL)	230	2530	33.2
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	553	3070	249

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

Table 4: Appendix III Data Summary
Welsh Plant - Primary Bottom Ash Pond

Parameter	Unit	Description	AD-8		AD-9		AD-15	
			5/29/2019*	7/23/2019	5/29/2019*	7/23/2019	5/29/2019*	7/23/2019
Boron	mg/L	Interwell Background Value (UPL)	0.700					
		Detection Monitoring Result	1.07	**1.21**	0.0600	0.0810	0.0200	0.306
Calcium	mg/L	Intrawell Background Value (UPL)	32.4		299		5.40	
		Detection Monitoring Result	16.9	20.8	10.1	222	2.97	3.45
Chloride	mg/L	Intrawell Background Value (UPL)	35.5		138		38.8	
		Detection Monitoring Result	19.5	15.0	44.0	77.0	21.4	28.0
Fluoride	mg/L	Intrawell Background Value (UPL)	0.737		1.00		1.00	
		Detection Monitoring Result	0.890	0.559	0.160	0.574	0.0600	0.0860
pH	SU	Interwell Background Value (UPL)	7.0					
		Interwell Background Value (LPL)	4.8					
		Detection Monitoring Result	5.5	6.6	3.6	6.3	4.9	**3.2**
Sulfate	mg/L	Intrawell Background Value (UPL)	230		2530		33.2	
		Detection Monitoring Result	150	145	503	1700	2.10	18.0
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	553		3070		249	
		Detection Monitoring Result	324	392	1760	2460	34.0	214

Notes:
UPL: Upper prediction limit
LPL: Lower prediction limit
Bold values exceed the background value.
*257.95(b) results not used to determine SSI

Background values are shaded gray.

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Welsh Primary Bottom Ash Pond CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

STATE OF TEXAS
DAVID ANTHONY MILLER
112498
LICENSED
PROFESSIONAL ENGINEER

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature

112498	TEXAS	12.17.19
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS
CONSULTING

December 8, 2019

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

Re: Welsh PBAP - Assessment Monitoring Event & Background Update 2019

Dear Ms. Kreinberg,

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

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-1, AD-5, and AD-17; and
- **Downgradient wells:** AD-8, AD-9, and AD-15.

Data were sent electronically, and the statistical analysis was reviewed by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was conducted according to the Statistical Analysis Plan prepared by GSC and approved by Dr. Cameron.

The CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) **-** boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

- **Appendix IV** (Assessment Monitoring) – antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium.

Time series plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells. Values flagged as outliers may be seen in the Outlier Summary following this letter (Figure C) and are plotted in a lighter font and disconnected symbol on the time series graphs. Note that the measured concentrations of most metals for September 30, 2016 at well AD-15 are very high compared to the rest of the observations, which suggests a possible laboratory problem. These values were flagged as outliers as they do not appear to represent the population at this well.

Summary of Statistical Method:

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

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

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

- Nonparametric prediction limits are used on data containing greater than 50% nondetects.

Summary of Background Screening Conducted in December 2017

Outlier Evaluation

Time series plots are used to identify suspected outliers, or extreme values that would result in limits that are not conservative from a regulatory perspective, in proposed background data. Suspected outliers at all wells for Appendix III 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 a few outliers that were flagged as outliers and a summary of those values was submitted with the screening. The outliers identified by Tukey's test for TDS in well AD-15, however, were not flagged as these values were not unusual to the data set at the time and were similar to observations reported in neighboring wells. Flagged values may be seen in a lighter font on the time series graphs. Note that reporting limits have recently decreased; therefore, no nondetect substitution was made for the data. During the next background update, the more historical and higher reporting limits may be deselected providing there are sufficient samples to construct statistical limits.

No true seasonal patterns were observed on the time series plots for any of the detected data; therefore, no deseasonalizing adjustments were made to the data. When seasonal patterns are observed, data may be deseasonalized so that the resulting limits will correctly account for the seasonality as a predictable pattern rather than random variation or a release. It was noted that for each constituent evaluated, the highest concentrations are reported in the upgradient wells.

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

The results of the trend analyses showed a couple statistically significant decreasing trends that were relatively low in magnitude when compared to average concentrations; therefore, no adjustments were required.

Appendix III – Determination of Spatial Variation

The Analysis of Variance (ANOVA) was used to statistically evaluate differences in average concentrations among upgradient wells, which assists in identifying the most appropriate statistical approach. Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when average concentrations are similar across upgradient wells. Intrawell tests, which compare compliance data from a single well to screened historical data within the same well, are appropriate when upgradient wells exhibit spatial variation; when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; and when downgradient water quality is unimpacted compared to upgradient water quality for the same parameter.

All Appendix III parameters except pH exhibited variation when evaluated using the ANOVA. Therefore, these parameters were further evaluated as described for the appropriateness of intrawell testing to accommodate the groundwater quality. A summary table of the ANOVA results is included with the reports.

Appendix III - Statistical Limits

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

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

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

Parametric tolerance limits were constructed with a target of 99% confidence and 95% coverage using pooled upgradient well data for each of the Appendix III parameters. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. As more data are collected, the background population is better represented and the confidence and coverage levels increase.

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

Confidence intervals for the above parameters were found to be within their respective background limit for all Appendix III parameters with the exception of boron. Therefore, intrawell methods are recommended for calcium, chloride, fluoride, sulfate and TDS; and interwell methods are initially recommended for boron as well as pH which the ANOVA identified as having no variation among upgradient wells. As mentioned earlier, if a demonstration supports natural variation in groundwater, intrawell methods will be considered for all parameters.

All available data through June 2017 at each well were used to establish intrawell background limits for the parameters identified above based on a 1-of-2 resample plan that will be used for future comparisons. Interwell prediction limits, combined with a 1-of-2 resample plan, were constructed from upgradient wells for boron and pH.

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 will be necessary to accommodate these types of changes In the interwell case, newer data will be included in background during each sample event after screening the upgradient well data for any new outliers. Data will also be periodically evaluated for statistically significant trends, and earlier data may be deselected prior to construction of statistical limits so that limits represent present-day conditions. In the intrawell case, data for all wells and constituents are re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater quality. In some cases as well, 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.

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.

November 2019 - Background Update

Data were re-evaluated using Tukey's outlier test and visual screening with the February 2019 samples. Boron and pH are tested using interwell prediction limits and, therefore, only upgradient wells were tested for outliers for these constituents (Figure C). All other Appendix III parameters, which use intrawell prediction limits, were tested for outliers at each well (Figure C). Tukey's test did not identify any outliers except for TDS at well AD-15. This value was not flagged as an outlier during the initial background screening due to the limited number of samples. However, as more samples have been collected, it does not appear to represent the population at this well and was flagged accordingly as an outlier. Due to data transformations used in Tukey's test, several values were not identified as outliers. However, several values were flagged in the database as outliers because the measurements were significantly different that remaining measurements in the record. A list of all outliers flagged may be seen in the outlier summary (Figure C). The previously flagged outliers at this well were not included during this analysis.

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through June 2017 to the new compliance samples at each well through February 2019 to evaluate whether the groups are statistically different at the 99% confidence level, in which case background data may not be updated with more recent compliance data (Figure D). No statistically significant differences were found except for chloride in upgradient well AD-5.

Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background are not updated to include the newer data but will be reconsidered in the future. The chloride concentrations in upgradient well AD-5 are lower than those noted in upgradient well AD-17 and follow a similar pattern. Therefore, the background record was updated with more recent data through February 2019 for chloride in well AD-5 as these data represent natural variability in groundwater quality upgradient of the facility. All data will be reevaluated during the next background update, and earlier measurements will be deselected if they no longer represent present-day groundwater quality. Therefore, all records were updated with data through February 2019. A summary of these results follows this letter and the significant test results are included with the Mann Whitney test section at the end of this report.

Intrawell prediction limits using all historical data reported through February 2019, combined with a 1-of-2 resample plan, were constructed and a summary of the updated limits follows this letter (Figure E).

The Sen's Slope/Mann Kendall trend test was used to evaluate data at upgradient wells for boron and pH to identify statistically significant increasing or decreasing trends. The results of the trend analyses showed all data are consistent over time with no statistically significant increasing or decreasing trends (Figure F).

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells for the same time period for boron and pH (Figure G). Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent. A summary table of the updated limits may be found following this letter in the Prediction Limit Summary Tables.

Evaluation of Appendix IV Parameters

Upper tolerance limits were used to calculate background limits from all available pooled upgradient well data for Appendix IV parameters to determine the Alternate Contaminant Level (ACL) for each constituent (Figure H). Background data are screened for outliers and extreme trending patterns that would lead to artificially elevated statistical limits. Any flagged values may be seen on the Outlier Summary following this letter. Parametric tolerance limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure I).

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters and compared to the highest limit of the MCL, CCR-Rule specified level, or ACL as discussed above (Figure J). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence intervals exceedances were found except for lithium in well AD-9. A summary of the confidence interval results follows this letter.

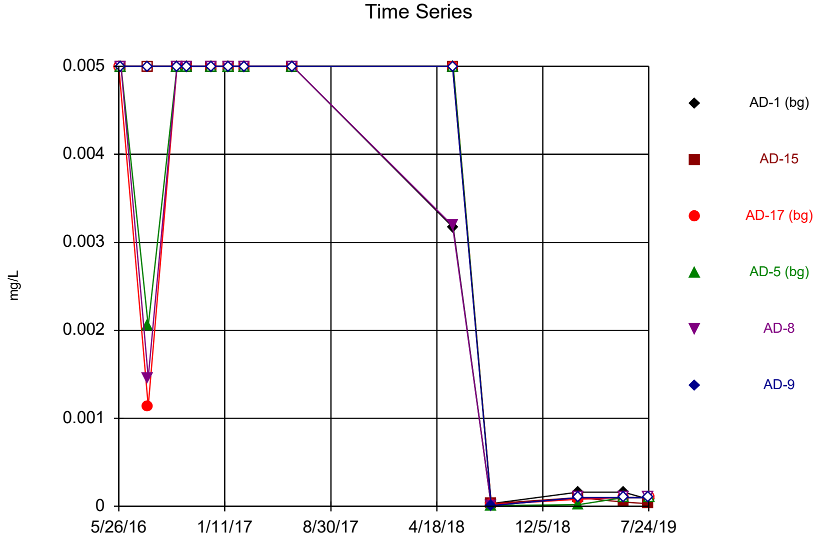
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Welsh PBAP. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

Kristina Rayner

Kristina L. Rayner
Groundwater Statistician

Sanitas™ v.9.6.23 . UG
Hollow symbols indicate censored values.



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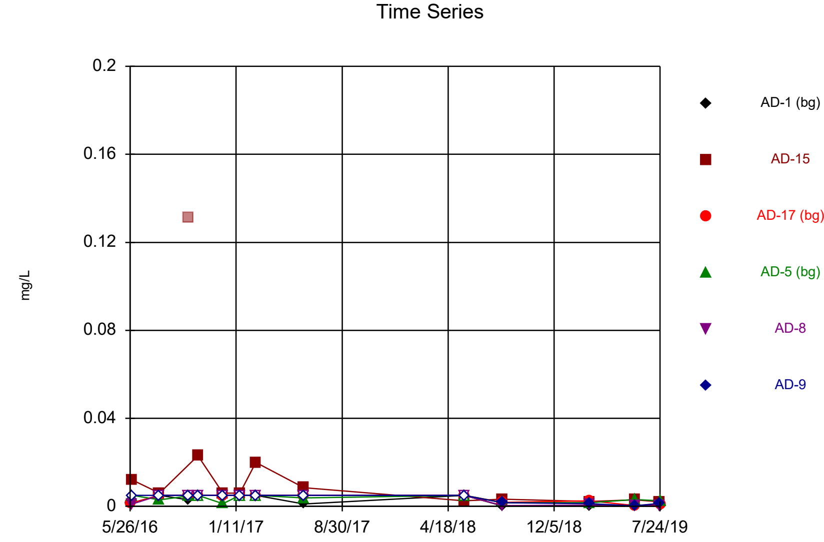
Hollow symbols indicate censored values.



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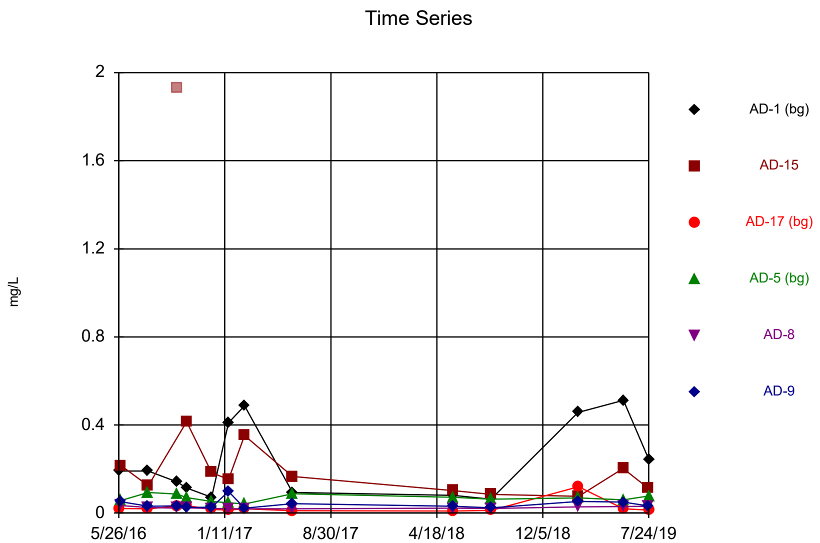

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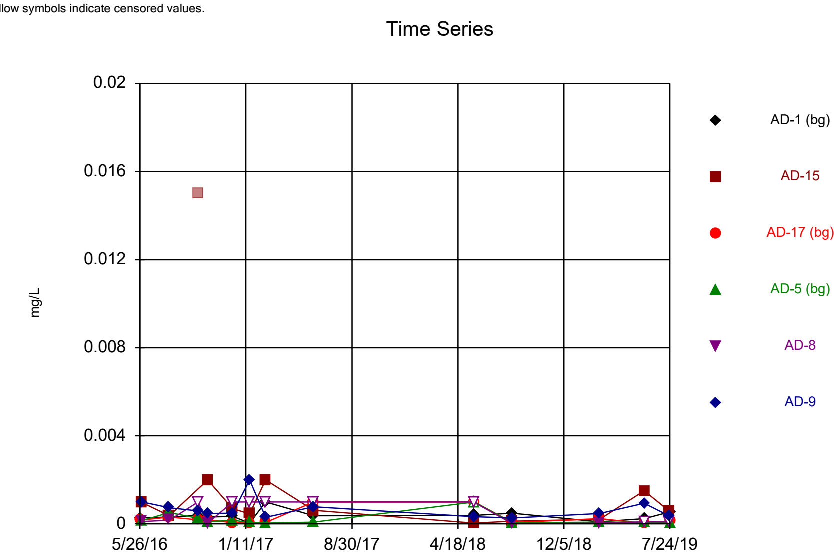

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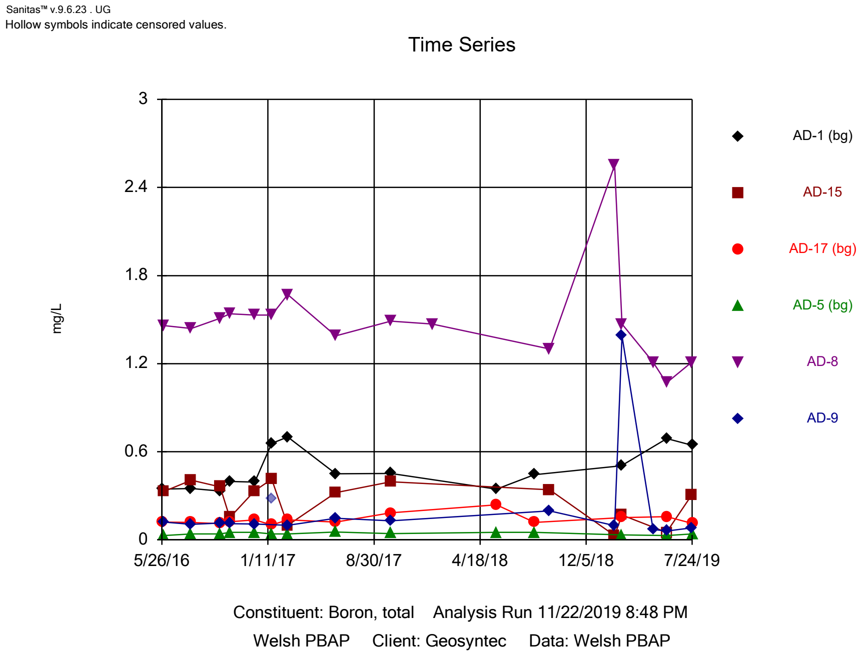
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Hollow symbols indicate censored values.
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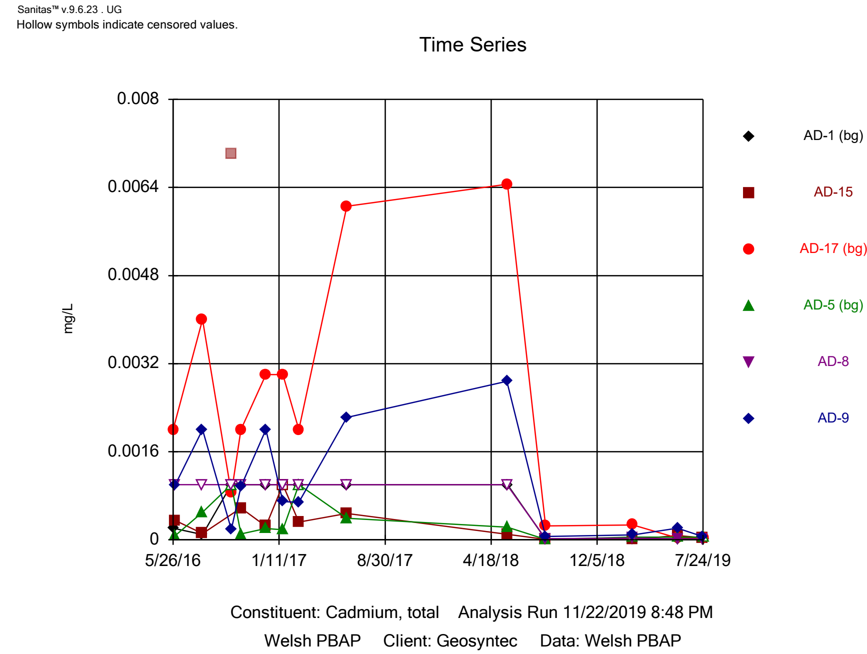
8/30/17
4/18/18
12/5/18
7/24/19
AD-1 (bg)
AD-15
AD-17 (bg)
AD-5 (bg)
AD-8
AD-9
Constituent: Boron, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP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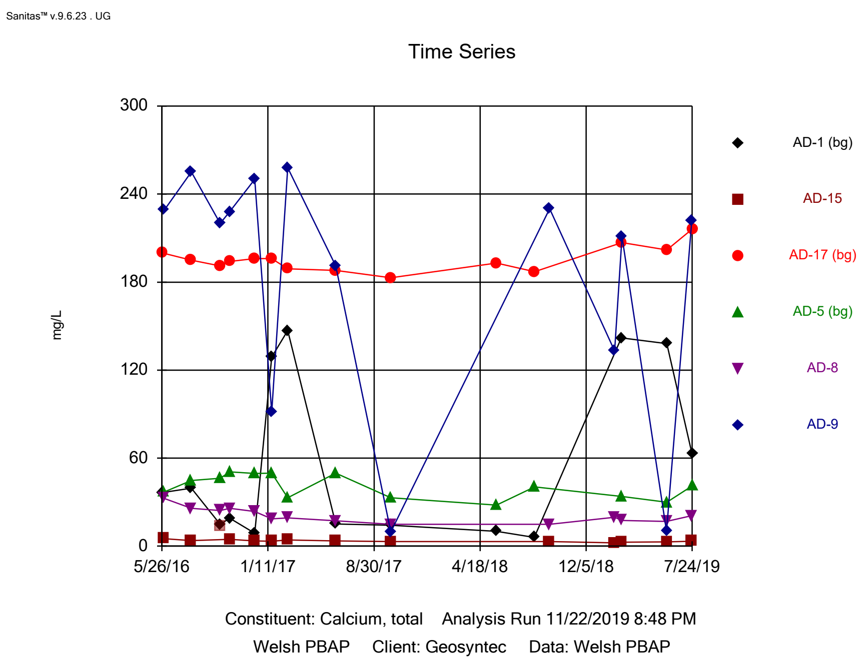
AD-1 (bg)
AD-15
AD-17 (bg)
AD-5 (bg)
AD-8
AD-9
Constituent: Cadmium, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP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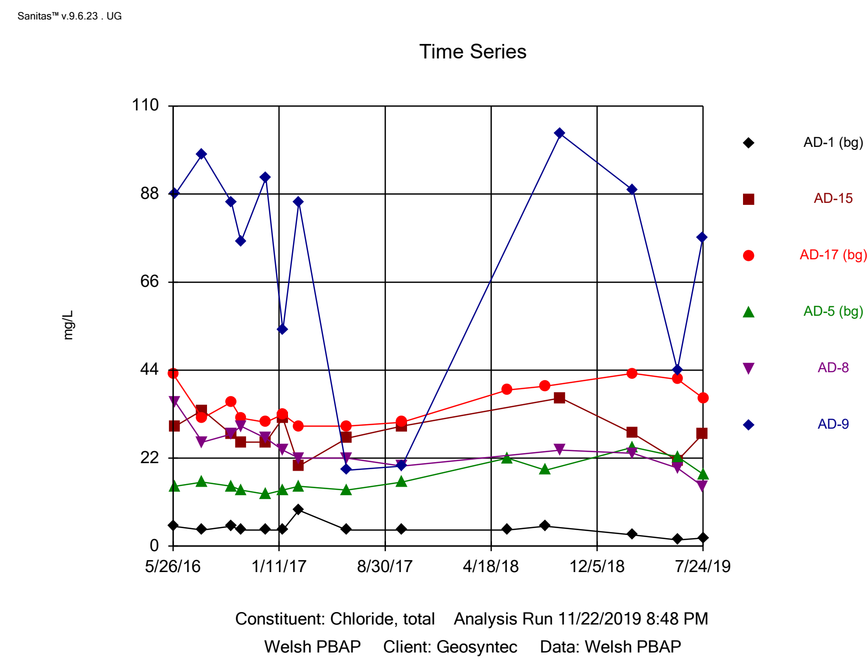
4/18/18
12/5/18
7/24/19
AD-1 (bg)
AD-15
AD-17 (bg)
AD-5 (bg)
AD-8
AD-9
Constituent: Calcium, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP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AD-5 (bg)
AD-8
AD-9
Constituent: Chloride, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG
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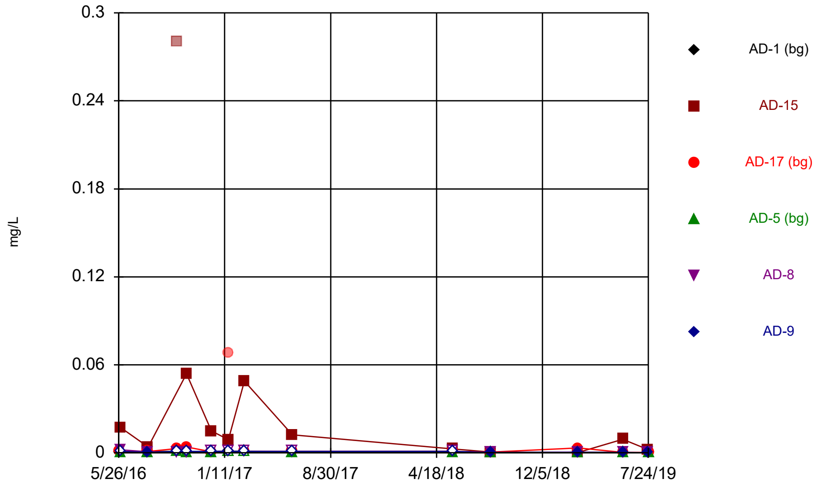

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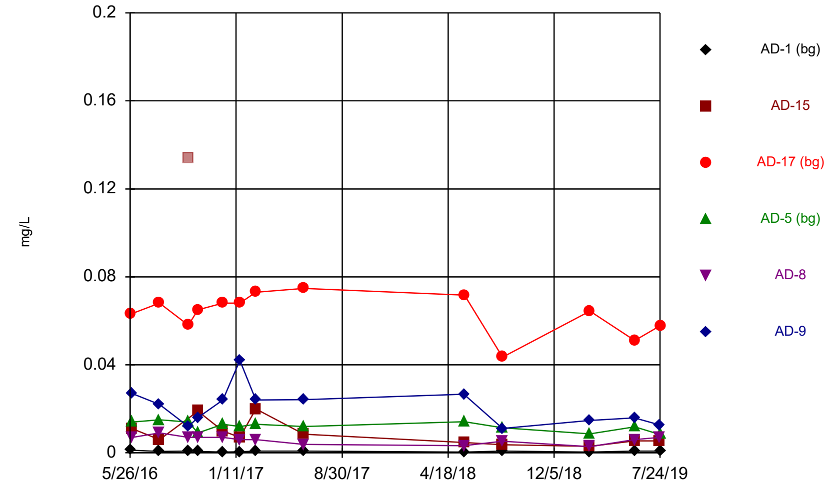
Sanitas™ v.9.6.23 . UG

Time Series



Constituent: Cobalt, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

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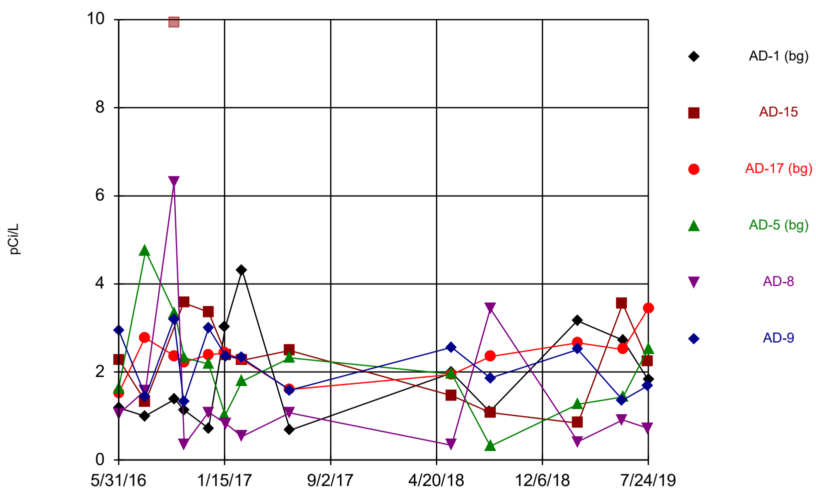
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG
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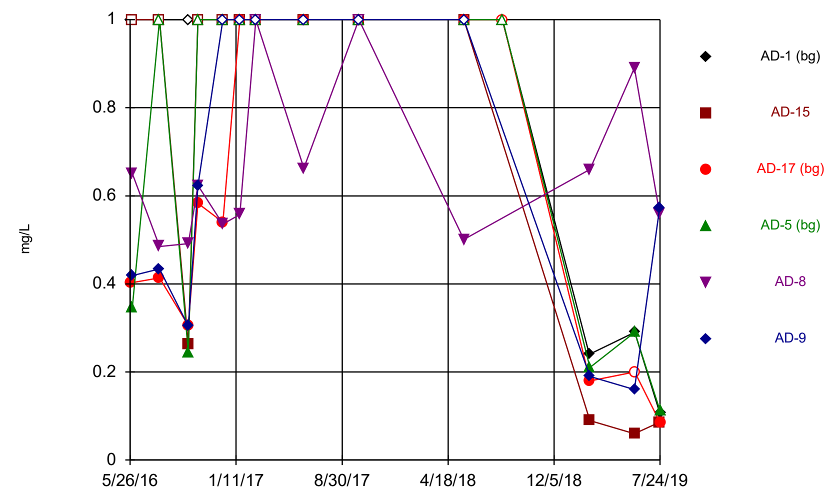
Time Series



Constituent: Fluoride, total Analysis Run 11/22/2019 8:48 PM
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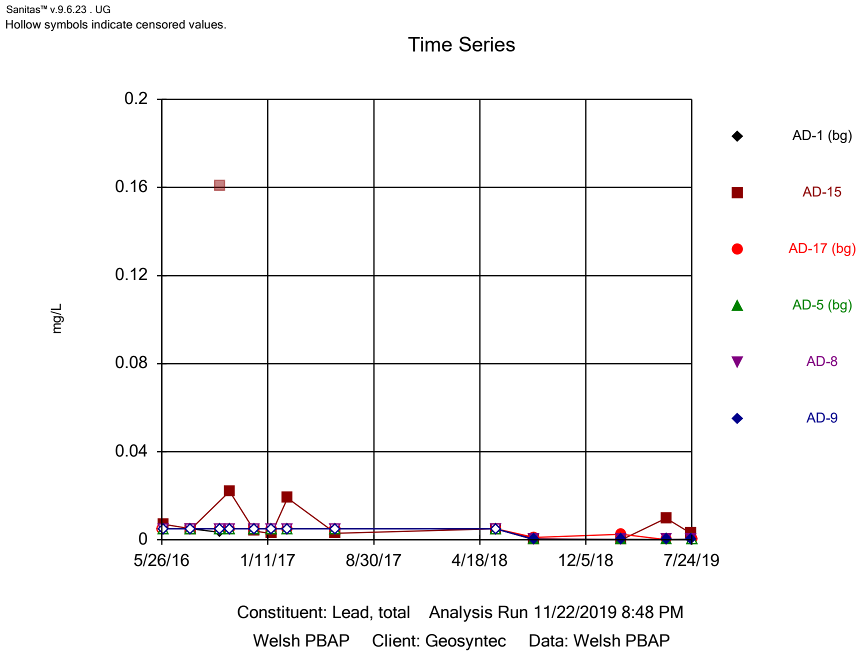
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Hollow symbols indicate censored values.
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AD-1 (bg)
AD-15
AD-17 (bg)
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AD-8
AD-9
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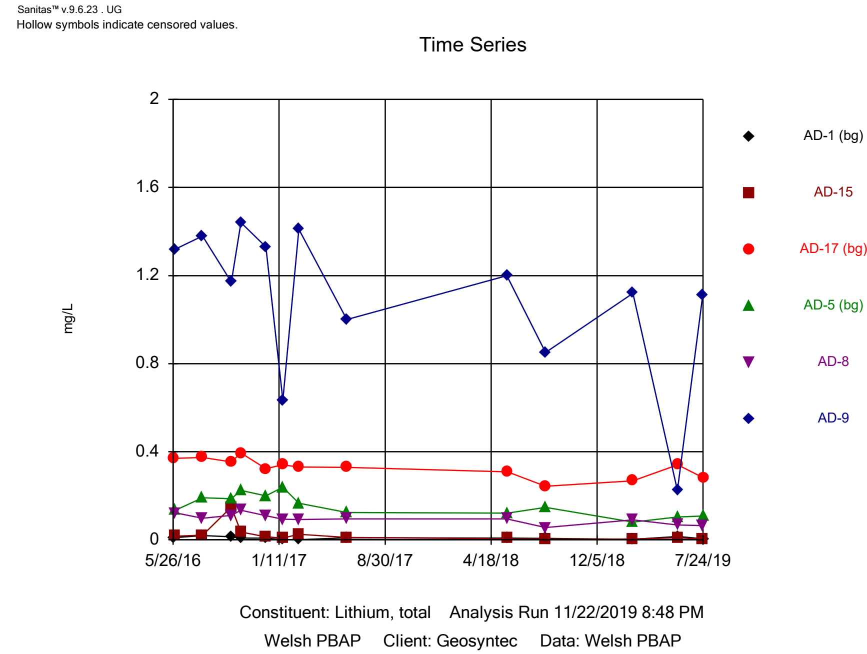
Welsh PBAP Client: Geosyntec Data: Welsh PBAP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Hollow symbols indicate censored values.
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mg/L
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0.8
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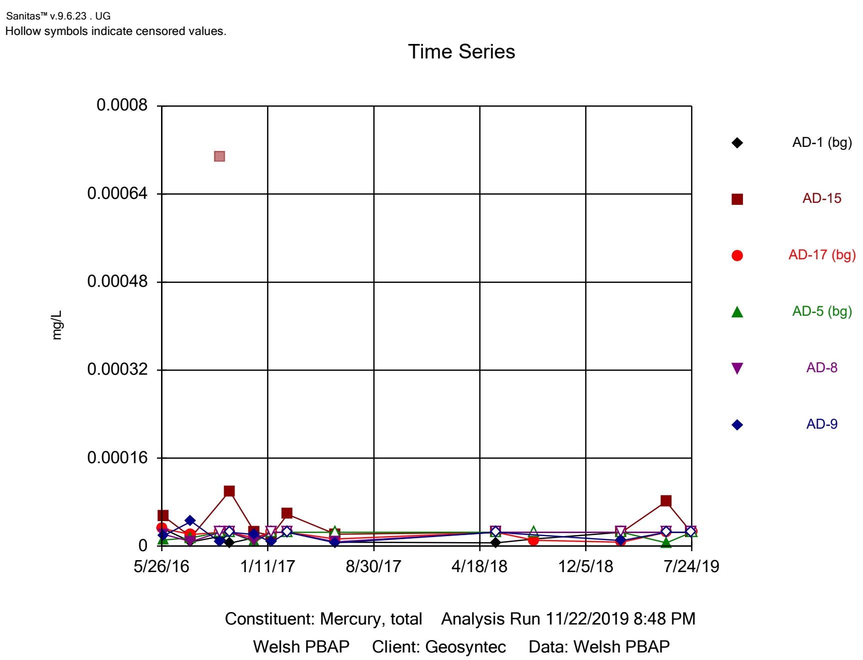
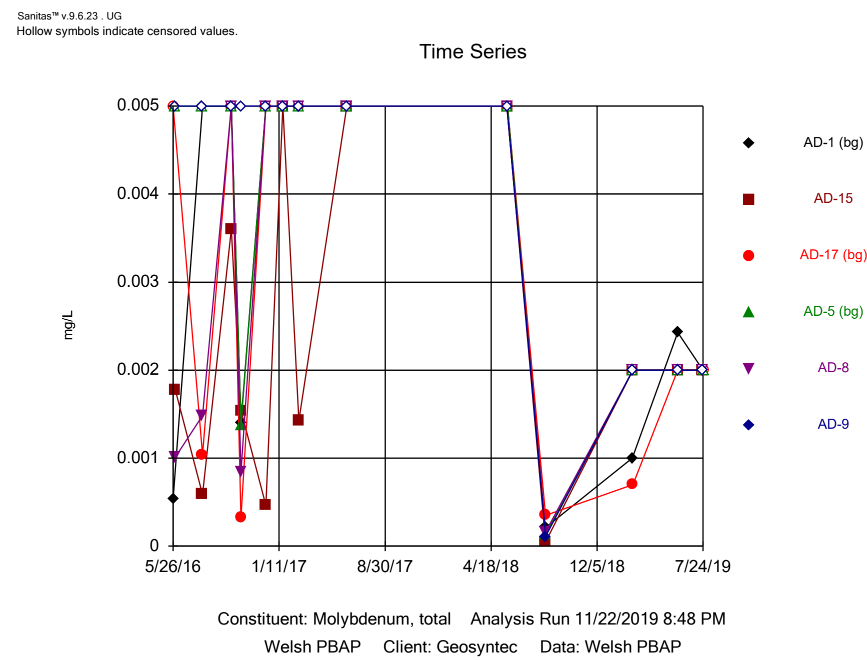
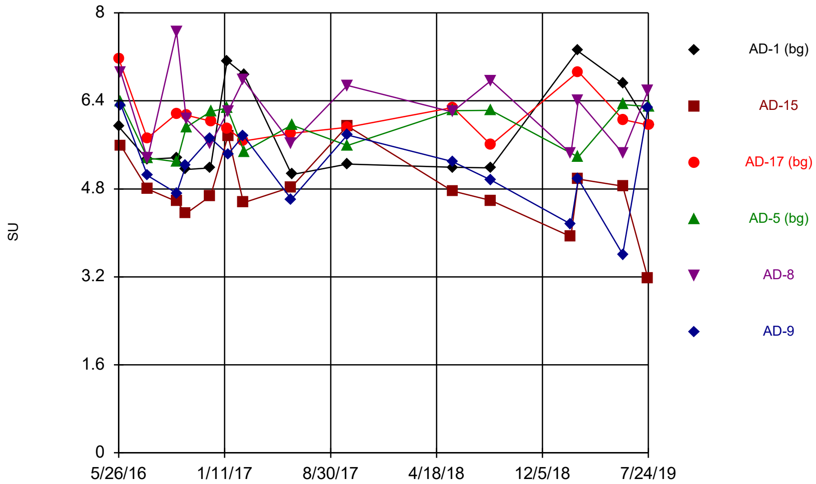
4/18/18
12/5/18
7/24/19
AD-1 (bg)
AD-15
AD-17 (bg)
AD-5 (bg)
AD-8
AD-9
Constituent: Lithium, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.0008
0.00064
0.00048
0.00032
0.00016
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
AD-1 (bg)
AD-15
AD-17 (bg)
AD-5 (bg)
AD-8
AD-9
Constituent: Mercury, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Hollow symbols indicate censored values.
Time Series
mg/L
0.005
0.004
0.003
0.002
0.001
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
AD-1 (bg)
AD-15
AD-17 (bg)
AD-5 (bg)
AD-8
AD-9
Constituent: Molybdenum, total Analysis Run 11/22/2019 8:48 PM
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Time Series



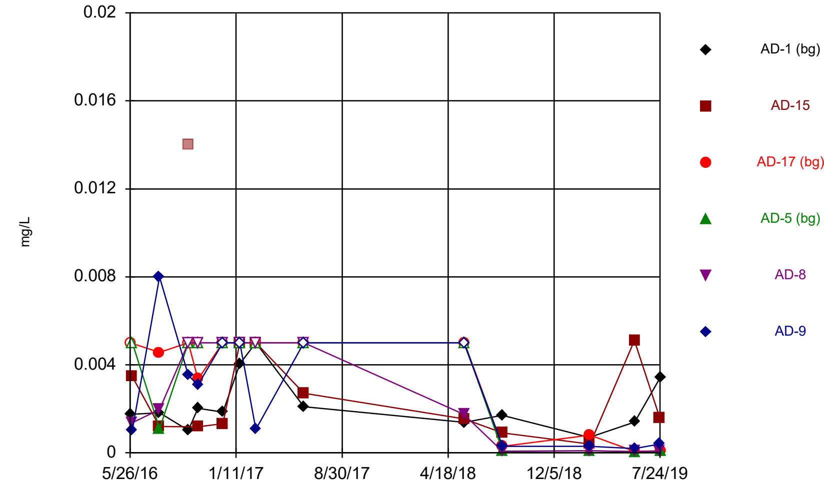
Constituent: pH, field Analysis Run 11/22/2019 8:48 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Hollow symbols indicate censored values.

Time Series

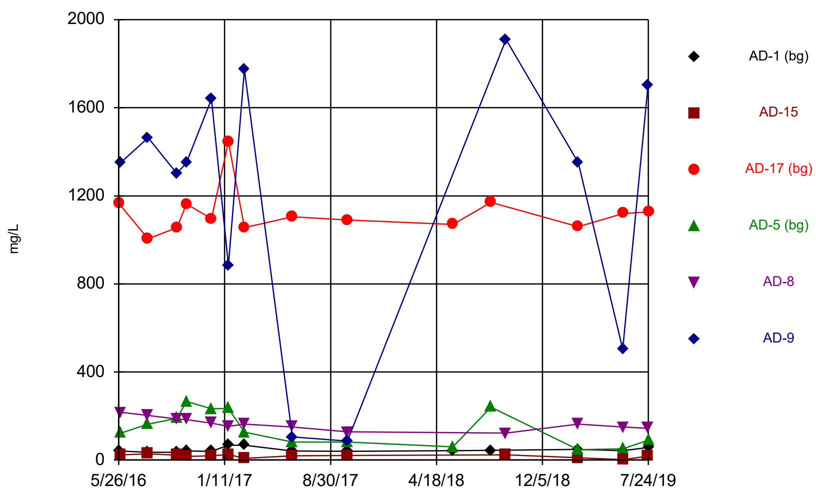


Constituent: Selenium, total Analysis Run 11/22/2019 8:48 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Time Series



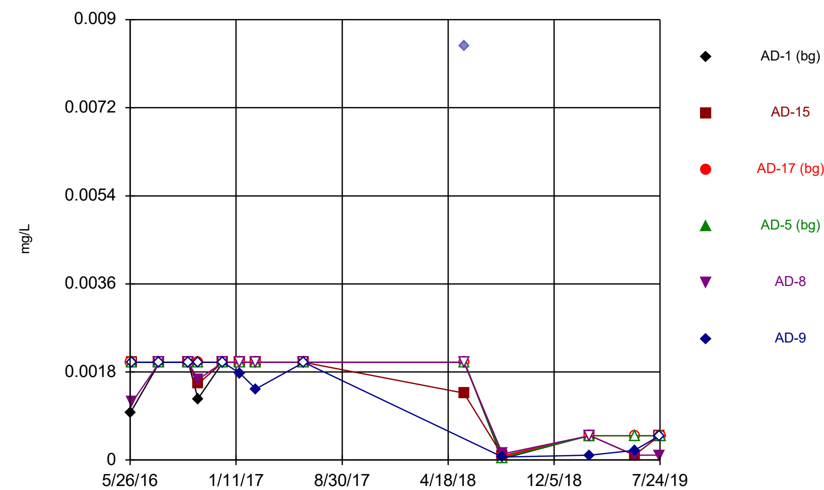
Constituent: Sulfate, total Analysis Run 11/22/2019 8:48 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Hollow symbols indicate censored values.

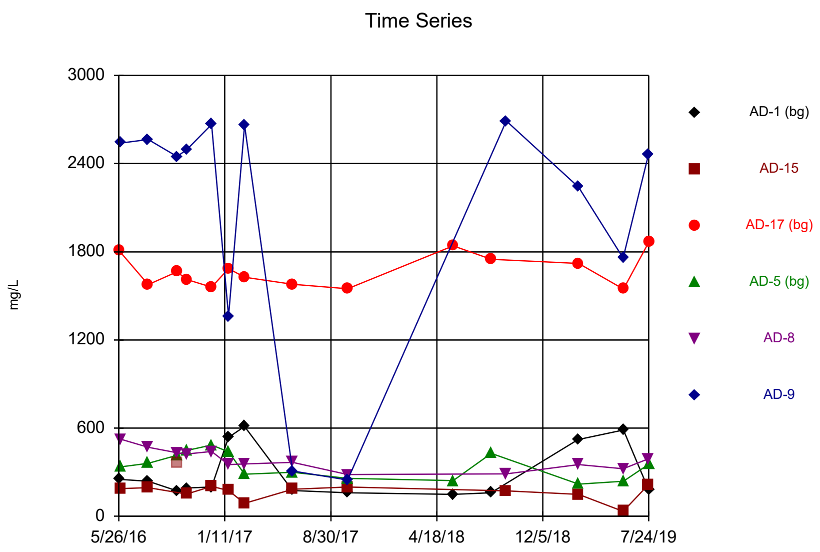
Time Series



Constituent: Thallium, total Analysis Run 11/22/2019 8:48 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

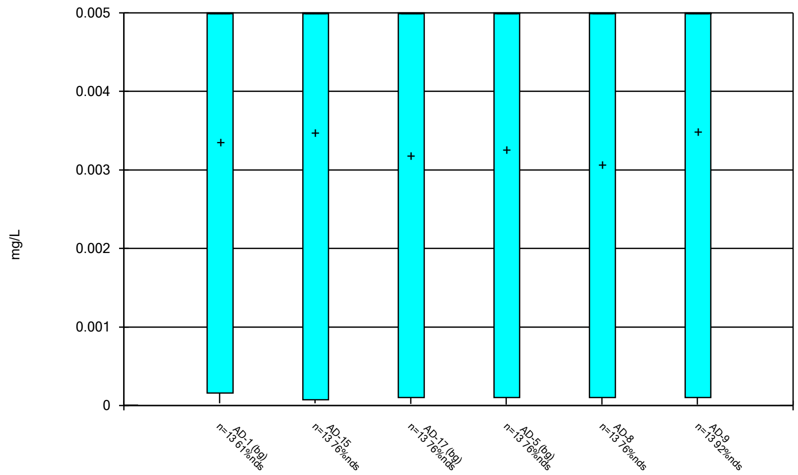


Constituent: Total Dissolved Solids Analysis Run 11/22/2019 8:48 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

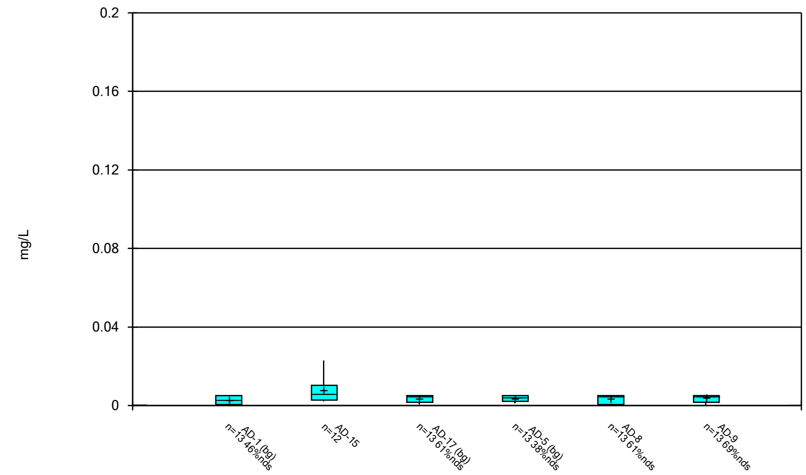


Constituent: Antimony, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

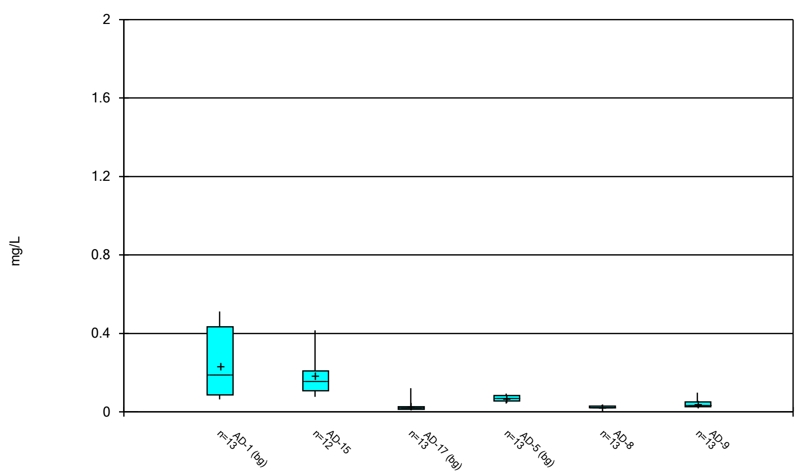


Constituent: Arsenic, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

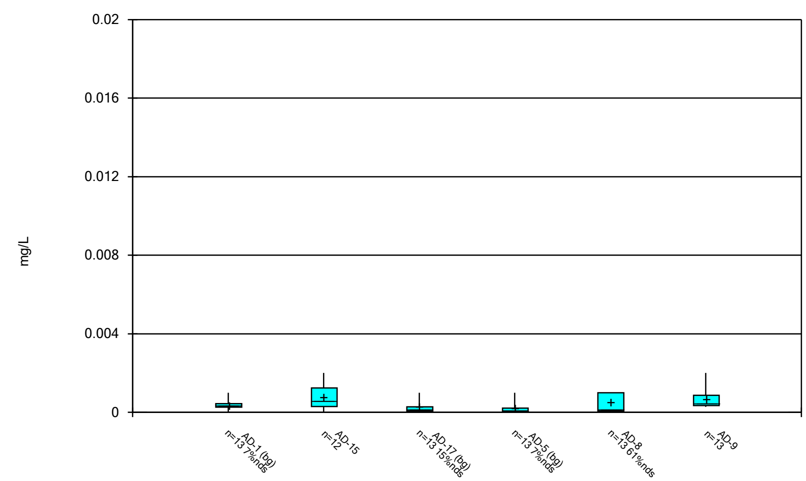


Constituent: Barium, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

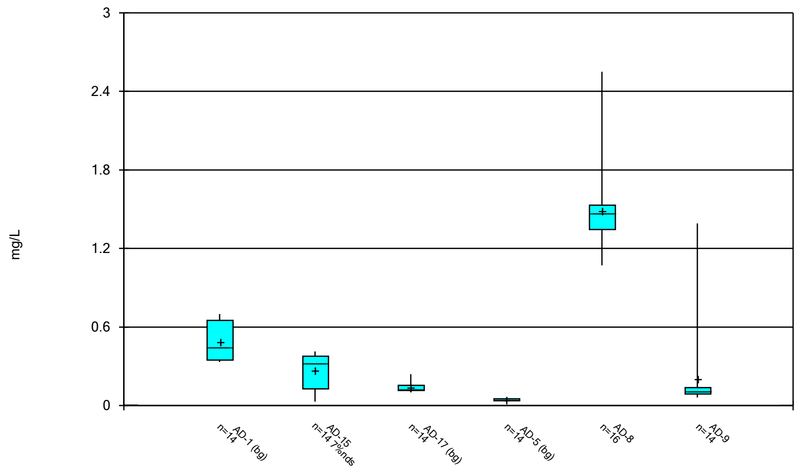


Constituent: Beryllium, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

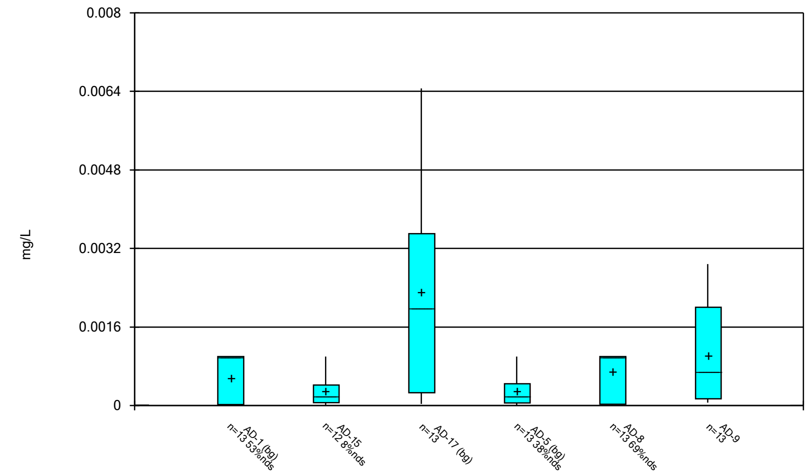


Constituent: Boron, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

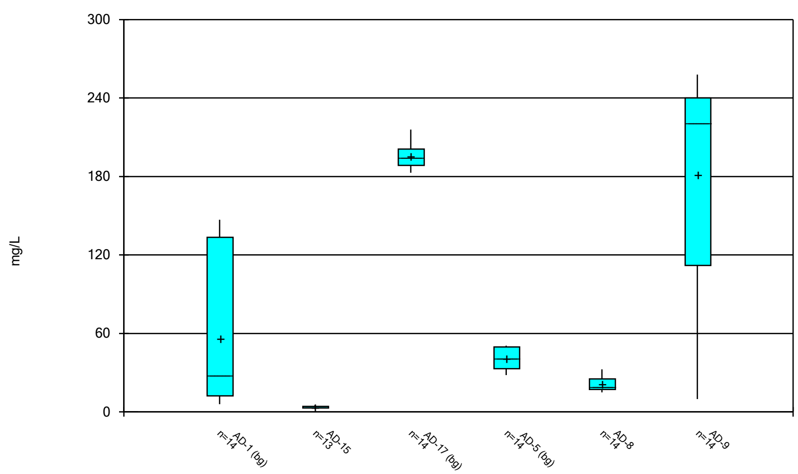


Constituent: Cadmium, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

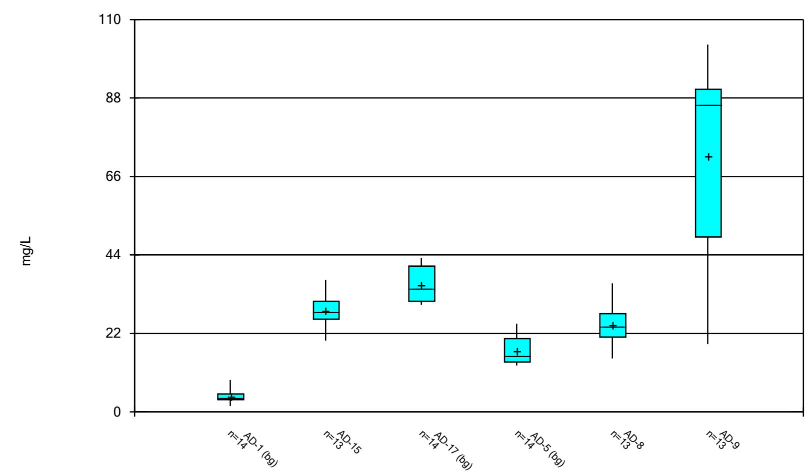


Constituent: Calcium, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

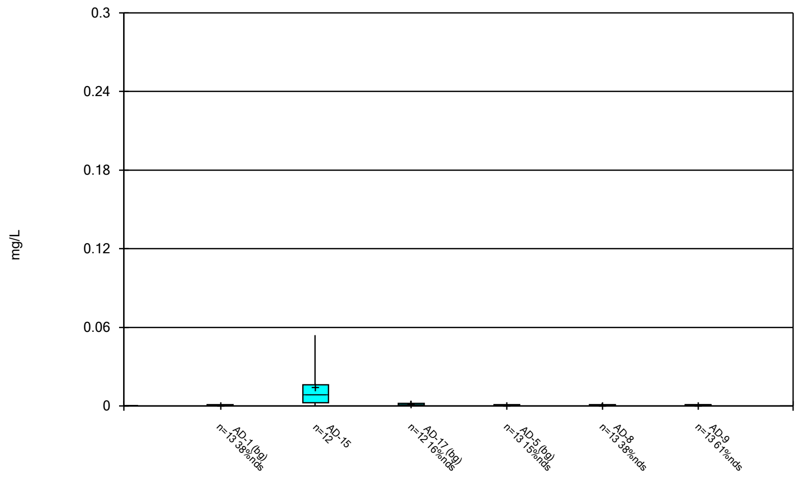


Constituent: Chloride, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

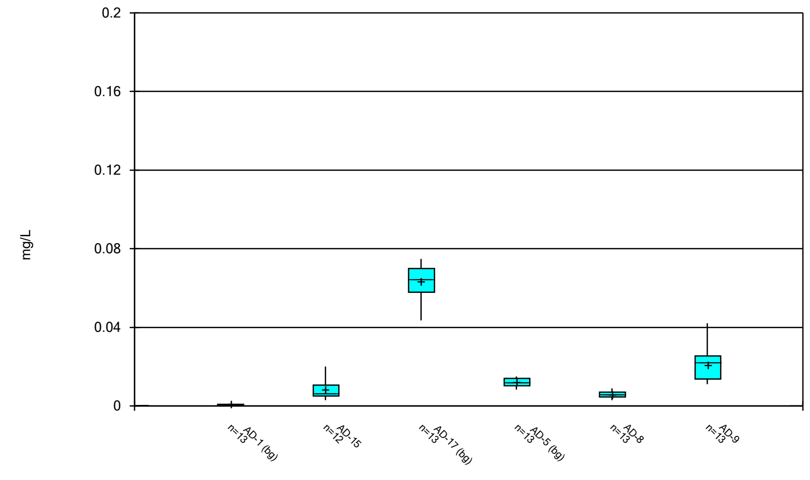


Constituent: Chromium, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

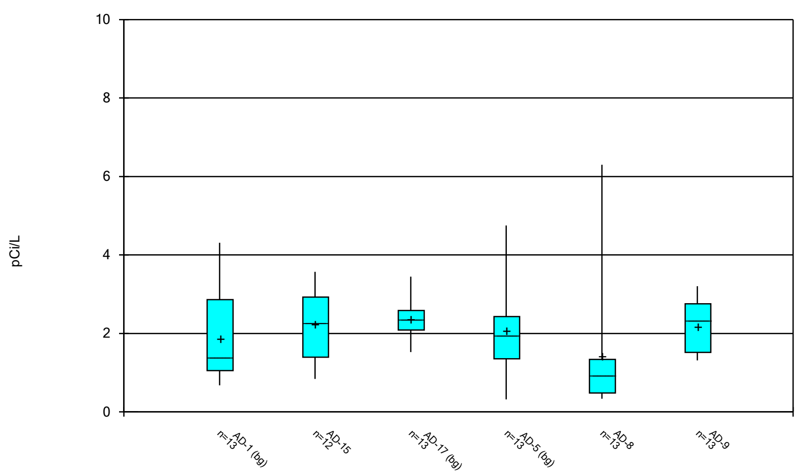


Constituent: Cobalt, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

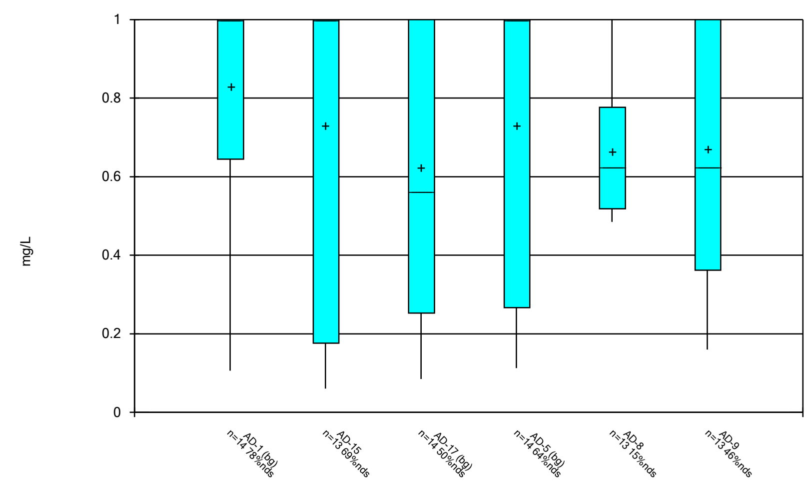


Constituent: Combined Radium 226 + 228   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

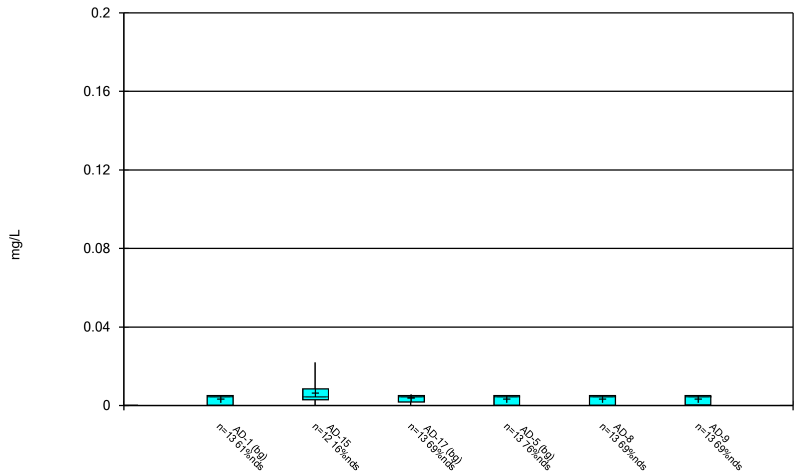


Constituent: Fluoride, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

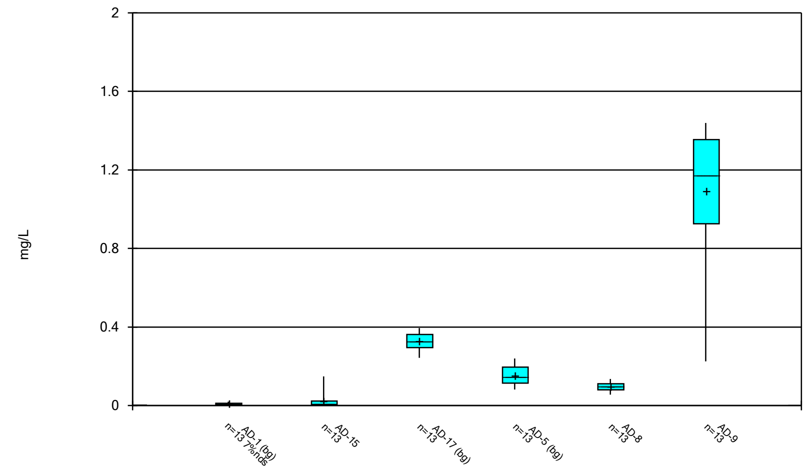


Constituent: Lead, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

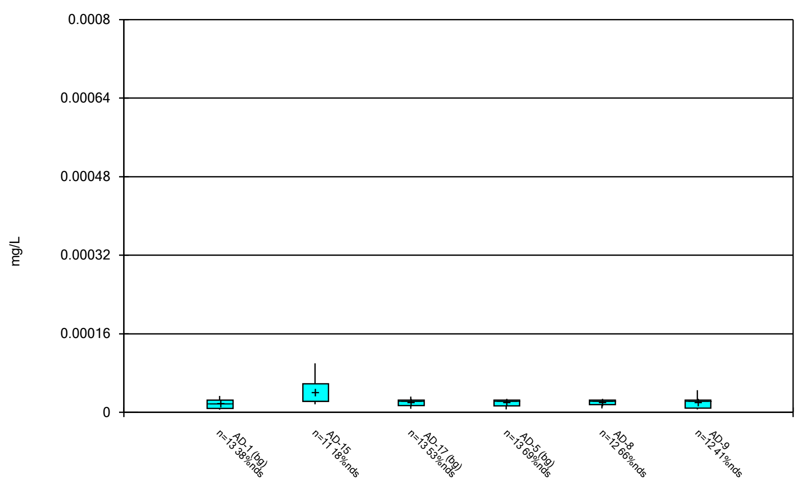


Constituent: Lithium, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

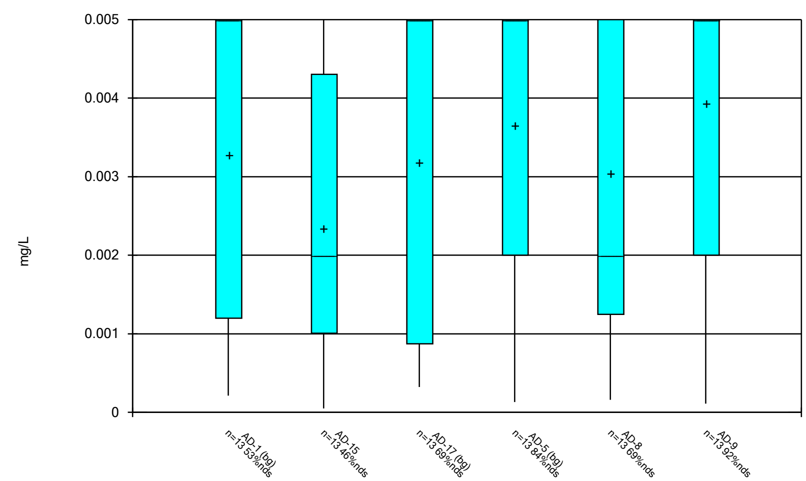


Constituent: Mercury, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

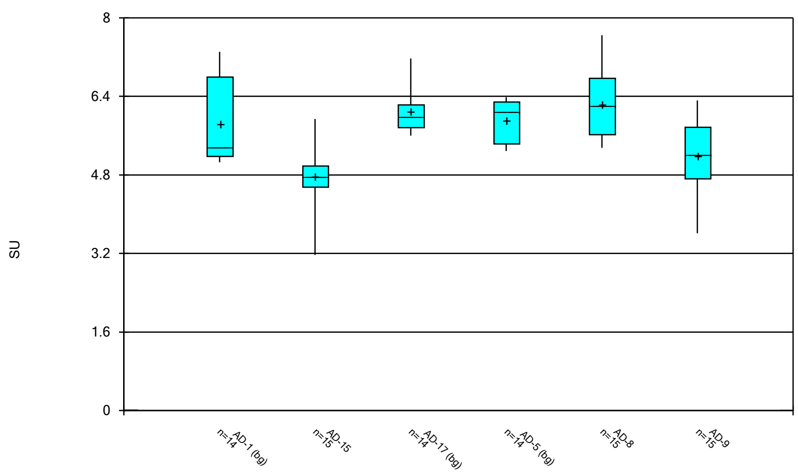


Constituent: Molybdenum, total Analysis Run 11/22/2019 8:38 PM

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

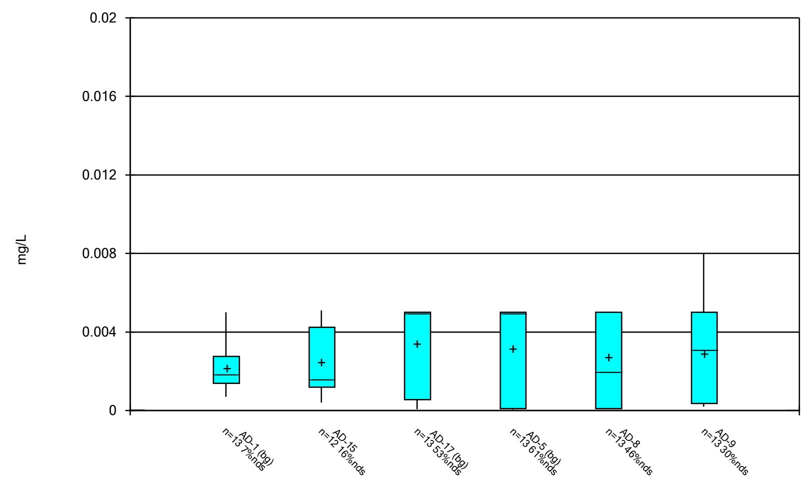


Constituent: pH, field   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

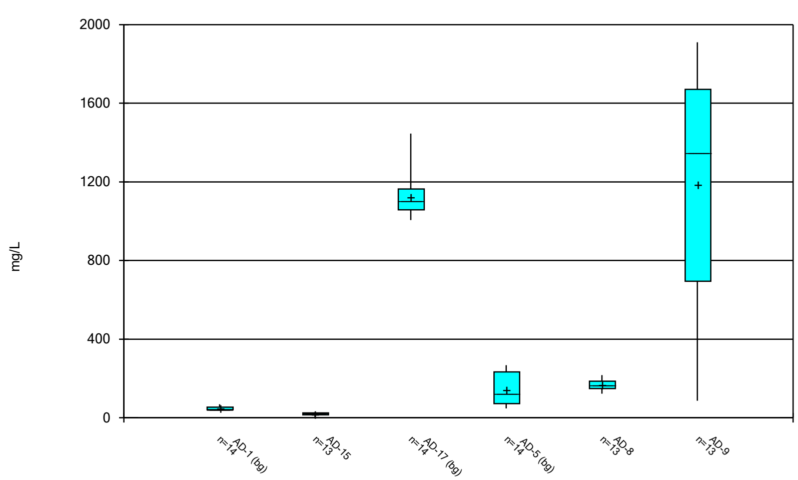


Constituent: Selenium, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Box & Whiskers Plot

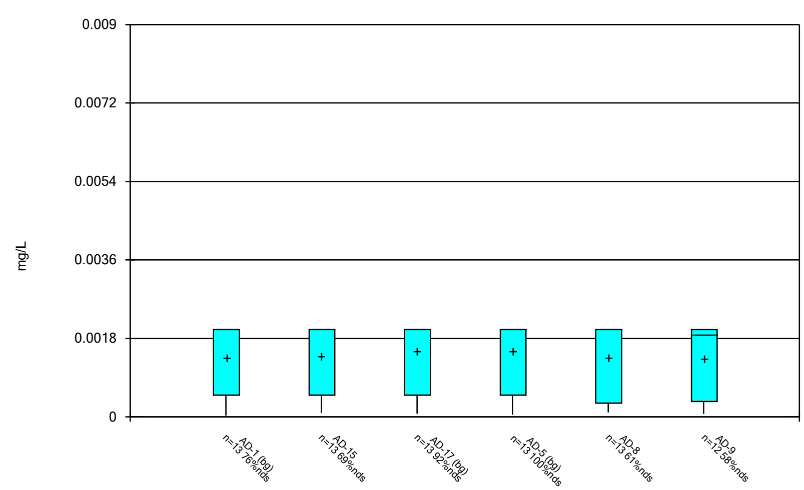


Constituent: Sulfate, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

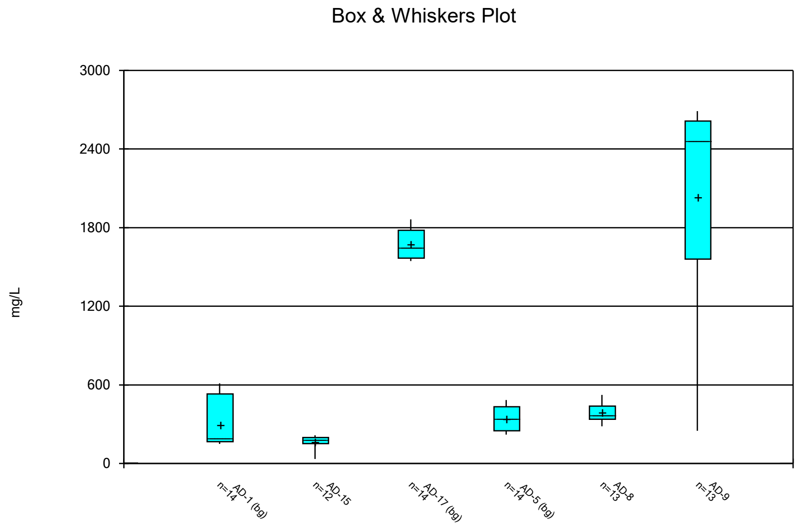
Box & Whiskers Plot



Constituent: Thallium, total   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



Constituent: Total Dissolved Solids   Analysis Run 11/22/2019 8:38 PM

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Outlier Summary

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 11/22/2019, 8:39 PM

	AD-15 Arsenic, total (mg/L)	AD-15 Barium, total (mg/L)	AD-15 Beryllium, total (mg/L)	AD-9 Boron, total (mg/L)	AD-15 Cadmium, total (mg/L)	AD-15 Calcium, total (mg/L)	AD-15 Chromium, total (mg/L)	AD-17 Chromium, total (mg/L)	AD-15 Cobalt, total (mg/L)	AD-15 Combined Radium 226 + 228 (pCi/L)
9/29/2016										9.92 (O)
9/30/2016	0.131 (O)	1.93 (O)	0.015 (o)		0.007 (O)	13.7 (o)	0.28 (O)		0.134 (O)	
1/20/2017				0.283 (o)				0.068 (o)		
5/23/2018										

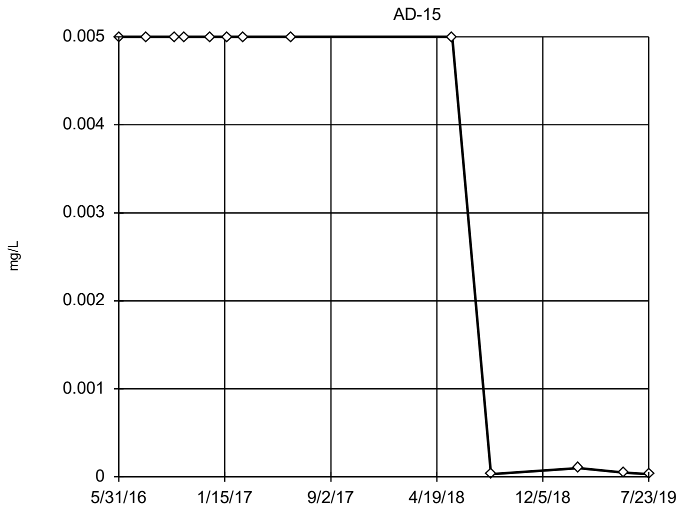
	AD-15 Lead, total (mg/L)	AD-15 Mercury, total (mg/L)	AD-15 Selenium, total (mg/L)	AD-9 Thallium, total (mg/L)	AD-15 Total Dissolved Solids (mg/L)
9/29/2016					
9/30/2016	0.161 (O)	0.000707 (O)	0.014 (O)		367 (O)
1/20/2017					
5/23/2018				0.00846 (O)	

Downgradient Appendix IV Outlier Analysis - All Results (No Significant)

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/20/2019, 1:09 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.003478	0.002377	ln(x)	ShapiroWilk
Antimony, total (mg/L)	AD-8	n/a	n/a	n/a	NP	NaN	13	0.003074	0.002318	unknown	ShapiroWilk
Antimony, total (mg/L)	AD-9	n/a	n/a	n/a	NP	NaN	13	0.003485	0.002365	unknown	ShapiroWilk
Arsenic, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.01736	0.0348	ln(x)	ShapiroWilk
Arsenic, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.003286	0.002263	ln(x)	ShapiroWilk
Arsenic, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.003804	0.001895	sqrt(x)	ShapiroWilk
Barium, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.3169	0.495	ln(x)	ShapiroWilk
Barium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.02452	0.004938	ln(x)	ShapiroWilk
Barium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.03994	0.02033	ln(x)	ShapiroWilk
Beryllium, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.001885	0.003995	ln(x)	ShapiroWilk
Beryllium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.000...	0.0004797	ln(x)	ShapiroWilk
Beryllium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.000...	0.0004653	ln(x)	ShapiroWilk
Cadmium, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.000...	0.001886	ln(x)	ShapiroWilk
Cadmium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.000...	0.0004696	ln(x)	ShapiroWilk
Cadmium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.001004	0.0009618	x^(1/3)	ShapiroWilk
Chromium, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.03502	0.07563	ln(x)	ShapiroWilk
Chromium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.000...	0.0005308	sqrt(x)	ShapiroWilk
Chromium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.000...	0.0003536	ln(x)	ShapiroWilk
Cobalt, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.01828	0.03518	ln(x)	ShapiroWilk
Cobalt, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.005953	0.00175	x^2	ShapiroWilk
Cobalt, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.02095	0.008543	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-15	No	n/a	n/a	NP	NaN	13	2.828	2.31	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-8	No	n/a	n/a	NP	NaN	13	1.432	1.671	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-9	No	n/a	n/a	NP	NaN	13	2.164	0.6618	sqrt(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.7306	0.4231	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.6628	0.184	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.6695	0.3425	x^(1/3)	ShapiroWilk
Lead, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.01862	0.0433	ln(x)	ShapiroWilk
Lead, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.003493	0.002353	ln(x)	ShapiroWilk
Lead, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.003509	0.002329	ln(x)	ShapiroWilk
Lithium, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.02353	0.03892	ln(x)	ShapiroWilk
Lithium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.09463	0.02262	normal	ShapiroWilk
Lithium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	1.092	0.3489	x^3	ShapiroWilk
Mercury, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	12	0.000...	0.0001941	ln(x)	ShapiroWilk
Mercury, total (mg/L)	AD-8	n/a	n/a	n/a	NP	NaN	12	0.000...	0.0000...	unknown	ShapiroWilk
Mercury, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	12	0.000...	0.0000...	sqrt(x)	ShapiroWilk
Molybdenum, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.002342	0.001751	sqrt(x)	ShapiroWilk
Molybdenum, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.003038	0.001957	x^(1/3)	ShapiroWilk
Molybdenum, total (mg/L)	AD-9	n/a	n/a	n/a	NP	NaN	13	0.003932	0.001734	unknown	ShapiroWilk
Selenium, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.003339	0.003615	ln(x)	ShapiroWilk
Selenium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.002723	0.002281	sqrt(x)	ShapiroWilk
Selenium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.002917	0.002549	sqrt(x)	ShapiroWilk
Thallium, total (mg/L)	AD-15	n/a	n/a	n/a	NP	NaN	13	0.001394	0.0007944	unknown	ShapiroWilk
Thallium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.001358	0.0008371	x^2	ShapiroWilk
Thallium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.001888	0.002136	x^(1/3)	ShapiroWilk

Tukey's Outlier Screening



n = 13

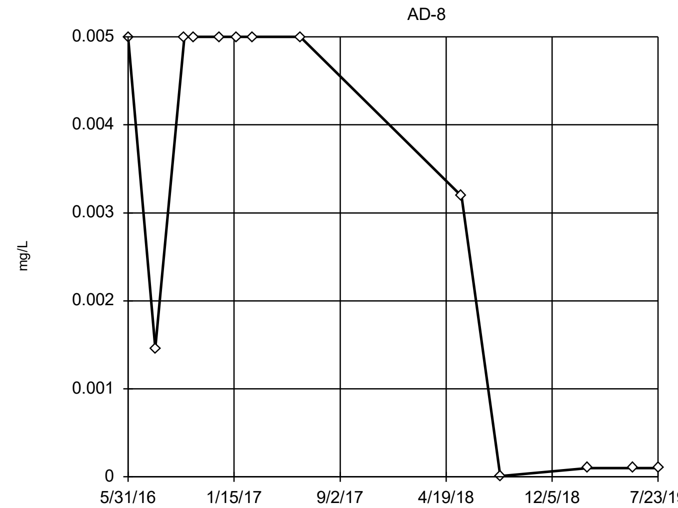
No outliers found. Tukey's method selected by user.

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

High cutoff = 1768, low cutoff = 2.0e-10, based on IQR multiplier of 3.

Constituent: Antimony, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Tukey's Outlier Screening



n = 13

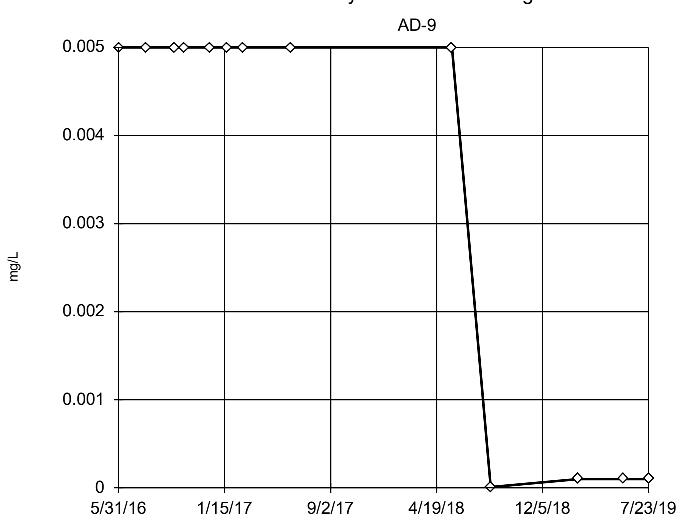
No outliers found. Tukey's method selected by user.

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

The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Antimony, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Tukey's Outlier Screening



n = 13

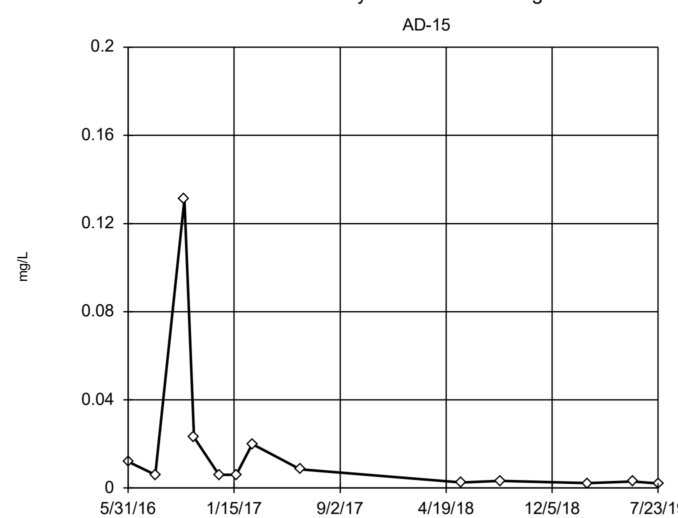
No outliers found. Tukey's method selected by user.

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

The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Antimony, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Tukey's Outlier Screening



n = 13

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

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

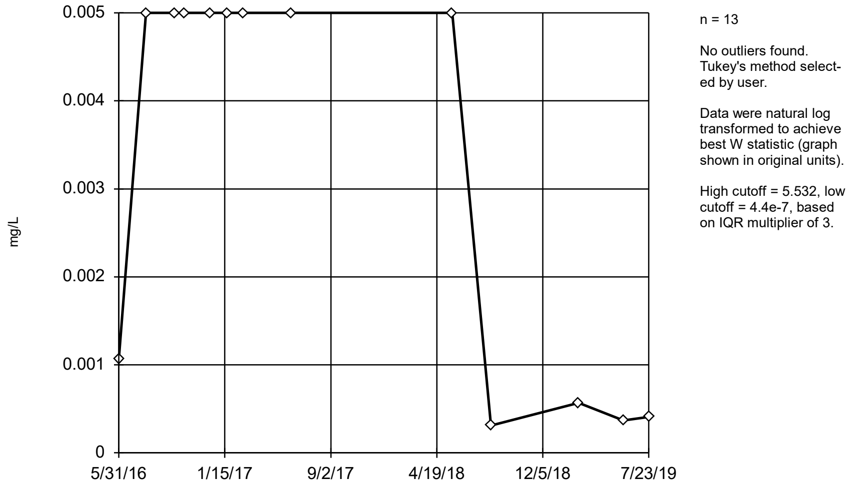
High cutoff = 2.775, low cutoff = 0.00001534, based on IQR multiplier of 3.

Constituent: Arsenic, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8

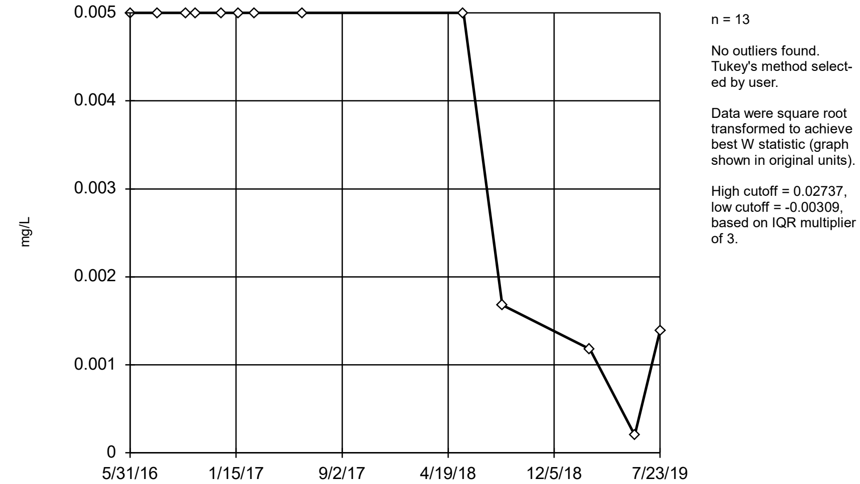


Constituent: Arsenic, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9

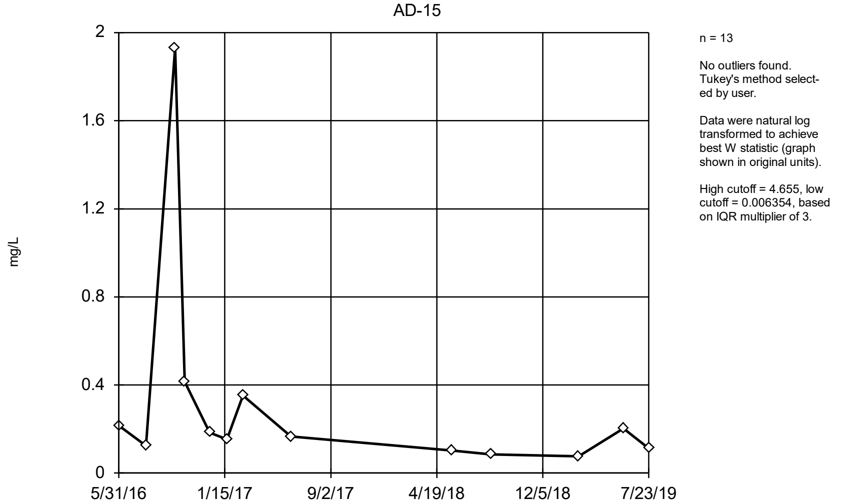


Constituent: Arsenic, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-15

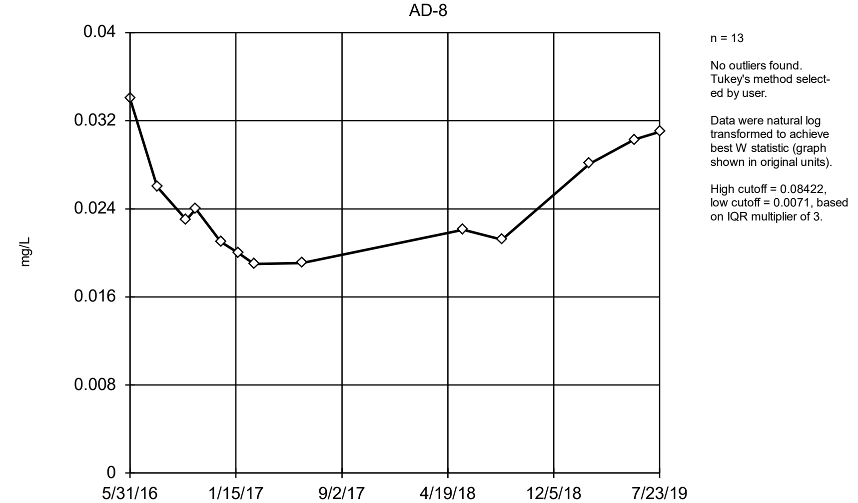


Constituent: Barium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8

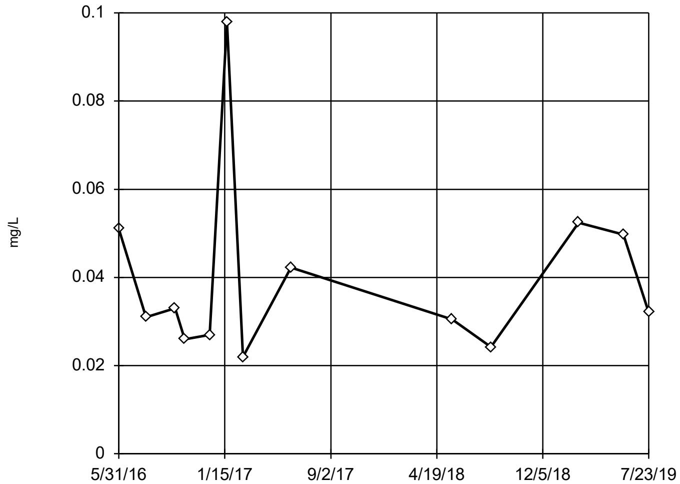


Constituent: Barium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9



n = 13

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

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

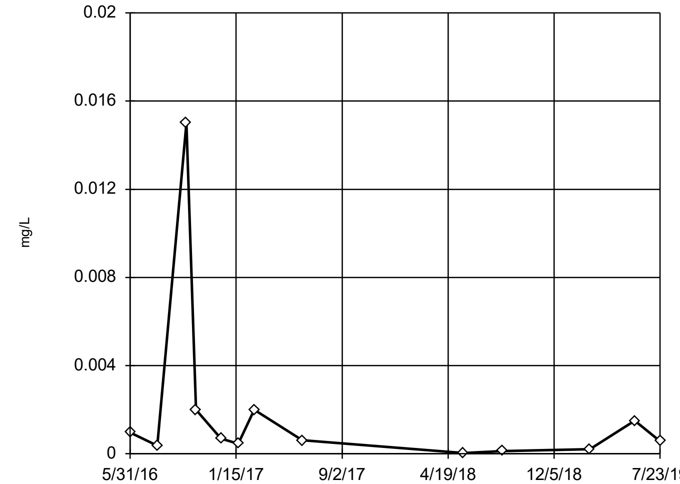
High cutoff = 0.3454, low cutoff = 0.003862, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-15



n = 13

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

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

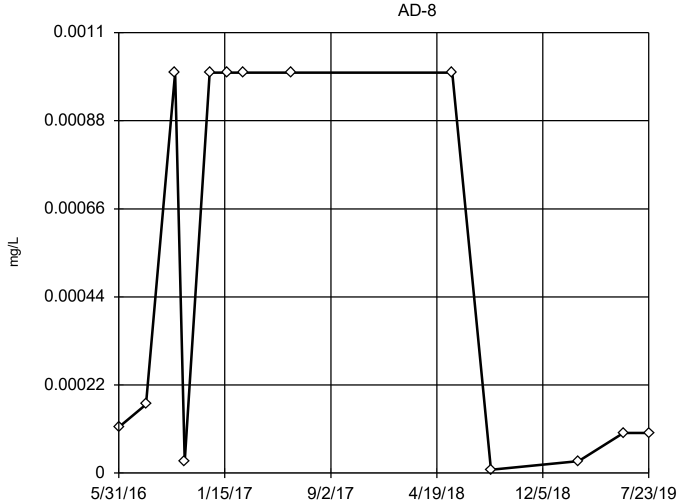
High cutoff = 0.4345, low cutoff = 0.000001095, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8



n = 13

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

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

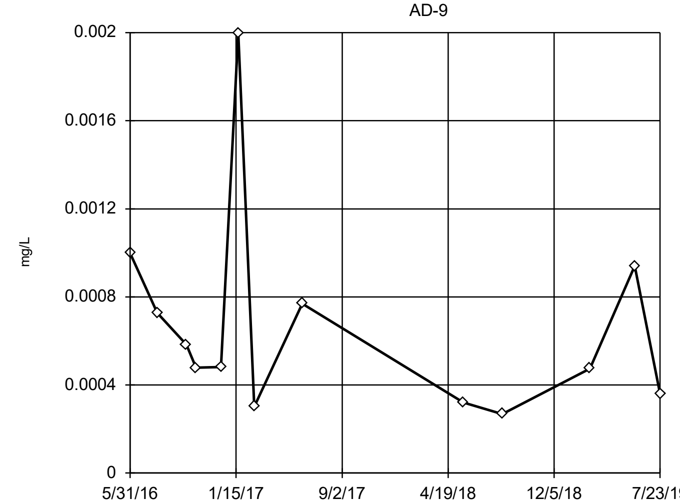
High cutoff = 6.086, low cutoff = 9.0e-9, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9



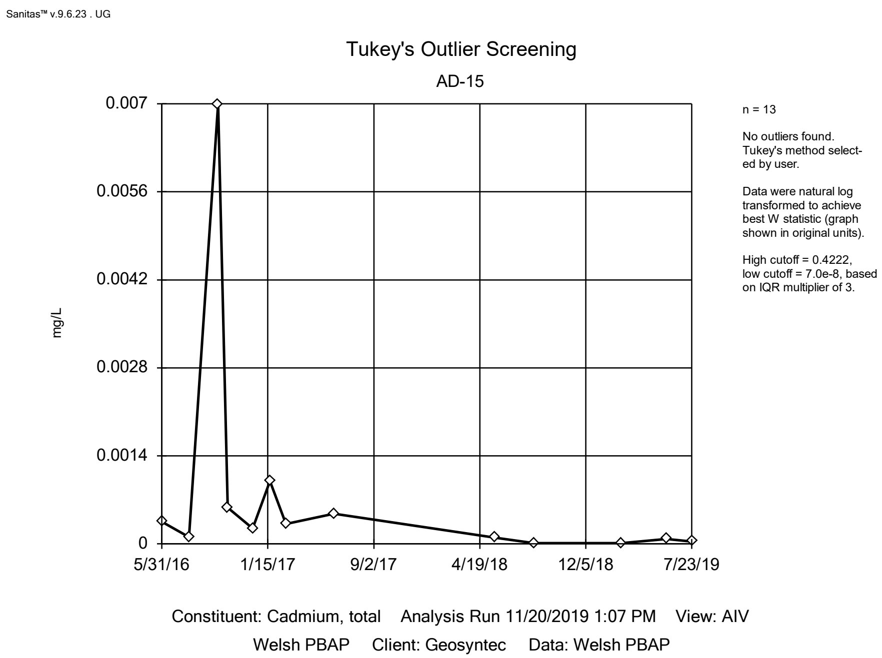
n = 13

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

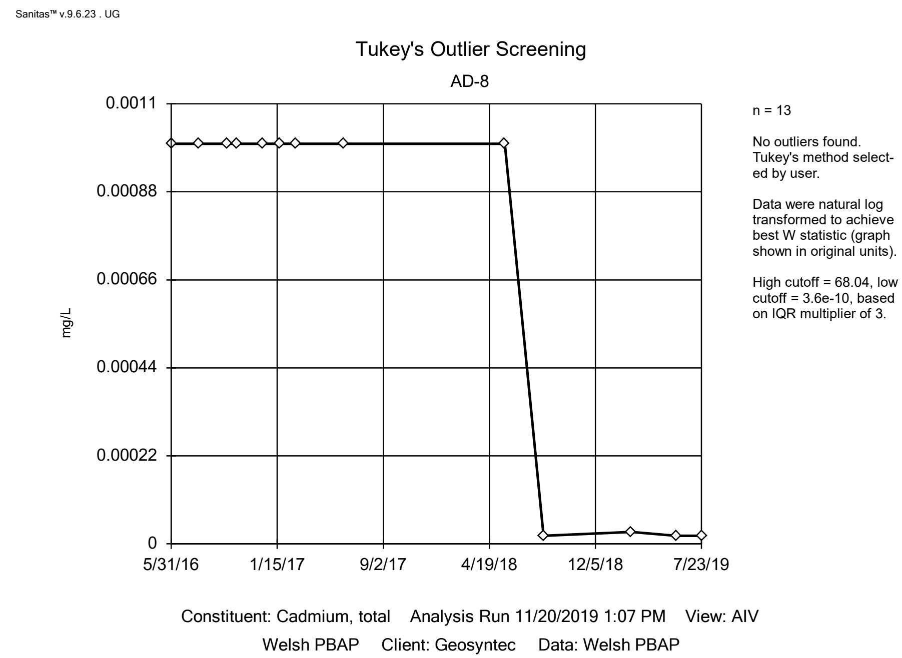
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.01337, low cutoff = 0.00002164, based on IQR multiplier of 3.

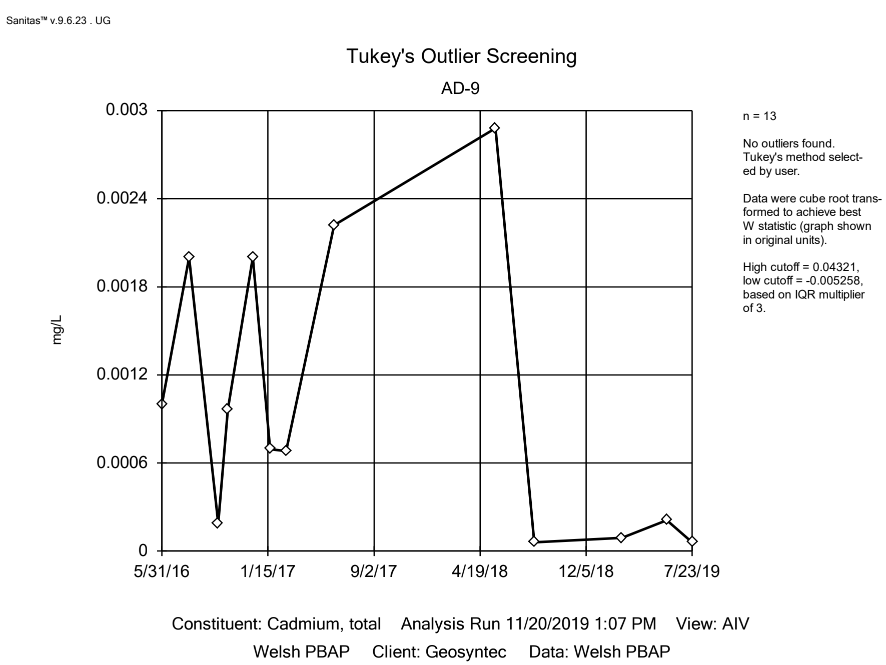
Constituent: Beryllium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



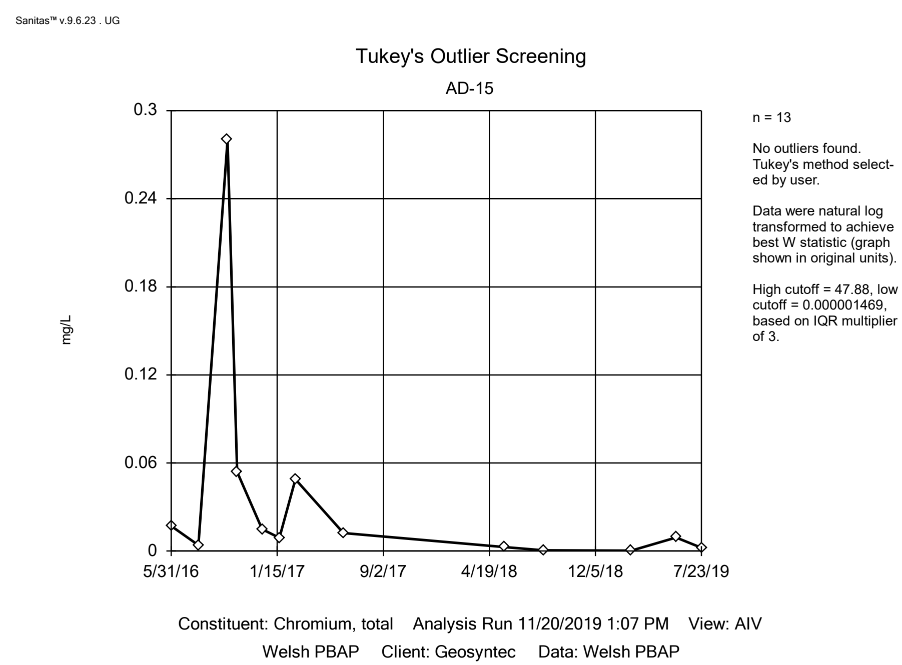
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-15
0.007
0.0056
0.0042
0.0028
0.0014
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.4222, low cutoff = 7.0e-8, based on IQR multiplier of 3.
Constituent: Cadmium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-8
0.0011
0.00088
0.00066
0.00044
0.00022
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 68.04, low cutoff = 3.6e-10, based on IQR multiplier of 3.
Constituent: Cadmium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-9
0.003
0.0024
0.0018
0.0012
0.0006
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were cube root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.04321, low cutoff = -0.005258, based on IQR multiplier of 3.
Constituent: Cadmium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

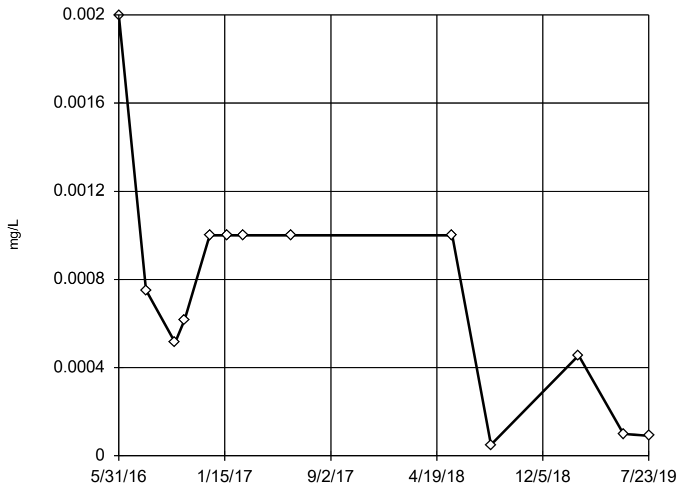


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-15
0.3
0.24
0.18
0.12
0.06
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 47.88, low cutoff = 0.000001469, based on IQR multiplier of 3.
Constituent: Chromium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8



n = 13

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

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

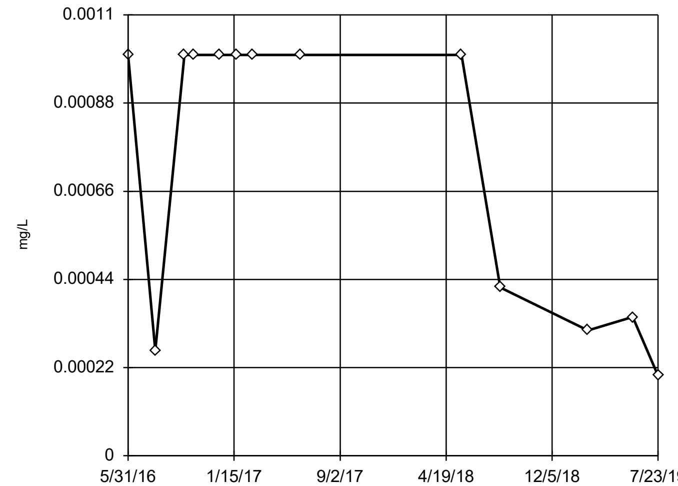
High cutoff = 0.006314, low cutoff = -0.001034, based on IQR multiplier of 3.

Constituent: Chromium, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9



n = 13

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

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

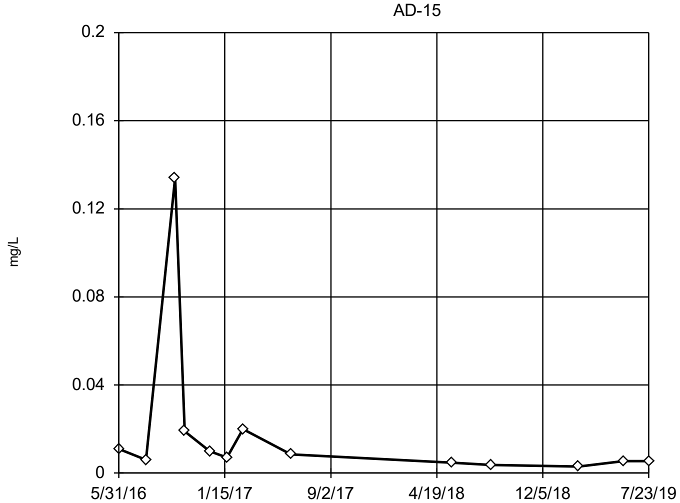
High cutoff = 0.02806, low cutoff = 0.00001173, based on IQR multiplier of 3.

Constituent: Chromium, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-15



n = 13

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

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

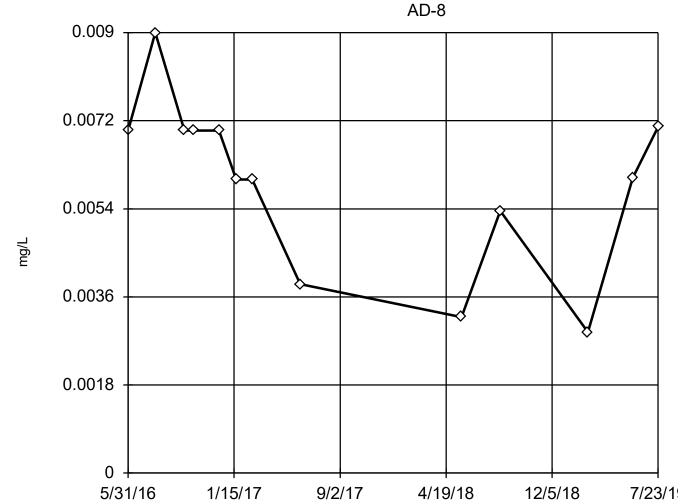
High cutoff = 0.3364, low cutoff = 0.0002176, based on IQR multiplier of 3.

Constituent: Cobalt, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8



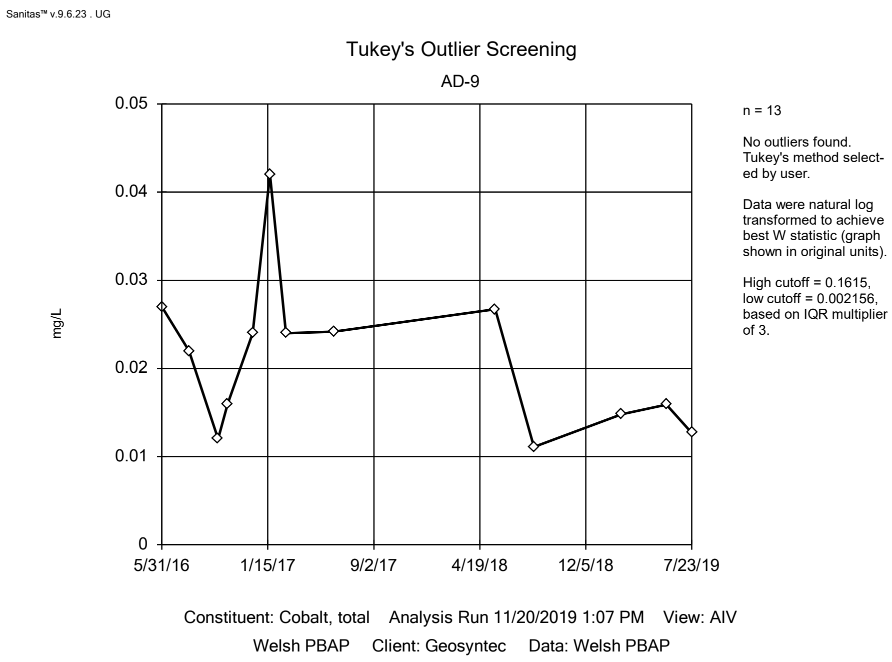
n = 13

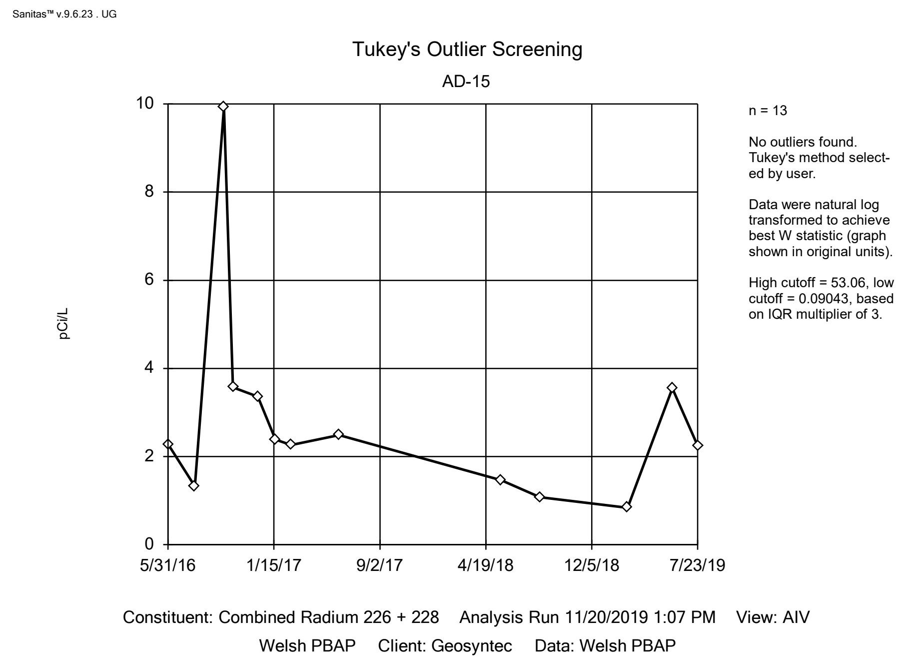
No outliers found. Tukey's method selected by user.

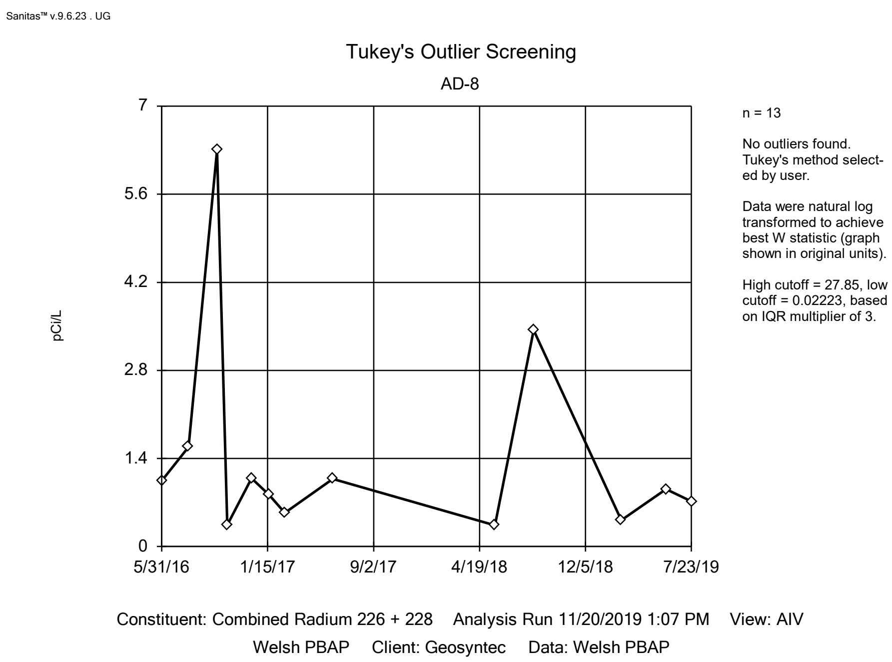
Data were square transformed to achieve best W statistic (graph shown in original units).

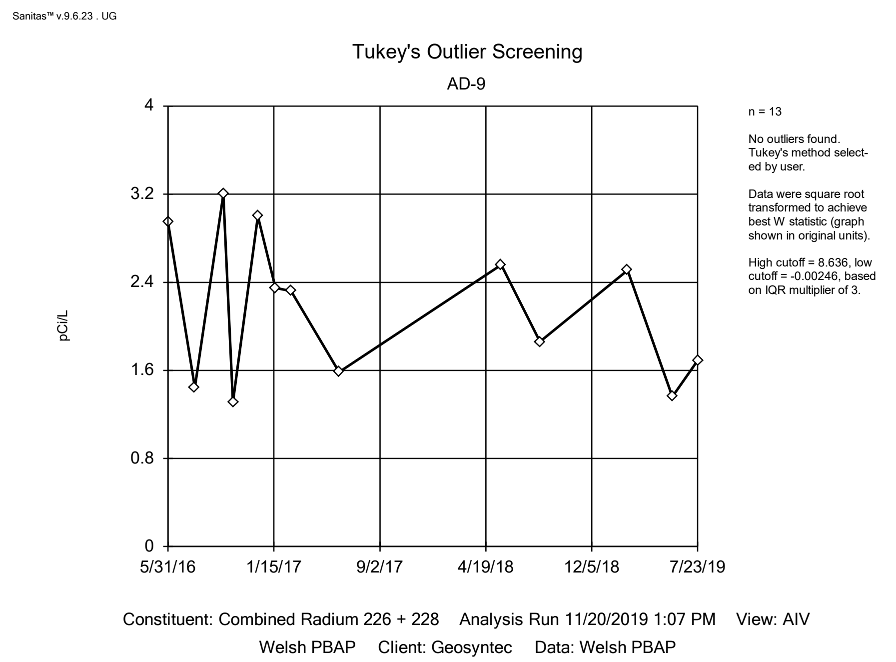
High cutoff = 0.01143, low cutoff = -0.007729, based on IQR multiplier of 3.

Constituent: Cobalt, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-9
mg/L
0.05
0.04
0.03
0.02
0.01
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.1615, low cutoff = 0.002156, based on IQR multiplier of 3.
Constituent: Cobalt, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

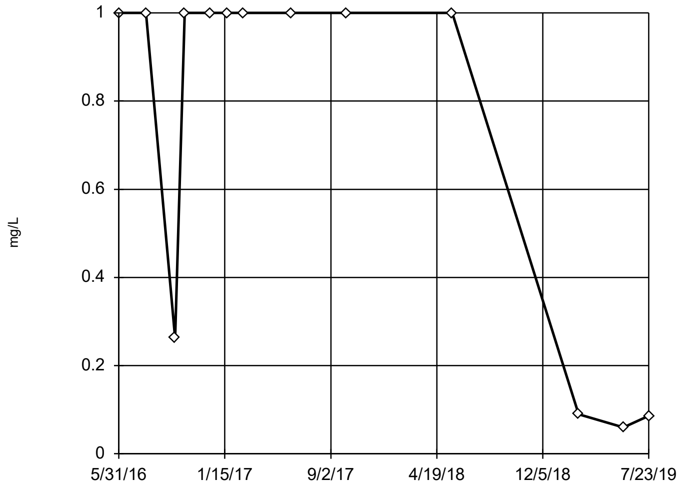

Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-15
pCi/L
10
8
6
4
2
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 53.06, low cutoff = 0.09043, based on IQR multiplier of 3.
Constituent: Combined Radium 226 + 228 Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-8
pCi/L
7
5.6
4.2
2.8
1.4
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 27.85, low cutoff = 0.02223, based on IQR multiplier of 3.
Constituent: Combined Radium 226 + 228 Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-9
pCi/L
4
3.2
2.4
1.6
0.8
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 8.636, low cutoff = -0.00246, based on IQR multiplier of 3.
Constituent: Combined Radium 226 + 228 Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Tukey's Outlier Screening

AD-15



n = 13

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

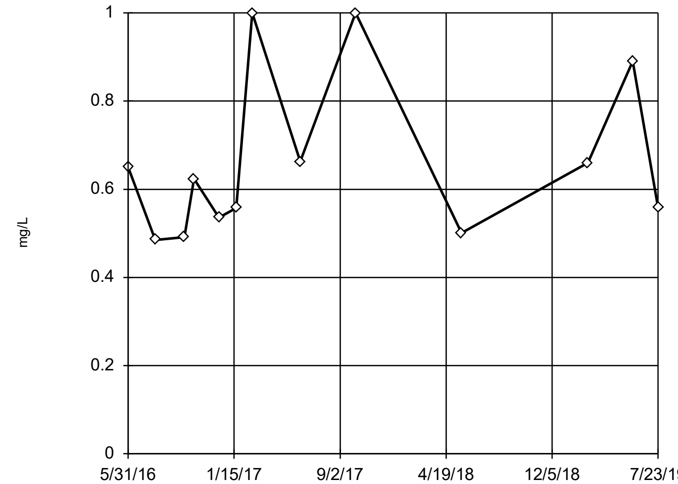
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 276, low cutoff = 0.0005564, based on IQR multiplier of 3.

Constituent: Fluoride, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Tukey's Outlier Screening

AD-8



n = 13

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

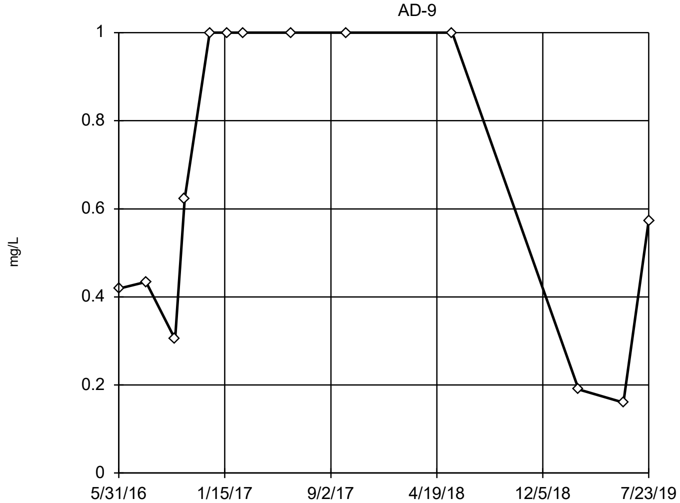
Data were natural log transformed to achieve best W statistic (graph shown in original units).

High cutoff = 2.504, low cutoff = 0.1589, based on IQR multiplier of 3.

Constituent: Fluoride, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Tukey's Outlier Screening

AD-9



n = 13

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

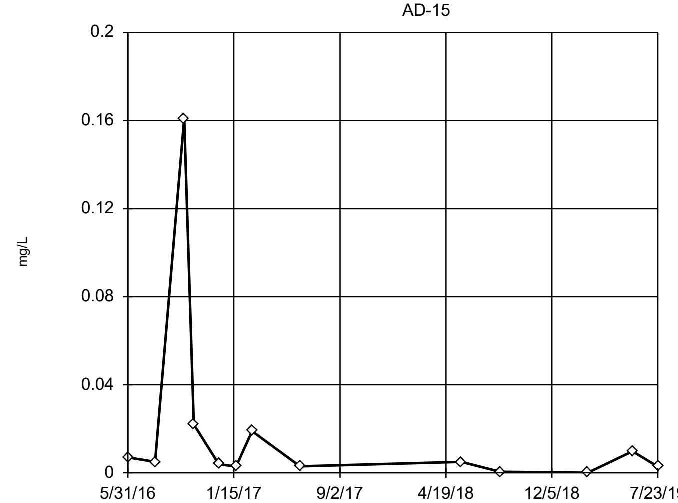
Data were cube root transformed to achieve best W statistic (graph shown in original units).

High cutoff = 6.527, low cutoff = -0.003982, based on IQR multiplier of 3.

Constituent: Fluoride, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Tukey's Outlier Screening

AD-15



n = 13

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

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

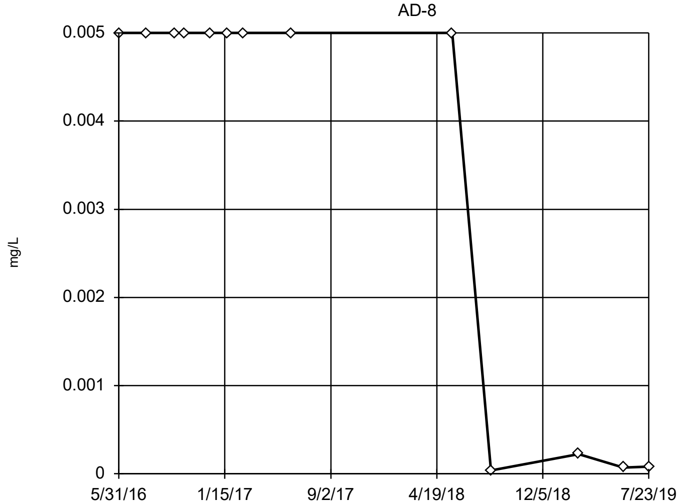
High cutoff = 1.478, low cutoff = 0.0000266, based on IQR multiplier of 3.

Constituent: Lead, total   Analysis Run 11/20/2019 1:07 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8



n = 13

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

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

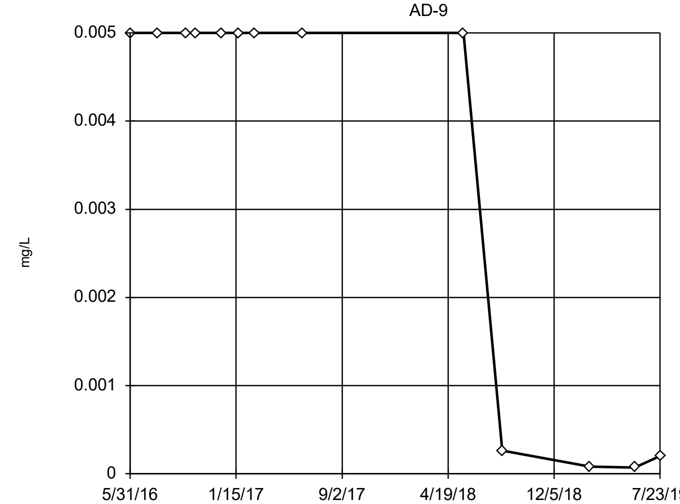
High cutoff = 262.3, low cutoff = 2.5e-9, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9



n = 13

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

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

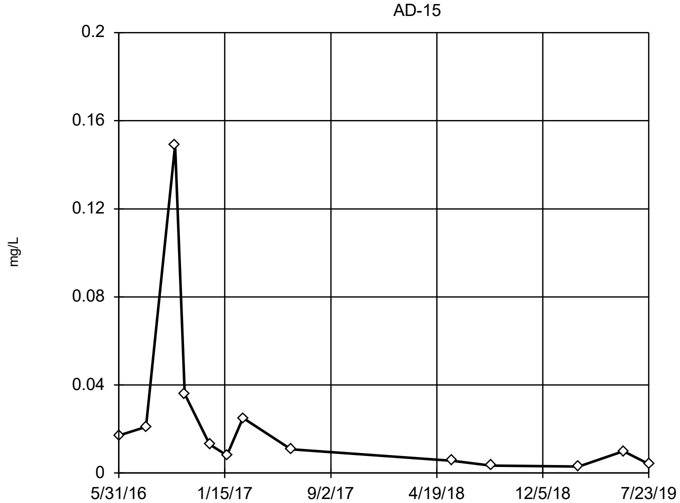
High cutoff = 52.11, low cutoff = 2.2e-8, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-15



n = 13

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

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

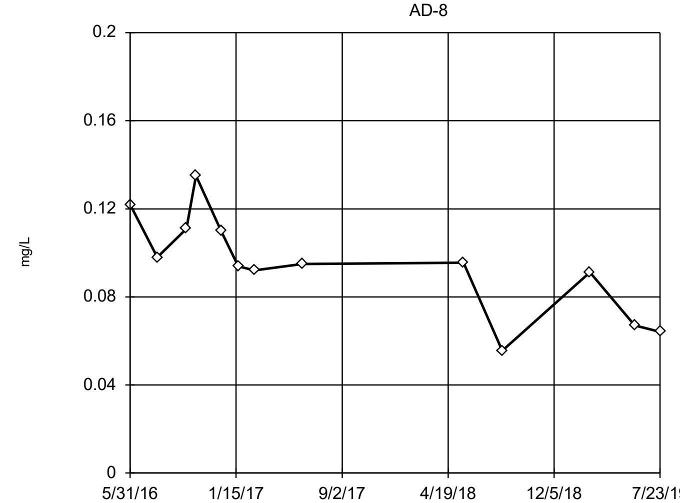
High cutoff = 2.456, low cutoff = 0.000045, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8



n = 13

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

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

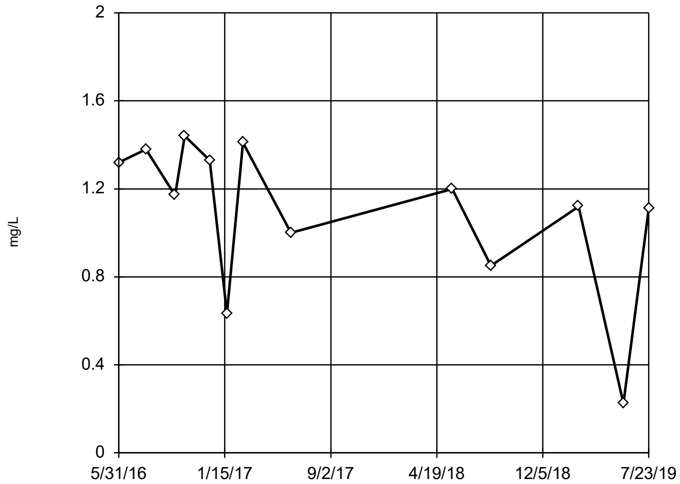
High cutoff = 0.2049, low cutoff = -0.0153, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9



n = 13

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

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

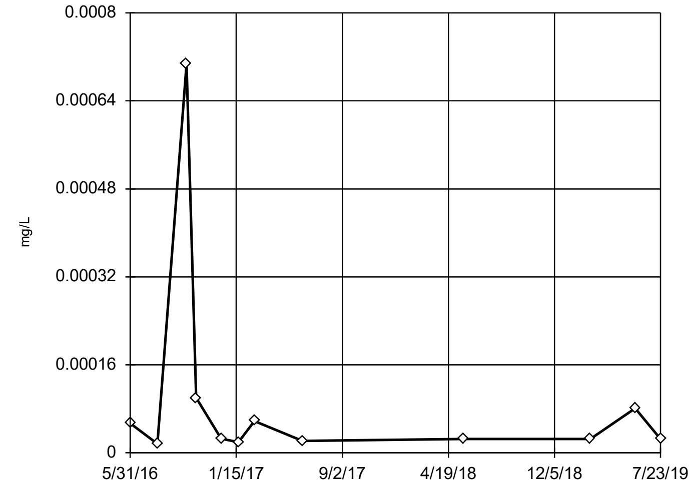
High cutoff = 1.961, low cutoff = -1.618, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-15



n = 12

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

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

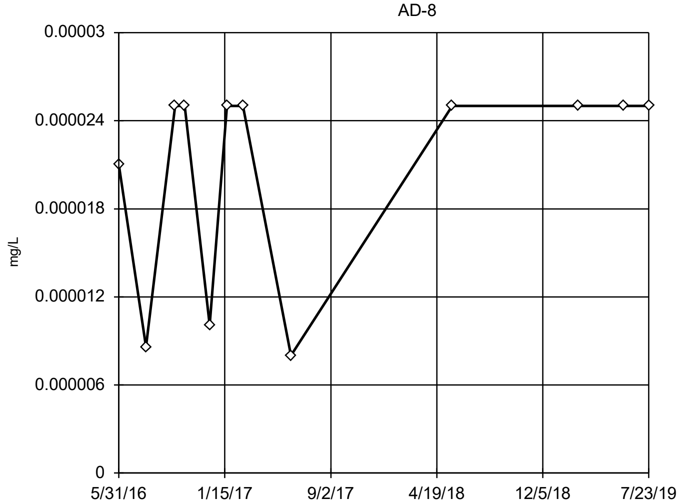
High cutoff = 0.001711, low cutoff = 9.4e-7, based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8



n = 12

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

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

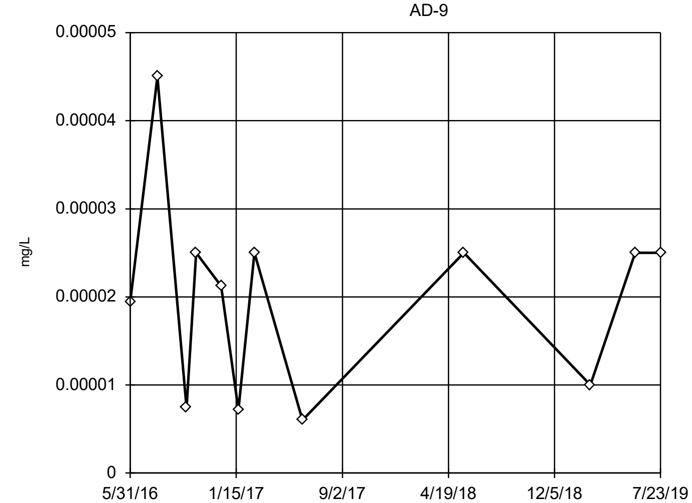
The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Mercury, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9



n = 12

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

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

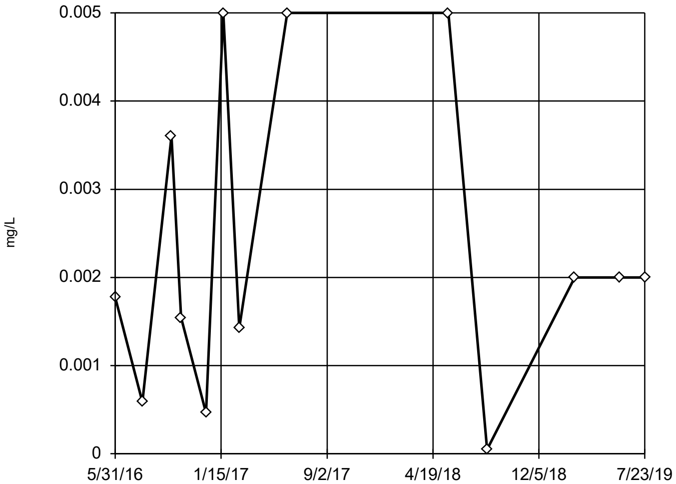
High cutoff = 0.000125, low cutoff = -0.00001049, based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-15



n = 13

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

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

High cutoff = 0.02838, low cutoff = -0.0052, based on IQR multiplier of 3.

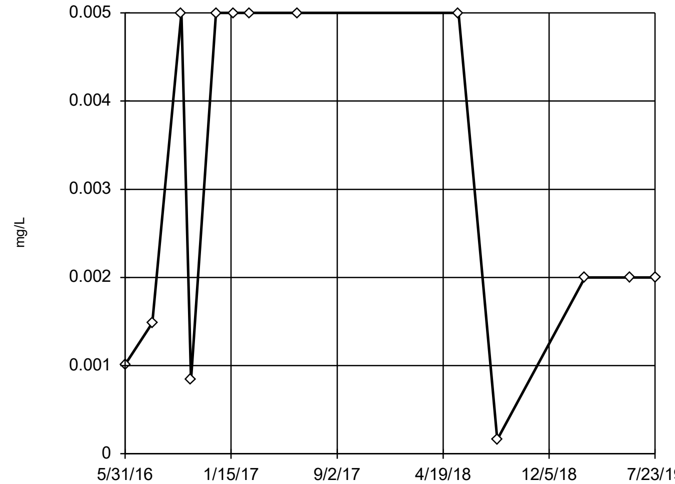
Constituent: Molybdenum, total   Analysis Run 11/20/2019 1:07 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-8



n = 13

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

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

High cutoff = 0.04755, low cutoff = -0.0005935, based on IQR multiplier of 3.

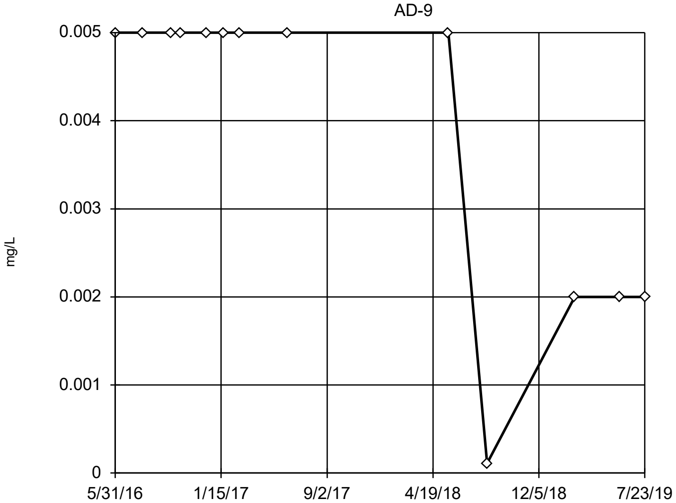
Constituent: Molybdenum, total   Analysis Run 11/20/2019 1:07 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-9



n = 13

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

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

The results were invalidated, because both the lower and upper quartiles represent reporting limits.

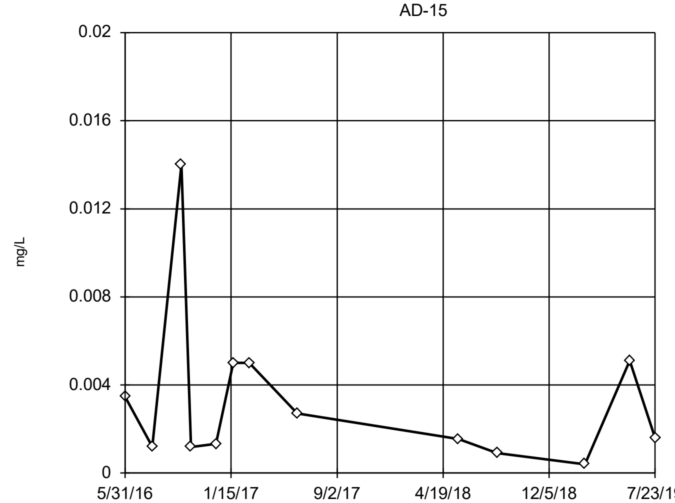
Constituent: Molybdenum, total   Analysis Run 11/20/2019 1:07 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening

AD-15



n = 13

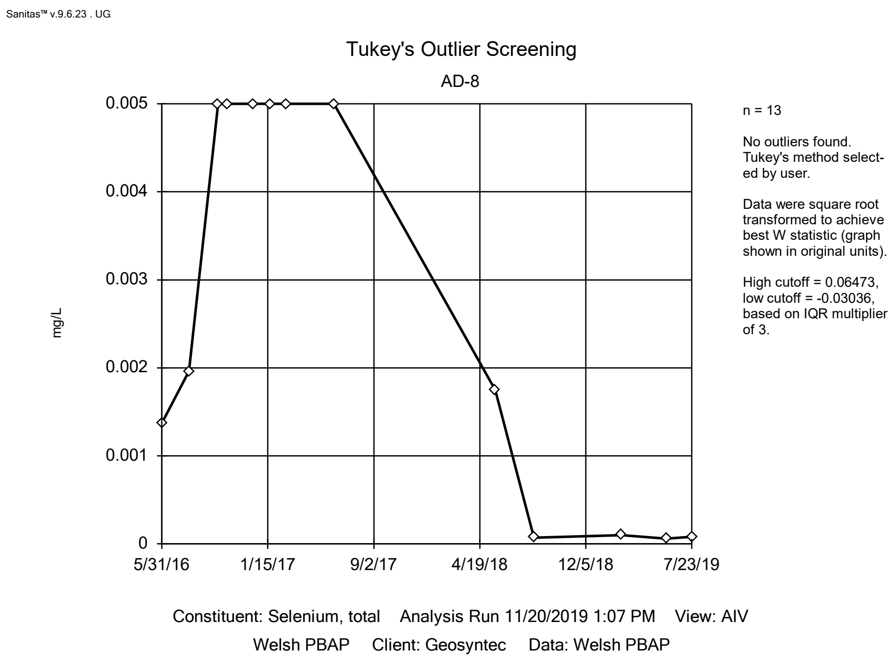
No outliers found. Tukey's method selected by user.

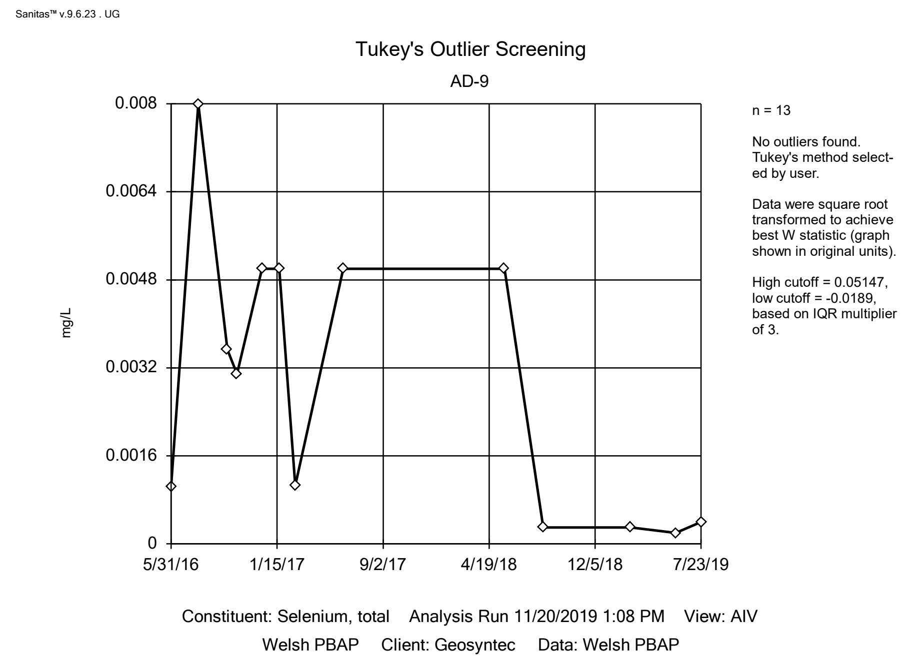
Data were natural log transformed to achieve best W statistic (graph shown in original units).

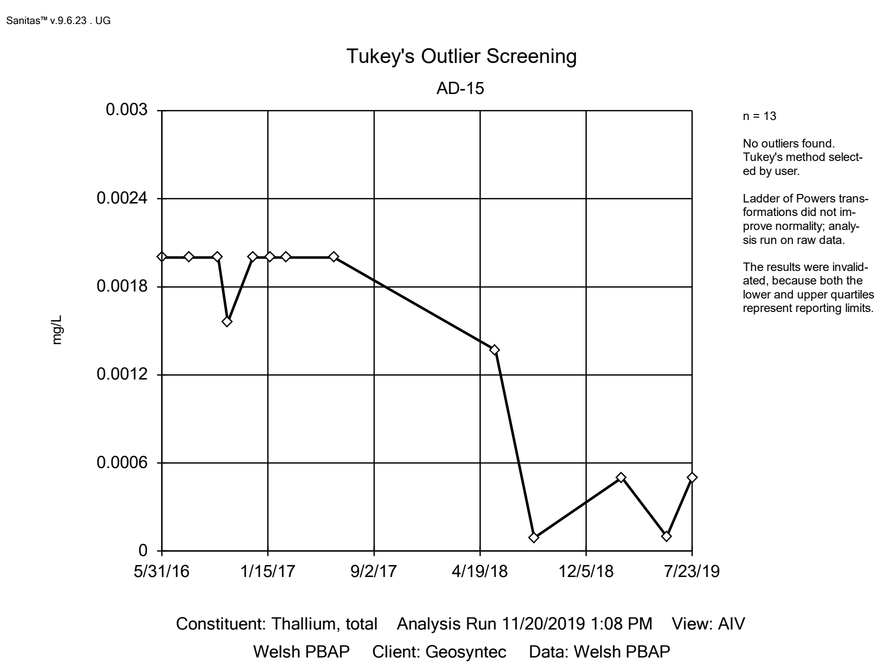
High cutoff = 0.3754, low cutoff = 0.00001579, based on IQR multiplier of 3.

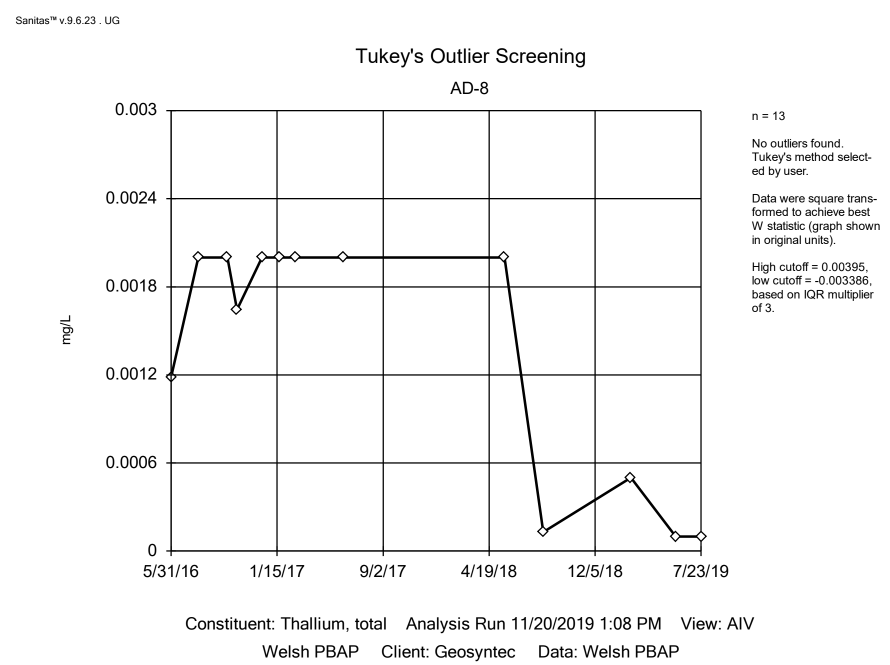
Constituent: Selenium, total   Analysis Run 11/20/2019 1:07 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

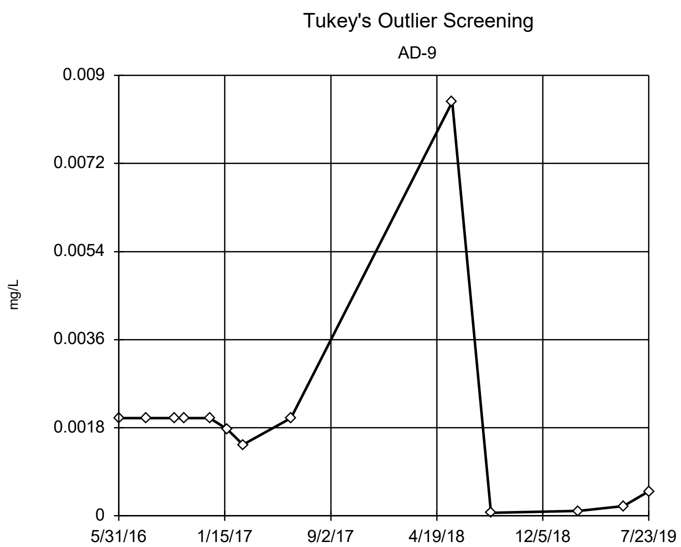

Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-8
0.005
0.004
0.003
0.002
0.001
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.06473, low cutoff = -0.03036, based on IQR multiplier of 3.
Constituent: Selenium, total Analysis Run 11/20/2019 1:07 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-9
0.008
0.0064
0.0048
0.0032
0.0016
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.05147, low cutoff = -0.0189, based on IQR multiplier of 3.
Constituent: Selenium, total Analysis Run 11/20/2019 1:08 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-15
0.003
0.0024
0.0018
0.0012
0.0006
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
The results were invalidated, because both the lower and upper quartiles represent reporting limits.
Constituent: Thallium, total Analysis Run 11/20/2019 1:08 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-8
0.003
0.0024
0.0018
0.0012
0.0006
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were square transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.00395, low cutoff = -0.003386, based on IQR multiplier of 3.
Constituent: Thallium, total Analysis Run 11/20/2019 1:08 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



n = 13

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

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

High cutoff = 0.02625, low cutoff = -0.00107, based on IQR multiplier of 3.

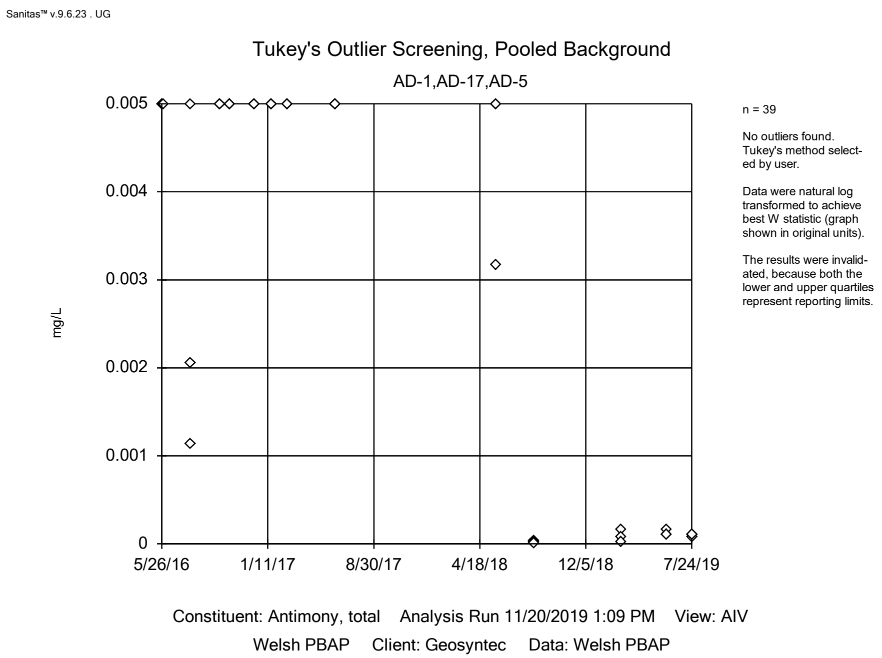
Constituent: Thallium, total   Analysis Run 11/20/2019 1:08 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

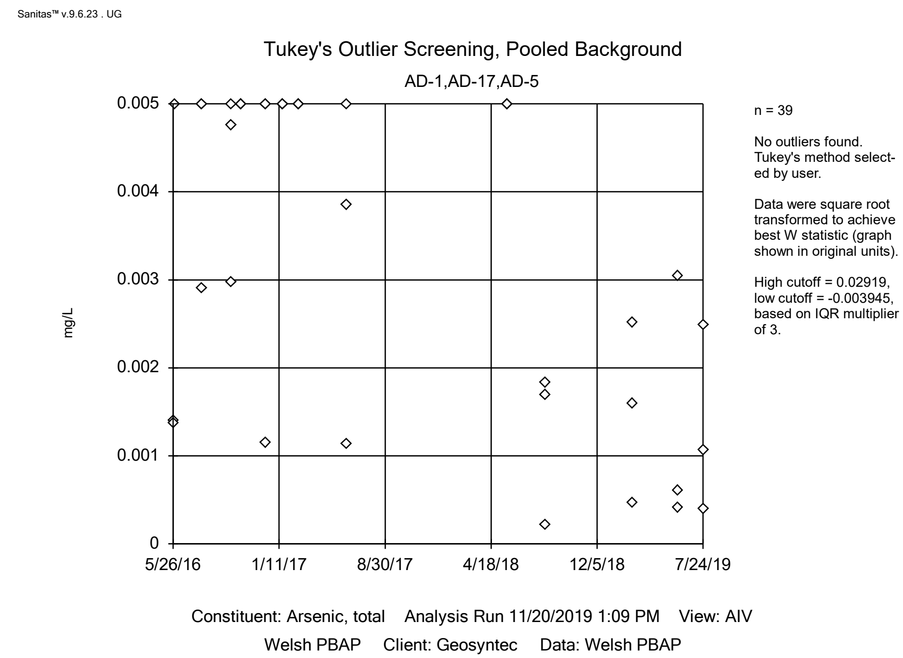
Upgradient Appendix IV Outlier Analysis - All Results (No Significant)

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 11/20/2019, 1:10 PM

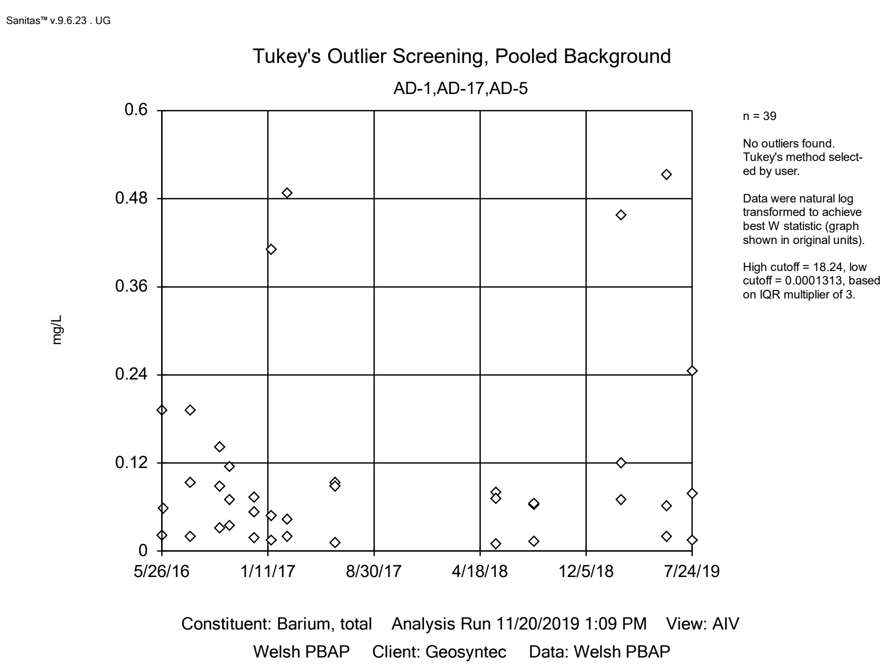
Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, total (mg/L)	AD-1,AD-1...	n/a	n/a	n/a w/com...	NP	NaN	39	0.003265	0.002294	unknown	ShapiroWilk
Arsenic, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.003355	0.001848	sqrt(x)	ShapiroWilk
Barium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.1097	0.1337	ln(x)	ShapiroWilk
Beryllium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.000...	0.000171	x^(1/3)	ShapiroWilk
Cadmium, total (mg/L)	AD-1,AD-1...	n/a	n/a	n/a w/com...	NP	NaN	39	0.001055	0.001552	unknown	ShapiroWilk
Chromium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	38	0.000...	0.00086	ln(x)	ShapiroWilk
Cobalt, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.02542	0.02821	x^(1/3)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	2.091	0.9476	sqrt(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	42	0.7273	0.3627	ln(x)	ShapiroWilk
Lead, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.003549	0.002164	ln(x)	ShapiroWilk
Lithium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.1639	0.1373	normal	ShapiroWilk
Mercury, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.000...	0.0000...	x^2	ShapiroWilk
Molybdenum, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.003371	0.001944	x^(1/3)	ShapiroWilk
Selenium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.002917	0.002031	sqrt(x)	ShapiroWilk
Thallium, total (mg/L)	AD-1,AD-1...	n/a	n/a	n/a w/com...	NP	NaN	39	0.001458	0.000758	unknown	ShapiroWilk



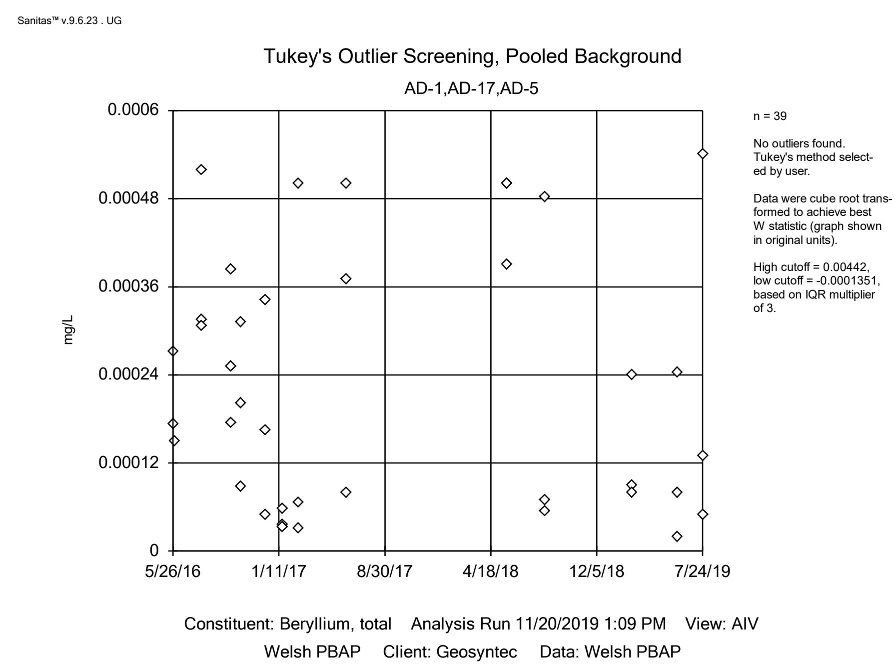
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening, Pooled Background
AD-1,AD-17,AD-5
mg/L
0.005
0.004
0.003
0.002
0.001
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 39
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
The results were invalidated, because both the lower and upper quartiles represent reporting limits.
Constituent: Antimony, total Analysis Run 11/20/2019 1:09 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening, Pooled Background
AD-1,AD-17,AD-5
mg/L
0.005
0.004
0.003
0.002
0.001
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 39
No outliers found. Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.02919, low cutoff = -0.003945, based on IQR multiplier of 3.
Constituent: Arsenic, total Analysis Run 11/20/2019 1:09 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening, Pooled Background
AD-1,AD-17,AD-5
mg/L
0.6
0.48
0.36
0.24
0.12
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 39
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 = 18.24, low cutoff = 0.0001313, based on IQR multiplier of 3.
Constituent: Barium, total Analysis Run 11/20/2019 1:09 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

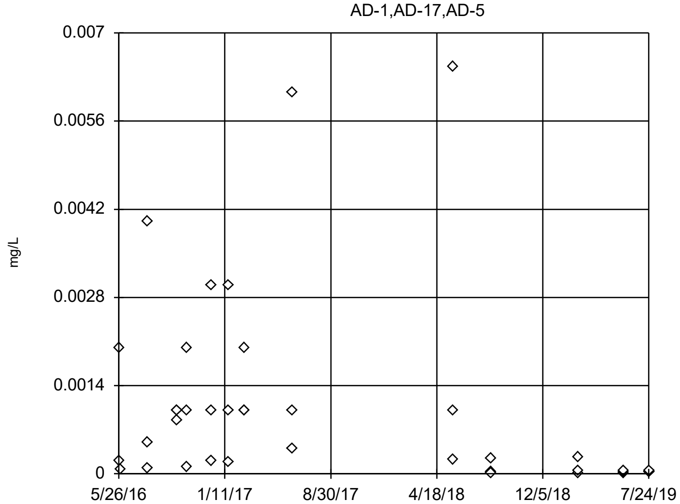


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening, Pooled Background
AD-1,AD-17,AD-5
mg/L
0.0006
0.00048
0.00036
0.00024
0.00012
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 39
No outliers found. Tukey's method selected by user.
Data were cube root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.00442, low cutoff = -0.0001351, based on IQR multiplier of 3.
Constituent: Beryllium, total Analysis Run 11/20/2019 1:09 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 39

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

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

The results were invalidated, because both the lower and upper quartiles represent reporting limits.

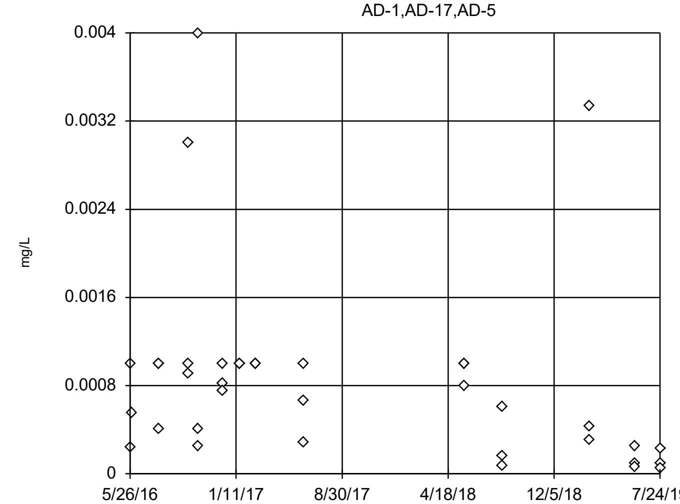
Constituent: Cadmium, total   Analysis Run 11/20/2019 1:09 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 38

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 = 0.06633, low cutoff = 0.000003725, based on IQR multiplier of 3.

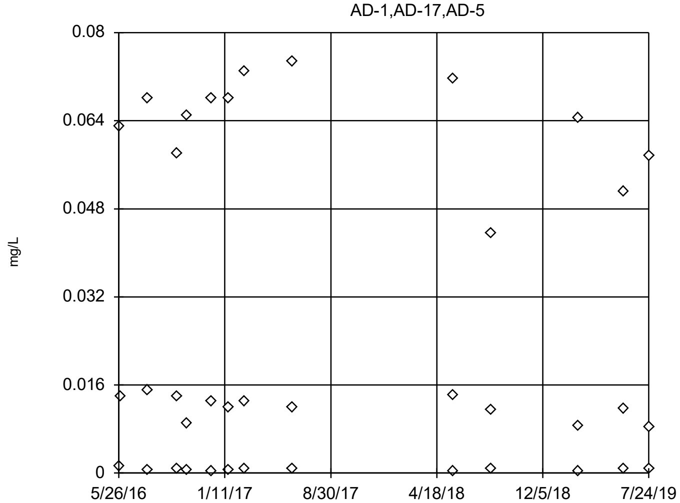
Constituent: Chromium, total   Analysis Run 11/20/2019 1:09 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 39

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

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

High cutoff = 2.054, low cutoff = -0.4961, based on IQR multiplier of 3.

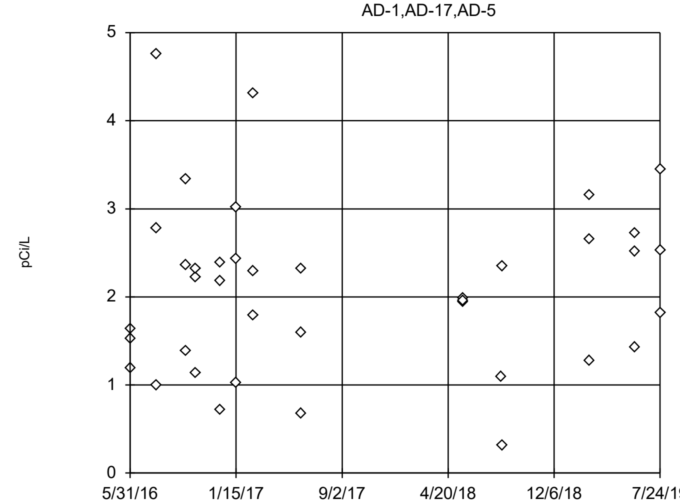
Constituent: Cobalt, total   Analysis Run 11/20/2019 1:09 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 39

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

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

High cutoff = 8.077, low cutoff = -0.005728, based on IQR multiplier of 3.

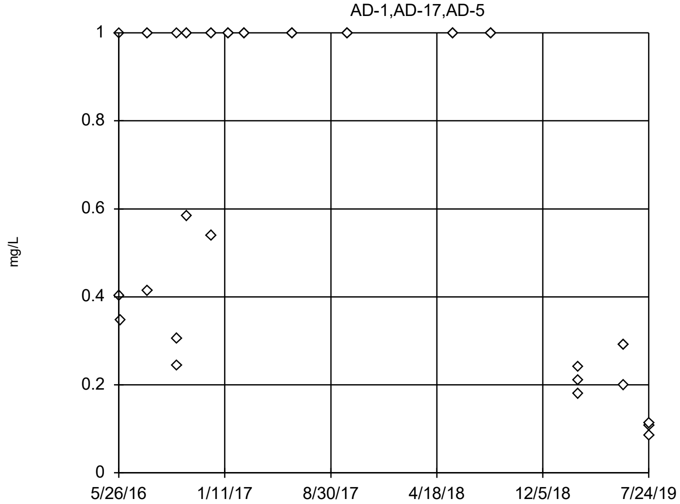
Constituent: Combined Radium 226 + 228   Analysis Run 11/20/2019 1:09 PM   View: AIV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-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).

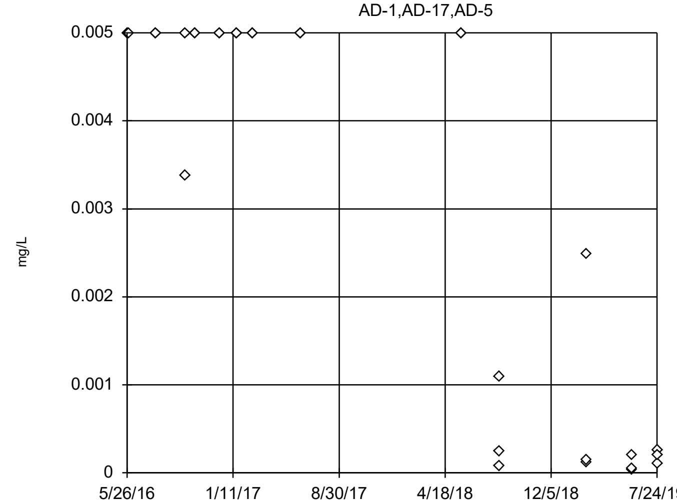
High cutoff = 37.92, low cutoff = 0.007849, based on IQR multiplier of 3.

Constituent: Fluoride, total   Analysis Run 11/20/2019 1:09 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 39

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

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

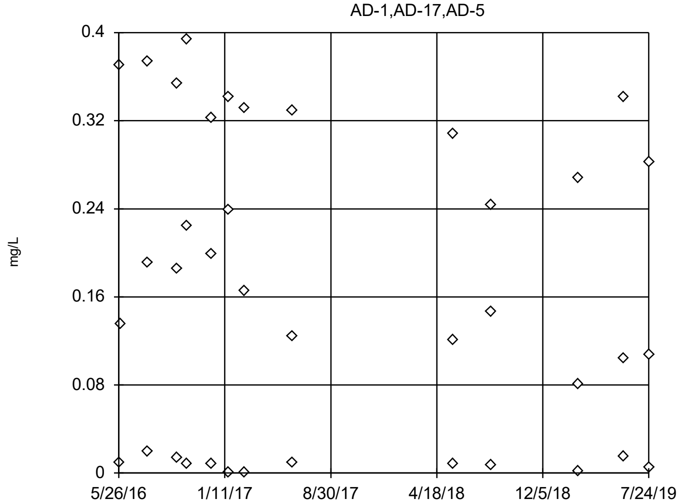
High cutoff = 34.36, low cutoff = 3.8e-8, based on IQR multiplier of 3.

Constituent: Lead, total   Analysis Run 11/20/2019 1:09 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 39

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

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

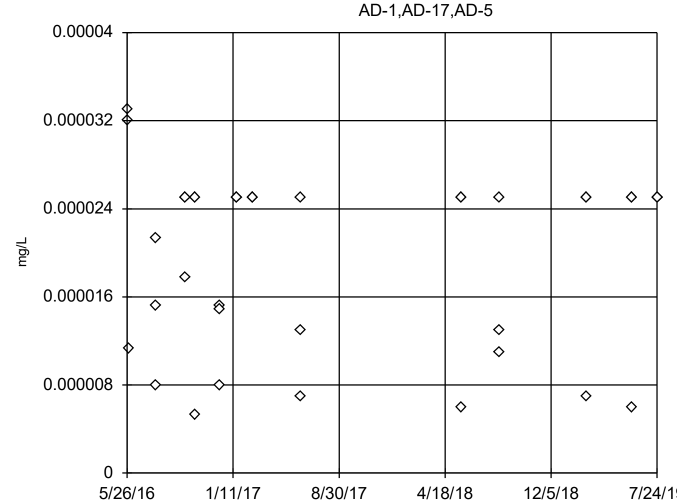
High cutoff = 1.202, low cutoff = -0.884, based on IQR multiplier of 3.

Constituent: Lithium, total   Analysis Run 11/20/2019 1:09 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



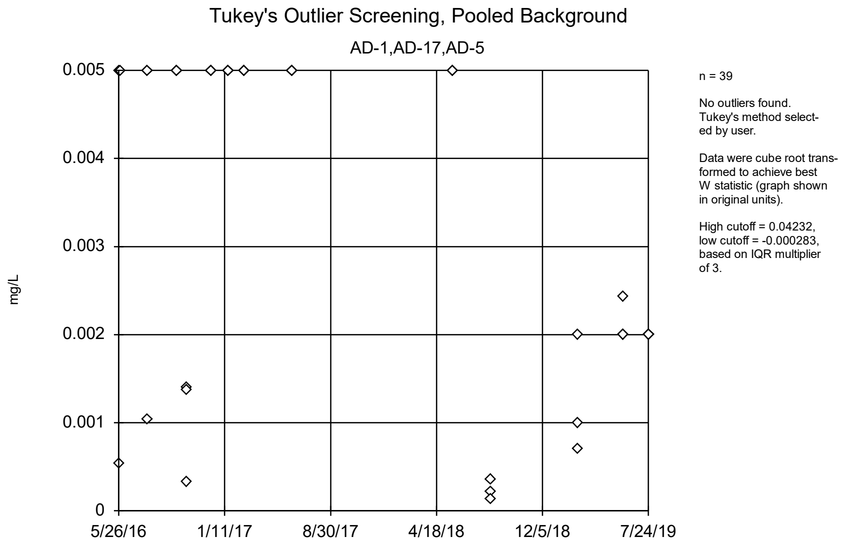
n = 39

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

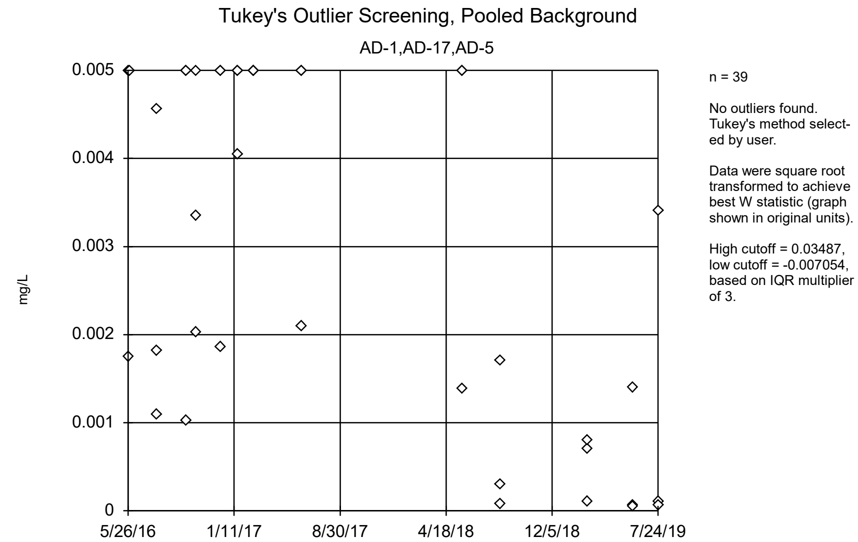
Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 0.00004464, low cutoff = -0.00003463, based on IQR multiplier of 3.

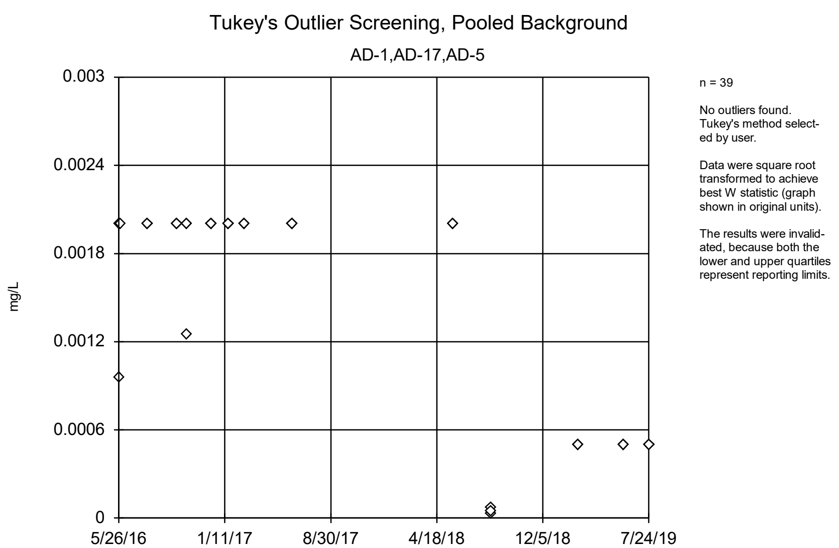
Constituent: Mercury, total   Analysis Run 11/20/2019 1:09 PM   View: AIV
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP



Constituent: Molybdenum, total Analysis Run 11/20/2019 1:09 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Constituent: Selenium, total Analysis Run 11/20/2019 1:09 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



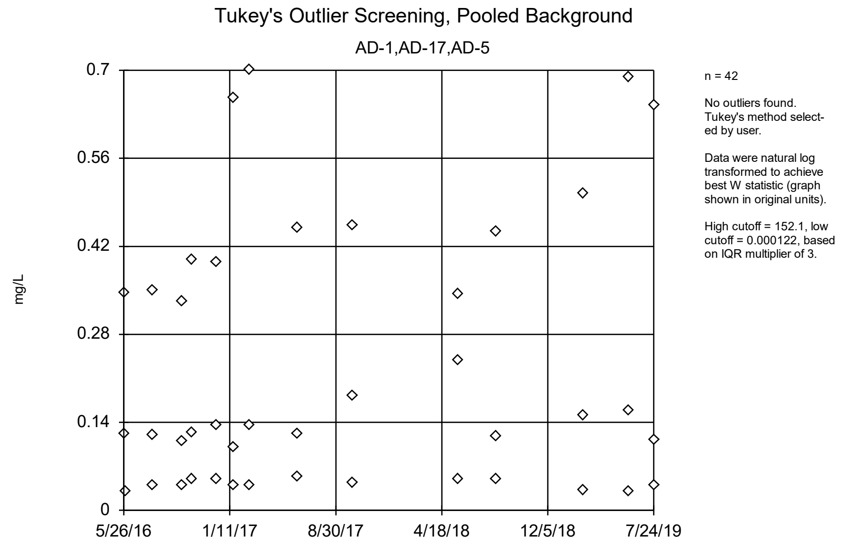
Constituent: Thallium, total Analysis Run 11/20/2019 1:09 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Interwell Appendix III Outlier Analysis - All Results (No Significant)

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/20/2019, 1:03 PM

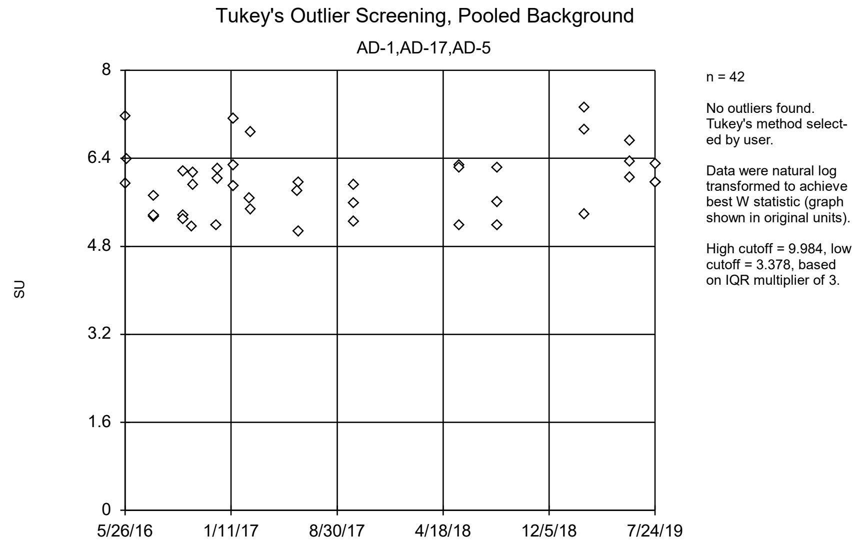
Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	42	0.2196	0.2058	ln(x)	ShapiroWilk
pH, field (SU)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	42	5.951	0.5895	ln(x)	ShapiroWilk

Sanitas™ v.9.6.23 . UG



Constituent: Boron, total Analysis Run 11/20/2019 1:03 PM View: Interwell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



Constituent: pH, field Analysis Run 11/20/2019 1:03 PM View: Interwell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Intrawell Appendix III Outlier Analysis - Significant Results

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/20/2019, 1:07 PM

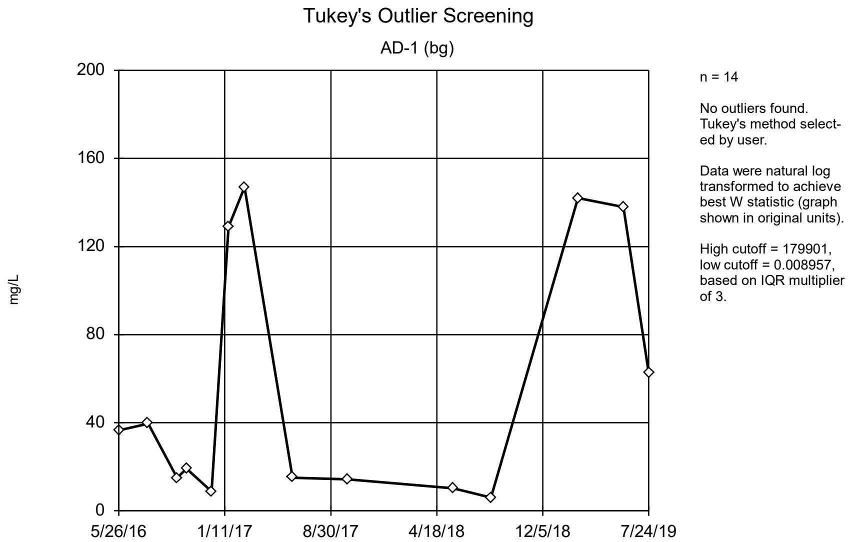
Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Total Dissolved Solids (mg/L)	**AD-15**	**Yes**	**367**	**9/30/2016**	**NP**	**NaN**	**13**	**179**	**75.8**	**normal**	**ShapiroWilk**

Intrawell Appendix III Outlier Analysis - All Results

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/20/2019, 1:07 PM

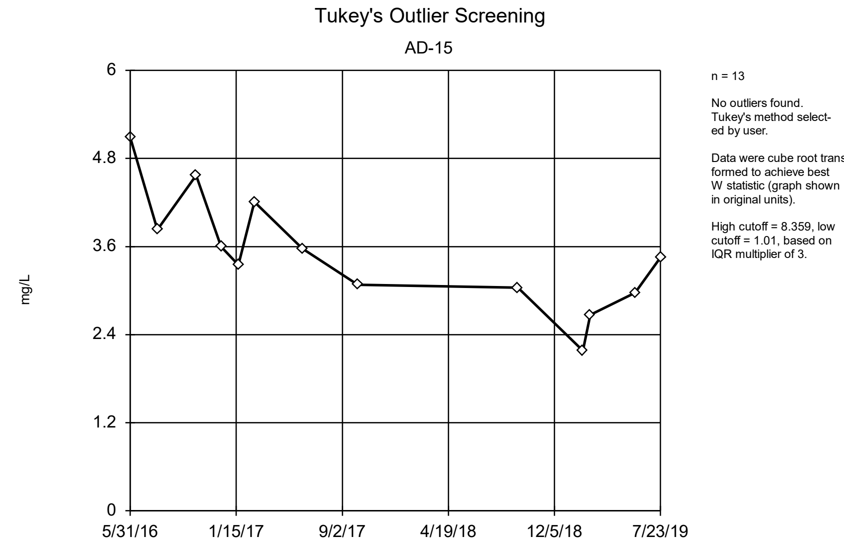
Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Calcium, total (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	55.94	56.65	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	3.508	0.7866	x^(1/3)	ShapiroWilk
Calcium, total (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	195.5	8.645	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	40.53	8.044	x^(1/3)	ShapiroWilk
Calcium, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	14	20.9	4.996	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	14	181.3	86.04	x^5	ShapiroWilk
Chloride, total (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	4.172	1.727	x^(1/3)	ShapiroWilk
Chloride, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	28.28	4.624	normal	ShapiroWilk
Chloride, total (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	35.64	4.965	ln(x)	ShapiroWilk
Chloride, total (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	17	3.662	ln(x)	ShapiroWilk
Chloride, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	24.36	5.269	x^(1/3)	ShapiroWilk
Chloride, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	71.69	28.34	x^4	ShapiroWilk
Fluoride, total (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	0.8311	0.3376	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	0.7306	0.4231	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	0.6221	0.3637	x^(1/3)	ShapiroWilk
Fluoride, total (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	0.7288	0.3808	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	0.6628	0.184	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	0.6695	0.3425	x^(1/3)	ShapiroWilk
Sulfate, total (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	46.46	10.67	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-15	No	n/a	n/a	NP	NaN	13	18.36	7.438	x^2	ShapiroWilk
Sulfate, total (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	1123	104.3	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	142.1	78.09	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	164	27.48	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	1186	608.9	x^2	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	295.9	180	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	**AD-15**	**Yes**	**367**	**9/30/2016**	**NP**	**NaN**	**13**	**179**	**75.8**	**normal**	**ShapiroWilk**
Total Dissolved Solids (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	1670	111	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	343.5	88.41	sqrt(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-8	No	n/a	n/a	NP	NaN	13	385.2	70.74	x^(1/3)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-9	No	n/a	n/a	NP	NaN	13	2034	869.4	x^6	ShapiroWilk

Sanitas™ v.9.6.23 . UG



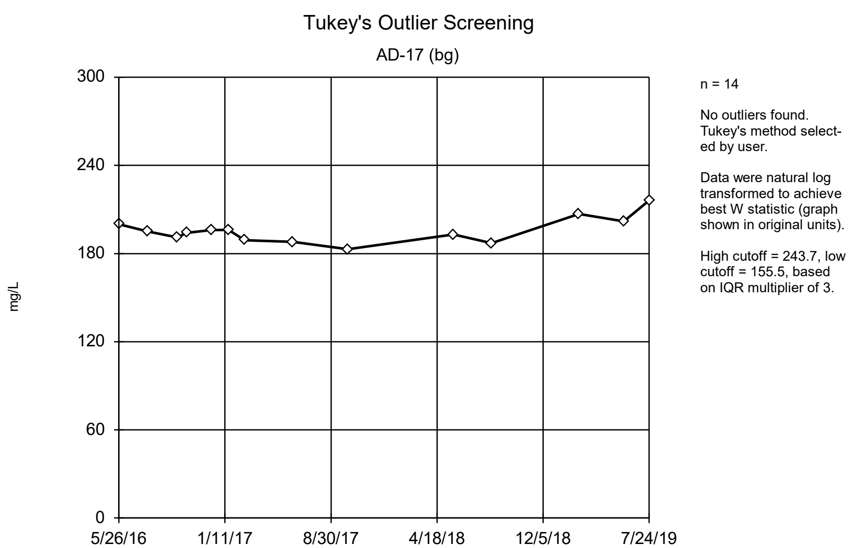
Constituent: Calcium, total   Analysis Run 11/20/2019 1:04 PM   View: Intrawell AIII
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



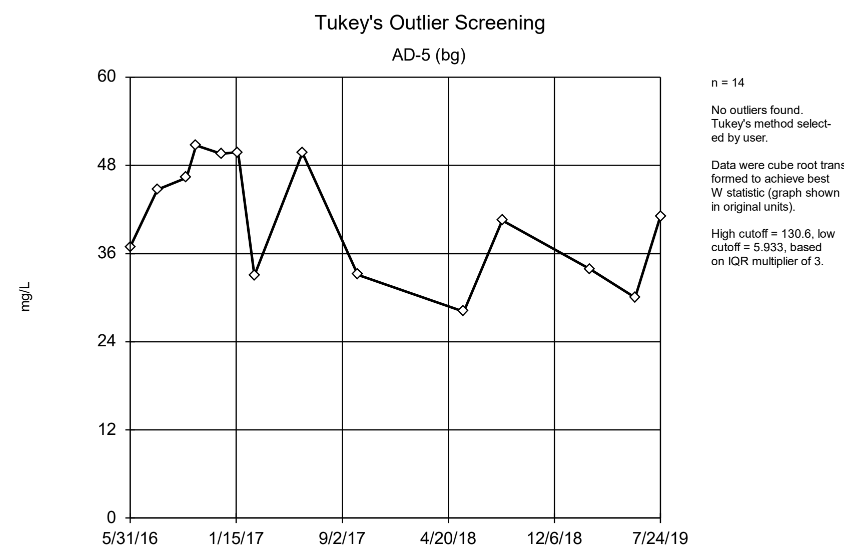
Constituent: Calcium, total   Analysis Run 11/20/2019 1:04 PM   View: Intrawell AIII
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

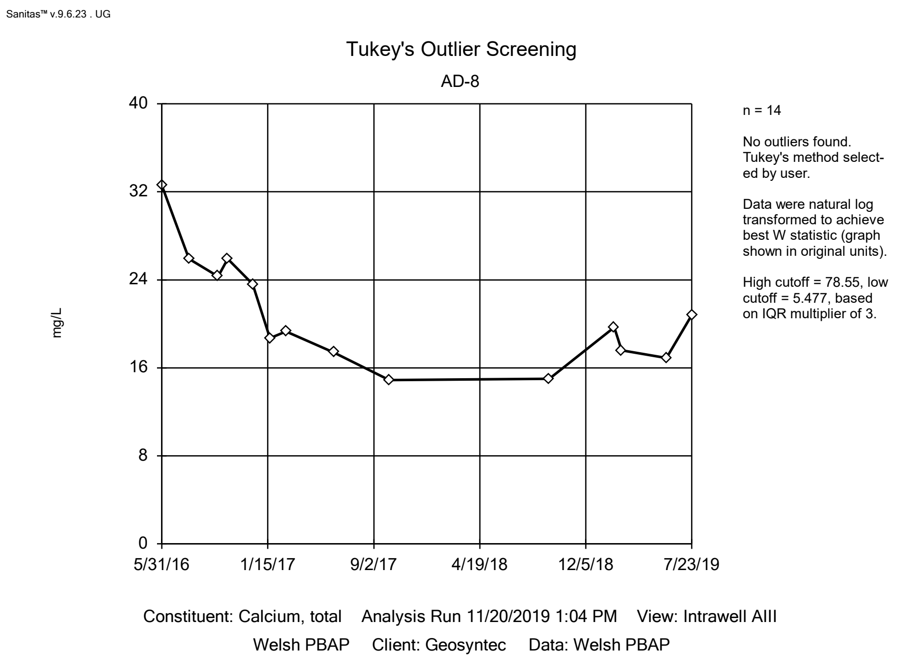


Constituent: Calcium, total   Analysis Run 11/20/2019 1:04 PM   View: Intrawell AIII
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

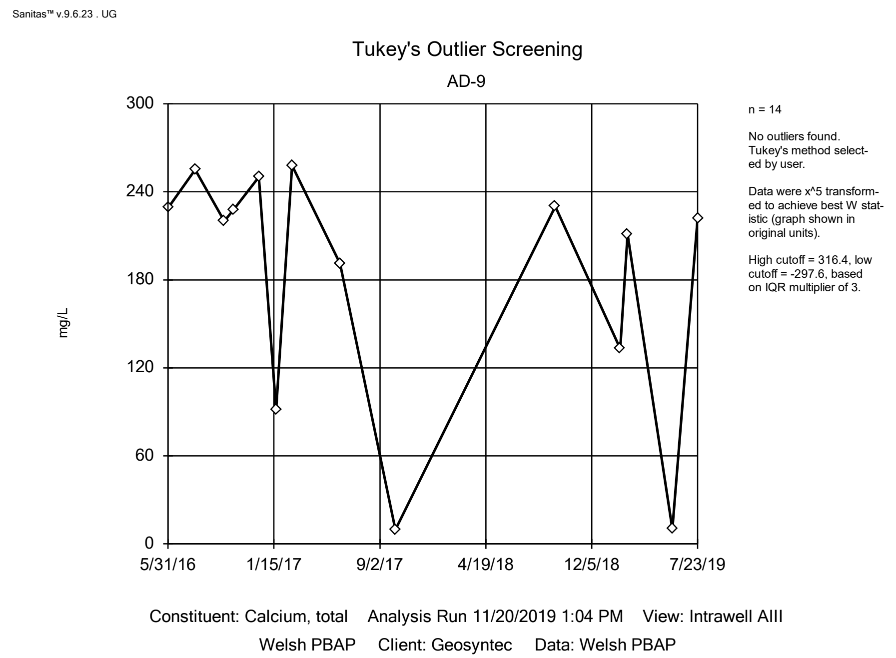
Sanitas™ v.9.6.23 . UG



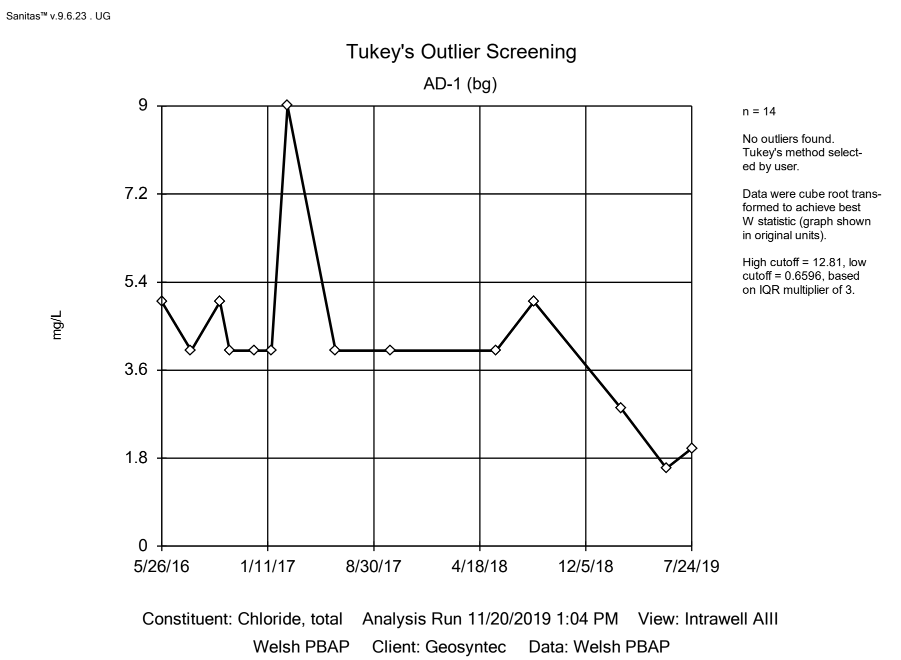
Constituent: Calcium, total   Analysis Run 11/20/2019 1:04 PM   View: Intrawell AIII
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP



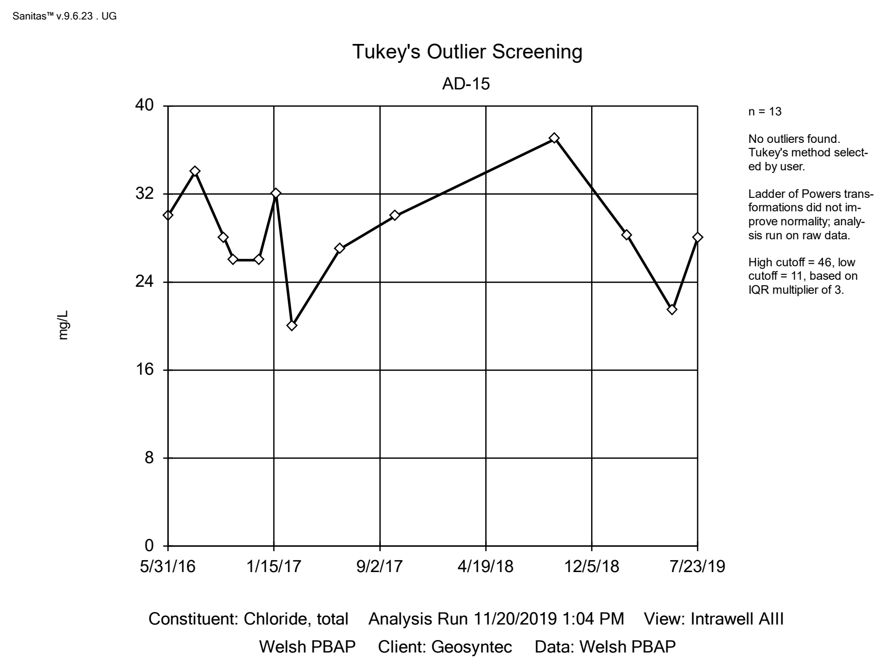
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-8
mg/L
40
32
24
16
8
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 78.55, low cutoff = 5.477, based on IQR multiplier of 3.
Constituent: Calcium, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



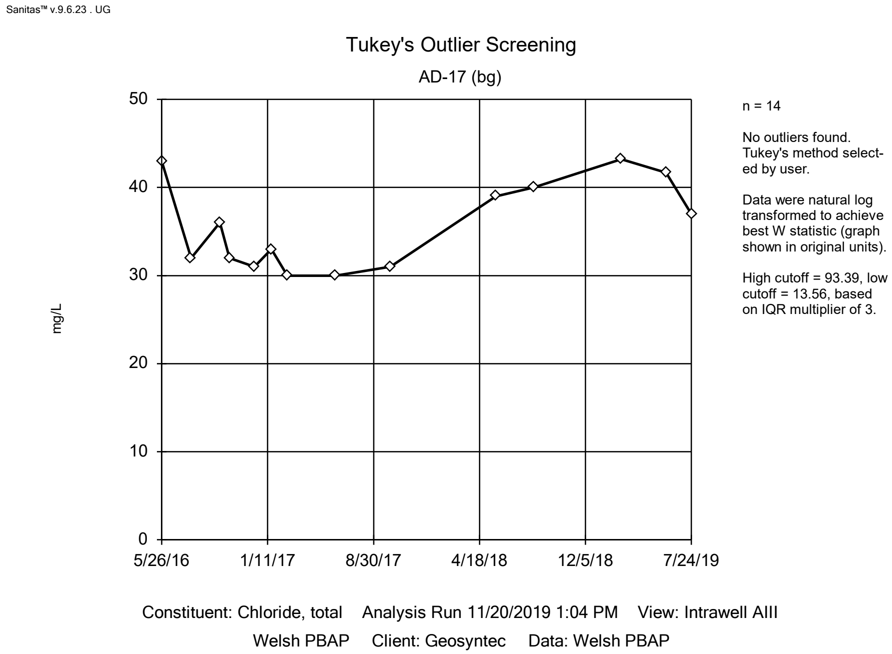
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-9
mg/L
300
240
180
120
60
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 14
No outliers found. Tukey's method selected by user.
Data were x^5 transformed to achieve best W statistic (graph shown in original units).
High cutoff = 316.4, low cutoff = -297.6, based on IQR multiplier of 3.
Constituent: Calcium, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

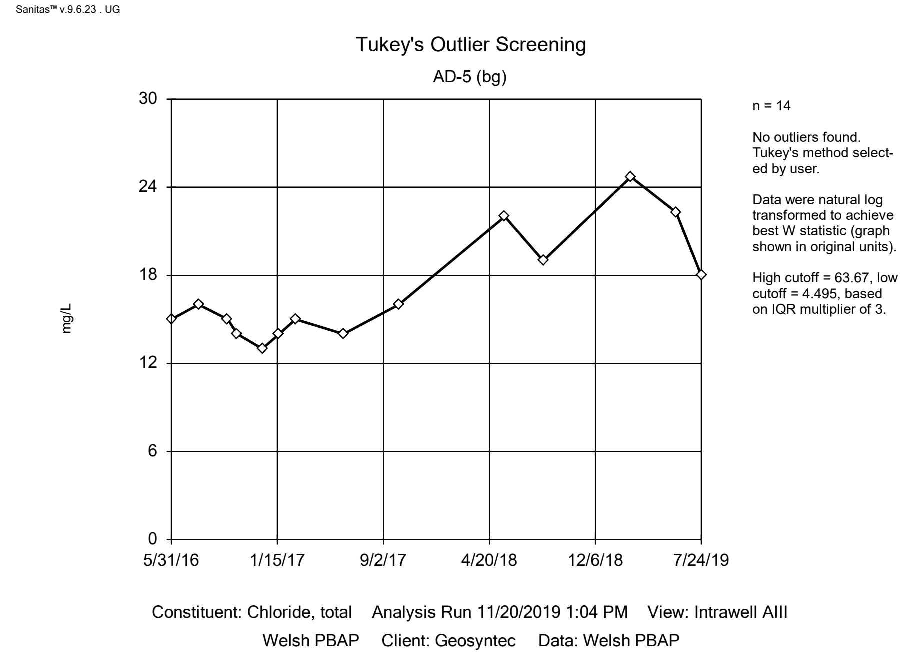


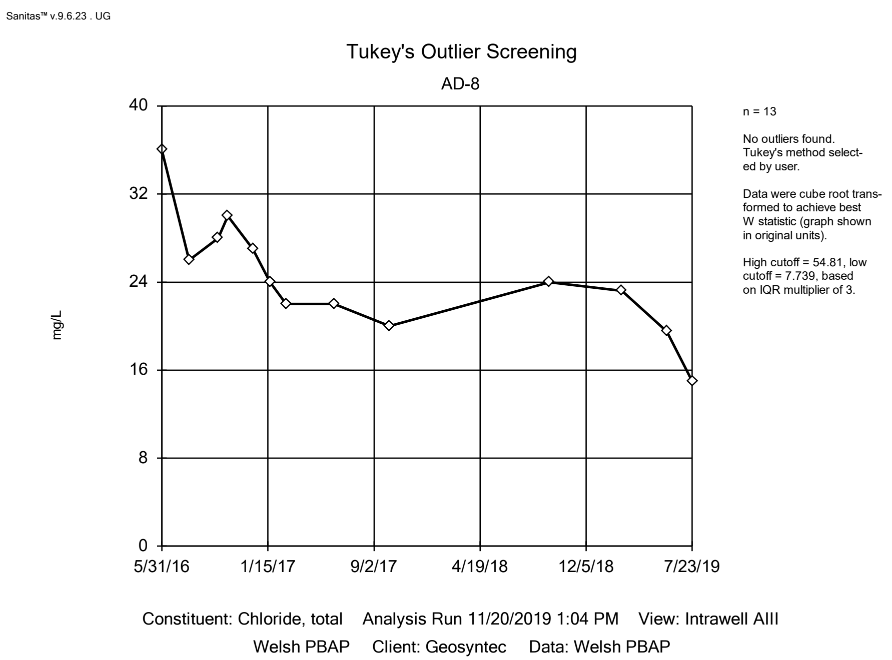
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-1 (bg)
mg/L
9
7.2
5.4
3.6
1.8
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 14
No outliers found. Tukey's method selected by user.
Data were cube root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 12.81, low cutoff = 0.6596, based on IQR multiplier of 3.
Constituent: Chloride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

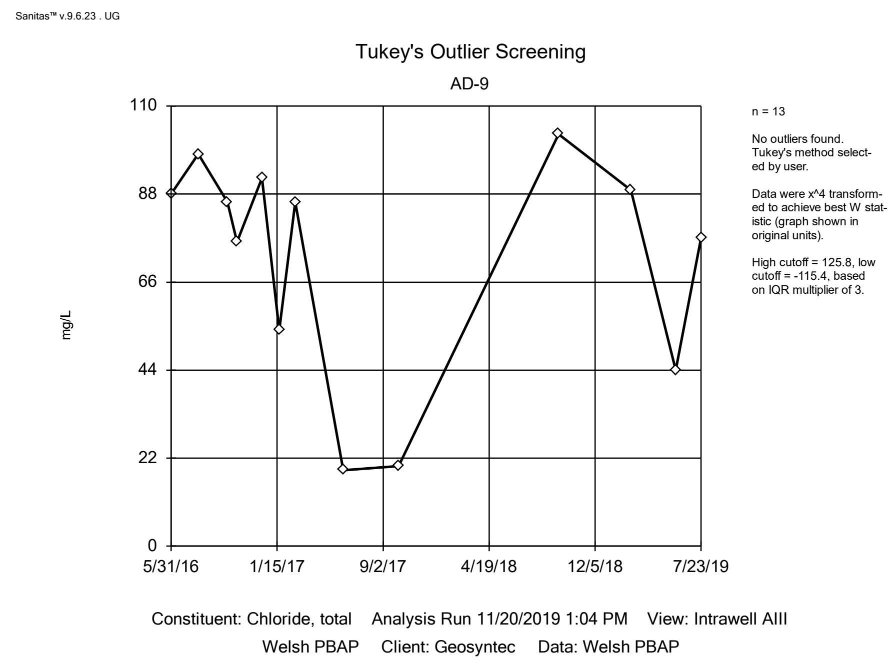


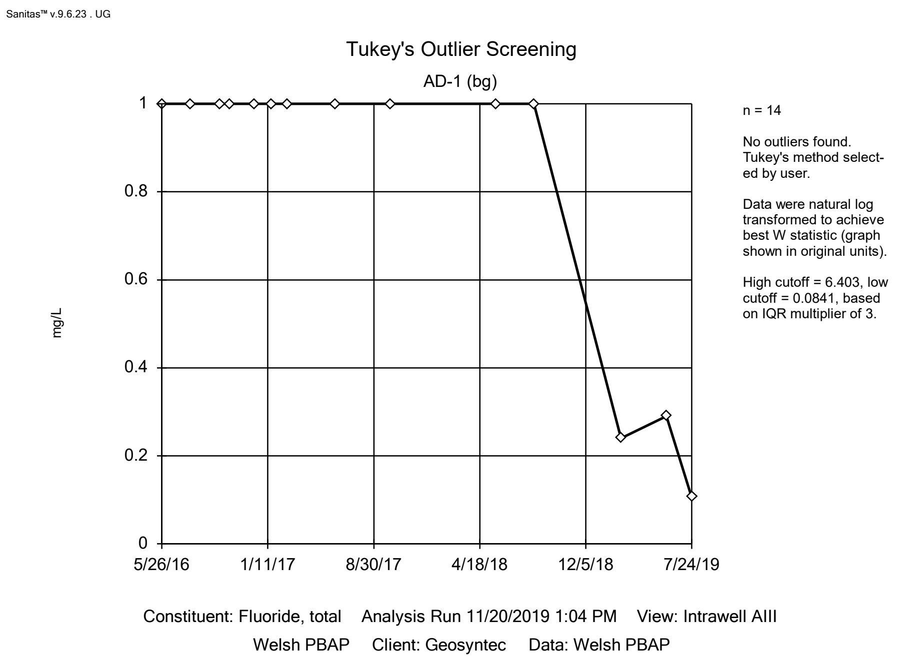
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-15
mg/L
40
32
24
16
8
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
High cutoff = 46, low cutoff = 11, based on IQR multiplier of 3.
Constituent: Chloride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-17 (bg)
50
40
30
20
10
0
mg/L
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 14
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 = 93.39, low cutoff = 13.56, based on IQR multiplier of 3.
Constituent: Chloride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

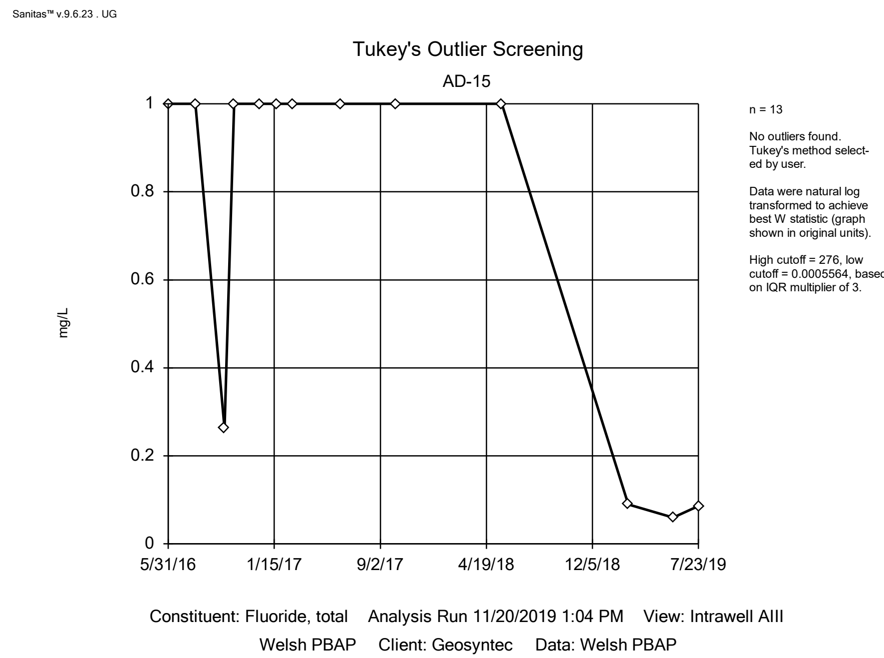

Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-5 (bg)
30
24
18
12
6
0
mg/L
5/31/16
1/15/17
9/2/17
4/20/18
12/6/18
7/24/19
n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 63.67, low cutoff = 4.495, based on IQR multiplier of 3.
Constituent: Chloride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-8
40
32
24
16
8
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were cube root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 54.81, low cutoff = 7.739, based on IQR multiplier of 3.
Constituent: Chloride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

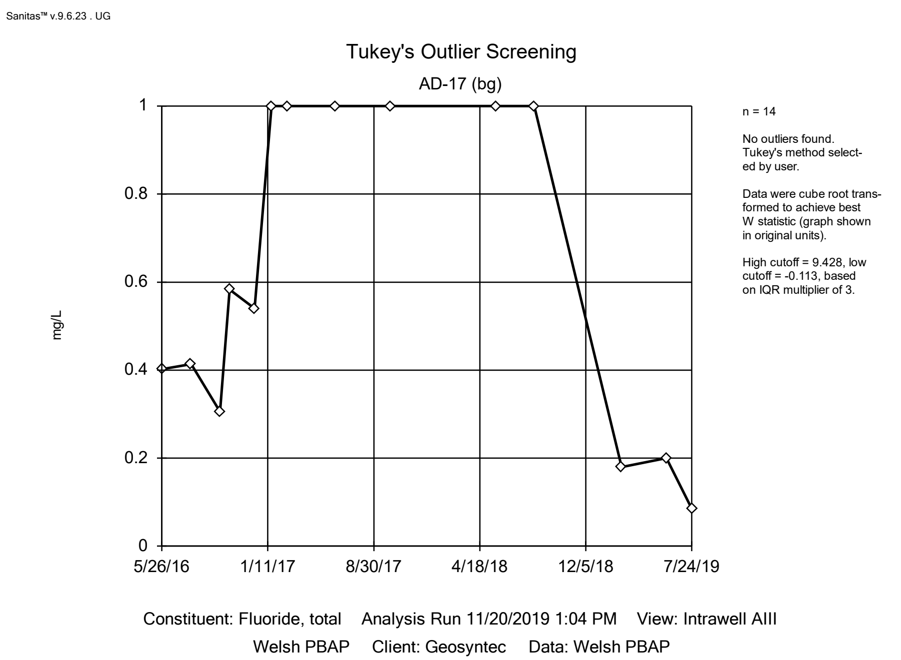

Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-9
110
88
66
44
22
0
mg/L
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were x^4 transformed to achieve best W statistic (graph shown in original units).
High cutoff = 125.8, low cutoff = -115.4, based on IQR multiplier of 3.
Constituent: Chloride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



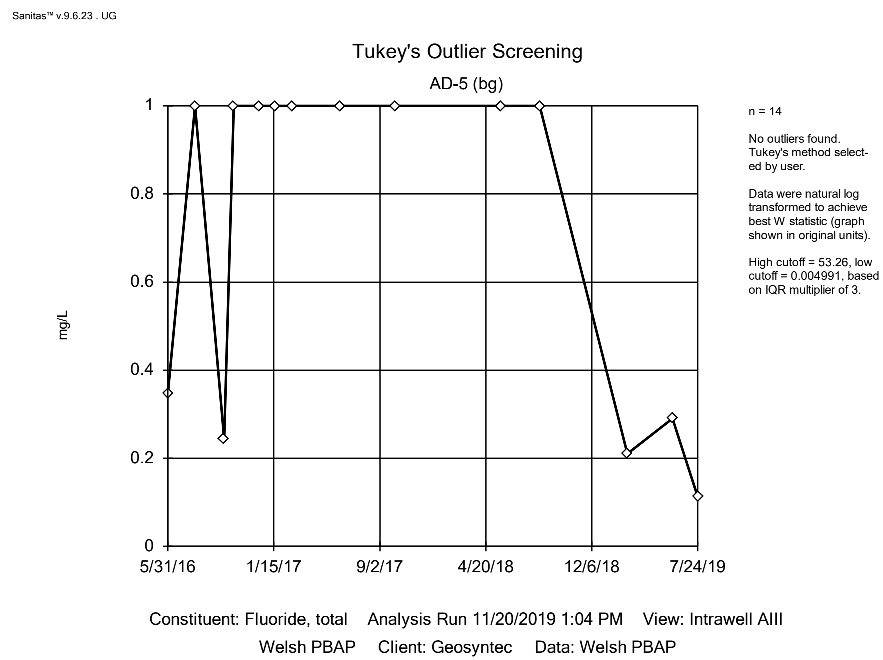
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-1 (bg)
mg/L
1
0.8
0.6
0.4
0.2
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 6.403, low cutoff = 0.0841, based on IQR multiplier of 3.
Constituent: Fluoride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



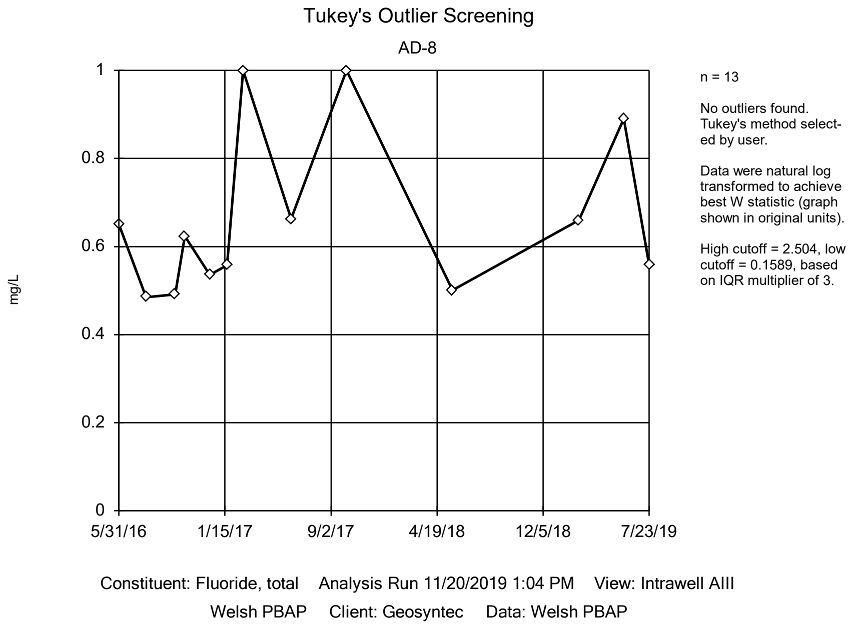
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-15
mg/L
1
0.8
0.6
0.4
0.2
0
5/31/16
1/15/17
9/2/17
4/19/18
12/5/18
7/23/19
n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 276, low cutoff = 0.0005564, based on IQR multiplier of 3.
Constituent: Fluoride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



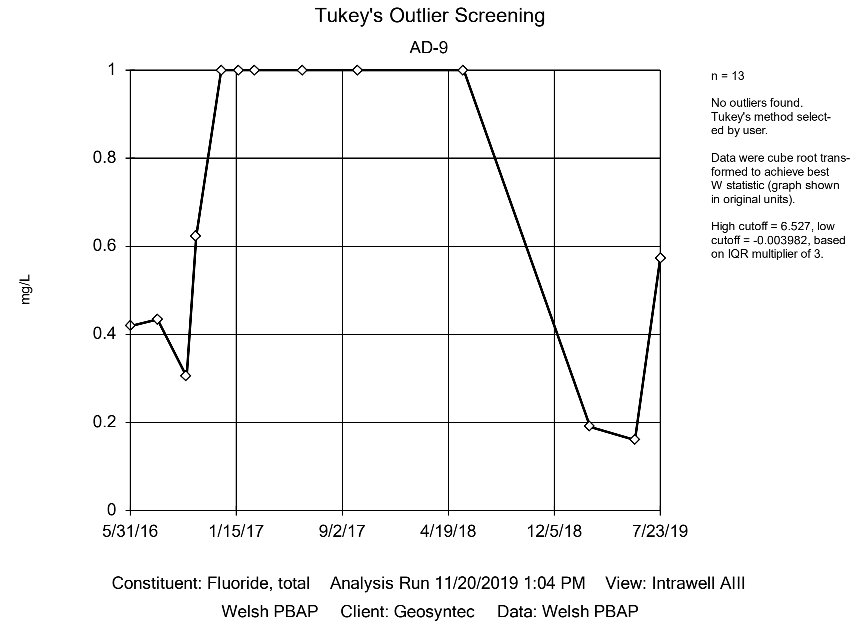
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-17 (bg)
mg/L
1
0.8
0.6
0.4
0.2
0
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 14
No outliers found. Tukey's method selected by user.
Data were cube root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 9.428, low cutoff = -0.113, based on IQR multiplier of 3.
Constituent: Fluoride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



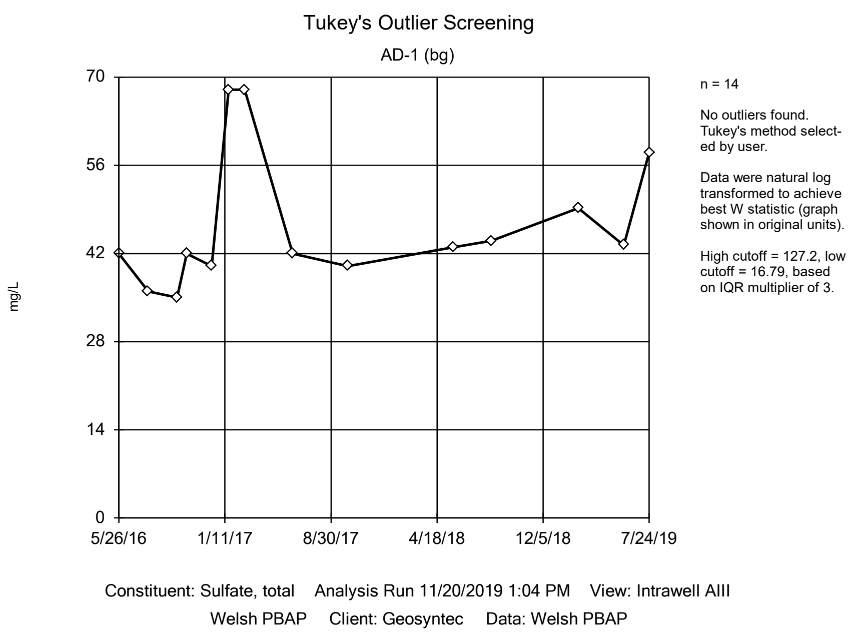
Sanitas™ v.9.6.23 . UG
Tukey's Outlier Screening
AD-5 (bg)
mg/L
1
0.8
0.6
0.4
0.2
0
5/31/16
1/15/17
9/2/17
4/20/18
12/6/18
7/24/19
n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 53.26, low cutoff = 0.004991, based on IQR multiplier of 3.
Constituent: Fluoride, total Analysis Run 11/20/2019 1:04 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



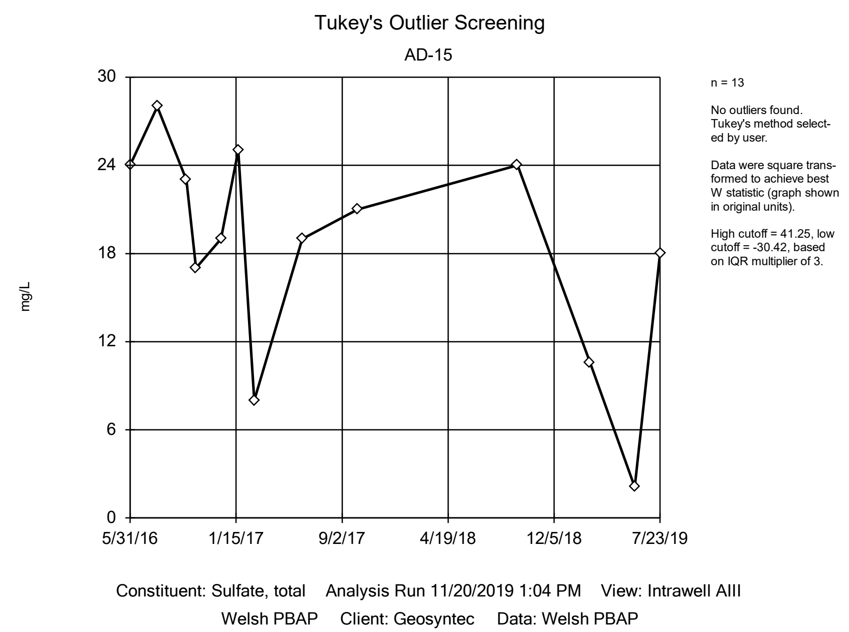
Sanitas™ v.9.6.23 . UG



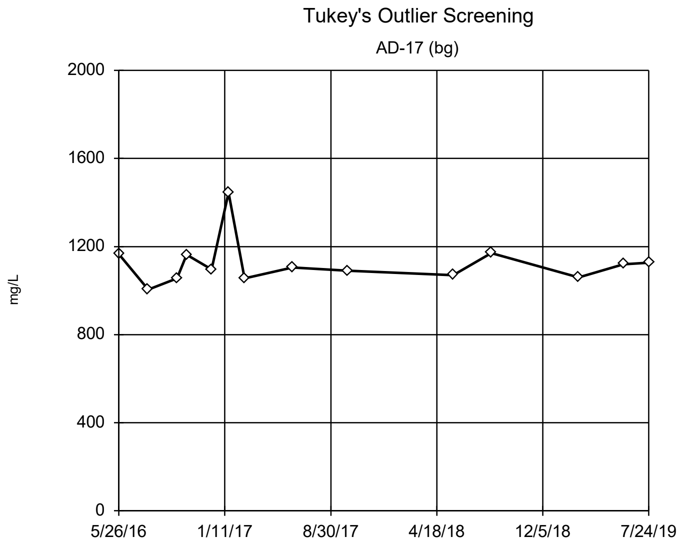
Sanitas™ v.9.6.23 . UG



Sanitas™ v.9.6.23 . UG



Sanitas™ v.9.6.23 . UG



n = 14

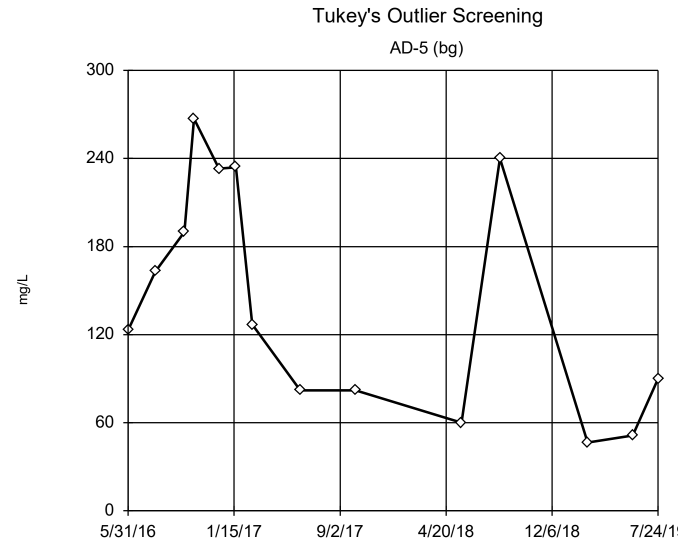
No outliers found. Tukey's method selected by user.

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

High cutoff = 1555, low cutoff = 792, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



n = 14

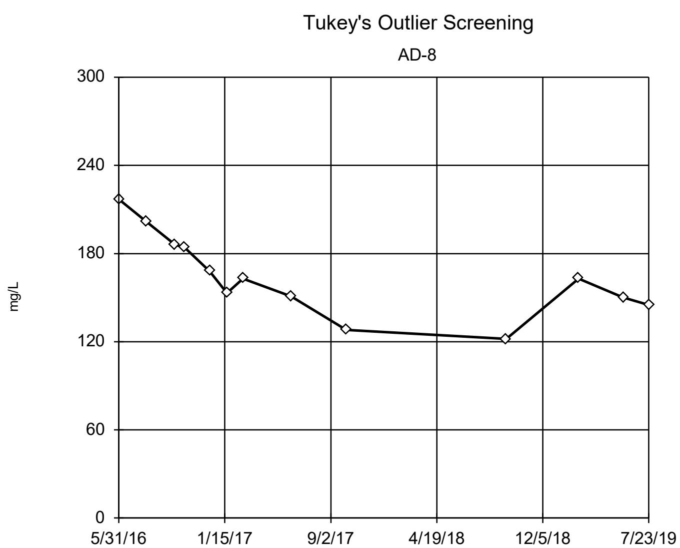
No outliers found. Tukey's method selected by user.

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

High cutoff = 8614, low cutoff = 1.901, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



n = 13

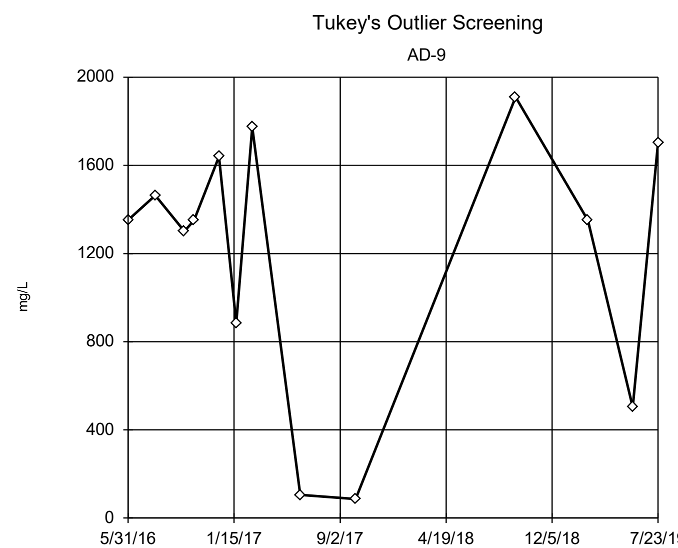
No outliers found. Tukey's method selected by user.

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

High cutoff = 365.2, low cutoff = 74.72, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



n = 13

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

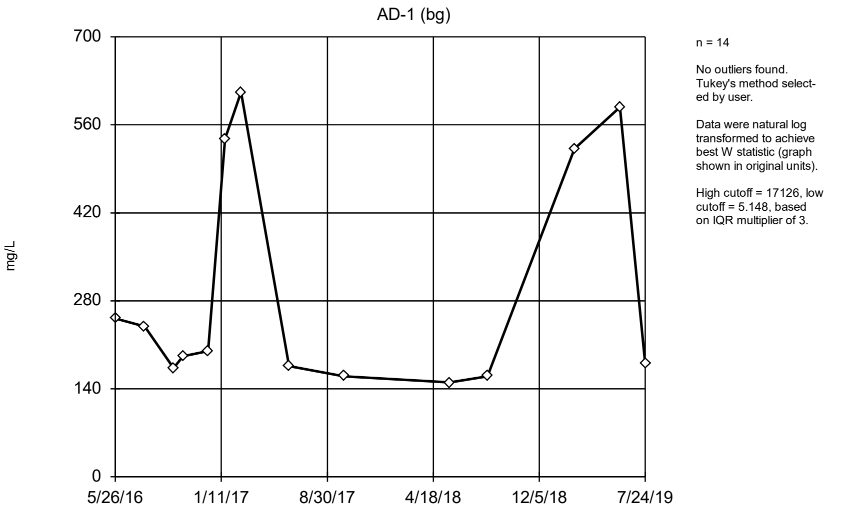
Data were square transformed to achieve best W statistic (graph shown in original units).

High cutoff = 3100, low cutoff = -2510, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

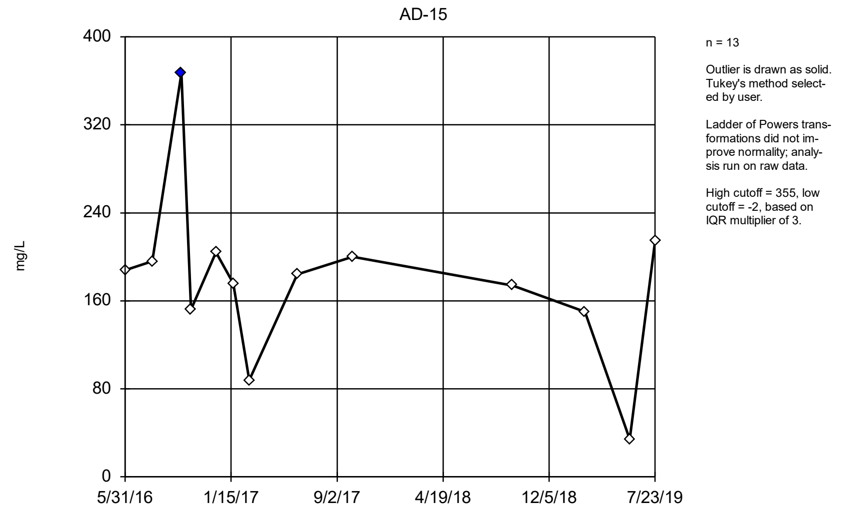
Tukey's Outlier Screening



Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

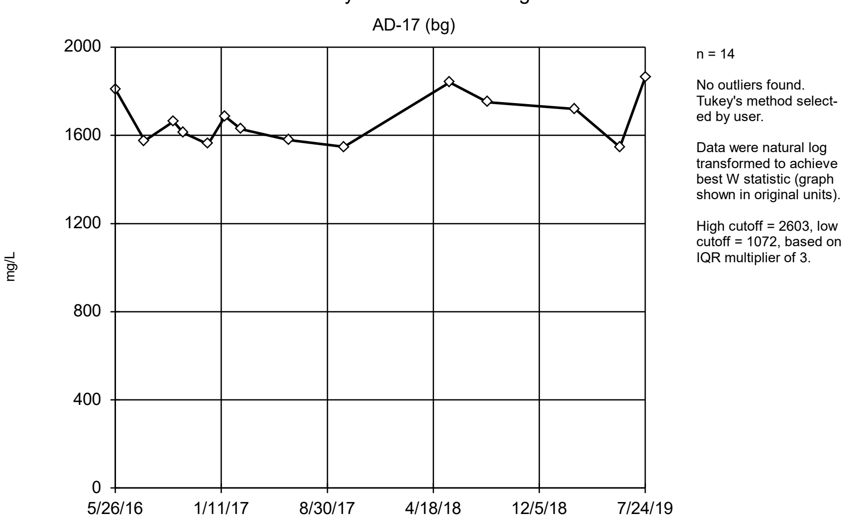
Tukey's Outlier Screening



Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

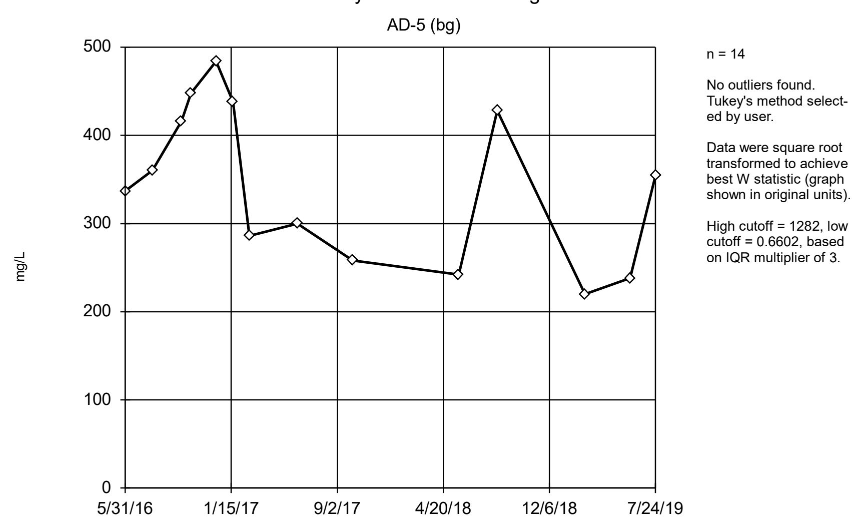
Tukey's Outlier Screening



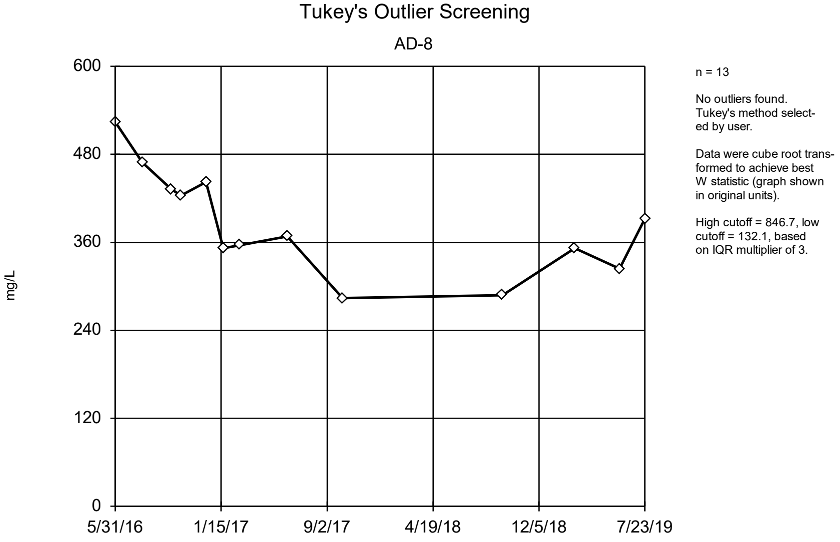
Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

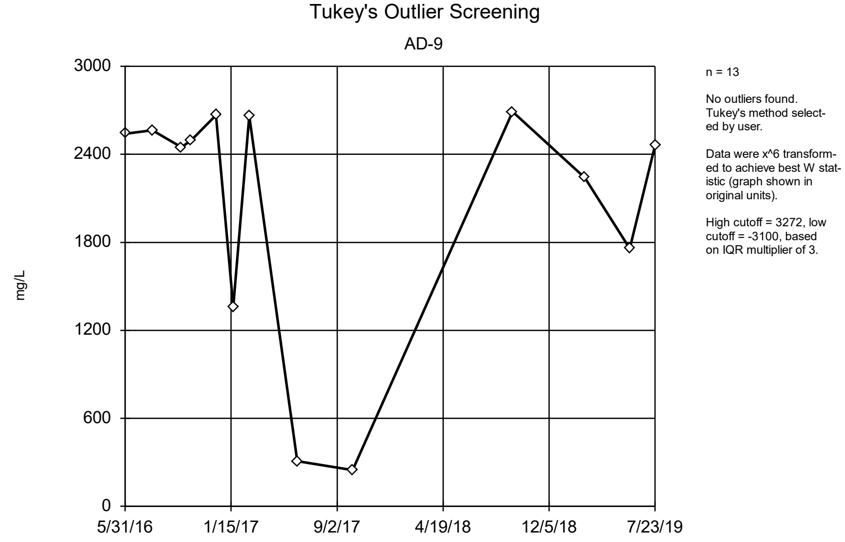
Tukey's Outlier Screening



Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:05 PM View: Intrawell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Mann-Whitney - Significant Results

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/8/2019, 4:18 PM

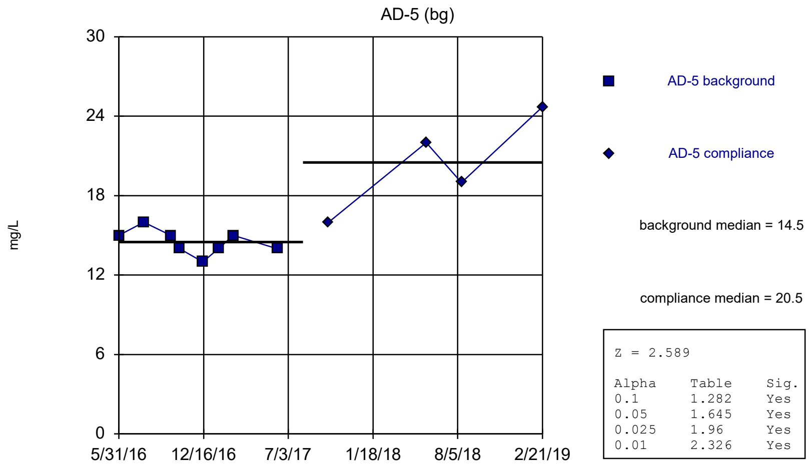
Constituent	Well	Calc.	0.01	Sig.	Method
Chloride, total (mg/L)	**AD-5 (bg)**	**2.589**	**Yes**	**Yes**	**Mann-W**

Mann-Whitney - All Results

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/8/2019, 4:18 PM

Constituent	Well	Calc.	0.01	Sig.	Method
Calcium, total (mg/L)	AD-1 (bg)	-1.274	No	No	Mann-W
Calcium, total (mg/L)	AD-17 (bg)	-0.9358	No	No	Mann-W
Calcium, total (mg/L)	AD-5 (bg)	-2.123	No	No	Mann-W
Calcium, total (mg/L)	AD-15	-2.74	No	No	Mann-W
Calcium, total (mg/L)	AD-8	-2.127	No	No	Mann-W
Calcium, total (mg/L)	AD-9	-1.444	No	No	Mann-W
Chloride, total (mg/L)	AD-1 (bg)	-1.051	No	No	Mann-W
Chloride, total (mg/L)	AD-17 (bg)	1.366	No	No	Mann-W
Chloride, total (mg/L)	**AD-5 (bg)**	**2.589**	**Yes**	**Yes**	**Mann-W**
Chloride, total (mg/L)	AD-15	1.23	No	No	Mann-W
Chloride, total (mg/L)	AD-8	-1.64	No	No	Mann-W
Chloride, total (mg/L)	AD-9	0.5115	No	No	Mann-W
Fluoride, total (mg/L)	AD-1 (bg)	-1.591	No	No	Mann-W
Fluoride, total (mg/L)	AD-17 (bg)	0.5439	No	No	Mann-W
Fluoride, total (mg/L)	AD-5 (bg)	-0.3344	No	No	Mann-W
Fluoride, total (mg/L)	AD-15	-1.06	No	No	Mann-W
Fluoride, total (mg/L)	AD-8	0.6138	No	No	Mann-W
Fluoride, total (mg/L)	AD-9	-0.1113	No	No	Mann-W
Sulfate, total (mg/L)	AD-1 (bg)	0.6866	No	No	Mann-W
Sulfate, total (mg/L)	AD-17 (bg)	-0.08507	No	No	Mann-W
Sulfate, total (mg/L)	AD-5 (bg)	-1.531	No	No	Mann-W
Sulfate, total (mg/L)	AD-15	-0.4101	No	No	Mann-W
Sulfate, total (mg/L)	AD-8	-2.046	No	No	Mann-W
Sulfate, total (mg/L)	AD-9	-0.2046	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-1 (bg)	-1.786	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-17 (bg)	0.9341	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-5 (bg)	-1.953	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-15	-0.4558	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-8	-2.455	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-9	-0.5103	No	No	Mann-W

Mann-Whitney (Wilcoxon Rank Sum)



Constituent: Chloride, total Analysis Run 12/8/2019 4:15 PM View: Mann Whitney

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Intrawell Prediction Limit Summary

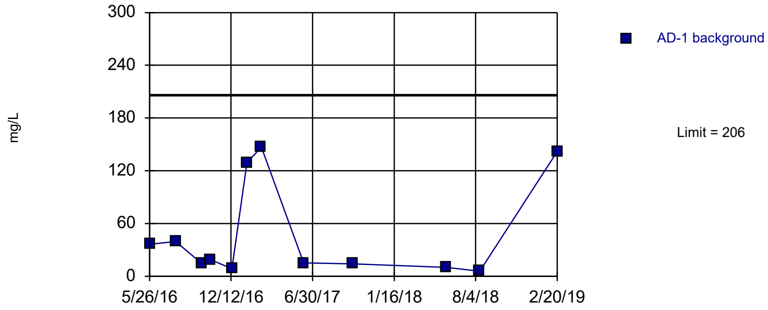
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/8/2019, 4:24 PM

Constituent	Well	Upper Lim.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium, total (mg/L)	AD-1	206	n/a	12	3.196	1.283	0	None	x^(1/3)	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-17	206.7	n/a	12	193.3	6.384	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-5	58.47	n/a	12	41.36	8.1	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-15	5.395	n/a	11	3.563	0.8426	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-8	32.4	n/a	12	21.24	5.284	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-9	298.7	n/a	12	42241	22241	0	None	x^2	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-1	9	n/a	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2
Chloride, total (mg/L)	AD-17	45.62	n/a	12	35.02	5.02	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-5	24.25	n/a	12	4.039	0.4191	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-15	38.76	n/a	11	28.93	4.523	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-8	35.47	n/a	11	25.65	4.511	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-9	138.2	n/a	11	73.73	29.65	0	None	No	0.002505	Param Intra 1 of 2
Fluoride, total (mg/L)	AD-1	1	n/a	12	n/a	n/a	91.67	n/a	n/a	0.01077	NP Intra (NDs) 1 of 2
Fluoride, total (mg/L)	AD-17	0.7482	n/a	12	0.6254	0.1134	50	Kaplan-Meier	sqrt(x)	0.002505	Param Intra 1 of 2
Fluoride, total (mg/L)	AD-5	1	n/a	12	n/a	n/a	75	n/a	n/a	0.01077	NP Intra (NDs) 1 of 2
Fluoride, total (mg/L)	AD-15	1	n/a	11	n/a	n/a	81.82	n/a	n/a	0.01276	NP Intra (NDs) 1 of 2
Fluoride, total (mg/L)	AD-8	0.7368	n/a	11	0.7562	0.04695	18.18	Kaplan-Meier	sqrt(x)	0.002505	Param Intra 1 of 2
Fluoride, total (mg/L)	AD-9	1	n/a	11	n/a	n/a	54.55	n/a	n/a	0.01276	NP Intra (NDs) 1 of 2
Sulfate, total (mg/L)	AD-1	70.37	n/a	12	3.801	0.2145	0	None	ln(x)	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-17	1445	n/a	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2
Sulfate, total (mg/L)	AD-5	318.3	n/a	12	154	77.83	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-15	33.18	n/a	11	19.87	6.117	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-8	230.1	n/a	11	167	28.99	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-9	2527	n/a	11	1201	609.4	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-1	612	n/a	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2
Total Dissolved Solids (mg/L)	AD-17	1872	n/a	12	1664	98.5	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-5	542	n/a	12	351.4	90.26	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-15	248.5	n/a	10	171.2	34.54	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-8	552.8	n/a	11	390.1	74.83	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-9	3070	n/a	11	1.2e10	7.7e9	0	None	x^3	0.002505	Param Intra 1 of 2

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-1 (bg)



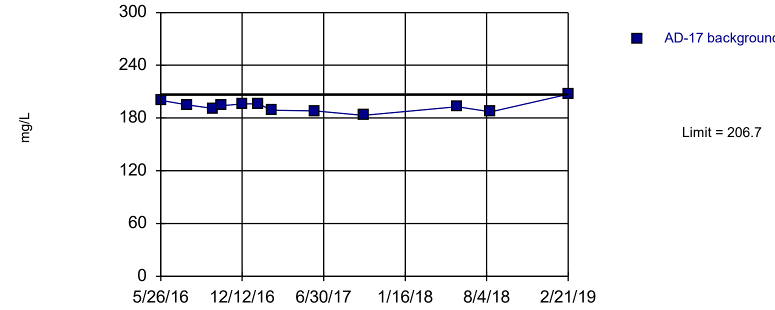
Background Data Summary (based on cube root transformation): Mean=3.196, Std. Dev.=1.283, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8246, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-17 (bg)



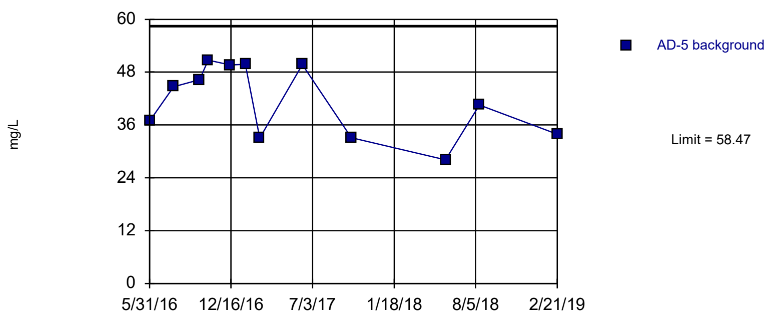
Background Data Summary: Mean=193.3, Std. Dev.=6.384, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9698, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-5 (bg)



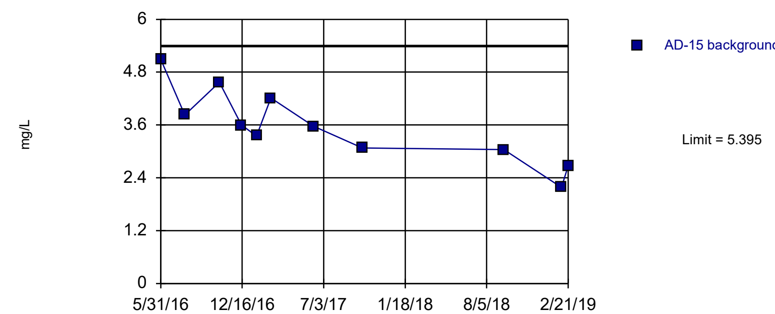
Background Data Summary: Mean=41.36, Std. Dev.=8.1, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8897, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

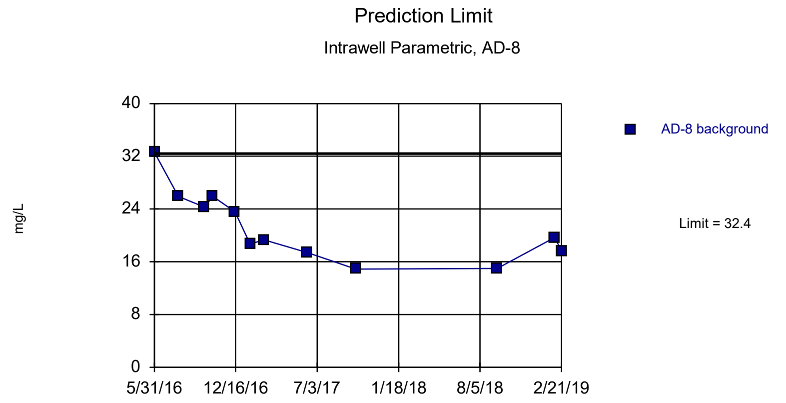
Prediction Limit

Intrawell Parametric, AD-15



Background Data Summary: Mean=3.563, Std. Dev.=0.8426, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9882, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

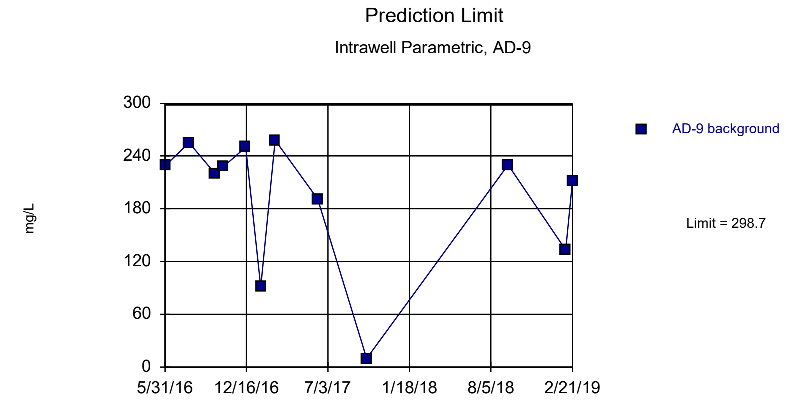
Constituent: Calcium, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Background Data Summary: Mean=21.24, Std. Dev.=5.284, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.923, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

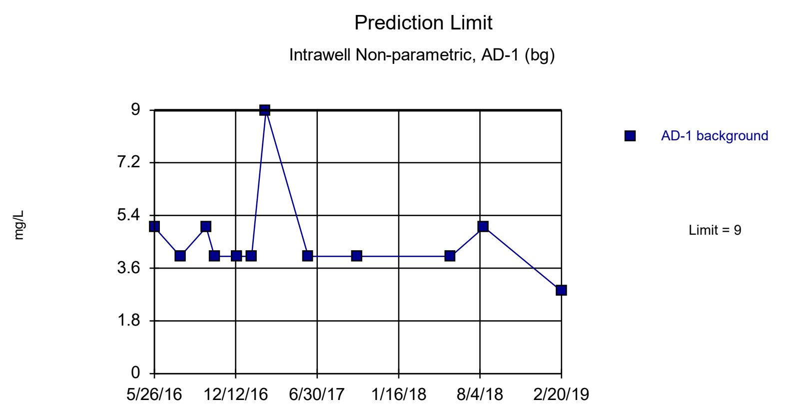
Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG



Background Data Summary (based on square transformation): Mean=42241, Std. Dev.=22241, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8804, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

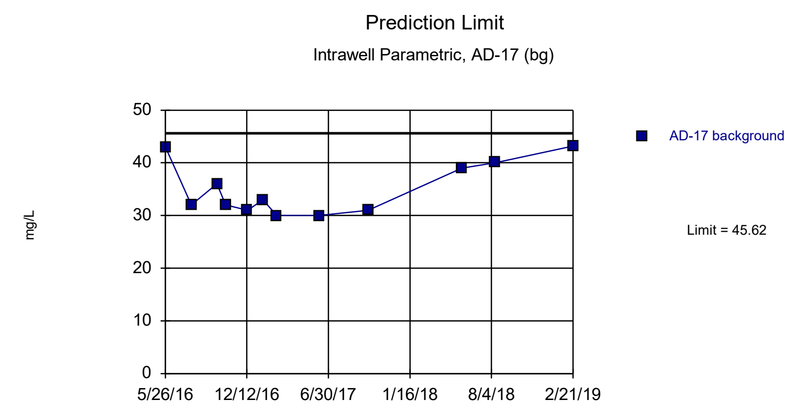
Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG



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 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

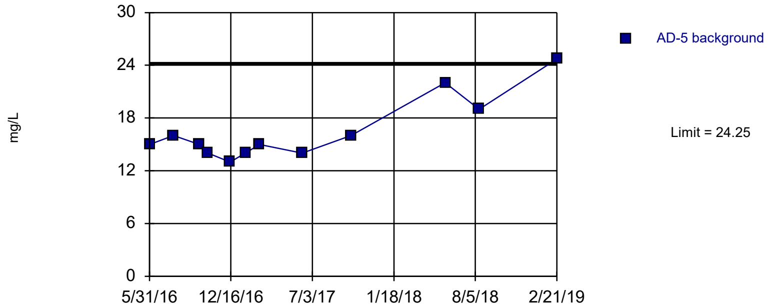


Background Data Summary: Mean=35.02, Std. Dev.=5.02, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8477, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-5 (bg)

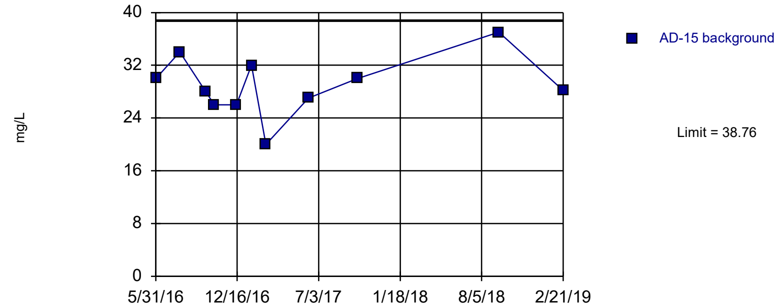


Background Data Summary (based on square root transformation): Mean=4.039, Std. Dev.=0.4191, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8217, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-15

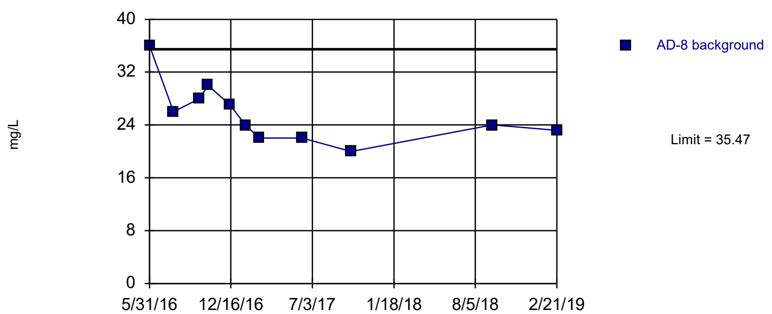


Background Data Summary: Mean=28.93, Std. Dev.=4.523, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9714, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-8

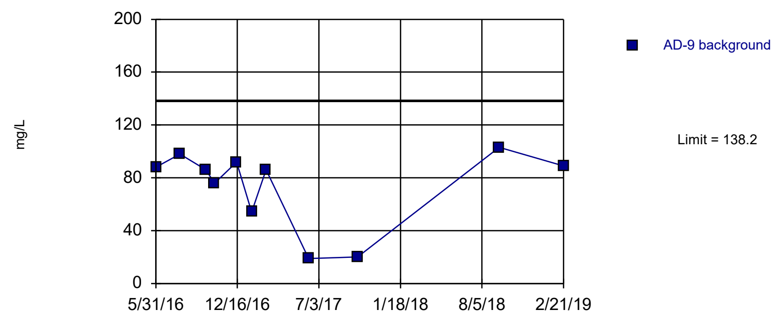


Background Data Summary: Mean=25.65, Std. Dev.=4.511, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9157, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-9



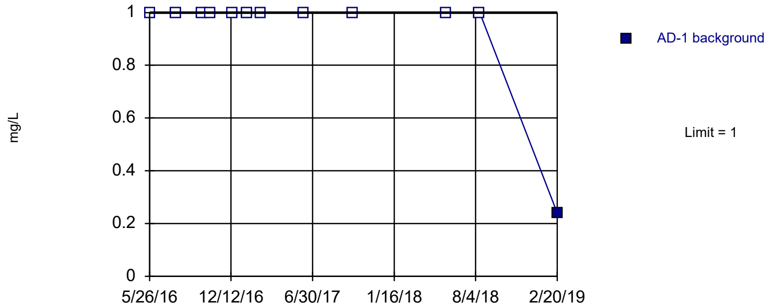
Background Data Summary: Mean=73.73, Std. Dev.=29.65, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7926, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, AD-1 (bg)



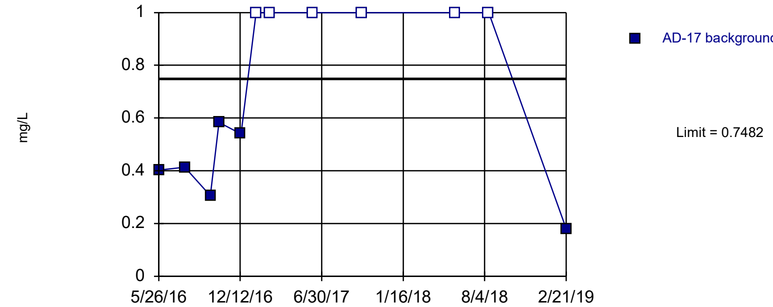
Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 12 background values. 91.67% NDs. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Parametric, AD-17 (bg)



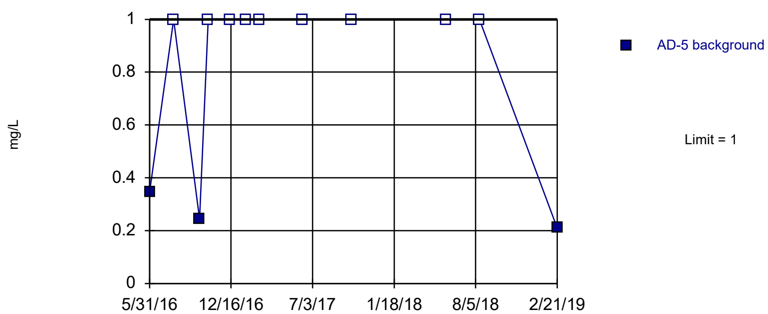
Background Data Summary (based on square root transformation) (after Kaplan-Meier Adjustment): Mean=0.6254, Std. Dev.=0.1134, n=12, 50% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8173, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

Intrawell Non-parametric, AD-5 (bg)



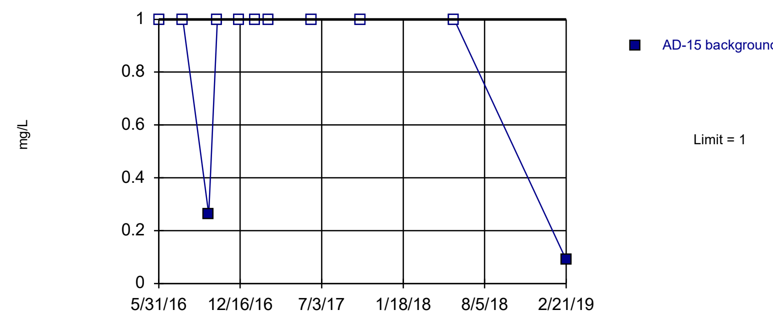
Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 12 background values. 75% NDs. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Prediction Limit

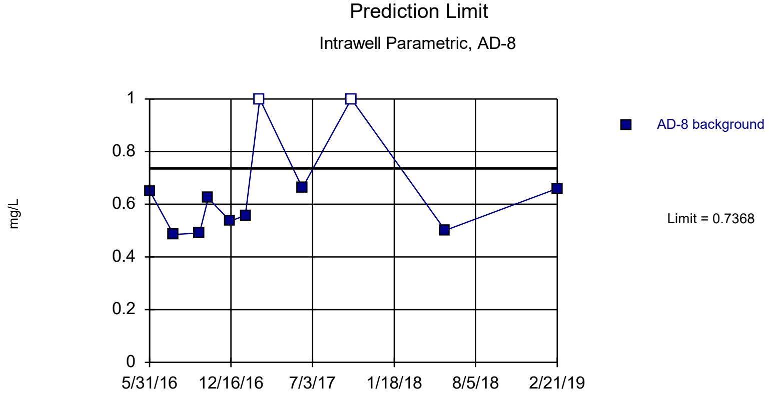
Intrawell Non-parametric, AD-15



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 11 background values. 81.82% NDs. Well-constituent pair annual alpha = 0.02537. Individual comparison alpha = 0.01276 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

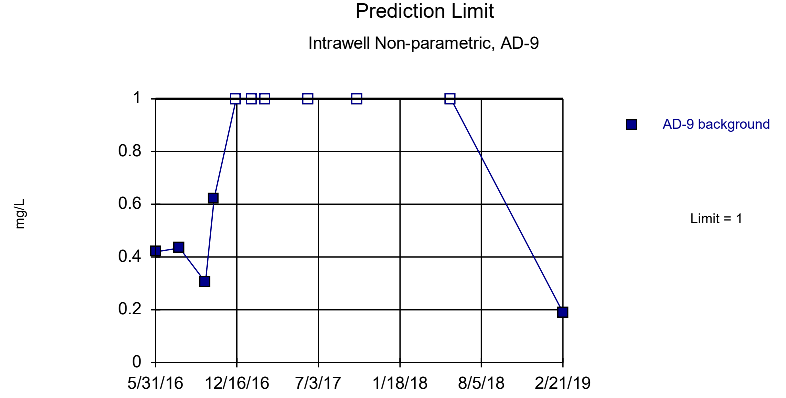
Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



Background Data Summary (based on square root transformation) (after Kaplan-Meier Adjustment): Mean=0.7562, Std. Dev.=0.04695, n=11, 18.18% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8152, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

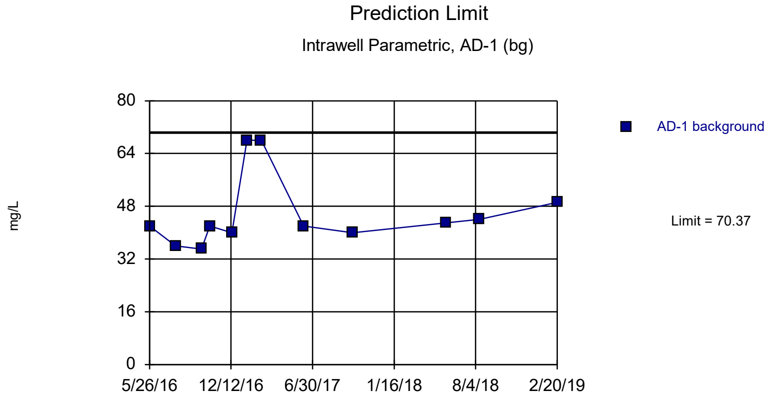
Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 11 background values. 54.55% NDs. Well-constituent pair annual alpha = 0.02537. Individual comparison alpha = 0.01276 (1 of 2). Assumes 1 future value.

Constituent: Fluoride, total Analysis Run 12/8/2019 4:22 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

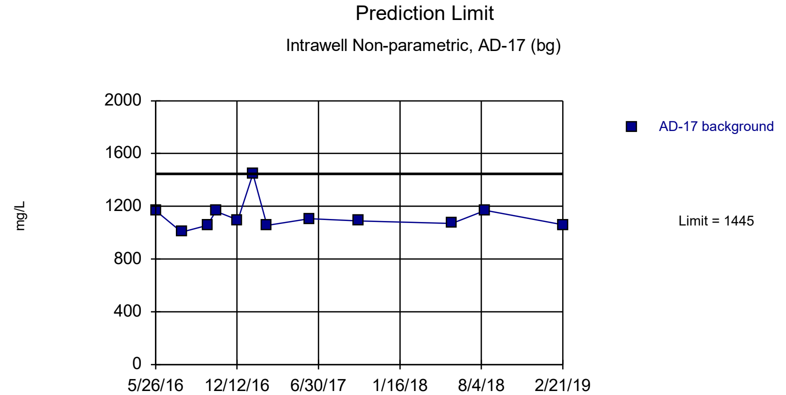
Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG



Background Data Summary (based on natural log transformation): Mean=3.801, Std. Dev.=0.2145, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.812, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

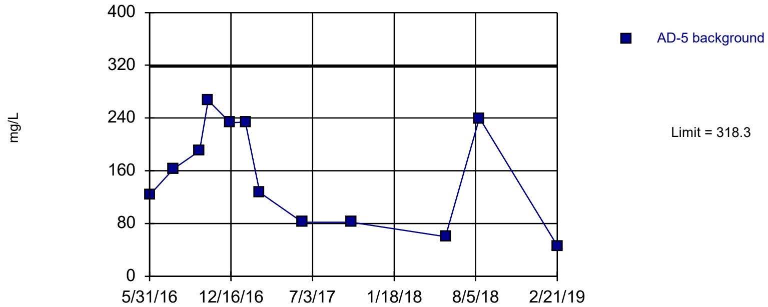


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-5 (bg)

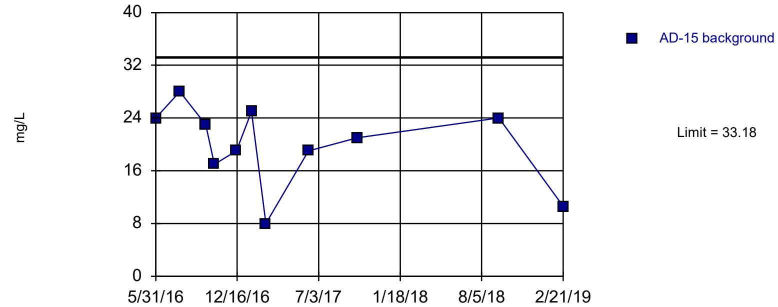


Background Data Summary: Mean=154, Std. Dev.=77.83, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.919, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-15

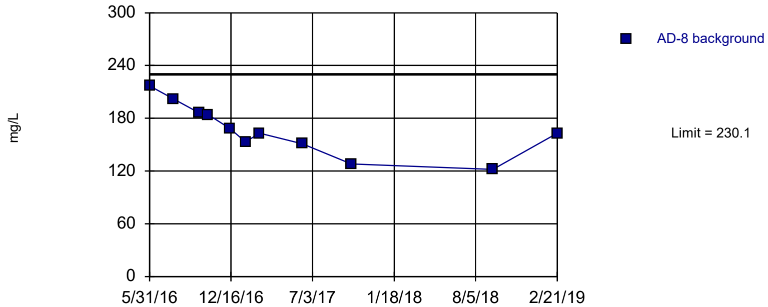


Background Data Summary: Mean=19.87, Std. Dev.=6.117, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9196, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-8

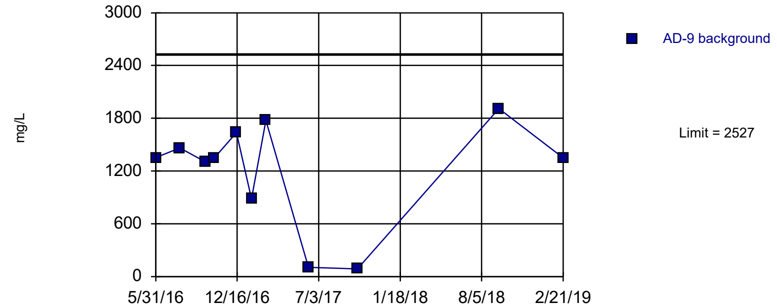


Background Data Summary: Mean=167, Std. Dev.=28.99, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9728, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Prediction Limit

Intrawell Parametric, AD-9



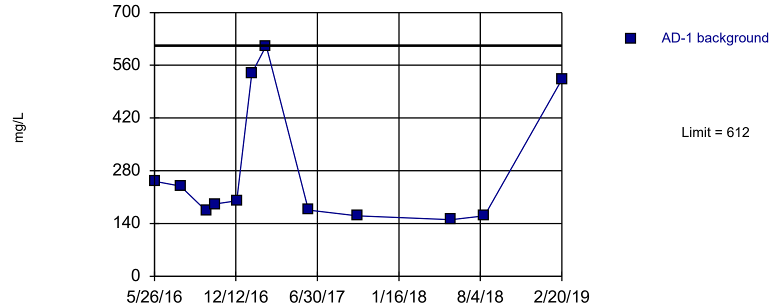
Background Data Summary: Mean=1201, Std. Dev.=609.4, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8425, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Non-parametric, AD-1 (bg)



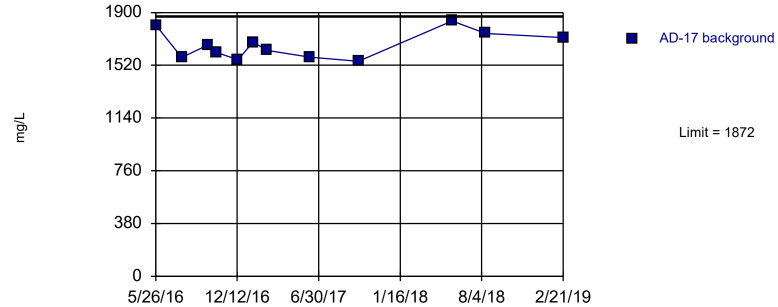
Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-17 (bg)



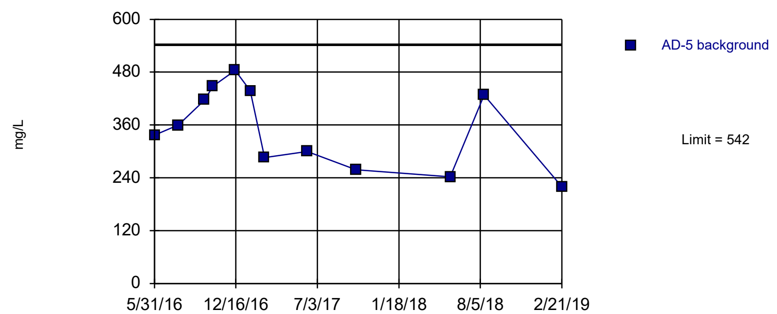
Background Data Summary: Mean=1664, Std. Dev.=98.5, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9253, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-5 (bg)



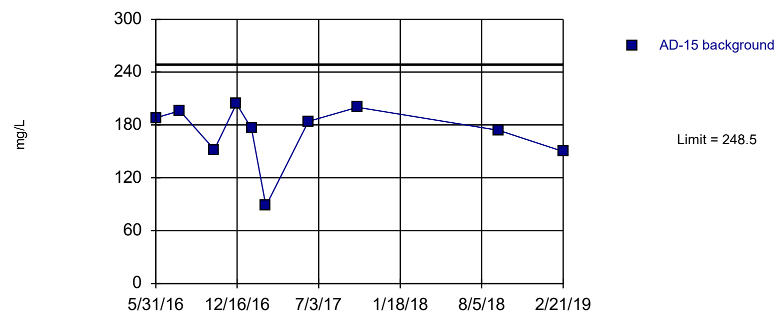
Background Data Summary: Mean=351.4, Std. Dev.=90.26, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9333, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-15



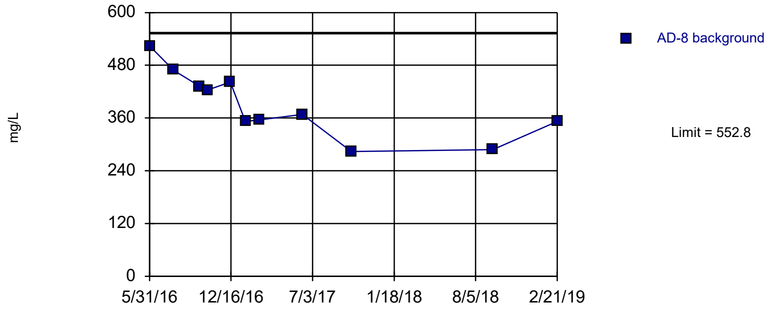
Background Data Summary: Mean=171.2, Std. Dev.=34.54, n=10. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8313, critical = 0.781. Kappa = 2.238 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-8



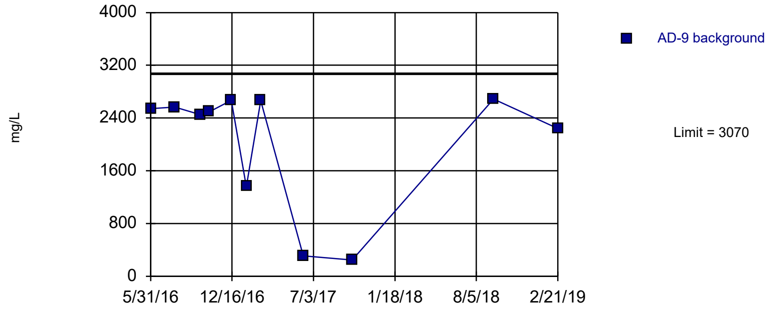
Background Data Summary: Mean=390.1, Std. Dev.=74.83, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9524, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23e Sanitas software utilized by Groundwater Stats Consulting. UG

Prediction Limit

Intrawell Parametric, AD-9



Background Data Summary (based on cube transformation): Mean=1.2e10, Std. Dev.=7.7e9, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8038, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

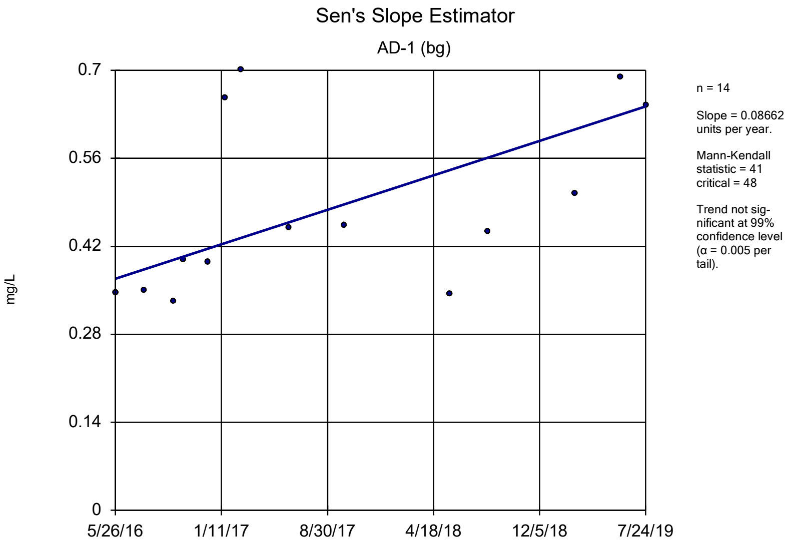
Constituent: Total Dissolved Solids Analysis Run 12/8/2019 4:23 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Trend Test Summary Table - All Results (No Significant)

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/22/2019, 8:13 PM

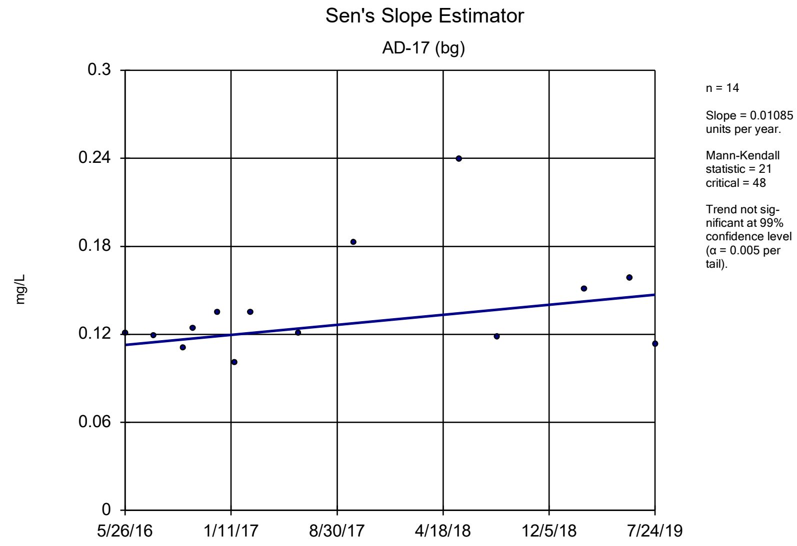
Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron, total (mg/L)	AD-1 (bg)	0.08662	41	48	No	14	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-17 (bg)	0.01085	21	48	No	14	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-5 (bg)	0	3	48	No	14	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-1 (bg)	0.02509	8	48	No	14	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-17 (bg)	-0.05848	-9	-48	No	14	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-5 (bg)	0.07449	23	48	No	14	0	n/a	n/a	0.01	NP

Sanitas™ v.9.6.23 . UG



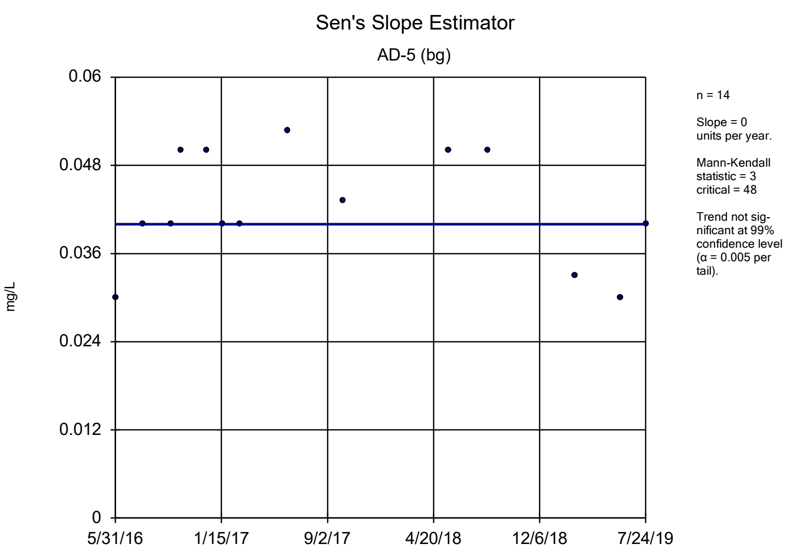
Constituent: Boron, total Analysis Run 11/22/2019 8:12 PM View: Interwell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



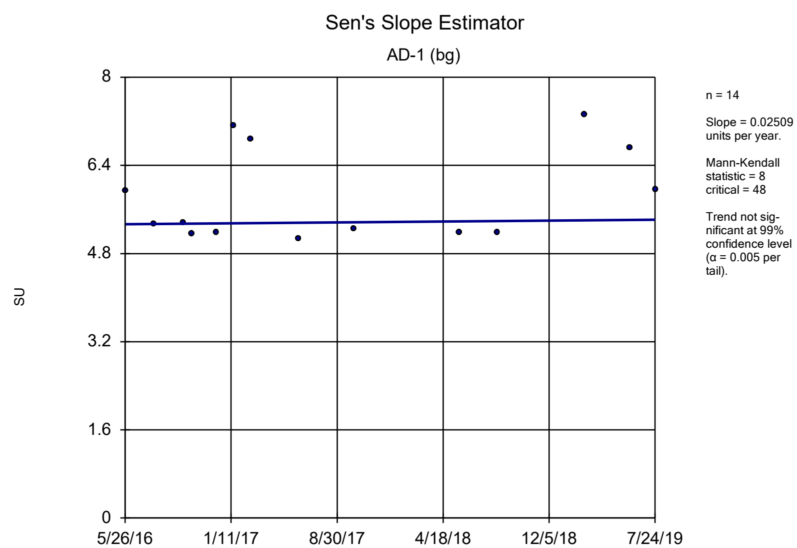
Constituent: Boron, total Analysis Run 11/22/2019 8:12 PM View: Interwell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

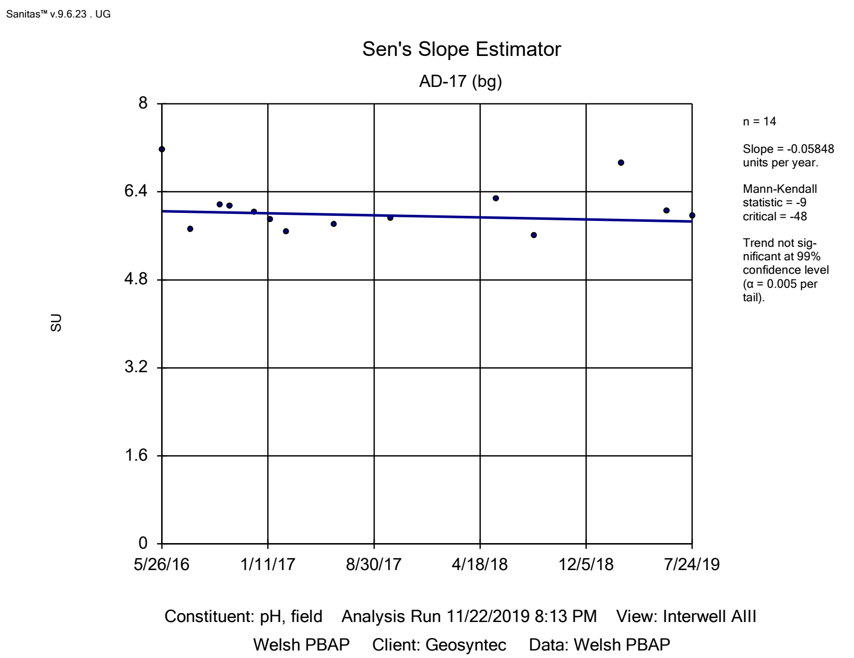


Constituent: Boron, total Analysis Run 11/22/2019 8:13 PM View: Interwell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



Constituent: pH, field Analysis Run 11/22/2019 8:13 PM View: Interwell AIII
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Sanitas™ v.9.6.23 . UG
Sen's Slope Estimator
AD-17 (bg)
8
6.4
4.8
3.2
1.6
0
SU
5/26/16
1/11/17
8/30/17
4/18/18
12/5/18
7/24/19
n = 14
Slope = -0.05848 units per year.
Mann-Kendall statistic = -9 critical = -48
Trend not significant at 99% confidence level (α = 0.005 per tail).
Constituent: pH, field   Analysis Run 11/22/2019 8:13 PM   View: Interwell AIII
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG
Sen's Slope Estimator
AD-5 (bg)
7
5.6
4.2
2.8
1.4
0
SU
5/31/16
1/15/17
9/2/17
4/20/18
12/6/18
7/24/19
n = 14
Slope = 0.07449 units per year.
Mann-Kendall statistic = 23 critical = 48
Trend not significant at 99% confidence level (α = 0.005 per tail).
Constituent: pH, field   Analysis Run 11/22/2019 8:13 PM   View: Interwell AIII
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP

Interwell Prediction Limit Summary

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 12/8/2019, 4:25 PM

Constituent	Well	Upper Lim.	Lower Lim.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	n/a	0.7	n/a	n/a	36	n/a	n/a	0	n/a	n/a	0.001409	NP (normality) 1 of 2
pH, field (SU)	n/a	6.995	4.816	n/a	36	5.906	0.6169	0	None	No	0.001253	Param 1 of 2

Upper Tolerance Limits - Appendix IV

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/22/2019, 8:15 PM

Constituent	Well	Upper Lim.	Date	Observ.	Sig.	Bg N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	n/a	0.005	n/a	n/a	n/a	39	71.79	n/a	0.1353	NP Inter(normal...
Arsenic, total (mg/L)	n/a	0.005	n/a	n/a	n/a	39	48.72	n/a	0.1353	NP Inter(normal...
Barium, total (mg/L)	n/a	0.6226	n/a	n/a	n/a	39	0	ln(x)	0.05	Inter
Beryllium, total (mg/L)	n/a	0.0007877	n/a	n/a	n/a	39	10.26	x^(1/3)	0.05	Inter
Cadmium, total (mg/L)	n/a	0.00367	n/a	n/a	n/a	39	30.77	x^(1/3)	0.05	Inter
Chromium, total (mg/L)	n/a	0.004	n/a	n/a	n/a	38	23.68	n/a	0.1424	NP Inter(normal...
Cobalt, total (mg/L)	n/a	0.0748	n/a	n/a	n/a	39	0	n/a	0.1353	NP Inter(normal...
Combined Radium 226 + 228 (pCi/L)	n/a	4.113	n/a	n/a	n/a	39	0	No	0.05	Inter
Fluoride, total (mg/L)	n/a	1	n/a	n/a	n/a	42	64.29	n/a	0.116	NP Inter(normal...
Lead, total (mg/L)	n/a	0.005	n/a	n/a	n/a	39	69.23	n/a	0.1353	NP Inter(normal...
Lithium, total (mg/L)	n/a	0.394	n/a	n/a	n/a	39	2.564	n/a	0.1353	NP Inter(normal...
Mercury, total (mg/L)	n/a	0.000033	n/a	n/a	n/a	39	53.85	n/a	0.1353	NP Inter(normal...
Molybdenum, total (mg/L)	n/a	0.005	n/a	n/a	n/a	39	69.23	n/a	0.1353	NP Inter(normal...
Selenium, total (mg/L)	n/a	0.005	n/a	n/a	n/a	39	41.03	n/a	0.1353	NP Inter(normal...
Thallium, total (mg/L)	n/a	0.002	n/a	n/a	n/a	39	89.74	n/a	0.1353	NP Inter(NDs)

Confidence Interval Summary Table - Significant Results

Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/22/2019, 8:31 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Lithium, total (mg/L)	**AD-9**	**1.33**	**0.9164**	**0.39**	**Yes**	**13**	**0**	**x^2**	**0.01**	**Param.**

Confidence Interval Summary Table - All Results

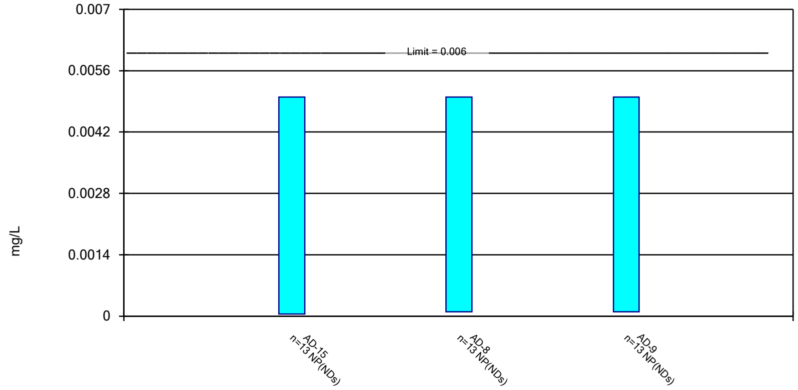
Welsh PBAP   Client: Geosyntec   Data: Welsh PBAP   Printed 11/22/2019, 8:31 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	AD-15	0.005	0.00005	0.006	No	13	76.92	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-8	0.005	0.0001	0.006	No	13	76.92	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-9	0.005	0.0001	0.006	No	13	92.31	No	0.01	NP (NDs)
Arsenic, total (mg/L)	AD-15	0.01211	0.002878	0.01	No	12	0	sqrt(x)	0.01	Param.
Arsenic, total (mg/L)	AD-8	0.005	0.00037	0.01	No	13	61.54	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-9	0.005	0.00118	0.01	No	13	69.23	No	0.01	NP (normality)
Barium, total (mg/L)	AD-15	0.2524	0.1048	2	No	12	0	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-8	0.02819	0.02085	2	No	13	0	No	0.01	Param.
Barium, total (mg/L)	AD-9	0.04967	0.02686	2	No	13	0	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-15	0.001332	0.0002516	0.004	No	12	0	No	0.01	Param.
Beryllium, total (mg/L)	AD-8	0.001	0.00002876	0.004	No	13	61.54	No	0.01	NP (normality)
Beryllium, total (mg/L)	AD-9	0.0009336	0.0003607	0.004	No	13	0	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	AD-15	0.0004524	0.00005473	0.005	No	12	8.333	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	AD-8	0.001	0.00002	0.005	No	13	69.23	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-9	0.001719	0.0002884	0.005	No	13	0	No	0.01	Param.
Chromium, total (mg/L)	AD-15	0.02417	0.002105	0.1	No	12	0	sqrt(x)	0.01	Param.
Chromium, total (mg/L)	AD-8	0.001525	0.0004025	0.1	No	13	38.46	No	0.01	Param.
Chromium, total (mg/L)	AD-9	0.001	0.0002622	0.1	No	13	61.54	No	0.01	NP (normality)
Cobalt, total (mg/L)	AD-15	0.01231	0.004507	0.075	No	12	0	sqrt(x)	0.01	Param.
Cobalt, total (mg/L)	AD-8	0.007254	0.004652	0.075	No	13	0	No	0.01	Param.
Cobalt, total (mg/L)	AD-9	0.0273	0.0146	0.075	No	13	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-15	2.969	1.505	5	No	12	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-8	1.81	0.5087	5	No	13	0	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-9	2.656	1.672	5	No	13	0	No	0.01	Param.
Fluoride, total (mg/L)	AD-15	1	0.086	4	No	13	69.23	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-8	0.89	0.4912	4	No	13	15.38	No	0.01	NP (Cohens/xfrm)
Fluoride, total (mg/L)	AD-9	1	0.19	4	No	13	46.15	No	0.01	NP (normality)
Lead, total (mg/L)	AD-15	0.019	0.000438	0.015	No	12	16.67	No	0.01	NP (Cohens/xfrm)
Lead, total (mg/L)	AD-8	0.005	0.00007	0.015	No	13	69.23	No	0.01	NP (normality)
Lead, total (mg/L)	AD-9	0.005	0.00008	0.015	No	13	69.23	No	0.01	NP (normality)
Lithium, total (mg/L)	AD-15	0.02713	0.005433	0.39	No	13	0	ln(x)	0.01	Param.
Lithium, total (mg/L)	AD-8	0.1115	0.07781	0.39	No	13	0	No	0.01	Param.
Lithium, total (mg/L)	**AD-9**	**1.33**	**0.9164**	**0.39**	**Yes**	**13**	**0**	**x^2**	**0.01**	**Param.**
Mercury, total (mg/L)	AD-15	0.000081	0.00001932	0.002	No	11	18.18	No	0.006	NP (Cohens/xfrm)
Mercury, total (mg/L)	AD-8	0.000025	0.00000859	0.002	No	12	66.67	No	0.01	NP (normality)
Mercury, total (mg/L)	AD-9	0.00003859	0.00001278	0.002	No	12	41.67	No	0.01	Param.
Molybdenum, total (mg/L)	AD-15	0.006706	0.001625	0.1	No	13	46.15	No	0.01	Param.
Molybdenum, total (mg/L)	AD-8	0.005	0.0008389	0.1	No	13	69.23	No	0.01	NP (normality)
Molybdenum, total (mg/L)	AD-9	0.005	0.002	0.1	No	13	92.31	No	0.01	NP (NDs)
Selenium, total (mg/L)	AD-15	0.005	0.0009	0.05	No	12	16.67	No	0.01	NP (Cohens/xfrm)
Selenium, total (mg/L)	AD-8	0.005	0.00007	0.05	No	13	46.15	No	0.01	NP (normality)
Selenium, total (mg/L)	AD-9	0.006134	0.001092	0.05	No	13	30.77	No	0.01	Param.
Thallium, total (mg/L)	AD-15	0.002	0.0001	0.002	No	13	69.23	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-8	0.002	0.000129	0.002	No	13	61.54	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-9	0.002	0.0001	0.002	No	12	58.33	No	0.01	NP (normality)

Sanitas™ v.9.6.23 . UG

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.

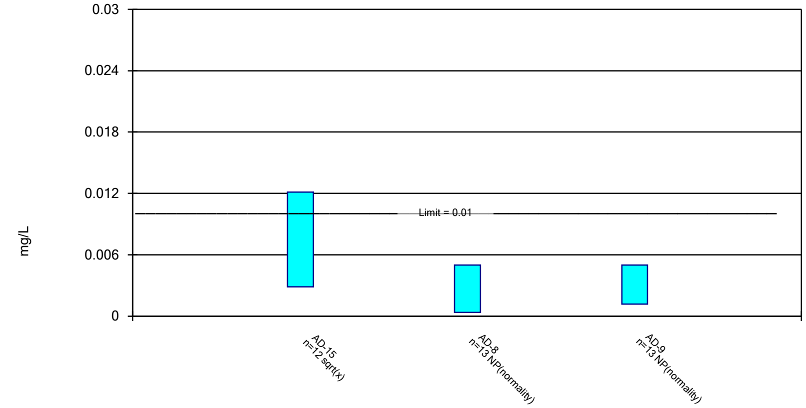


Constituent: Antimony, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

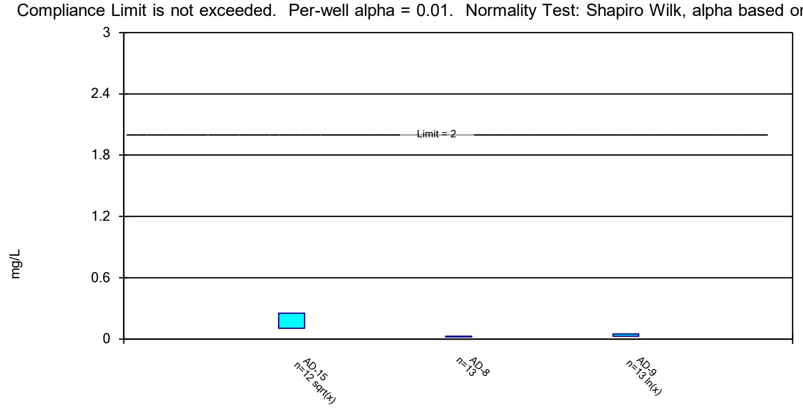


Constituent: Arsenic, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

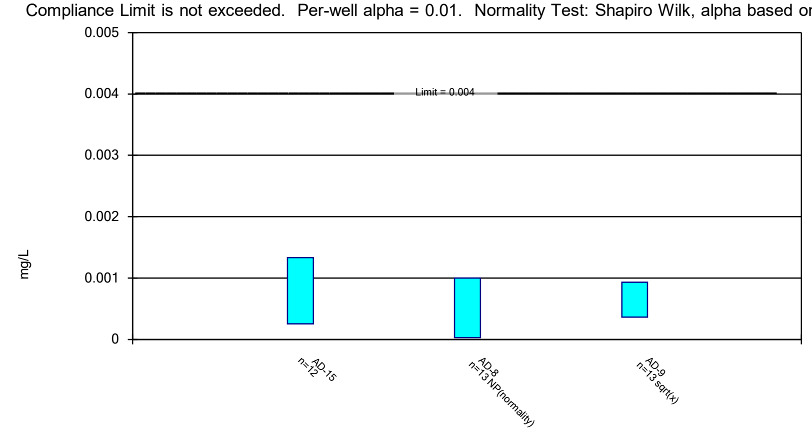


Constituent: Barium, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

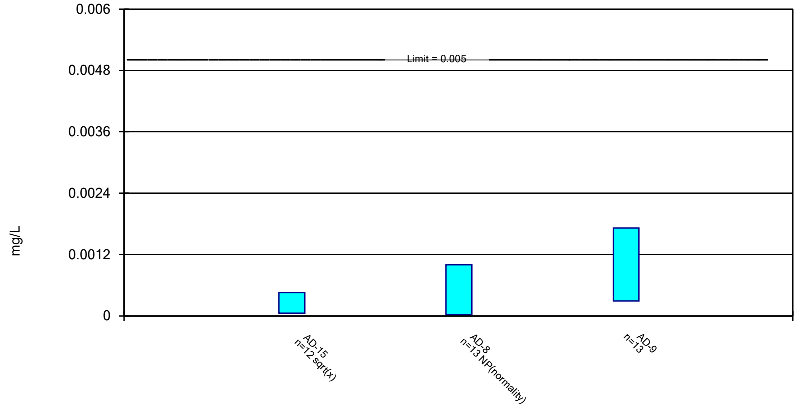


Constituent: Beryllium, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

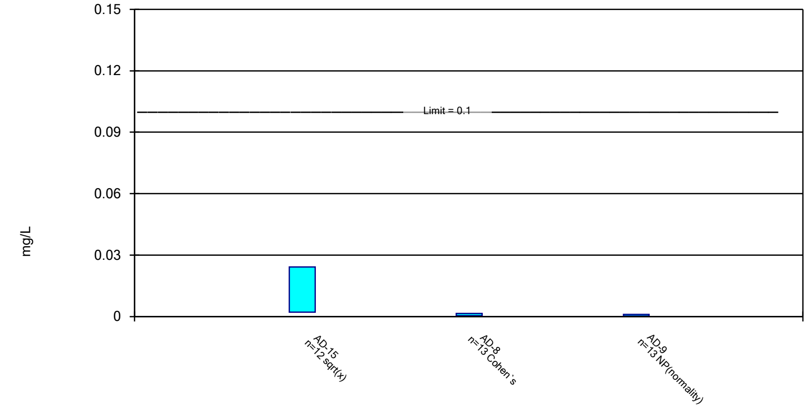


Constituent: Cadmium, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

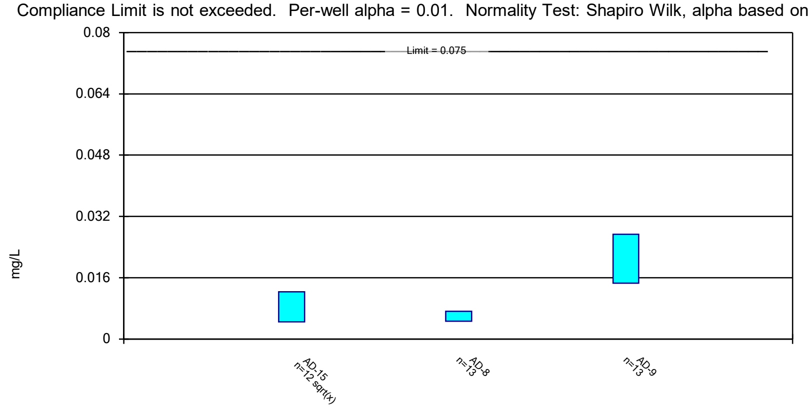


Constituent: Chromium, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

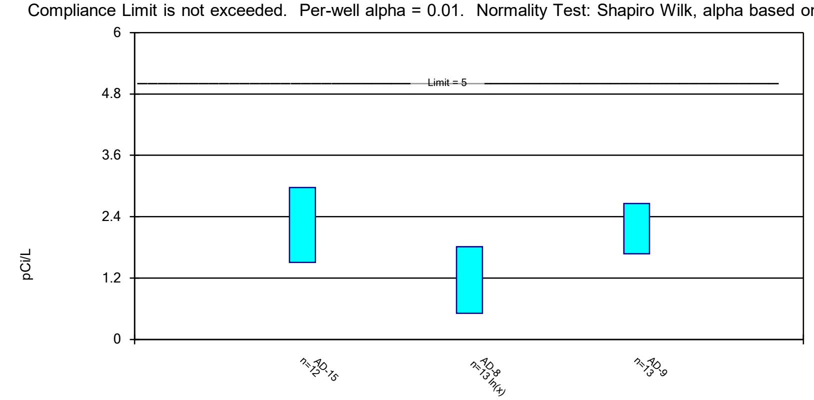


Constituent: Cobalt, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

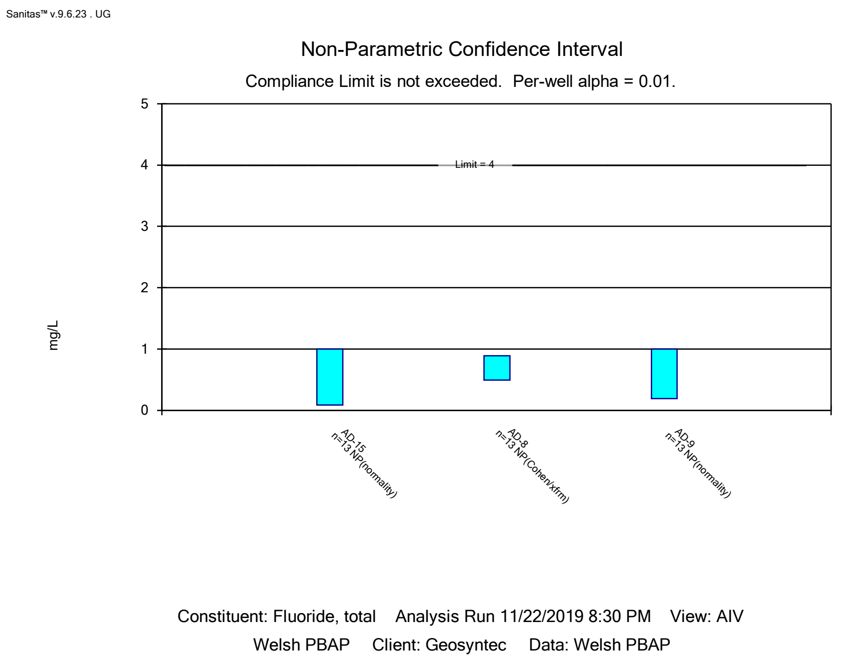
Sanitas™ v.9.6.23 . UG

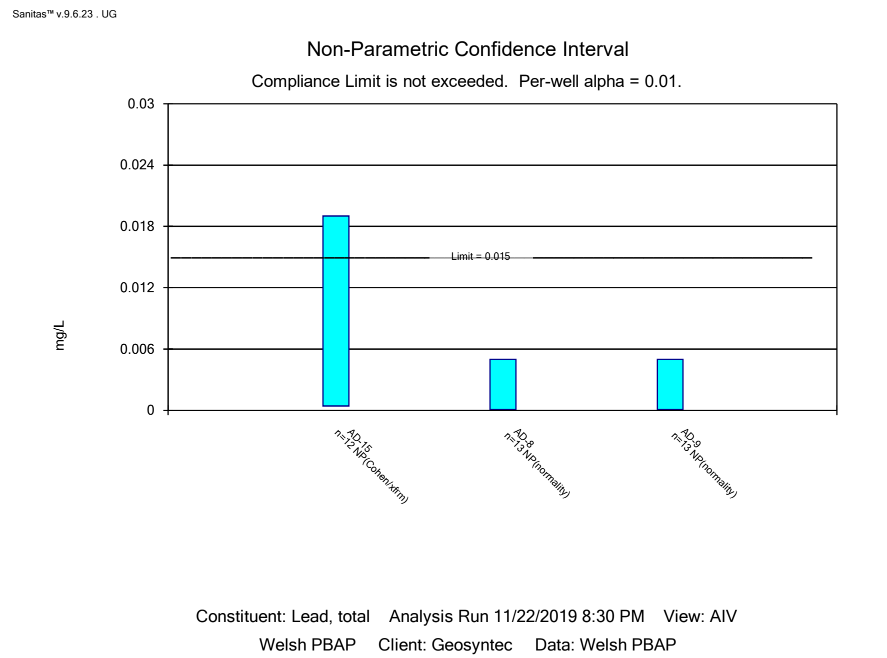
Parametric Confidence Interval

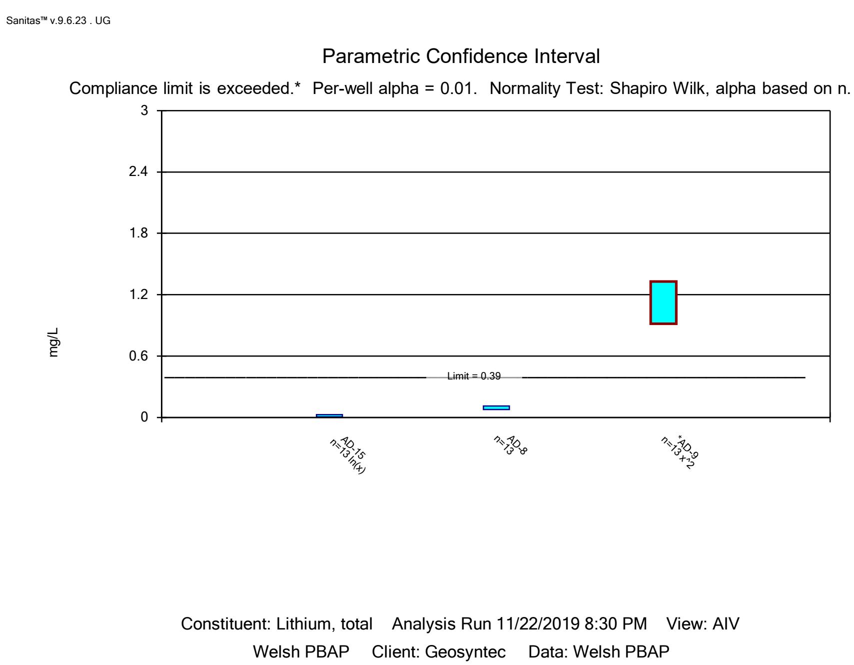
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

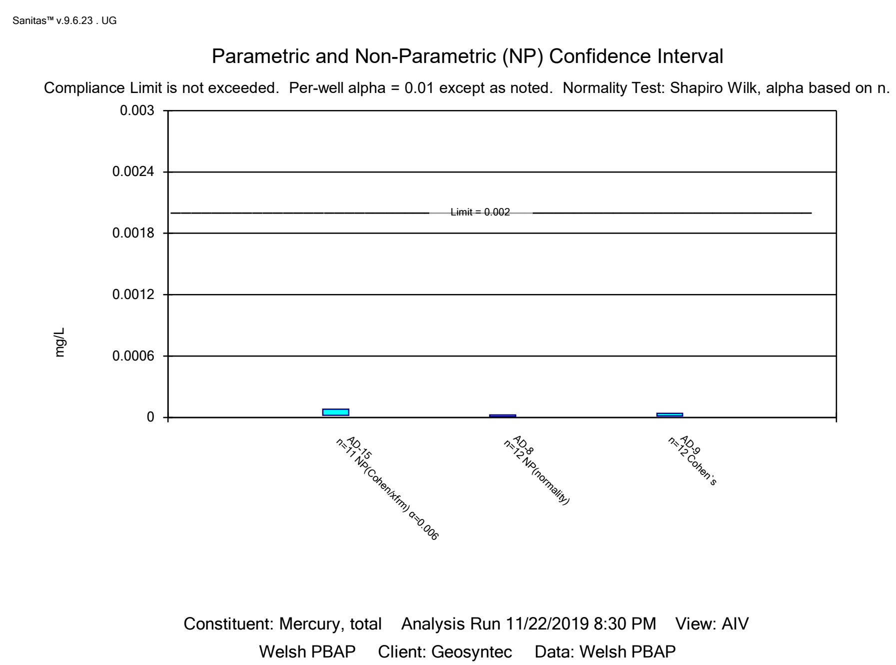


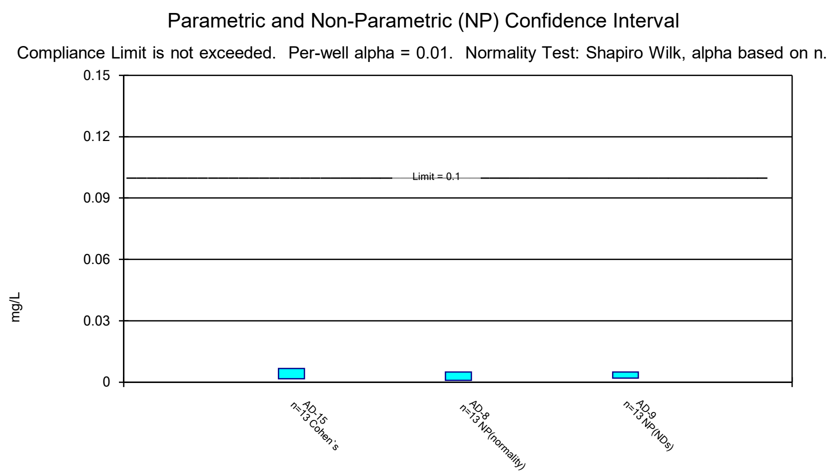
Constituent: Combined Radium 226 + 228 Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Non-Parametric Confidence Interval
Compliance Limit is not exceeded. Per-well alpha = 0.01.
mg/L
5
4
3
2
1
0
Limit = 4
AD-15
n=13 NP(normality)
AD-8
n=13 NP(Cohen/xfrm)
AD-9
n=13 NP(normality)
Constituent: Fluoride, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Non-Parametric Confidence Interval
Compliance Limit is not exceeded. Per-well alpha = 0.01.
mg/L
0.03
0.024
0.018
0.012
0.006
0
Limit = 0.015
AD-15
n=12 NP(Cohen/xfrm)
AD-8
n=13 NP(normality)
AD-9
n=13 NP(normality)
Constituent: Lead, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

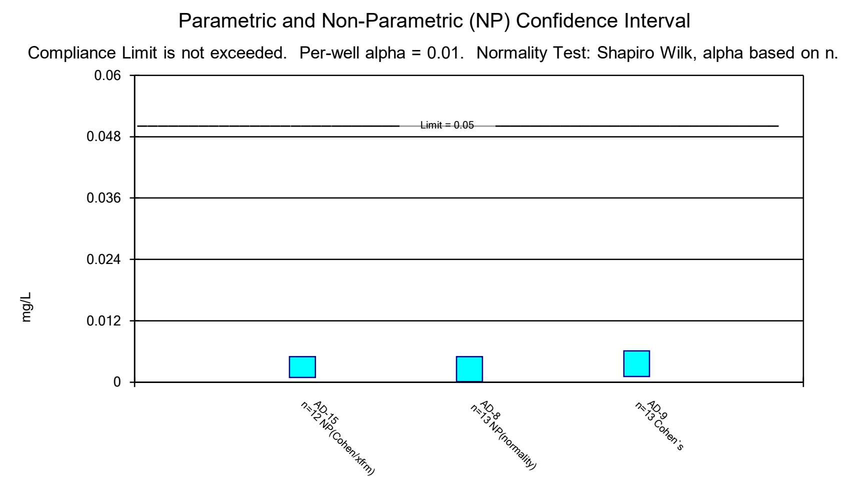

Sanitas™ v.9.6.23 . UG
Parametric Confidence Interval
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.
mg/L
3
2.4
1.8
1.2
0.6
0
Limit = 0.39
AD-15
n=13 ln(x)
AD-8
n=13
*AD-9
n=13 x^2
Constituent: Lithium, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP


Sanitas™ v.9.6.23 . UG
Parametric and Non-Parametric (NP) Confidence Interval
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.
mg/L
0.003
0.0024
0.0018
0.0012
0.0006
0
Limit = 0.002
AD-15
n=11 NP(Cohen/xfrm) α=0.006
AD-8
n=12 NP(normality)
AD-9
n=12 Cohen`s
Constituent: Mercury, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



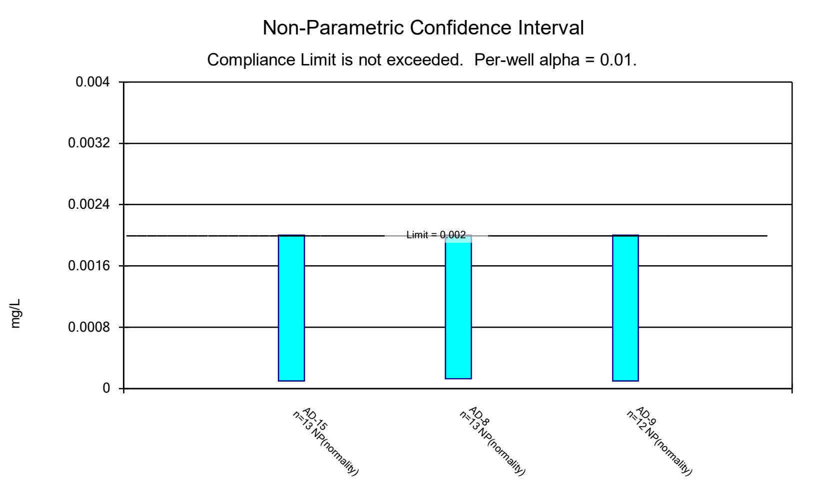
Constituent: Molybdenum, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



Constituent: Selenium, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.23 . UG



Constituent: Thallium, total Analysis Run 11/22/2019 8:30 PM View: AIV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

APPENDIX III

Alternate source demonstrations are included in this appendix. Alternate sources are sources or reasons that explain that statistically significant increases over background or statistically significant levels above the groundwater protection standard are not attributable to the CCR unit.

Welsh Power Plant
Primary Bottom Ash Pond
Alternate Source Demonstration

The Welsh Power Plant Primary Bottom Ash Pond initiated an assessment monitoring program in accordance with 40 CFR 257.95 on April 13, 2018. Groundwater protection standards (GWPS) were set in accordance with 257.95(d)(2) and a statistical evaluation of the assessment monitoring data was conducted. The statistical evaluation revealed an exceedance of the lithium GWPS on January 8, 2019. A successful alternate source demonstration (ASD) was completed per 257.95(g)(3), therefore, the Welsh Primary Bottom Ash Pond will remain in assessment monitoring. An ASD is documentation that shows a source other than the CCR unit was responsible for causing the statistics to exceed the GWPS. The ASD document will explain the alternate cause of the GWPS exceedance. The successful ASD is attached.

ALTERNATIVE SOURCE DEMONSTRATION - LITHIUM PRIMARY BOTTOM ASH POND

J. Robert Welsh Power Plant

1187 County Road 4865

Pittsburg, Titus County, Texas

February 7, 2019

ALTERNATIVE SOURCE DEMONSTRATION - LITHIUM PRIMARY BOTTOM ASH POND

J. Robert Welsh Power Plant
1187 County Road 4865
Pittsburg, Titus County, Texas

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Date:

February 7, 2019

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ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power Service Corporation
amsl	above mean sea level
Arcadis	Arcadis U.S., Inc.
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	Coal Combustion Residual
CCR Unit	ash pond system
CFR	Code of Federal Regulations
cfs	cubic feet per second
GWPS	groundwater protection standards
ft	feet
ft/day	feet per day
ft^3/sec	cubic feet per second
MCL	maximum contaminant limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
NRCS	Natural Resources Conservation Services
PBAP	Primary Bottom Ash Pond
PCL	protective concentration level
SPLP	Synthetic Precipitation Leaching Procedure
SSI	statistically significant increase
SSL	statistically significant level
USDA	United States Department of Agriculture

1 INTRODUCTION

This Alternate Source Demonstration (ASD) report has been prepared on behalf of American Electric Power Service Company (AEP) for lithium detected in groundwater in the area of the Primary Bottom Ash Pond (PBAP) at the J. Robert Welsh Plant site located in Titus County, Texas. This ASD report was prepared in accordance with the Coal Combustion Residual (CCR) Rule (the Rule) specified in 40 Code of Federal Regulations (CFR) §257 and in consultation with the Electric Power Research Institute "Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites" (EPRI, 2017). As part of the Rule, CCR facility owners are required to conduct detection and assessment monitoring of "Appendix III" and "Appendix IV" constituents, respectively, to ensure compliance with applicable groundwater standards (described further below). Because the monitored constituents also have natural sources and can be influenced by sampling methodology implementation, the Rule allows owners or operators to evaluate and demonstrate whether a source other than the CCR unit caused a statistically significant increase (SSI) over background levels for an Appendix III or and Statistically significant levels (SSLs) over groundwater protection standards for Appendix IV constituent, such as natural variation in groundwater quality or sampling methodology error.

The owner or operator must complete the written ASD within 90 days of identifying the SSI or SSL and include the certification from a qualified professional engineer to verify the accuracy of the information in the report. This ASD report was prepared by Arcadis U.S., Inc. (Arcadis) on behalf of AEP within the 90-day period and has been certified by a qualified professional engineer.

1.1 Facility History

The J. Robert Welsh Plant is located within southern Titus County, approximately eight miles northeast of Pittsburg, Texas, and approximately two miles northwest of Cason, Texas (**Figure 1-1**). The Plant began operations in 1977 with three coal-fired generating units (Units 1, 2, and 3). Throughout the life of the Plant, CCR materials (fly ash, bottom ash, economizer ash) have been generated. These byproducts were stored in the PBAP and in the adjacent Landfill that was constructed in the late 1970s. In 2000, the 22-acre Bottom Ash Storage Pond was installed south of the Landfill. The Bottom Ash Storage Pond was constructed with a 60-mil high-density polyethylene liner (**Figure 1-2**).

Presently bottom ash and economizer ash from the Plant are sluiced to the PBAP. Solids settle as the clear liquids flow through a drainage canal into the clear water pond (a non-CCR unit). Solids (bottom ash and economizer ash) in the PBAP are dredged and sluiced into the Bottom Ash Storage Pond. Marketable ash material from the PBAP is also temporarily stored in the western two thirds of the Landfill for processing, then loaded into trucks and sold for beneficial reuse (highway road base, etc.).

2 PHYSICAL SETTING

2.1 Regional Topography

The elevation at the Site ranges from approximately 300 feet (ft) above mean sea level (amsl) at Swauano Creek downstream of the Welsh Reservoir, to 360 ft amsl at a topographically high ridge at the west end of the Landfill. The PBAP is in a topographically low area that had been an un-named intermittent tributary of Swauano Creek prior to development of the Site. The Landfill is approximately 40 acres in size and is located in a topographically higher area directly south of the PBAP. The Bottom Ash Storage Pond is approximately 22 acres in size and in a topographically higher area directly south of the Landfill.

2.2 Geology and Soils

2.2.1 Regional and Local Geology

The Site area is located within the West Gulf Coastal Plain. Cretaceous formations crop out in belts that extend in a northeasterly direction parallel to the Gulf of Mexico, and dip gently to the southeast. The Site, including all three CCR Units (PBAP, Landfill, Bottom Ash Storage Pond), is located along the outcrop of the Eocene-age Reklaw Formation, which consists of very fine to fine grained sand and clay (Flawn, 1966). The Reklaw Formation attains a thickness of approximately 110 ft in Titus County, and is underlain by the Eocene-age Carrizo Sand which consists of fine to coarse sand, silt, and clay (Broom et al. 1965). In the topographically low areas underlying the Welsh Reservoir to the east of the PBAP, Quaternary alluvial sediments associated with Swauano Creek are present (Flawn 1966). All the CCR monitoring wells at the Site are completed in the Reklaw Formation. Monitoring well locations are shown on **Figure 2-1.**

As shown on the regional geologic map and legend (**Figure 2-2A** and **Figure 2-2B**), the Reklaw Formation outcrop (Er) at the Site is relatively narrow (less than 1 mile in width). The Reklaw Formation is overlain by the Eocene-age Queen City Formation, which outcrops directly to the west of the Site. The Queen City Formation consists of fine to medium grained sand, shale, silt, and impure lignite, and attains a thickness of approximately 210 ft in Titus County (USGS., 1965). The Queen City Formation also contains ironstone concretions (Flawn, 1966).

2.2.2 Regional and Local Soil Composition

Information gathered from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) soil data provides a detailed inventory of the regional soils and their characteristics, including the widespread distribution of clay-bearing soils, that support data collected at the Site from soil borings and groundwater monitoring locations. Two main named soil layers are present in the Pittsburgh, TX, area in the vicinity of the Site:

- Norfolk sandy loam
- Susquehanna fine sandy loam

Both soils are similar in the uppermost 1.5 ft of material, generally grayish in color and containing fine sand, silt, and clay. However, the subsoils of both units have subtle differences from one another and are described herein. Observations from soil borings at the Site are consistent with the characteristics of one or both of these soil units, as described in the USDA NRCS document.

The Norfolk sandy loam is a widely distributed soil unit that is uniformly developed in the lowland areas and is derived from weathering Eocene-aged deposits. It is a generally porous soil, allowing infiltrating water to migrate downward toward the water table. The soil layer is generally yellowish-gray in color, however the subsoil at greater depths is characterized by increased clay content and a mottled red and yellow appearance. As noted in the USDA soil descriptions, the soil and subsoils of the Norfolk sandy loam may be broken down into the grain size distributions presented in **Table 2-1.**

The Susquehanna fine sandy loam is also widely distributed and generally resembles the Norfolk sandy loam at the surface. Subsoils of the Susquehanna contain a greater component of clay, and likely contain increased iron content, as evidenced by observed iron concretions and iron crust formation within the subsoil. This soil is often mottled in appearance, ranging from red and yellow to a reddish brown or gray. Despite the greater clay content, the soil and subsoil is not impervious to infiltrating water that migrates toward the water table. As noted in the USDA soil descriptions, the soil and subsoils of the Susquehanna fine sandy loam may be broken down into the grain size distributions presented in **Table 2-2.**

These soil descriptions are important for the understanding of contributing sources of key constituents, such as lithium to the groundwater system. Lithium can occur in soils through natural weathering processes and the development of clay minerals. In particular, lithium can be incorporated into the structure of clays in the smectite group through cation substitution, which is further influenced in the presence of iron within the clay structure (Drever, 2002; Stucki, 2005). The widespread distribution of clay deposits in the native soils in and near the Site and the propensity for clays to contain trace constituents of potential concern, supports the potential for natural sources of lithium.

Geologic cross-sections were generated to evaluate the stratigraphy in the localized area of the PBAP. The lines of geologic cross-section are shown on **Figure 2-3** and the cross-section details for cross-sections A-A’ through E-E’ are shown on **Figures 2-4** through **2-8**, respectively. As shown on **Figure 2-4**, an unsaturated brown to gray clay and sandy clay stratum is present in the area of the PBAP from the surface to a depth of approximately 20 ft below ground surface (bgs). The clay stratum is underlain by a saturated fine to medium grained clayey and silty sand stratum with an average thickness of approximately 10 ft and is consistent with the soils of the Susquehanna fine sandy loam deposits. As discussed below in Section 2.3.2, this saturated sand stratum is the uppermost water-bearing unit in the area of the PBAP. This sand stratum is underlain by an unsaturated gray to black silty clay stratum that locally serves as a lower confining layer (aquitard) for the uppermost water-bearing unit.

2.3 Hydrology

2.3.1 Regional Hydrology

The Reklaw Formation, which outcrops in the area of the Site, and the overlying Queen City Formation, which outcrops directly west of the Site, are part of the Cypress Aquifer, which also includes the underlying Carrizo Sand and Wilcox Formation (USGS, 1965). As shown on **Figure 2-9,** the Cypress Aquifer is approximately 900 ft thick in the Site area, and the approximate base of fresh water in the Cypress Aquifer is approximately 800 ft bgs.

Regional groundwater characteristics are presented in Texas Water Commission Bulletin "*Ground-Water Resources of Camp, Franklin, Morris, and Titus Counties, Texas, Texas*" (USGS, 1965). All of the regional aquifer units are combined in this document, and considered as one interconnected unit, referred to as the "Cypress aquifer". This singular aquifer unit, composed of all water bearing units of similar character, was divided into three zones based on water quality characteristics of each zone rather than lithology. The following three zones were identified, in order of increasing relative depth:

- Zone A: characterized by minimal iron content and low pH, ranging from 4.5 to 6.5.
- Zone B: characterized by increased dissolved iron content and pH ranging from 5.0 to 7.0
- Zone C: characterized by iron concentrations of less than 0.3 milligrams per liter (mg/L) and neutral to alkaline pH (7.0 to 8.0)

Groundwater at the Site is generally assumed to be influenced by groundwater from Zones A and B. As described in USGS, 1965, Zones A and B can be more simply described as:

- Zone A: zone of oxidation and acidic groundwater
- Zone B: intermediate zone

The dissolved iron content in the A and B zones (ranging from non-detect to greater than 10 mg/L; USGS 1965) is likely influenced by iron present in the soils and sediments, which are described in Section 2.2. Slow recharge rates and transmissive properties of these zones contributes to longer residence times whereby the infiltrating groundwater may react with soil and sediments, allowing for the oxidation of sulfides to generate sulfate and mobilizing ferrous iron into solution. In addition, groundwater from several wells completed in shallow (less than 60 ft in depth) sediments contained sulfate of up to 1,420 mg/L. Sulfate concentrations observed at the Site are consistent with the range of data for other similar depth wells in the four-county area (USGS, 1965).

Additional regional groundwater information is provided in the 107th Annual Meeting of the Texas Academy of Science abstract titled "Natural Sources of Poor Water Quality in Streams of East Texas" (Ledger et. al., 2004). This study characterized surface water streams associated with the regional groundwater in the Eocene-aged Reklaw Formation as acidic with high concentrations of sulfate and arsenic concentrations greater than 0.01 mg/L.

An observed decline in surface water quality was also noted if springs from the Reklaw Formation discharge to surface water bodies. Abundant sulfur is noted in the Reklaw formation and sediments undergo acid-sulfate weathering, as evidenced in the red-stained soils and sulfate concentrations of greater than 1,000 mg/L (Ledger et. al., 2004). In streams associated with the Reklaw Formation, sulfate levels may exceed 1,000 mg/L.

2.3.2 Local Hydrology

Groundwater flow direction at the Site is generally from west to east, following surface topography towards the Welsh Reservoir. Groundwater elevations and well construction information from monitoring wells completed in the uppermost water-bearing unit at the Site are summarized on **Table 2-3**. Depth to groundwater in the monitoring wells in the area of the PBAP ranges from approximately 10 to 15 ft bgs.

Figure 2-10 is a potentiometric surface map for the uppermost water-bearing unit at the Site based on October 29, 2018 water level data. As shown on **Figure 2-10**, shallow groundwater flow direction in the area of the CCR Units is in a general easterly direction toward the Welsh Reservoir at an average hydraulic gradient of approximately 0.01 foot per foot.

The hydraulic conductivity of the uppermost water-bearing unit at the Site was determined by conducting aquifer tests. A constant-rate pumping test was conducted at monitoring well AD-6 on September 21, 2017. Based on the AD-6 pumping test data, the hydraulic conductivity for the uppermost water-bearing unit was calculated at 0.05 ft per day (1.83 x 10-5 centimeters per second).

To provide a broader understanding of the hydraulic conductivity distribution across the Site, bail down slug tests were performed in October 2018 on a total of 5 wells; 1 up gradient well (AD-17) and 4 down gradient wells (AD-6, AD-9, AD-13 and AD-19) on October 30 and 31, 2018. These wells are all screened in the uppermost water-bearing unit and were chosen based on their distribution across the Site. The hydraulic conductivity estimates from the five monitoring wells tested ranged from 0.15 ft per day (AD-6) to 2.0 ft per day (AD-13). The overall mean hydraulic conductivity estimate was 0.84 ft per day, while the overall geometric mean was 0.60 ft per day.

2.4 Surface Water

The Site is located directly west of Swauano Creek, which was dammed near the southern end of the Site during plant development to form the Welsh Reservoir. The PBAP normal operating water level is near the weir box which has a bottom elevation of 325 ft amsl. The surface water elevation of the Welsh Reservoir, located east of the PBAP, is maintained at approximately 320 ft amsl. The Welsh Reservoir is likely a gaining surface water feature, and groundwater elevations at the Site are higher than the normal stage elevation of the Welsh Reservoir (approximately 320 ft amsl) as shown on **Figure 2-10**.

There are no current or historic gauging stations on Swauano Creek; however, there was a historic gauging station on adjacent Boggy Creek, which has a drainage basin area of 72 square miles versus 21.2 square miles for Swauano Creek. The average annual flow of the Boggy Creek gauging station during the driest year on record (1956) was 10.65 cubic feet per second (cfs), which corresponds to a flow of approximately 3 cfs for Swauano Creek.

3 DETECTION AND ASSESSMENT MONITORING STATISTICAL EVALUATION

3.1 General

The groundwater monitoring network for the uppermost water-bearing unit at the PBAP consists of three upgradient monitoring wells (AD-1, AD-5, AD-17) and three downgradient monitoring wells (AD-8, AD-9, AD-15). Additional details regarding the groundwater monitoring network are provided in the August 22, 2017 report entitled "*Primary Bottom Ash Pond – CCR Groundwater Monitoring Well Network Evaluation*" (Arcadis, 2017).

3.2 Detection Monitoring Results

Detection monitoring at the Site involves collection of groundwater samples from the groundwater monitoring network upgradient and downgradient monitoring wells for analyses of Appendix III CCR constituents, which includes boron, calcium, chloride, fluoride, sulfate, pH, and total dissolved solids. Following the baseline monitoring program, which included a minimum collection of eight independent samples from each of the background and downgradient wells that are part of the certified monitoring network, the first round of Detection Monitoring was conducted. Based on detection monitoring conducted at the PBAP in 2017 and 2018, an SSI over the background concentration was calculated for boron in AD-8. Because of the SSI noted for boron from the 2018 sample from AD-8, an Alternate Source Demonstration was completed which did not identify an alternate source for the boron SSI (Geosyntec, 2018).

3.3 Assessment Monitoring Results

Groundwater protection standards (GWPSs) were established for the Appendix IV parameters in accordance with 40 CFR Part 257.95(h). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or regional screening level for each Appendix IV parameter.

Confidence intervals were calculated for Appendix IV parameters at the compliance wells (AD-8, AD-9, AD-15) to assess whether Appendix IV parameters were present at an SSL above the GWPS. An SSL was identified for lithium, which exceeded the GWPS of 0.390 mg/L at monitoring well AD-9 (0.935 mg/L), despite no observed SSIs in Appendix III parameters for this well (Geosyntec, 2019). Because the native soils have the potential to be a natural source of lithium in the regional and local groundwater and soil composition, this ASD report was prepared to provide additional information on the sources and distribution of lithium in groundwater at the Site. Further discussion of the Site-specific soil and groundwater data is provided in Section 4. Additional details regarding the statistical evaluation of the groundwater monitoring data is provided in the January 8, 2019 report entitled "*Statistical Analysis Summary, Primary Bottom Ash Pond*" (Geosyntec, 2019).

4 SOIL AND GROUNDWATER ANALYTICAL DATA EVALUATION

4.1 General

In addition to the detection and assessment monitoring groundwater sampling events conducted at the PBAP in 2017 and 2018 for statistical evaluation, a comprehensive site-wide groundwater sampling event was conducted by Arcadis during May 2018 to evaluate alternate potential sources of lithium detected in downgradient monitoring well AD-9. This May 2018 evaluation included the following tasks:

- Collection of groundwater samples from the PBAP upgradient monitoring wells (AD-1, AD-5, AD-17), the PBAP downgradient monitoring wells (AD-8, AD-9, AD-15), and other monitoring wells in the area completed in the uppermost water-bearing unit, including upgradient monitoring well AD-18; sidegradient monitoring wells MW-9, MW-10, and Temp-1; and downgradient monitoring wells AD-3, AD-4c, AD-10, AD-11, AD-13, AD-14, AD-16R, and AD-19.
- Collection of soil samples from eight soil borings (Temp-1, SB-2 through SB-8) around the perimeter of the CCR units at the site.
- Collection of three CCR material samples from the PBAP (Sample IDs: Ash-1, Ash-2, Ash-3) and one CCR material sample from the HDPE-lined Bottom Ash Storage Pond (Sample ID: Ash-4) for analysis of total metals, pore water concentrations, and leachate water using the Synthetic Precipitation Leaching Procedure (SPLP) (**Table 4-1**).

In addition, two sentinel downgradient monitoring wells (AD-20, AD-21) were installed in the uppermost water-bearing unit (Reklaw Formation) near the shoreline of the Welsh Reservoir east (hydraulically downgradient) of the CCR units during October 2018.

4.2 Soil and Groundwater Analytical Data Evaluation

4.2.1 Soil Evaluation

The soil evaluation results demonstrate a correlation between lithium in soil and lithium in groundwater in key locations, with a correlation in soil between lithium and iron. Boring logs from Site monitoring locations highlight similarities with observations provided in the county-wide soil survey reports. For example, boring locations SB-04 (AD-5) and SB-05 (AD-8) contain a greater content of the reddish-brown clay subsoils as noted in the Susquehanna fine sandy loam, which directly overlie the water table in these locations. The reddish brown color generally denotes the presence of iron in these locations, which can be either incorporated directly into the clay mineral structure (e.g. smectite), or as a secondary mineral (e.g. iron hydroxide) that is also present in the aquifer matrix (Stucki, 2005). The role of iron incorporated into the clay structure is important to localized geochemical processes, such as cation exchange, redox conditions, and hydrophilic properties, which can influence weathering characteristics and the mobility of trace constituents (i.e. lithium) in groundwater (Stucki, 2005). As shown on **Table 4-1** and **Figure 4-1**, the highest concentration of lithium (13.6 mg/kg) was detected in the soil sample from soil boring SB-4, which is located adjacent to monitoring well AD-5 hydraulically upgradient (northwest) of the PBAP. This data indicates lithium concentrations in soil in the area of the PBAP are naturally occurring and not the result of impacts from CCR materials. This is one line of evidence that the lithium detected in groundwater at monitoring well AD-9 is from a naturally occurring source, and not the CCR unit. Groundwater quality measured in the adjacent monitoring wells (AD-5 and AD-8) generally contained greater lithium concentrations (0.056 mg/L to 0.147 mg/L) than other monitoring locations on Site that did not contain such subsoils. Soil samples collected from monitoring locations SB-04 (AD-5) and SB-05 (AD-8, background) similarly contained greater concentrations of lithium (10.5 milligrams per kilogram [mg/kg] to 13.6 mg/kg) and iron (6,210 mg/kg to 10,400 mg/kg) than other locations on Site. While there is localized variation in the native soil sediments collected, these results demonstrate that the soils are a potential alternative source for lithium.

As shown on **Table 4-1** and **Figure 4-2**, the highest iron concentrations in soil are from soil boring SB-4 (AD-5; 10,400 mg/kg), located upgradient (northwest) of the PBAP, and soil boring SB-8 (AD-3; 11,000 mg/kg), located over 1,000 ft south (side gradient) of the PBAP. **Figure 4-3** shows an apparent correlation between the iron and lithium content in the coal ash, upgradient locations, and downgradient locations. However, SPLP and pore water results from the coal ash samples show that the iron and lithium present in the coal ash is not in a mobile form. Therefore, it is more likely that the regional groundwater interaction with naturally occurring lithium and iron is responsible for the observed lithium concentrations and variability across the Site. As detailed below in Section 4.2.2, iron and lithium concentrations in groundwater at the Site show a similar distribution to iron and lithium concentrations in soil, indicating naturally occurring sources for iron and lithium.

4.2.2 Groundwater Evaluation

Groundwater analytical results for the PBAP, the landfill, and the bottom ash storage pond are summarized on **Tables 4-2**, **4-3**, and **4-4**, respectively. As shown on **Figure 4-4**, the highest lithium concentration in groundwater is at monitoring well AD-18 (2.07 mg/L), which is west (upgradient) relative to the PBAP. This data indicates lithium concentrations in groundwater in the area of the PBAP are from a source other than the PBAP.

As shown on **Figure 4-5**, iron concentrations in groundwater are also elevated upgradient (west) relative to the PBAP. **Figure 4-6** shows the relationship of total and dissolved iron concentrations to lithium concentrations in upgradient, side-gradient, and downgradient monitoring wells. These results demonstrate a clear correlation between aqueous iron and lithium, with higher lithium concentrations associated with elevated iron. The greatest concentrations of both iron and lithium are observed in the upgradient monitoring wells AD-17 and AD-18. As identified in **Table 4-1** and noted on **Figure 4-6**, SPLP leachate and pore water analyzed from coal ash samples contain lithium in concentrations below detection, or at very low concentrations less than 0.02 mg/L. This data indicates lithium concentrations in groundwater in the area of the PBAP are from a source other than the PBAP. As discussed above in Section 2.2.1, the Queen City Formation, which overlies the Reklaw Formation, is located directly west of the Site. Therefore, groundwater from the Queen City Formation west (upgradient) of the CCR units may be the source of lithium and iron detected in soils and groundwater in the area of the CCR units. As discussed above in Section 2.3.1, elevated naturally occurring iron is documented in the Cypress Aquifer, and as discussed above in Section 2.2.1, the Queen City Formation contains naturally-occurring iron concretions.

Another line of evidence the lithium detected in groundwater in the area of the PBAP is from a naturally occurring source is provided in the 2002 Publication “Springs of Texas” (Gunnar Brune, 1981). The Springs of Texas publication states “*Hynoon Springs, also known as Marshall, Noonday Camp, and Iron Springs, are six kilometers north of Hallsville. They became very popular as a health resort about 1851. The waters are highly mineralized, containing much iron, sulfur, aluminum, and lithium. Originally there were said to be over 100 springs flowing from the Queen City Formation*.” This spring, which contains naturally-occurring lithium, is located approximately 35 miles southeast of the Site. A copy of this reference is provided in **Appendix A**.

When reviewing historical and recent datasets, a broad relationship was noted between trace metal chemistry and turbidity. Where turbidity values were greatest, greater concentrations of selected CCR monitored constituents were also observed (e.g. arsenic and cadmium) and in some cases, in exceedance of Federal MCLs. As a result, low-flow sampling methodology was employed to reduce the amount of turbidity in the groundwater sample.

A comprehensive groundwater sampling event was conducted at the Site by Arcadis during May 2018 using low-flow methodology. A clean stainless steel low-flow sampling pump with new, well-dedicated polyethylene piping was slowly lowered into the mid-point of the water column at each monitoring well, and groundwater was then pumped at a low flow rate of less than 0.1 liters per minute until the produced water was visually clear. The turbidity of the produced water was measured using calibrated field instruments during well development, and groundwater samples were not collected until the turbidity measurements declined and stabilized. Once low-flow groundwater sampling techniques were properly followed by Arcadis during May 2018, water quality results indicated concentrations of selected constituents to be much less than previously reported and did not exceed criteria. Therefore, it was determined that the sediment disturbances generated during well purging and improper (turbid) groundwater sampling were causing most of the Federal MCL groundwater exceedances. Specifically, since CCR Rule monitoring requires analysis of unfiltered samples, the results suggest that the exceedances were associated with constituents present in undissolved suspended solid particulates rather than in a dissolved form, on a location by location basis. The May 2018 groundwater analytical results are most representative of groundwater quality at the Site because proper low-flow sampling protocols were adhered to and sediment contributions to the analytical results were minimized.

5 SUMMARY AND CONCLUSIONS

This ASD has been prepared in consultation with the Electric Power Research Institute “Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites”. The following lines of evidence indicate the SSL related to the lithium concentration in groundwater at AD-8 is from naturally occurring sources (ASD Type V), with some additional minor contributions from sampling methodology error (ASD Type I):

- An SSI was confirmed for boron within monitoring well AD-8 followed by a failed Alternate Source Demonstration for boron, triggering the assessment monitoring program for the PBAP. Under the assessment monitoring program, an SSL was identified for lithium which exceeded the GWPS of 0.390 mg/L at monitoring well AD-9 (0.935 mg/L), despite no observed SSIs in Appendix III parameters for this well. SSIs would be expected for Appendix III parameters if there was a CCR unit source for the lithium exceedance of the SSL, indicating that there may be an alternate source of lithium.
- As demonstrated in this ASD report, iron and lithium are associated in the sediments and in groundwater. The subsoils at the Site, particularly the Susquehanna fine sandy loam, contain naturally occurring high clay content. The role of iron incorporated into the clay structure is important to localized geochemical processes, such as cation exchange, redox conditions, and hydrophilic properties, which can influence weathering characteristics and the mobility of trace constituents (i.e. lithium) in groundwater (Stucki, 2005). This is a supporting line of evidence.
- The highest lithium concentration in the uppermost saturated zone soil samples collected during the Arcadis May 2018 investigation was from a background soil sample (SB-4, 27 ft depth) located upgradient (northwest) of the PBAP near AD-5. This is a key line of evidence that the PBAP is not the source of elevated lithium concentrations in soil at the Site.
- Leachate and pore water analyzed from coal ash samples contain lithium in concentrations below detection, or at very low concentrations less than 0.02 mg/L. This data indicates lithium concentrations in groundwater in the area of the PBAP are from a source other than the PBAP. This is a key line of evidence.
- The highest lithium concentration in groundwater samples collected during the Arcadis May 2018 investigation was from an upgradient (background) monitoring well (AD-18) located west of the PBAP. This is a key line of evidence that the PBAP is not the source of elevated lithium concentrations in groundwater at the Site.
- Iron and lithium concentrations in soil and groundwater at the Site show a similar distribution, indicating there is likely a common source for these metals. The 1965 USGS publication “*Ground-Water Resources of Camp, Franklin, Morris and Titus Counties, Texas”* documents naturally occurring high iron concentrations within zones of the Cypress Aquifer, in which the monitoring wells at the Site are completed. The University of Texas at Austin Bureau of Economic Geology 1966 publication “*Geologic Atlas of Texas, Texarkana Sheet*” documents naturally occurring iron concretions in the Queen City Formation, which outcrops directly west (upgradient) of the PBAP. This is a supporting line of evidence.

- The 1981 Gunnar Brune publication "*Springs of Texas"* documents naturally occurring elevated lithium in groundwater in the Queen City Formation at Hynoon Springs, which is approximately 35 miles from the Site. The publication states "*Hynoon Springs, also known as Marshall, Noonday Camp, and Iron Springs, are six kilometers north of Hallsville. They became very popular as a health resort about 1851. The waters are highly mineralized, containing much iron, sulfur, aluminum, and lithium. Originally there were said to be over 100 springs flowing from Queen City sand".* This publication, along with soil and groundwater analytical data at the Site, supports the conclusion that the primary source of lithium in groundwater at the PBAP is from the Queen City Formation, which outcrops directly west (upgradient) of the PBAP. This is a key line of evidence.
- Effective well development and proper low flow sampling techniques minimize the potential for groundwater analyses to be unrepresentative of formation groundwater. This is a supporting line of evidence.
- This ASD report provides a strong demonstration of naturally occurring sources of lithium in groundwater (ASD Type V) as supported by five key lines of evidence and three supporting lines of evidence.

6 PROFESSIONAL ENGINEER'S CERTIFICATION

I, Kenneth J. Brandner, certify that this report was prepared under my direction and supervision, and that the information contained herein is true and accurate to the best of my knowledge. Based on my experience and knowledge of the site, the alternate source demonstration for lithium at the Primary Bottom Ash Pond meets the requirements of 40 CFR Part 257.95.

Kenneth J. Brandner

Printed Name of Registered Professional Engineer

Kenneth J. Brandner

Signature

69586	Texas	2-7-19
Registration No.	Registration State	Date

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TABLES

Table 2-1
Grain Size Distribution in Soil and Subsoil of the Norfolk Sandy Loam
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Grain Size	Soil	Subsoil
Fine Gravel	0.0%	0.0%
Coarse Sand	0.2%	0.1%
Medium Sand	0.4%	0.3%
Fine Sand	29.4%	29.9%
Very Fine Sand	37.9%	24.0%
Silt	25.9%	25.1%
Clay	5.9%	20.2%

Table 2-2
Grain Size Distribution in Soil and Subsoil of the Susquehanna Fine Sandy Loam
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Grain Size	Soil	Subsoil
Fine Gravel	0.4%	0.0%
Coarse Sand	0.7%	0.2%
Medium Sand	0.9%	0.8%
Fine Sand	53.4%	36.6%
Very Fine Sand	16.0%	10.8%
Silt	21.2%	19.0%
Clay	7.2%	32.8%

Table 2-3
Well Construction and Water Level Data - CCR Units
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Well ID	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Borehole Depth ft. bls	Date Installed	Screen Material	Well Diameter inches	Top of Screen Depth ft. bls	Top of Screen Elevation ft. msl	Bottom of Screen Depth ft. bls	Bottom of Screen Elevation ft. msl
Monitoring Wells												
AD-1 (c)	33° 02' 48"	94° 50' 47"	355.57	357.57	25.0	1/11/01	Sch. 40 PVC	2	15.0	340.57	25.0	330.57
AD-2 (c)	33° 02' 37"	94° 50' 44"	344.16	346.16	25.0	4/26/01	Sch. 40 PVC	2	15.0	329.16	25.0	319.16
AD-3 (c)	33° 02' 38"	94° 50' 37"	331.10	333.10	17.0	4/26/01	Sch. 40 PVC	2	7.0	324.10	17.0	314.10
AD-4 (c)	33° 02' 43"	94° 50' 33"	340.61	342.61	30.0	4/26/01	Sch. 40 PVC	2	19.0	321.61	29.0	311.61
AD-4a (a)	33.04527	94.84258	340.19	342.85	30.0	9/22/09	Sch. 40 PVC	2	20.0	320.19	30.0	310.19
AD-4b (a)	33.04531	94.84230	329.55	333.23	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.55	15.0	314.55
AD-4c (a)	33.04507	94.84244	329.15	333.28	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.15	15.0	314.15
AD-5 (c)	33° 03' 13"	94° 51' 00"	349.00	351.00	30.0	1/11/01	Sch. 40 PVC	2	20.0	329.00	30.0	319.00
AD-6 (a)	33.05235	94.84757	343.31	346.33	33.0	9/23/09	Sch. 40 PVC	2	23.0	320.31	33.0	310.31
AD-7 (a)	33.05257	94.84219	347.86	350.82	38.0	9/24/09	Sch. 40 PVC	2	28.0	319.86	38.0	309.86
AD-8 (a)	33.05187	94.84026	337.53	340.01	29.0	9/21/09	Sch. 40 PVC	2	16.0	321.53	26.0	311.53
AD-9 (a)	33.04995	94.84196	340.32	343.09	35.0	9/21/09	Sch. 40 PVC	2	20.0	320.32	35.0	305.32
AD-10 (a)	33.04881	94.84047	340.23	343.01	35.0	9/22/09	Sch. 40 PVC	2	20.0	320.23	35.0	305.23
AD-11 (a)	33.04824	94.84177	339.61	342.18	20.0	9/22/09	Sch. 40 PVC	2	10.0	329.61	20.0	319.61
AD-12 (a)	33.04901	94.84977	366.27	369.33	30.0	9/24/09	Sch. 40 PVC	2	20.0	346.27	30.0	336.27
AD-13 (a)	33.04918	94.84275	344.12	347.00	20.0	9/22/09	Sch. 40 PVC	2	6.0	338.12	16.0	328.12
AD-14 (a)	33.04715	94.84256	342.32	345.43	19.0	9/22/09	Sch. 40 PVC	2	8.0	334.32	18.0	324.32
AD-15 (d)	33° 03' 04"	94° 50' 27"	340.21	343.29	46.0	12/12/15	Sch. 40 PVC	2	25.5	314.71	45.5	294.71
AD-16 (d)	33° 02' 49"	94° 50' 29"	350.86	353.97	21.0	12/10/15	Sch. 40 PVC	2	11.0	339.86	21.0	329.86
AD-16R (e)	33° 02' 49"	94° 50' 28.9"	350.55	353.49	27.0	4/12/17	Sch. 40 PVC	2	12.0	338.55	27.0	323.55
AD-17 (d)	33° 02' 57"	94° 51' 06"	353.99	357.10	40.0	12/10/15	Sch. 40 PVC	2	24.0	329.99	39.0	314.99
AD-18 (d)	33° 03' 03"	94° 51' 03"	346.17	349.28	29.0	12/11/15	Sch. 40 PVC	2	14.0	332.17	29.0	317.17
AD-19	33.047201°	94.839694°	323.58	326.35	15.0	5/8/18	Sch. 40 PVC	2	5.0	318.58	15.0	308.58
AD-20	33° 02' 45.6"	94° 50' 22.8"	324.85	327.65	20.0	10/23/18	Sch. 40 PVC	2	4.0	320.85	19.0	305.85
AD-21	33° 02' 49.6"	94° 50' 20"	322.04	325.29	20.0	10/23/18	Sch. 40 PVC	2	3.5	318.54	18.5	303.54
Piezometers												
B-2 (b)	33° 03.078'	94° 50.449'	339.7	339.7	50.0	10/28/09	Sch. 40 PVC	2	10.0	329.70	20.0	319.70
B-4 (b)	33° 03.011'	94° 50.462'	340.6	340.6	50.0	10/27/09	Sch. 40 PVC	2	8.0	332.60	18.0	322.60
B-5 (b)	33° 02.964'	94° 50.428'	340.0	340.0	50.0	10/27/09	Sch. 40 PVC	2	10.0	330.00	20.0	320.00
B-6 (b)	33° 02.912'	94° 50.462'	340.1	340.1	50.0	10/28/09	Sch. 40 PVC	2	12.0	328.10	22.0	318.10
Temp-1	33.046864°	94.852059°	356.36	358.17	28.0	5/8/18	Sch. 40 PVC	2	8.0	348.36	28.0	328.36
MW-9	33° 03' 18"	94° 50' 19.4"	342.00	344.54	18.0	11/19/01	Sch. 40 PVC	2	3.0	339.00	18.0	324.00
MW-10	33° 03' 13.6"	94° 50' 19.4"	341.96	344.80	19.0	11/19/01	Sch. 40 PVC	2	4.0	337.96	19.0	322.96

Well ID	6/7/2011 GW Elev. ft. msl	12/6/2011 GW Elev. ft. msl	5/2/2012 GW Elev. ft. msl	11/1/2012 GW Elev. ft. msl	5/14/2013 GW Elev. ft. msl	11/19/2013 GW Elev. ft. msl	5/12/2014 GW Elev. ft. msl	11/16/2014 GW Elev. ft. msl	5/12/2015 GW Elev. ft. msl	3/4/2016 GW Elev. ft. msl	5/26/2016 GW Elev. ft. msl	7/27/2016 GW Elev. ft. msl	10/19/2016 GW Elev. ft. msl	12/12/2016 GW Elev. ft. msl	1/17/2017 GW Elev. ft. msl	2/23/2017 GW Elev. ft. msl	10/6/2017 GW Elev. ft. msl	5/15/2018 GW Elev. ft. msl	10/29/2018 GW Elev. ft. msl
Monitoring Wells																			
AD-1 (c)	338.46	334.92	337.88	337.18	337.43	336.73	338.03	337.64	340.82	342.83	344.89	342.89	341.23	340.58	341.18	339.74	337.70	340.57	339.10
AD-2 (c)	330.16	329.07	330.00	329.26	329.83	329.70	330.09	329.69	332.56	332.32	---	---	---	---	---	---	---	331.50	331.25
AD-3 (c)	323.81	323.19	323.99	323.29	323.77	323.98	324.12	323.28	325.58	325.12	324.59	323.70	323.47	323.78	325.04	324.92	323.24	324.30	324.15
AD-4 (c)	324.81	324.84	324.62	324.40	324.74	325.52	325.44	325.13	327.00	326.90	---	---	---	---	---	---	---	---	---
AD-4a (a)	325.01	324.19	325.24	322.90	324.86	324.68	325.64	325.34	327.19	327.12	---	---	---	---	---	---	---	---	---
AD-4b (a)	324.35	324.32	324.50	324.30	324.30	325.21	325.22	324.90	326.58	326.67	---	---	---	---	---	---	---	---	---
AD-4c (a)	324.18	324.50	324.64	324.37	324.11	325.06	325.01	324.71	326.50	326.19	325.89	324.01	323.76	325.07	326.39	324.89	324.20	324.95	325.62
AD-5 (c)	336.34	336.58	336.82	336.99	336.78	336.47	336.80	336.01	339.07	338.04	337.62	337.24	337.74	337.01	338.34	336.17	337.40	337.25	336.98
AD-6 (a)	333.04	333.02	332.83	333.02	333.11	332.81	333.11	332.81	333.38	334.00	---	---	---	---	---	---	---	---	333.42
AD-7 (a)	334.32	334.12	334.19	334.20	334.13	334.58	333.77	333.98	334.09	333.61	---	---	---	---	---	---	---	---	---
AD-8 (a)	325.41	324.09	325.69	325.15	325.79	325.75	325.98	325.77	326.05	325.70	325.68	325.05	325.29	325.92	326.76	324.27	326.12	325.63	326.36
AD-9 (a)	328.46	328.53	328.63	328.44	328.74	329.38	NM	330.18	329.98	329.74	329.28	329.53	328.92	329.31	330.50	328.05	329.47	329.40	329.98
AD-10 (a)	323.44	322.55	323.27	323.35	323.51	323.76	323.57	323.88	323.95	323.55	---	---	---	---	---	---	---	323.53	324.19
AD-11 (a)	327.99	328.37	327.82	327.93	327.94	328.13	328.20	327.97	328.96	328.13	328.39	328.14	327.87	328.20	328.90	328.25	327.85	327.61	327.83
AD-12 (a)	348.30	348.29	349.86	349.56	349.99	349.65	349.89	350.01	350.65	350.39	---	---	---	---	---	---	---	349.52	348.28
AD-13 (a)	332.36	332.24	333.09	332.26	332.68	333.25	333.35	332.01	337.58	334.76	334.54	332.93	332.39	332.84	334.54	331.83	331.42	331.83	331.52
AD-14 (a)	330.40	329.80	331.67	330.34	330.94	331.69	332.12	330.17	336.63	334.83	334.51	331.71	330.94	330.79	332.63	330.87	329.91	330.76	330.52
AD-15 (d)	---	---	---	---	---	---	---	---	---	322.14	321.93	321.28	321.42	321.71	321.64	322.81	322.07	321.74	322.01
AD-16 (d)	---	---	---	---	---	---	---	---	---	337.09	335.84	332.14	331.52	331.43	330.96	330.71	---	---	---
AD-16R (e)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	327.12	328.68	326.71
AD-17 (d)	---	---	---	---	---	---	---	---	---	334.64	334.26	334.30	334.45	334.64	334.05	333.94	334.17	334.35	333.91
AD-18 (d)	---	---	---	---	---	---	---	---	---	343.66	343.26	340.81	339.92	339.38	338.97	340.38	339.43	342.75	340.97
AD-19	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	321.24	321.54
AD-20	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	323.28
AD-21	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	320.26
Piezometers																			
B-2 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-4 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-5 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-6 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Temp-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	345.55	342.79
MW-9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	331.34	331.24
MW-10	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	332.29	332.75

NOTES:
NM = Not measured
(a) Source: Eagle Environmental Services Well Logs (2009).
(b) Source: ETTL Engineers & Consultants Inc. (June 21, 2010).
(c) Source: Southwest Electric Power, State of Texas Well Report (2001).
(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-15 through AD-18 installed during December 2015.
(e) Monitoring well installed by ARCADIS on April 12, 2017 as a replacement for monitoring well AD-16.
Groundwater Elevation Source: AEP, Shallow Groundwater Data Summary through February 2017.
1983 State Plane Lambert Coordinate System
Datum: NAD 83
ft bls = feet below land surface
ft msl = feet above mean sea level
Elev. = Elevation
---- = No record

Table 4-1
Soil and Coal Ash Sample Analytical Results (mg/kg) - CCR Units
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Sample ID	Date Sampled	Sample Depth (feet)	Units	Appendix III Parameters						Appendix IV Parameters															
				Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Soil Samples																									
Temp-1	5/8/18	15'	mg/kg	14.3	43.3	15	<1	5.0	93	<0.25	1.77	16.8	<0.05	<0.05	5.22	0.28	1.77	0.104	0.004	1.18	<0.25	1.26	0.273	<12.5	5.4
SB-2	5/10/18	22'	mg/kg	11.9	35.8	13	2	3.9	878	<0.25	<0.25	18.3	0.08	<0.05	3.53	0.551	3.98	0.08	0.005	0.287	0.684	<0.25	0.159	890	4.46
(AD-17)																									
SB-3	5/10/18	30'	mg/kg	3.05	90.2	94	1	3.8	1,194	<0.25	3.83	13.6	<0.05	0.132	9.21	0.649	4.22	0.322	0.009	1.64	<0.25	<0.25	0.593	3,960	6.87
(AD-18)																									
SB-4	5/9/18	5'	mg/kg	(FOC = 0.00723 g/g)			---	4.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
(AD-5)		27'	mg/kg	7.76	634	8	1	6.4	724	<0.25	1.81	20.4	0.115	0.417	6.73	4.76	3.2	13.6	0.006	0.561	0.536	<0.25	0.657	10,400	65.5
(Background)		27'	mg/kg	(FOC = 0.00688 g/g)																					
SB-5	5/9/18	19'	mg/kg	5.45	655	16	3	7.2	69	<0.25	1.11	8.53	0.109	0.241	3.75	3.58	2.96	10.5	0.044	0.313	0.297	<0.25	0.216	6,210	35.5
(AD-8)																									
SB-6	5/9/18	21'	mg/kg	5.33	397	20	2	7.8	116	<0.25	1.11	17.9	0.09	0.24	3.5	3.37	2.67	10.3	0.051	0.299	0.471	<0.25	2.502	5,970	38.4
(AD-9)																									
SB-7	5/9/18	13'	mg/kg	8.11	1,360	19	<1	5.0	198	<0.25	10.1	65	0.154	0.356	6.87	3.21	3.14	5.3	0.004	1.39	<0.25	<0.25	0.262	9,220	28.4
(AD-13)																									
SB-8	5/9/18	12'	mg/kg	16.6	6,150	13	1	5.2	24	<0.25	3.3	213	0.409	0.452	8.22	4.13	9.05	4.63	0.013	0.488	<0.25	<0.25	0.433	11,000	25.4
(AD-3)																									
AD-20	10/23/18	15-17	mg/kg	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.567	---	---
AD-21	10/23/18	15-17	mg/kg	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.424	---	---
Coal Ash Samples																									
Ash-1	5/10/18	1-2'	mg/kg	34.4	33,800	30.5	8.21	7.1	219	<0.877	14.6	607	1.02	0.464	31.8	5.55	16.9	11.6	0.0473	2.66	2.27	<0.54	*2.92*	37,500	139
		SPLP:	*mg/L*	*0.594*	*30.2*	---	---	---	---	*<0.00344*	*<0.00411*	*0.284*	*<0.000333*	*<0.000164*	*0.00273*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0176*	*<0.00363*	*<0.00287*	*0.0991*	*<0.0305*	*<0.00267*
		Pore Water:	*mg/L*	*0.643*	*113*	*20.1*	*1.86*	*7.4*	*6.6*	*<0.00344*	*0.0095*	*3.43*	*<0.000333*	*<0.000164*	*0.00396*	*<0.000553*	*<0.00285*	*0.0123*	*<0.0000653*	*0.00484*	*<0.00363*	*<0.00287*	0.755	---	*0.357*
Ash-2	5/10/18	1-2'	mg/kg	92.6	96,000	53.8	11.2	7.3	293	<1.56	19.4	2,760	1.64	1.56	41.2	9.63	24.5	15.5	0.0967	2.08	5.25	<0.957	*2.32*	18,300	365
		SPLP:	*mg/L*	*0.526*	*24.1*	---	---	---	---	*<0.00344*	*<0.00411*	*0.192*	*<0.000333*	*<0.000164*	*0.00222*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0165*	*<0.00363*	*<0.00287*	*0.112*	*<0.0305*	*<0.00267*
		Pore Water:	*mg/L*	*0.772*	*143*	*20.4*	*0.28*	*7.6*	*8.73*	*<0.00344*	*0.0106*	*3.99*	*<0.000333*	*<0.000164*	*0.00196*	*<0.000553*	*0.00346*	*0.0173*	*<0.0000653*	*0.00428*	*<0.00363*	*<0.00287*	0.508	---	*0.376*
Ash-3	5/10/18	1-2'	mg/kg	29	14,300	11.5	10.7	7.4	152	<0.687	11.8	766	0.845	0.394	19.2	5.77	12.2	6.87	0.0403	1.79	1.44	<0.423	*1.754*	21,100	110
		SPLP:	*mg/L*	*0.958*	*19.8*	---	---	---	---	*<0.00344*	*<0.00411*	*0.0315*	*<0.000333*	*<0.000164*	*0.00389*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0222*	*<0.00363*	*<0.00287*	*<0.256*	*0.471*	*<0.00267*
		Pore Water:	*mg/L*	*1.000*	*103*	*13.0*	*0.998*	*7.6*	*51.1*	*<0.00344*	*0.0108*	*1.54*	*<0.000333*	*<0.000164*	*0.00110*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0111*	*<0.00363*	*<0.00287*	0.594	---	*0.715*
Ash-4	5/10/18	1-2'	mg/kg	281	106,000	27.6	1.34	10.5	961	<0.757	9.72	3,390	2.23	1.06	35.1	16.2	16.3	20.4	0.0340	2.21	1.30	<0.466	*3.18*	24,200	177
		SPLP:	*mg/L*	*1.3*	*25.1*	---	---	---	---	*<0.00344*	*<0.00411*	*0.0216*	*<0.000333*	*<0.000164*	*0.00329*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*<0.00281*	*<0.00363*	*<0.00287*	*<0.407*	*<0.0305*	*<0.00267*
		Pore Water:	*mg/L*	*4.75*	*63.5*	*28.8*	*0.697*	*10.8*	*381*	*<0.00344*	*0.00745*	*0.217*	*<0.000333*	*<0.000164*	*0.00225*	*0.00093*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0798*	*<0.00363*	*<0.00287*	0.259	---	*0.00814*

NOTES:
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
FOC = Fraction organic carbon (Walkley Black)
--- = Not analyzed
SPLP = Synthetic precipitation leaching procedure (concentrations shown in milligrams per liter)
Total concentrations (mg/kg) shown in normal font, SPLP and Pore Water concentrations (mg/L) shown in italics.
Radium concentrations for soil shown in picoCuries per gram. SPLP concentrations shown in picoCuries per liter.

Table 4-2
Groundwater Sampling Analytical Results (mg/L) - Primary Bottom Ash Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

ARCADIS Design & Consultancy for natural and built assets

		Appendix III Parameters								Appendix IV Parameters															
Well	Date Sampled	Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Background (Upgradient) Wells																									
AD-1	05/26/16	0.346	36.5	5	<1	5.93	--	42	252	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.010	0.000033	<0.005	<0.005	<0.002	1.18	--	--
	07/27/16	0.350	39.6	4	<1	5.93	--	36	239	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.019	<0.000025	<0.005	<0.005	<0.002	0.9952	--	--
	09/29/16	0.332	15	5	<1	5.37	--	35	173	<0.005	<0.005	0.141	<0.001	<0.001	0.005	<0.005	<0.005	0.014	<0.000025	<0.005	<0.005	<0.002	1.38	--	--
	10/19/16	0.398	19.1	4	<1	5.15	--	42	192	<0.005	<0.005	0.114	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	1.141	--	--
	12/12/16	0.394	8.74	4	<1	5.18	--	40	200	<0.005	<0.005	0.072	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	0.719	--	--
	01/17/17	0.656	129	4	<1	7.13	--	68	538	<0.005	<0.005	0.410	<0.001	<0.001	<0.001	<0.005	<0.005	<0.001	<0.000025	<0.005	<0.005	<0.002	3.009	--	--
	02/23/17	0.700	147	9	<1	6.88	--	68	612	<0.005	<0.005	0.488	<0.001	<0.001	<0.001	<0.005	<0.005	0.001	<0.000025	<0.005	<0.005	<0.002	4.309	--	--
	06/07/17	0.449	15.1	4	<0.083	5.06	109	42	176	<0.00093	0.00114	0.09346	0.00037	<0.00007	0.00066	0.00077	<0.00068	0.00902	0.000007	<0.00029	0.0021	<0.00086	0.676	--	--
	10/06/17	--	--	--	--	5.25	97.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.352	12.1	3	<0.083	4.82	8.4	--	174	<0.00093	<0.00105	0.08823	0.00048	<0.00007	<0.00023	0.0008	<0.00068	0.00816	<0.000005	<0.00029	<0.00099	<0.00086	0.837	0.03	0.025
	Dissolved	*0.35*	*12*	--	--	4.82	8.4	--	--	*<0.00093*	*<0.00105*	*0.08582*	*0.00044*	*<0.00007*	*<0.00023*	*0.00083*	*<0.00068*	*0.00799*	*<0.000005*	*<0.00029*	*0.00197*	*<0.00086*	*0.531*	0.01	0.026
	05/24/18	0.345	10.2	4	<0.083	5.19	118	43	150	0.00317 J	<0.00105	0.0799	0.00039 J	<0.00007	<0.00023	0.00035 J	<0.00068	0.00814	0.000006 J	<0.00029	0.00138 J	<0.00086	1.983	--	--
	08/14/18	0.443	5.95	5	<0.083	5.18	102	44	160	0.00003 J	0.00021	0.063	0.000482	0.00002	0.00016	0.000797	0.000238	0.00708	0.000013 J	0.00021	0.0017	0.00003 J	1.10	--	--
AD-5	05/31/16	0.03	36.9	15	<1	6.38	--	123	337	<0.005	<0.005	0.057	<0.001	<0.001	<0.001	0.014	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	1.63	--	--
	07/28/16	0.04	44.7	16	<1	6.38	--	163	360	<0.005	<0.005	0.093	<0.001	<0.001	<0.001	0.015	<0.005	0.191	<0.000025	<0.005	<0.005	<0.002	4.75	--	--
	09/29/16	0.04	46.3	15	<1	5.29	--	190	416	<0.005	<0.005	0.087	<0.001	<0.001	<0.001	0.014	<0.005	0.186	<0.000025	<0.005	<0.005	<0.002	3.33	--	--
	10/20/16	0.05	50.7	14	<1	5.92	--	267	448	<0.005	<0.005	0.07	<0.001	<0.001	<0.001	0.009	<0.005	0.225	<0.000025	<0.005	<0.005	<0.002	2.319	--	--
	12/13/16	0.05	49.6	13	<1	6.29	--	233	484	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	0.013	<0.005	0.199	<0.000025	<0.005	<0.005	<0.002	2.182	--	--
	01/17/17	0.04	49.8	14	<1	6.27	--	234	438	<0.005	<0.005	0.047	<0.001	<0.001	<0.001	0.012	<0.005	0.239	<0.000025	<0.005	<0.005	<0.002	1.023	--	--
	02/23/17	0.04	33.0	15	<1	5.48	--	127	286	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	0.013	<0.005	0.166	<0.000025	<0.005	<0.005	<0.002	1.788	--	--
	06/07/17	0.05281	49.7	14	<0.083	5.96	867	82	300	<0.00093	0.00385	0.0877	0.00008	0.00039	0.00028	0.01193	<0.00068	0.124	<0.000005	<0.00029	<0.00099	<0.00086	2.32	--	--
	10/06/17	--	--	--	--	5.59	249	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.05063	30.1	21	<0.083	5.79	<100	--	248	<0.00093	<0.00105	0.07627	0.00014	0.00037	<0.00023	0.01907	<0.00068	0.118	<0.000005	<0.00029	<0.00099	<0.00086	1.495	14.4	0.45
	Dissolved	*0.03752*	*29.1*	--	--	5.79	<100	--	--	*<0.00093*	*<0.00105*	*0.06865*	*<0.00002*	*<0.00007*	*<0.00023*	*0.01747*	*<0.00068*	*0.119*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.043*	*2.051*	8.38	0.43
	05/24/18	0.05007	28.1	22	<0.083	6.22	17.8	60	242	<0.00093	<0.00105	0.07116	<0.00002	0.00023 J	0.0008 J	0.01424	<0.00068	0.121	<0.000005	<0.00029	<0.00099	<0.00086	1.946	--	--
	08/15/18	0.05	40.5	19	<0.083	6.23	57.1	240	428	0.00001 J	0.00169	0.0637	0.000055	0.000008 J	0.000072	0.0114	0.000079	0.147	<0.000005	0.00013	0.00008 J	<0.01	0.316	--	--
AD-17	05/26/16	0.121	200	43	<1	7.17	--	1,166	1,810	<0.005	<0.005	0.021	<0.001	0.002	0.001	0.063	<0.005	0.370	0.000032	<0.005	<0.005	<0.002	1.53	--	--
	07/27/16	0.119	195	32	<1	7.17	--	1,005	1,576	<0.005	<0.005	0.020	<0.001	0.004	0.001	0.068	<0.005	0.374	<0.000025	<0.005	<0.005	<0.002	2.78	--	--
	09/29/16	0.111	191	36	<1	6.17	--	1,055	1,663	<0.005	<0.005	0.031	<0.001	<0.001	0.003	0.058	<0.005	0.354	<0.000025	<0.005	<0.005	<0.002	2.358	--	--
	10/20/16	0.124	194	32	1.0	6.14	--	1,163	1,612	<0.005	<0.005	0.034	<0.001	0.002	0.004	0.065	<0.005	0.394	<0.000025	<0.005	<0.005	<0.002	2.224	--	--
	12/13/16	0.135	196	31	<1	6.03	--	1,096	1,560	<0.005	<0.005	0.017	<0.001	0.003	<0.001	0.068	<0.005	0.323	<0.000025	<0.005	<0.005	<0.002	2.384	--	--
	01/17/17	0.101	196	33	<1	5.96	--	1,445	1,686	<0.005	<0.005	0.014	<0.001	0.003	0.068	0.068	<0.005	0.341	<0.000025	<0.005	<0.005	<0.002	2.436	--	--
	02/22/17	0.135	189	30	<1	5.67	--	1,055	1,628	<0.005	<0.005	0.020	<0.001	0.002	0.001	0.073	<0.005	0.331	<0.000025	<0.005	<0.005	<0.002	2.288	--	--
	06/06/17	0.121	188	30	<0.083	5.81	156	1,105	1,578	<0.00093	<0.00105	0.01033	<0.00002	0.00606	<0.00023	0.0748	<0.00068	0.329	0.000013	<0.00029	<0.00099	<0.00086	1.598	--	--
	10/05/17	--	--	--	--	5.92	598	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.247	213	45	<0.083	5.51	<100	--	1,846	<0.00093	<0.00105	0.00978	<0.00002	0.00915	<0.00023	0.07451	<0.00068	0.306	<0.000005	<0.00029	0.00414	<0.00086	1.514	260	3.72
	Dissolved	*0.231*	*205*	--	--	5.51	<100	--	--	*<0.00093*	*<0.00105*	*0.00737*	*<0.00002*	*0.00609*	*<0.00023*	*0.07938*	*<0.00068*	*0.301*	*<0.000005*	*<0.00029*	*0.00515*	*0.02*	*1.57*	241	3.56
	05/24/18	0.239	193	39	<0.083	6.28	7.8	1,067	1,836	<0.00093	<0.00105	0.00965	<0.00002	0.00646	<0.00023	0.07173	<0.00068	0.308	<0.000005	<0.00029	<0.00099	<0.00086	1.939	--	--
	08/15/18	0.118	187	40	<0.083	5.60	418	1,170	1,750	0.00002 J	0.00183	0.0128	0.000069	0.00025	0.000604	0.0435	0.0011	0.243	0.000011 J	0.00035	0.0003	0.000074	2.35	--	--
	Background Statistical Evaluation Summary - Upper Prediction Limits:[a]									0.005	0.005	0.36	0.00077	0.0065	0.004	0.075	0.005	0.39	0.000033	0.005	0.005	0.0013	4.21	--	--

		Appendix III Parameters								Appendix IV Parameters															
Well	Date Sampled	Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Point of Compliance Wells																									
AD-8	05/31/16	1.46	32.6	36	1	6.91	--	217	524	<0.005	<0.005	0.034	<0.001	<0.001	0.002	0.007	<0.005	0.122	<0.000025	<0.005	<0.005	<0.002	1.046	--	--
	07/28/16	1.44	25.9	26	<1	6.91	--	202	469	<0.005	<0.005	0.026	<0.001	<0.001	<0.001	0.009	<0.005	0.098	<0.000025	<0.005	<0.005	<0.002	1.584	--	--
	09/29/16	1.51	24.3	28	<1	7.65	--	186	432	<0.005	<0.005	0.023	<0.001	<0.001	<0.001	0.007	<0.005	0.111	<0.000025	<0.005	<0.005	<0.002	6.3	--	--
	10/20/16	1.54	25.9	30	<1	6.07	--	184	424	<0.005	<0.005	0.024	<0.001	<0.001	<0.001	0.007	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	0.345	--	--
	12/12/16	1.53	23.6	27	<1	5.62	--	168	442	<0.005	<0.005	0.021	<0.001	<0.001	<0.001	0.007	<0.005	0.11	<0.000025	<0.005	<0.005	<0.002	1.083	--	--
	01/19/17	1.53	18.7	24	1	6.21	--	153	352	<0.005	<0.005	0.02	<0.001	<0.001	<0.001	0.006	<0.005	0.094	<0.000025	<0.005	<0.005	<0.002	0.823	--	--
	02/22/17	1.67	19.3	22	<1	6.78	--	163	356	<0.005	<0.005	0.019	<0.001	<0.001	<0.001	0.006	<0.005	0.092	<0.000025	<0.005	<0.005	<0.002	0.536	--	--
	06/06/17	1.39	17.4	22	0.6628	5.63	54	151	368	<0.00093	<0.00105	0.01908	<0.00002	<0.00007	<0.00023	0.00386	<0.00068	0.09491	0.000008	<0.00029	<0.00099	<0.00086	1.0735	--	--
	10/05/17	--	--	--	--	6.68	41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/18	1.29	17.2	22	0.716	6.07	3.0	--	368	<0.00093	<0.00105	0.02283	0.00004	<0.00007	<0.00023	0.00521	<0.00068	0.08418	0.000009	<0.00029	<0.00099	<0.00086	1.106	0.673	0.388
	Dissolved	*1.31*	*17.1*	--	--	6.07	3.0	--	--	*<0.00093*	*<0.00105*	*0.02046*	*<0.00002*	*<0.00007*	*<0.00023*	*0.00513*	*<0.00068*	*0.08356*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*0.5773*	< 0.01	0.363
	05/23/18	--	--	--	0.501 J	6.20	*48.2*	--	--	0.00319 J	<0.00105	0.02212	<0.00002	<0.00007	<0.00023	0.00319 J	<0.00068	0.0956	<0.000005	<0.00029	0.00175 J	<0.00086	0.3366	--	--
	8/15/18[b]	1.30	15.0	24	0.615 J	6.77	104	122	288	0.00001 J	0.00031	0.0212	0.000008 J	0.000002 J	0.00005	0.00536	0.000039	0.0555	0.000007 J	0.00016	0.00007 J	0.000129	3.44	--	--
AD-9	05/31/16	0.12	229	88	<1	6.32	--	1,352	2,541	<0.005	<0.005	0.051	<0.001	0.001	<0.001	0.027	<0.005	1.32	<0.000025	<0.005	<0.005	<0.002	2.95	--	--
	07/28/16	0.105	255	98	<1	6.32	--	1,464	2,564	<0.005	<0.005	0.031	<0.001	0.002	<0.001	0.022	<0.005	1.38	0.000045	<0.005	0.008	<0.002	1.447	--	--
	09/29/16	0.115	220	86	<1	4.72	--	1,301	2,448	<0.005	<0.005	0.033	<0.001	<0.001	<0.001	0.012	<0.005	1.17	<0.000025	<0.005	<0.005	<0.002	3.199	--	--
	10/19/16	0.109	228	76	1	5.22	--	1,350	2,494	<0.005	<0.005	0.026	<0.001	<0.001	<0.001	0.016	<0.005	1.44	<0.000025	<0.005	<0.005	<0.002	1.311	--	--
	12/12/16	0.108	250	92	<1	5.72	--	1,639	2,667	<0.005	<0.005	0.027	<0.001	0.002	<0.001	0.024	<0.005	1.33	<0.000025	<0.005	<0.005	<0.002	3.0	--	--
	01/19/17	0.312	91.1	54	<1	5.43	--	884	1,360	<0.005	<0.005	0.098	0.002	<0.001	<0.001	0.042	<0.005	0.634	<0.000025	<0.005	<0.005	<0.002	2.349	--	--
	02/22/17	0.1	258	86	<1	5.77	--	1,774	2,662	<0.005	<0.005	0.022	<0.001	<0.001	<0.001	0.024	<0.005	1.41	<0.000025	<0.005	<0.005	<0.002	2.32	--	--
	06/06/17	0.146	191	19	<0.083	4.61	100	105	308	<0.00093	<0.00105	0.04227	0.00077	0.00222	<0.00023	0.02416	<0.00068	1.00	0.000006	<0.00029	<0.00099	<0.00086	1.586	--	--
	10/05/17	--	--	--	--	5.78	102	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	0.08607	10.5	85	<0.083	4.20	<100		1,972	<0.00093	<0.00105	0.04937	0.00134	0.00023	<0.00023	0.01628	<0.00068	0.217	<0.000005	<0.00029	<0.00099	<0.00086	1.582	0.446	0.378
	Dissolved	*0.07126*	*10.2*	--	--	4.20	<100	--	--	*<0.00093*	*<0.00105*	*0.04695*	*0.00122*	*0.00012*	*<0.00023*	*0.01592*	*<0.00068*	*0.204*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.549*	0.166	0.369
	05/23/18	--	--	--	<0.083	5.30	44.6	--	--	<0.00093	<0.00105	0.03045	0.00032 J	0.00288	<0.00023	0.0267	<0.00068	1.20	<0.000005	<0.00029	<0.00099	0.00846	2.556	--	--
	8/15/18[b]	0.198	230	103	<0.083	4.96	237	1,910	2,694	<0.01	0.00168	0.0242	0.000268	0.00006	0.00042	0.0111	0.000262	0.851	0.000013 J	0.00011	0.0003	0.000062	1.864	--	--
AD-15	05/31/16	0.329	5.09	30	<1	5.58	--	24	188	<0.005	0.012	0.215	<0.001	<0.001	0.017	0.011	0.007	0.017	0.000054	<0.005	<0.005	<0.002	2.28	--	--
	07/28/16	0.407	3.83	34	<1	5.58	--	28	196	<0.005	0.006	0.124	<0.001	<0.001	0.004	0.006	<0.005	0.021	<0.000025	<0.005	<0.005	<0.002	1.322	--	--
	09/29/16	0.360	13.7	28	<1	4.57	--	23	367	<0.005	0.131	1.93	0.015	0.007	0.28	0.134	0.161	0.149	0.000707	<0.005	0.014	<0.002	9.92	--	--
	10/19/16	0.152	4.57	26	<1	4.35	--	17	152	<0.005	0.023	0.415	0.002	<0.001	0.054	0.019	0.022	0.036	0.0001	<0.005	<0.005	<0.002	3.567	--	--
	12/12/16	0.334	3.60	26	<1	4.67	--	19	204	<0.005	0.006	0.184	<0.001	<0.001	0.015	0.010	<0.005	0.013	0.000026	<0.005	<0.005	<0.002	3.36	--	--
	01/19/17	0.413	3.35	32	<1	5.77	--	25	176	<0.005	0.006	0.153	<0.001	<0.001	0.009	0.007	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	2.386	--	--
	02/22/17	0.100	4.21	20	<1	4.95	--	8	88	<0.005	0.020	0.353	0.002	<0.001	0.049	0.020	0.019	0.025	0.000058	<0.005	<0.005	<0.002	2.261	--	--
	06/06/17	0.321	3.57	27	<0.083	4.83	246	19	184	<0.00093	0.00854	0.166	0.00061	0.00048	0.01235	0.00844	0.00298	0.0108	0.000022	<0.00029	0.00271	<0.00086	2.491	--	--
	10/05/17	--	--	--	--	5.94	208	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/18	0.08009	2.49	22	<0.083	4.60	7.32		94	<0.00093	0.00222	0.08419	0.00024	<0.00007	<0.00023	0.00403	<0.00068	0.00395	<0.000005	<0.00029	<0.00099	<0.00086	1.749	6.64	0.036
	Dissolved	*0.05773*	*2.49*	--	--	4.60	7.32	--	--	*<0.00093*	*<0.00105*	*0.08405*	*0.00019*	*<0.00007*	*<0.00023*	*0.00346*	*<0.00068*	*0.00378*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*0.748*	< 0.01	0.034
	Field Filtered[c]	*0.301*	*3.03*	*35*	*<0.083*	4.60	7.32	--	*8*	*<0.00093*	*0.00216*	*0.08611*	*0.00012*	*<0.00007*	*<0.00023*	*0.00421*	*<0.00068*	*0.00498*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.630*	7.09	0.061
	FF Dissolved[c]	*0.309*	*3*	--	--	4.60	7.32	--	--	*<0.00093*	*<0.00105*	*0.08373*	*0.00024*	*<0.00007*	*<0.00023*	*0.0038*	*<0.00068*	*0.00516*	*<0.000005*	*0.00048*	*<0.00099*	*<0.00086*	*5.743*	<0.01	0.062
	05/23/18	--	--	--	<0.083	4.76	147	--	--	<0.00093	0.00256 J	0.102	0.00003 J	0.0001 J	0.00263	0.00474 J	<0.00068	0.00562	<0.000005	<0.00029	0.00154 J	0.00137 J	1.46	--	--
	8/15/18[b]	0.341	3.04	37	<0.083	4.59	249	24	174	0.00003 J	0.00326	0.0852	0.000116	0.00001 J	0.000481	0.00371	0.000438	0.00338	0.000008 J	0.00005 J	0.0009	0.00009	1.076	--	--

Table 4-2
Groundwater Sampling Analytical Results (mg/L) - Primary Bottom Ash Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Supplemental Downgradient Monitoring Wells																									
AD-10	5/16/2018	0.08311	15.5	40	<0.083	3.72	<100	--	280	<0.00093	0.0022	0.03855	0.00166	0.00033	<0.00023	0.02432	<0.00068	0.316	<0.000005	<0.00029	<0.00099	0.00098	1.704	0.338	0.25
	Dissolved	*0.07733*	*15.3*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.03712*	*0.00149*	*0.00009*	*<0.00023*	*0.02412*	*<0.00068*	*0.296*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.505*	0.282	0.251
Supplemental Sidegradient Monitoring Wells																									
MW-9	5/15/2018	0.578	44.8	93	<0.083	4.74	57.4	--	780	0.00097	<0.00105	0.01661	0.00021	0.00019	<0.00023	0.03083	<0.00068	0.03225	0.000127	<0.00029	<0.00099	<0.00086	0.779	0.142	0.306
	Dissolved	*0.556*	*44.7*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.01588*	*0.00015*	*0.00036*	*<0.00023*	*0.03189*	*0.00813*	*0.03151*	*0.00015*	*<0.00029*	*<0.00099*	*<0.00086*	*0.2578*	< 0.01	0.308
MW-10	5/15/2018	0.707	59.3	5	<0.083	6.68	1.7	--	346	<0.00093	0.00128	0.08634	0.00006	<0.00007	<0.00023	0.00385	<0.00068	0.01001	<0.000005	0.00079	0.01898	<0.00086	0.969	0.101	0.054
	Dissolved	*0.689*	*59.8*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.08253*	*<0.00002*	*<0.00007*	*<0.00023*	*0.00064*	*<0.00068*	*0.00924*	*<0.000005*	*0.00082*	*0.01651*	*<0.00086*	*1.026*	< 0.01	0.002
Reference Values:																									
MCL					4					0.006	0.01	2	0.004	0.005	0.1				0.002		0.05	0.002	5[e]		
Rule Specified																0.006	0.015	0.04		0.1					
Background Limit					1					0.005	0.005	0.36	0.00077	0.0065[d]	0.004	0.075[d]	0.005	0.39[d]	0.000033	0.005	0.005	0.0013	4.21[e]		
Interwell Background Value(s) (UPL, LPL where applicable) AD-8, AD-9, AD-15		0.652				4.81-6.99																			
Intrawell Background Value (UPL) AD-8			35.68	38.3	1.034			236	569																
Intrawell Background Value (UPL) AD-9			350	139.3	0.7259			2527	3147																
Intrawell Background Value (UPL) AD-15			5.71	38.42	1			35.6	388																

NOTES:
All concentration data are provided in milligrams per liter (mg/L) unless otherwise noted.
J = Analyte was positively identified, though the quantitation was below Reporting Limit.
MCL = Maximum contaminant level
LPL = Lower prediction limit
UPL = Upper prediction limit
pCi/L = PicoCuries per liter
-- = Not analyzed
a = Data taken from Geosyntec "Statistical Analysis Summary, Primary Bottom Ash Pond" dated January 8, 2019.
b = Some inorganic analyte groundwater samples collected 9/17/18.
c = Sample ID "AD-15 DUP" was field filtered (FF) using a 5 micron filter.
d = Calculated Upper Tolerance Limit is higher than MCL.
e = Data is "Combined Radium, Total".
Denotes groundwater sample collected by ARCADIS using low-flow methods.
Unless otherwise noted, values shown are total (unfiltered) analyses.
Dissolved (0.45-micron lab filtered) parameter concentrations shown in italics.

Table 4-3
Groundwater Sampling Analytical Results (mg/L) - Landfill
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

ARCADIS Design & Consultancy for natural and built assets

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Background (Upgradient) Wells																									
AD-5	05/31/16	0.03	36.9	15	<1	6.38	--	123	337	<0.005	<0.005	0.057	<0.001	<0.001	<0.001	0.014	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	1.63	--	--
	07/28/16	0.04	44.7	16	<1	6.38	--	163	360	<0.005	<0.005	0.093	<0.001	<0.001	<0.001	0.015	<0.005	0.191	<0.000025	<0.005	<0.005	<0.002	4.75	--	--
	09/29/16	0.04	46.3	15	<1	5.29	--	190	416	<0.005	<0.005	0.087	<0.001	<0.001	<0.001	0.014	<0.005	0.186	<0.000025	<0.005	<0.005	<0.002	3.33	--	--
	10/20/16	0.05	50.7	14	<1	5.92	--	267	448	<0.005	<0.005	0.07	<0.001	<0.001	<0.001	0.009	<0.005	0.225	<0.000025	<0.005	<0.005	<0.002	2.319	--	--
	12/13/16	0.05	49.6	13	<1	6.29	--	233	484	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	0.013	<0.005	0.199	<0.000025	<0.005	<0.005	<0.002	2.182	--	--
	01/17/17	0.04	49.8	14	<1	6.27	--	234	438	<0.005	<0.005	0.047	<0.001	<0.001	<0.001	0.012	<0.005	0.239	<0.000025	<0.005	<0.005	<0.002	1.023	--	--
	02/23/17	0.04	33.0	15	<1	5.48	--	127	286	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	0.013	<0.005	0.166	<0.000025	<0.005	<0.005	<0.002	1.788	--	--
	06/07/17	0.05281	49.7	14	<0.083	5.96	867	82	300	<0.00093	0.00385	0.0877	0.00008	0.00039	0.00028	0.01193	<0.00068	0.124	<0.000005	<0.00029	<0.00099	<0.00086	2.32	--	--
	10/06/17	--	--	--	--	5.59	249	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.05063	30.1	21	<0.083	5.79	<100	--	248	<0.00093	<0.00105	0.07627	0.00014	0.00037	<0.00023	0.01907	<0.00068	0.118	<0.000005	<0.00029	<0.00099	<0.00086	1.495	14.4	0.45
	Dissolved	*0.03752*	*29.1*	--	--	5.79	<100	--	--	*<0.00093*	*<0.00105*	*0.06865*	*<0.00002*	*<0.00007*	*<0.00023*	*0.01747*	*<0.00068*	*0.119*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.043*	*2.051*	8.38	0.43
	05/24/18	0.05007	28.1	22	<0.083	6.22	17.8	60	242	<0.00093	<0.00105	0.07116	<0.00002	0.00023 J	0.0008 J	0.01424	<0.00068	0.121	<0.000005	<0.00029	<0.00099	<0.00086	1.946	--	--
	08/15/18	0.05	40.5	19	<0.083	6.23	57.1	240	428	0.00001 J	0.00169	0.0637	0.000055	0.000008 J	0.000072	0.0114	0.000079	0.147	<0.000005	0.00013	0.00008 J	<0.01	0.316	--	--
AD-18	05/26/16	0.146	409	422	<1	5.1	--	5,135	10,000	<0.005	<0.005	0.012	0.014	0.003	<0.001	0.922	<0.005	2.07	0.000168	<0.005	0.006	0.003	12.6	--	--
	07/27/16	0.148	457	432	2	5.1	--	4,930	9,476	<0.005	<0.005	0.019	0.005	0.002	<0.001	0.734	<0.005	1.94	0.000091	<0.005	0.007	0.003	10.62	--	--
	09/29/16	0.156	469	637	4	5.59	--	4,632	9,569	<0.005	<0.005	0.02	0.004	<0.001	<0.001	0.666	<0.005	1.86	0.000117	<0.005	0.007	<0.002	7.05	--	--
	10/20/16	0.188	498	876	0.8664	5.7	--	5,537	9,540	<0.005	<0.005	0.021	0.002	0.001	<0.001	0.569	<0.005	2.06	0.000053	<0.005	<0.005	<0.002	5.82	--	--
	12/13/16	0.178	510	695	5	5.75	--	4,382	8,912	<0.005	<0.005	0.021	0.007	0.001	<0.001	0.641	<0.005	1.74	0.00005	<0.005	<0.005	<0.002	9.6	--	--
	01/17/17	0.050	412	159	5	4.49	--	5,414	8,562	<0.005	0.01	0.014	0.022	0.001	<0.001	0.929	<0.005	1.95	0.000224	<0.005	<0.005	0.002	22.51	--	--
	02/22/17	0.090	401	151	6	4.37	--	5,169	8,412	<0.005	<0.005	0.014	0.026	0.002	<0.001	0.961	<0.005	1.82	0.000107	<0.005	<0.005	0.00228	19.11	--	--
	06/06/17	0.125	428	304	6.53	4.27	121	5,920	9,394	<0.00093	0.00331	0.01038	0.01883	0.00303	<0.00023	0.940	<0.00068	2.15	0.000113	<0.00029	0.00212	<0.00086	16.12	--	--
	10/05/17	--	--	--	--	5.87	165	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.163	433	362	9.4	3.61	104.1	--	9,952	0.00224	0.00276	0.00813	0.01733	0.0036	0.00098	0.928	<0.00068	2.07	0.000043	<0.00029	0.00194	0.00144	19.95	19.7	14.1
	Dissolved	*0.153*	*423*	--	--	--	--	--	--	*0.00467*	*0.00189*	*0.00748*	*0.01676*	*0.00316*	*<0.00023*	*0.898*	*<0.00068*	*2.06*	*0.000012*	*<0.00029*	*0.00135*	*0.01466*	*18.09*	19.1	13.7
Background Statistical Evaluation Summary - Upper Prediction Limits:[a]										0.005	0.005	0.36	0.00077	0.0065	0.004	0.075	0.005	0.39	0.000033	0.005	0.005	0.002	4.21	---	---
Point of Compliance Wells																									
AD-11	05/31/16	2.47	8.47	9	2	5.21	--	518	388	<0.005	<0.005	0.014	0.004	<0.001	0.003	0.026	<0.005	0.032	<0.000025	<0.005	<0.005	<0.002	1.77	--	--
	07/28/16	2.83	8.88	10	2	5.21	--	596	1,000	<0.005	<0.005	0.012	0.004	<0.001	<0.001	0.026	<0.005	0.047	<0.000025	<0.005	<0.005	<0.002	2.23	--	--
	09/29/16	3.4	10.7	12	2	4.08	--	683	1,065	<0.005	<0.005	0.052	0.005	<0.001	0.007	0.03	<0.005	0.047	<0.000025	<0.005	<0.005	<0.002	3.92	--	--
	10/19/16	3.77	8.78	11	<1	3.68	--	706	1,024	<0.005	<0.005	0.02	0.005	<0.001	0.002	0.027	<0.005	0.047	<0.000025	<0.005	<0.005	<0.002	2.56	--	--
	12/12/16	3.36	8.98	10	2	3.75	--	548	1,044	<0.005	<0.005	0.013	0.004	<0.001	<0.001	0.025	<0.005	0.041	<0.000025	<0.005	<0.005	<0.002	1.569	--	--
	01/17/17	2.81	10.3	11	2	4.41	--	760	1,048	<0.005	<0.005	0.013	0.004	<0.001	<0.001	0.025	<0.005	0.046	<0.000025	<0.005	<0.005	<0.002	1.082	--	--
	02/22/17	2.88	9.31	10	2	4.34	--	558	876	<0.005	<0.005	0.019	0.004	<0.001	0.002	0.024	<0.005	0.035	<0.000025	<0.005	<0.005	<0.002	1.45	--	--
	06/06/17	2.79	9.93	10	1.366	3.86	219	556	960	<0.00093	0.00123	0.01012	0.00279	0.00041	0.00032	0.02216	<0.00068	0.03654	<0.000005	<0.00029	<0.00099	<0.00086	1.902	--	--
	10/05/17	--	--	--	--	4.43	162	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	1.48	4.37	10	<0.083	3.77	75.3		558	0.00417	0.00127	0.01281	0.00148	0.00053	0.00041	0.00935	<0.00068	0.01978	<0.000005	0.00094	0.00103	<0.00086	1.264	1.35	0.063
	Dissolved	*1.45*	*4.28*	--	--	3.77	75.3	--	--	*<0.00093*	*0.00278*	*0.01202*	*0.00098*	*<0.00007*	*<0.00023*	*0.00877*	*<0.00068*	*0.01836*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.656*	1.25	0.062
	05/23/18	--	--	--	<0.083	*4.05*	*49.8*	--	--	<0.00093	0.0026 J	0.01627	0.00089 J	0.00018 J	0.0008 J	0.00863	<0.00068	0.01875	0.000007 J	<0.00029	0.00134 J	0.046	1.912	--	--
	08/15/18	1.84	6.61	15	<0.083	4.73	112	410	720	--	0.00105	0.0119	0.00118	0.00037	0.000257	0.0153	--	0.0175	<0.000005	--	0.0024	0.0002	2.6	--	--

Table 4-3
Groundwater Sampling Analytical Results (mg/L) - Landfill
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

ARCADIS Design & Consultancy for natural and built assets

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
AD-13	05/31/16	1.19	8.02	12	<1	6.05		177	900	<0.005	<0.005	0.062	<0.001	<0.001	<0.001	<0.005	<0.005	0.011	<0.000025	<0.005	<0.005	<0.002	1.22	--	--
	07/27/16	1.23	3.7	15	1	6.05		187	--	<0.005	<0.005	0.036	<0.001	<0.001	<0.001	<0.005	<0.005	0.026	<0.000025	<0.005	<0.005	<0.002	1.601	--	--
	09/29/16	1.37	2.7	17	1	4.56		207	431	<0.005	<0.005	0.04	<0.001	<0.001	<0.001	<0.005	<0.005	0.02	<0.000025	<0.005	<0.005	<0.002	2.213	--	--
	10/19/16	1.67	3.66	19	1	4.34		226	482	<0.005	<0.005	0.03	<0.001	<0.001	<0.001	<0.005	<0.005	0.022	<0.000025	<0.005	<0.005	<0.002	3.662	--	--
	12/05/16	--	--	--	--	--		--	532	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/13/16	1.96	3.77	18	1	4.79		287	596	<0.005	<0.005	0.051	0.001	<0.001	0.007	0.007	<0.005	0.025	<0.000025	<0.005	<0.005	<0.002	2.27	--	--
	01/19/17	0.402	33.5	7	<1	5.38		90	222	<0.005	0.006	0.112	<0.001	<0.001	0.004	<0.005	<0.005	0.004	<0.000025	<0.005	<0.005	<0.002	2.228	--	--
	02/23/17	1.27	10.3	13	<1	5.06		183	392	<0.005	<0.005	0.041	<0.001	<0.001	<0.001	<0.005	<0.005	0.015	<0.000025	<0.005	<0.005	<0.002	1.556	--	--
	06/06/17	1.68	3.03	15	0.6679	4.22	171	244	494	0.00153	<0.00105	0.01712	0.00089	0.00014	<0.00023	0.00624	<0.00068	0.02082	<0.000005	<0.00029	0.00103	<0.00086	1.565	--	--
	10/06/17	--	--	--	--	4.61	173	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	1.42	7.48	10	0.5362	4.20	1.4		532	<0.00093	<0.00105	0.0216	0.00088	0.00011	<0.00023	0.00809	<0.00068	0.02603	<0.000005	<0.00029	<0.00099	<0.00086	2.064	0.858	0.046
	Dissolved	*1.41*	*7.31*	--	--	4.20	1.4	--	--	*<0.00093*	*<0.00105*	*0.02097*	*0.0008*	*<0.00007*	*<0.00023*	*0.00784*	*<0.00068*	*0.02439*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.407*	0.712	0.045
	05/23/18	--	--	--	0.6534 J	*4.52*	*52.7*	--	--	<0.00093	<0.00105	0.02653	0.00087 J	<0.00007	0.00073 J	0.00937	<0.00068	0.0291	0.000008 J	<0.00029	<0.00099	<0.043	2.16	--	--
	08/14/18	1.49	10.1	18	0.7442	4.82	131	316	620	--	0.00137	0.0169	0.000971	0.00031	0.000503	0.0131	--	0.0321	<0.000005	--	0.0017	0.000277	4.0	--	--
AD-14	05/31/16	1.28	2.88	4	<1	4.75	--	115	285	<0.005	<0.005	0.031	<0.001	<0.001	<0.001	0.010	<0.005	0.012	0.00003	<0.005	<0.005	<0.002	0.87	--	--
	07/27/16	1.14	2.51	5	<1	4.75	--	111	267	<0.005	<0.005	0.084	<0.001	<0.001	0.001	0.009	<0.005	0.024	<0.000025	<0.005	<0.005	<0.002	1.487	--	--
	09/29/16	1.14	1.19	5	<1	4.17	--	111	252	<0.005	<0.005	0.03	<0.001	<0.001	<0.001	0.009	<0.005	0.015	<0.000025	<0.005	<0.005	<0.002	4.817	--	--
	10/19/16	1.25	2.48	4	<1	3.88	--	118	276	<0.005	<0.005	0.039	<0.001	0.001	<0.001	0.009	<0.005	0.014	<0.000025	<0.005	<0.005	<0.002	1.972	--	--
	12/12/16	1.25	2.41	5	<1	4.11	--	101	296	<0.005	<0.005	0.047	<0.001	0.001	0.001	0.009	<0.005	0.013	0.000037	<0.005	<0.005	<0.002	1.271	--	--
	01/17/17	0.915	10.3	4	<1	6.07	--	92	254	<0.005	<0.005	0.038	<0.001	<0.001	<0.001	<0.005	<0.005	0.013	<0.000025	<0.005	<0.005	<0.002	1.825	--	--
	02/22/17	1.06	9.48	4	<1	5.39	--	90	212	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	<0.005	<0.005	0.012	<0.000025	<0.005	<0.005	<0.002	0.512	--	--
	06/06/17	1.26	7.69	6	<0.083	4.77	167	108	256	<0.00093	<0.00105	0.04483	0.00038	0.00067	0.00127	0.00678	<0.00068	0.0127	0.000021	<0.00029	0.00261	<0.00086	1.138	--	--
	10/06/17	--	--	--	--	4.57	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	1.61	4.67	11	<0.083	4.11	5.1	--	332	<0.00093	<0.00105	0.03161	0.00094	0.00204	<0.00023	0.01501	<0.00068	0.01638	0.000137	<0.00029	0.00221	<0.00086	1.097	0.09	0.008
	Dissolved	*1.56*	*4.55*	--	--	4.11	5.1	--	--	*<0.00093*	*<0.00105*	*0.02938*	*0.00094*	*0.00193*	*<0.00023*	*0.01476*	*<0.00068*	*0.01523*	*0.000149*	*<0.00029*	*0.00387*	*<0.00086*	*0.5903*	0.06	0.007
	05/23/18	--	--	--	<0.083	4.17	43.2	--	--	<0.00093	<0.00105	0.02817	0.00078 J	0.00161	<0.00023	0.01434	<0.00068	0.0152	0.000145	<0.00029	0.00362	<0.043	1.601	--	--
	08/14/18	1.51	4.51	12	<0.083	4.27	198	204	384	--	0.00039	0.024	0.000854	0.00199	0.000276	0.0176	--	0.011	0.000181	--	0.0037	0.000242	1.5	--	--
Supplemental Downgradient Monitoring Well																									
AD-10	5/16/2018	0.08311	15.5	40	<0.083	3.72	<100	--	280	<0.00093	0.0022	0.03855	0.00166	0.00033	<0.00023	0.02432	<0.00068	0.316	<0.000005	<0.00029	<0.00099	0.00098	1.704	0.338	0.25
	Dissolved	*0.07733*	*15.3*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.03712*	*0.00149*	*0.00009*	*<0.00023*	*0.02412*	*<0.00068*	*0.296*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.505*	0.282	0.251
Supplemental Sidegradient Monitoring Well																									
Temp-1	5/17/2018	0.662	26.2	34	<0.083	4.90	23.8	--	556	<0.00093	<0.00105	0.07752	0.00058	<0.00007	0.00102	0.01058	<0.00068	0.01075	<0.000005	<0.00029	<0.00099	<0.00086	1.277	1.94	0.203
	Dissolved	*0.621*	*24.6*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.06778*	*0.00042*	*<0.00007*	*<0.00023*	*0.00946*	*<0.00068*	*0.00986*	*<0.000005*	*<0.00029*	*<0.00099*	*0.00191*	*2.278*	0.813	0.192
Reference Values:																									
MCL					4					0.006	0.01	2	0.004	0.005	0.1				0.002		0.05	0.002	5[c]		
Rule Specified																0.006	0.015	0.04		0.1					
Background Limit					1					0.005	0.005	0.36	0.00077	0.0065[b]	0.004	0.075[b]	0.005	0.39[b]	0.000033	0.005	0.005	0.0013	4.21[c]		
Interwell Background Value(s) (UPL, LPL where applicable) AD-8, AD-9, AD-15		0.652				4.81-6.99																			
Intrawell Background Value (UPL) AD-8			35.68	38.3	1.034			236	569																
Intrawell Background Value (UPL) AD-9			350	139.3	0.7259			2527	3147																
Intrawell Background Value (UPL) AD-15			5.71	38.42	1			35.6	388																

NOTES:
All concentration data are provided in milligrams per liter (mg/L) unless otherwise noted.
J = Analyte was positively identified, though the quantitation was below Reporting Limit.
MCL = Maximum contaminant level
LPL = Lower prediction limit
UPL = Upper prediction limit
pCi/L = PicoCuries per liter
-- - Not analyzed
a = Data taken from Geosyntec "Statistical Analysis Summary, Primary Bottom Ash Pond" dated January 8, 2019.
b = Calculated Upper Tolerance Limit is higher than MCL.
c = Data is "Combined Radium, Total".
Denotes groundwater sample collected by ARCADIS using low-flow methods.
Unless otherwise noted, values shown are total (unfiltered) analyses.
Dissolved (0.45-micron lab filtered) parameter concentrations shown in italics.

Table 4-4
Groundwater Sampling Analytical Results (mg/L) - Bottom Ash Storage Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

ARCADIS Design & Consultancy for natural and built assets

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Background (Upgradient) Wells																									
AD-1	05/26/16	0.346	36.5	5	<1	5.93	--	42	252	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.010	0.000033	<0.005	<0.005	<0.002	1.18	--	--
	07/27/16	0.350	39.6	4	<1	5.93	--	36	239	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.019	<0.000025	<0.005	<0.005	<0.002	0.9952	--	--
	09/29/16	0.332	15	5	<1	5.37	--	35	173	<0.005	<0.005	0.141	<0.001	<0.001	0.005	<0.005	<0.005	0.014	<0.000025	<0.005	<0.005	<0.002	1.38	--	--
	10/19/16	0.398	19.1	4	<1	5.15	--	42	192	<0.005	<0.005	0.114	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	1.141	--	--
	12/12/16	0.394	8.74	4	<1	5.18	--	40	200	<0.005	<0.005	0.072	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	0.719	--	--
	01/17/17	0.656	129	4	<1	7.13	--	68	538	<0.005	<0.005	0.410	<0.001	<0.001	<0.001	<0.005	<0.005	<0.001	<0.000025	<0.005	<0.005	<0.002	3.009	--	--
	02/23/17	0.700	147	9	<1	6.88	--	68	612	<0.005	<0.005	0.488	<0.001	<0.001	<0.001	<0.005	<0.005	0.001	<0.000025	<0.005	<0.005	<0.002	4.309	--	--
	06/07/17	0.449	15.1	4	<0.083	5.06	109	42	176	<0.00093	0.00114	0.09346	0.00037	<0.00007	0.00066	0.00077	<0.00068	0.00902	0.000007	<0.00029	0.0021	<0.00086	0.676	--	--
	10/06/17	--	--	--	--	5.25	97.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.352	12.1	3	<0.083	4.82	8.4	--	174	<0.00093	<0.00105	0.08823	0.00048	<0.00007	<0.00023	0.0008	<0.00068	0.00816	<0.000005	<0.00029	<0.00099	<0.00086	0.837	0.03	0.025
	Dissolved	*0.35*	*12*	--	--	4.82	8.4	--	--	*<0.00093*	*<0.00105*	*0.08582*	*0.00044*	*<0.00007*	*<0.00023*	*0.00083*	*<0.00068*	*0.00799*	*<0.000005*	*<0.00029*	*0.00197*	*<0.00086*	*0.531*	0.01	0.026
	05/24/18	0.345	10.2	4	<0.083	5.19	118	43	150	0.00317 J	<0.00105	0.0799	0.00039 J	<0.00007	<0.00023	0.00035 J	<0.00068	0.00814	0.000006 J	<0.00029	0.00138 J	<0.00086	1.983	--	--
	08/14/18	0.443	5.95	5	<0.083	5.18	102	44	160	0.00003 J	0.00021	0.063	0.000482	0.00002	0.00016	0.000797	0.000238	0.00708	0.000013 J	0.00021	0.0017	0.00003 J	1.10	--	--
AD-5	05/31/16	0.03	36.9	15	<1	6.38	--	123	337	<0.005	<0.005	0.057	<0.001	<0.001	<0.001	0.014	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	1.63	--	--
	07/28/16	0.04	44.7	16	<1	6.38	--	163	360	<0.005	<0.005	0.093	<0.001	<0.001	<0.001	0.015	<0.005	0.191	<0.000025	<0.005	<0.005	<0.002	4.75	--	--
	09/29/16	0.04	46.3	15	<1	5.29	--	190	416	<0.005	<0.005	0.087	<0.001	<0.001	<0.001	0.014	<0.005	0.186	<0.000025	<0.005	<0.005	<0.002	3.33	--	--
	10/20/16	0.05	50.7	14	<1	5.92	--	267	448	<0.005	<0.005	0.07	<0.001	<0.001	<0.001	0.009	<0.005	0.225	<0.000025	<0.005	<0.005	<0.002	2.319	--	--
	12/13/16	0.05	49.6	13	<1	6.29	--	233	484	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	0.013	<0.005	0.199	<0.000025	<0.005	<0.005	<0.002	2.182	--	--
	01/17/17	0.04	49.8	14	<1	6.27	--	234	438	<0.005	<0.005	0.047	<0.001	<0.001	<0.001	0.012	<0.005	0.239	<0.000025	<0.005	<0.005	<0.002	1.023	--	--
	02/23/17	0.04	33.0	15	<1	5.48	--	127	286	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	0.013	<0.005	0.166	<0.000025	<0.005	<0.005	<0.002	1.788	--	--
	06/07/17	0.05281	49.7	14	<0.083	5.96	867	82	300	<0.00093	0.00385	0.0877	0.00008	0.00039	0.00028	0.01193	<0.00068	0.124	<0.000005	<0.00029	<0.00099	<0.00086	2.32	--	--
	10/06/17	--	--	--	--	5.59	249	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.05063	30.1	21	<0.083	5.79	<100	--	248	<0.00093	<0.00105	0.07627	0.00014	0.00037	<0.00023	0.01907	<0.00068	0.118	<0.000005	<0.00029	<0.00099	<0.00086	1.495	14.4	0.45
	Dissolved	*0.03752*	*29.1*	--	--	5.79	<100	--	--	*<0.00093*	*<0.00105*	*0.06865*	*<0.00002*	*<0.00007*	*<0.00023*	*0.01747*	*<0.00068*	*0.119*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.043*	*2.051*	8.38	0.43
	05/24/18	0.05007	28.1	22	<0.083	6.22	17.8	60	242	<0.00093	<0.00105	0.07116	<0.00002	0.00023 J	0.0008 J	0.01424	<0.00068	0.121	<0.000005	<0.00029	<0.00099	<0.00086	1.946	--	--
	08/15/18	0.05	40.5	19	<0.083	6.23	57.1	240	428	0.00001 J	0.00169	0.0637	0.000055	0.000008 J	0.000072	0.0114	0.000079	0.147	<0.000005	0.00013	0.00008 J	<0.01	0.316	--	--
AD-17	05/26/16	0.121	200	43	<1	7.17	--	1,166	1,810	<0.005	<0.005	0.021	<0.001	0.002	0.001	0.063	<0.005	0.370	0.000032	<0.005	<0.005	<0.002	1.53	--	--
	07/27/16	0.119	195	32	<1	7.17	--	1,005	1,576	<0.005	<0.005	0.020	<0.001	0.004	0.001	0.068	<0.005	0.374	<0.000025	<0.005	<0.005	<0.002	2.78	--	--
	09/29/16	0.111	191	36	<1	6.17	--	1,055	1,663	<0.005	<0.005	0.031	<0.001	<0.001	0.003	0.058	<0.005	0.354	<0.000025	<0.005	<0.005	<0.002	2.358	--	--
	10/20/16	0.124	194	32	1.0	6.14	--	1,163	1,612	<0.005	<0.005	0.034	<0.001	0.002	0.004	0.065	<0.005	0.394	<0.000025	<0.005	<0.005	<0.002	2.224	--	--
	12/13/16	0.135	196	31	<1	6.03	--	1,096	1,560	<0.005	<0.005	0.017	<0.001	0.003	<0.001	0.068	<0.005	0.323	<0.000025	<0.005	<0.005	<0.002	2.384	--	--
	01/17/17	0.101	196	33	<1	5.96	--	1,445	1,686	<0.005	<0.005	0.014	<0.001	0.003	0.068	0.068	<0.005	0.341	<0.000025	<0.005	<0.005	<0.002	2.436	--	--
	02/22/17	0.135	189	30	<1	5.67	--	1,055	1,628	<0.005	<0.005	0.020	<0.001	0.002	0.001	0.073	<0.005	0.331	<0.000025	<0.005	<0.005	<0.002	2.288	--	--
	06/06/17	0.121	188	30	<0.083	5.81	156	1,105	1,578	<0.00093	<0.00105	0.01033	<0.00002	0.00606	<0.00023	0.0748	<0.00068	0.329	0.000013	<0.00029	<0.00099	<0.00086	1.598	--	--
	10/05/17	--	--	--	--	5.92	598	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.247	213	45	<0.083	5.51	<100	--	1,846	<0.00093	<0.00105	0.00978	<0.00002	0.00915	<0.00023	0.07451	<0.00068	0.306	<0.000005	<0.00029	0.00414	<0.00086	1.514	260	3.72
	Dissolved	*0.231*	*205*	--	--	5.51	<100	--	--	*<0.00093*	*<0.00105*	*0.00737*	*<0.00002*	*0.00609*	*<0.00023*	*0.07938*	*<0.00068*	*0.301*	*<0.000005*	*<0.00029*	*0.00515*	*0.02*	*1.57*	241	3.56
	05/24/18	0.239	193	39	<0.083	6.28	7.8	1,067	1,836	<0.00093	<0.00105	0.00965	<0.00002	0.00646	<0.00023	0.07173	<0.00068	0.308	<0.000005	<0.00029	<0.00099	<0.00086	1.939	--	--
	08/15/18	0.118	187	40	<0.083	5.6	418	1,170	1,750	0.00002 J	0.00183	0.0128	0.000069	0.00025	0.000604	0.0435	0.0011	0.243	0.000011 J	0.00035	0.0003	0.000074	2.35	--	--
AD-18	05/26/16	0.146	409	422	<1	5.1	--	5,135	10,000	<0.005	<0.005	0.012	0.014	0.003	<0.001	0.922	<0.005	2.07	0.000168	<0.005	0.006	0.003	12.58	--	--
	07/27/16	0.148	457	432	2	5.1	--	4,930	9,476	<0.005	<0.005	0.019	0.005	0.002	<0.001	0.734	<0.005	1.94	0.000091	<0.005	0.007	0.003	10.62	--	--
	09/29/16	0.156	469	637	4	5.59	--	4,632	9,569	<0.005	<0.005	0.02	0.004	<0.001	<0.001	0.666	<0.005	1.86	0.000117	<0.005	0.007	<0.002	7.05	--	--
	10/20/16	0.188	498	876	0.8664	5.7	--	5,537	9,540	<0.005	<0.005	0.021	0.002	0.001	<0.001	0.569	<0.005	2.06	0.000053	<0.005	<0.005	<0.002	5.82	--	--
	12/13/16	0.178	510	695	5	5.75	--	4,382	8,912	<0.005	<0.005	0.021	0.007	0.001	<0.001	0.641	<0.005	1.74	0.00005	<0.005	<0.005	<0.002	9.60	--	--
	01/17/17	0.050	412	159	5	4.49	--	5,414	8,562	<0.005	0.01	0.014	0.022	0.001	<0.001	0.929	<0.005	1.95	0.000224	<0.005	<0.005	0.002	22.51	--	--
	02/22/17	0.090	401	151	6	4.37	--	5,169	8,412	<0.005	<0.005	0.014	0.026	0.002	<0.001	0.961	<0.005	1.82	0.000107	<0.005	<0.005	0.00228	19.11	--	--
	06/06/17	0.125	428	304	6.53	4.27	121	5,920	9,394	<0.00093	0.00331	0.01038	0.01883	0.00303	<0.00023	0.940	<0.00068	2.15	0.000113	<0.00029	0.00212	<0.00086	16.12	--	--
	10/05/17	--	--	--	--	5.87	165	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.163	433	362	9.4	3.61	104.1	--	9,952	0.00224	0.00276	0.00813	0.01733	0.0036	0.00098	0.928	<0.00068	2.07	0.000043	<0.00029	0.00194	0.00144	19.95	19.7	14.1
	Dissolved	*0.153*	*423*	--	--	--	--	--	--	*0.00467*	*0.00189*	*0.00748*	*0.01676*	*0.00316*	*<0.00023*	*0.898*	*<0.00068*	*2.06*	*0.000012*	*<0.00029*	*0.00135*	*0.01466*	*18.09*	19.1	13.7

ARCADIS Design & Consultancy for natural and built assets

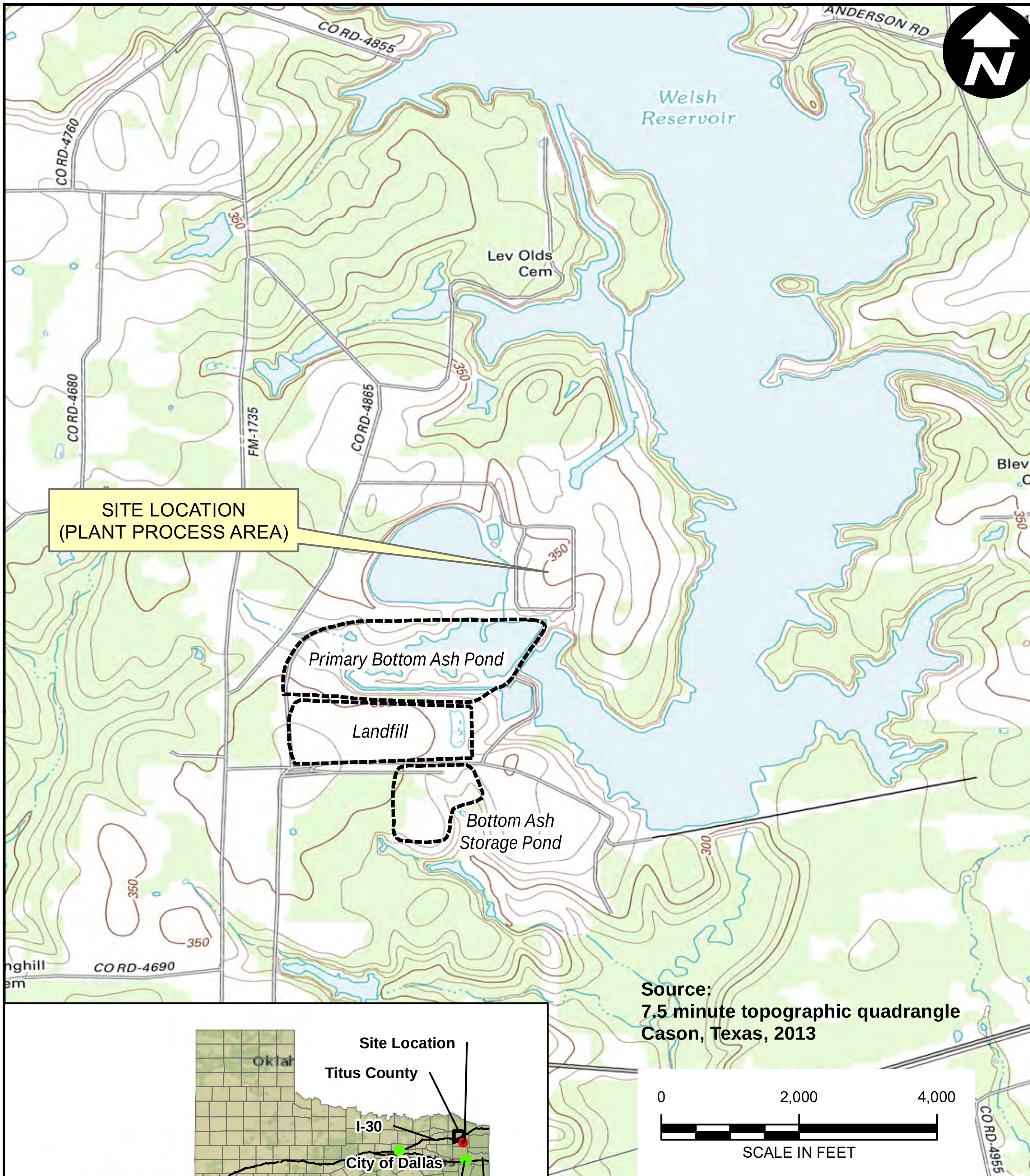
		Appendix III Parameters								Appendix IV Parameters															
Well	Date Sampled	Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Point of Compliance Wells																									
AD-3	05/31/16	0.02	1.41	9	<1	6.58	--	4	106	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	<0.005	<0.005	0.010	0.00085	<0.005	<0.005	<0.002	1.02	--	--
	07/27/16	0.02	0.706	8	<1	6.58	--	5	118	<0.005	<0.005	0.036	<0.001	<0.001	<0.001	<0.005	<0.005	0.024	0.000589	<0.005	<0.005	<0.002	0.1786	--	--
	09/30/16	0.02	<0.5	9	<1	4.75	--	6	127	<0.005	<0.005	0.043	<0.001	<0.001	<0.001	<0.005	<0.005	0.019	0.00039	<0.005	<0.005	<0.002	0.552	--	--
	10/19/16	0.06	0.794	8	<1	3.71	--	9	112	<0.005	<0.005	0.041	<0.001	<0.001	<0.001	<0.005	<0.005	0.018	0.000351	0.006	<0.005	<0.002	1.589	--	--
	12/12/16	0.02	1.05	8	<1	4.67	--	11	138	<0.005	<0.005	0.045	<0.001	<0.001	<0.001	<0.005	<0.005	0.017	0.000321	<0.005	<0.005	<0.002	0.546	--	--
	01/19/17	0.02	0.746	9	<1	4.60	--	4	76	<0.005	<0.005	0.041	<0.001	<0.001	<0.001	<0.005	<0.005	0.014	0.000504	<0.005	<0.005	<0.002	0.229	--	--
	02/23/17	0.02	0.573	9	<1	4.69	--	5	104	<0.005	<0.005	0.037	<0.001	<0.001	<0.001	<0.005	<0.005	0.014	0.000501	<0.005	<0.005	<0.002	0.4592	--	--
	06/07/17	0.03326	0.543	9	0.2625	4.49	56.6	5	104	<0.00093	0.00191	0.038	0.00024	0.00008	0.00075	0.00128	<0.00068	0.01503	0.000365	<0.00029	<0.00099	<0.00086	0.459	--	--
	10/06/17	--	--	--	--	5.15	65.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/15/18	0.01869	0.56	9	<0.083	4.31	11.1		132	0.00166	0.0016	0.0365	0.00034	0.00008	<0.00023	0.00136	<0.00068	0.01459	0.00037	<0.00029	0.00323	0.00127	0.016	0.188	0.004
	Dissolved	*0.01132*	*0.595*	--	--	4.31	11.1	--	--	*<0.00093*	*<0.00105*	*0.0361*	*0.00023*	*<0.00007*	*<0.00023*	*0.00133*	*<0.00068*	*0.01445*	*0.000379*	*<0.00029*	*<0.00099*	*<0.00086*	*0.242*	< 0.01	0.004
	05/24/18	0.0069 J	0.545	8	<0.083	4.58	8.50	3	98	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AD-4c	05/31/16	0.05	0.798	10	<1	5.41	--	32	204	<0.005	<0.005	0.088	<0.001	<0.001	0.009	<0.005	<0.005	0.004	0.000191	<0.005	<0.005	<0.002	1.29	--	--
	07/27/16	0.03	0.666	12	<1	5.41	--	35	208	<0.005	<0.005	0.059	<0.001	<0.001	0.004	<0.005	<0.005	0.015	0.000185	<0.005	<0.005	<0.002	0.5075	--	--
	09/29/16	0.02	<0.5	11	<1	4.96	--	45	212	<0.005	<0.005	0.074	<0.001	<0.001	0.008	<0.005	<0.005	0.006	0.00016	<0.005	<0.005	<0.002	2.572	--	--
	10/19/16	0.04	0.578	10	<1	4.30	--	35	212	<0.005	<0.005	0.069	<0.001	<0.001	0.009	<0.005	<0.005	0.006	0.000141	<0.005	<0.005	<0.002	1.657	--	--
	12/12/16	0.02	0.341	11	<1	4.62	--	36	252	<0.005	<0.005	0.021	<0.001	<0.001	<0.001	<0.005	<0.005	0.004	0.000143	<0.005	<0.005	<0.002	0.685	--	--
	01/19/17	0.02	0.761	10	<1	4.67	--	43	184	<0.005	<0.005	0.075	<0.001	<0.001	0.004	<0.005	<0.005	0.005	0.000125	<0.005	<0.005	<0.002	2.045	--	--
	02/23/17	0.02	0.467	9	<1	5.10	--	40	196	<0.005	<0.005	0.030	<0.001	<0.001	<0.001	<0.005	<0.005	0.004	0.000098	<0.005	<0.005	<0.002	0.517	--	--
	06/07/17	0.03331	0.573	10	<0.083	4.88	351	39	228	<0.00093	0.00119	0.05142	0.00019	0.00008	0.00403	0.00075	<0.00068	0.00482	0.000147	<0.00029	<0.00099	<0.00086	0.953	--	--
	10/06/17	--	--	--	--	5.38	308	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	0.0186	0.498	14	<0.083	4.67	6.40		232	<0.00093	<0.00105	0.02572	0.0001	<0.00007	0.00044	0.00049	<0.00068	0.00394	0.000228	<0.00029	<0.00099	<0.00086	0.435	0.592	< 0.001
	Dissolved	*0.02017*	*0.468*	--	--	4.67	6.40	--	--	*<0.00093*	*<0.00105*	*0.02223*	*0.00006*	*<0.00007*	*<0.00023*	*0.00043*	*<0.00068*	*0.0039*	*0.000031*	*<0.00029*	*<0.00099*	*<0.00086*	*0.354*	0.394	0.002
	05/24/18	0.02505	0.434	14	<0.083	*5.17*	*48.1*	42	224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/14/18	--	--	15	--	--	125	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AD-16	01/26/16	0.05	2.81	6	<1	3.84	--	49	180	<0.005	0.02	0.198	0.002	<0.001	0.054	0.013	0.016	0.015	0.000259	<0.005	<0.005	<0.002	4.478	--	--
	03/21/16	0.04	2.04	6	<1	4.20	--	47	104	<0.005	<0.005	0.119	<0.001	<0.001	0.009	<0.005	<0.005	0.007	0.000114	<0.005	<0.005	<0.002	4.44	--	--
	05/31/16	0.03	1.55	6	<1	4.44	--	40	96	<0.005	<0.005	0.127	<0.001	<0.001	0.001	<0.005	<0.005	0.002	0.000037	<0.005	<0.005	<0.002	5.99	--	--
	07/27/16	0.04	3.42	7	<1	4.44	--	70	184	<0.005	0.01	0.123	0.002	<0.001	0.011	0.022	<0.005	0.035	0.000212	<0.005	<0.005	<0.002	7.21	--	--
AD-16R	06/06/17	0.04198	2.75	7	0.3438	3.68	46.9	54	204	<0.00093	0.00707	0.0464	0.00221	0.00103	0.00176	0.04174	<0.00068	0.0293	<0.000005	<0.00029	0.00198	<0.00086	6.66	--	--
	06/28/17	0.06398	1.24	6	0.2512	3.91	--	55	200	<0.00093	0.00528	0.04143	0.00216	0.00092	0.00095	0.04087	<0.00068	0.02932	<0.000005	<0.00029	<0.00099	<0.00086	12.11	--	--
	07/28/17	0.02841	1.92	7	<0.083	2.77	--	48	162	<0.00093	0.0037	0.04851	0.00217	0.00128	0.00107	0.04533	<0.00068	0.02617	0.000006	<0.00029	0.00127	0.00143	8.52	--	--
	08/02/17	0.03177	1.86	7	<0.083	3.00	--	49	174	<0.00093	0.00446	0.04961	0.00206	0.00122	0.00095	0.04311	<0.00068	0.02498	<0.000005	<0.00029	0.00174	0.00202	5.45	--	--
	10/06/17	--	--	--	--	3.29	31.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/15/18	0.04030	2.73	6	<0.083	3.18	0.0		212	0.00269	0.0074	0.04301	0.00278	0.00129	0.0007	0.04123	<0.00068	0.02977	<0.000005	0.00103	<0.00099	<0.00086	5.89	1.47	0.053
	Dissolved	*0.02614*	*2.59*	--	--	3.18	0.0	--	--	*<0.00093*	*0.00294*	*0.04155*	*0.0022*	*0.00071*	*0.00025*	*0.03996*	*<0.00068*	*0.0278*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*5.90*	0.599	0.05
	05/23/18	0.03202	2.53	6	<0.083	*3.79*	*36.9*	67	204	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/14/18	--	--	--	--	--	142	44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Supplemental Downgradient Monitoring Wells																									
AD-19	5/17/2018	0.07234	9.4	34	<0.083	5.72	42.1	--	372	<0.00093	<0.00105	0.05026	0.00073	<0.00007	0.00117	0.0111	<0.00068	0.02924	<0.000005	0.00078	0.00194	<0.00086	1.421	3.04	0.089
	Dissolved	*0.06293*	*8.76*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.04*	*0.00025*	*<0.00007*	*<0.00023*	*0.00965*	*<0.00068*	*0.02842*	*<0.000005*	*0.00041*	*<0.00099*	*0.012*	*2.577*	2.13	0.08
AD-20	10/31/18	0.029	3.14	18.4	0.09	4.88	13	12.5	140	0.00004	0.00185	0.205	0.000651	0.00114	0.000514	0.0161	0.000425	0.0126	<0.00005	<0.0004	0.0008	0.0003	4.16	1.11	0.0742
AD-21	10/30/18	0.025	5.0	17	0.23	5.04	0.0	27.4	180	0.00006	0.00124	0.0868	0.00181	0.00065	0.000263	0.0337	0.000148	0.034	<0.00005	<0.0004	0.0011	0.0002	3.76	3.13	0.154

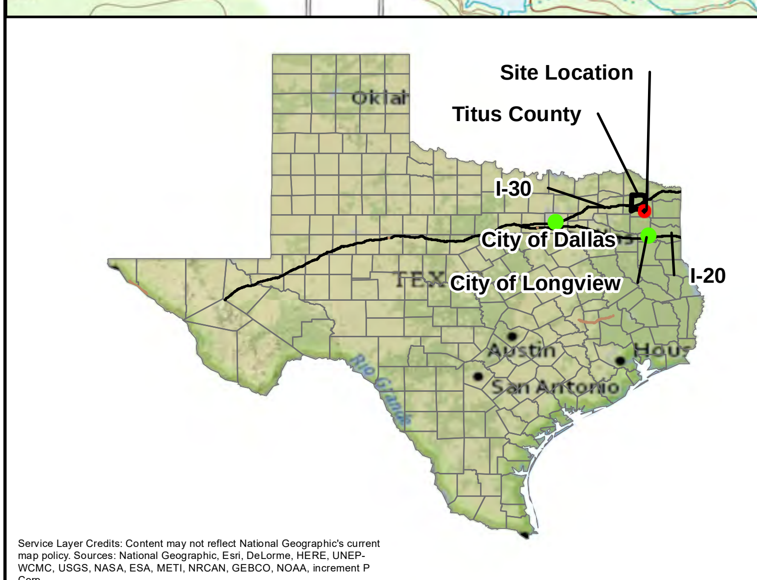
Table 4-4
Groundwater Sampling Analytical Results (mg/L) - Bottom Ash Storage Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Reference Values:																									
MCL					4					0.006	0.01	2	0.004	0.005	0.1				0.002	N/A	0.05	0.002	5[b]		
Rule Specified																0.006	0.015	0.04		0.1					
Background Limit					1					0.005	0.005	0.36	0.00077	0.0065[a]	0.004	0.075[a]	0.005	0.39[a]	0.000033	0.005	0.005	0.0013	4.21[b]		
Interwell Background Value(s) (UPL, LPL where applicable) AD-8, AD-9, AD-15		0.652				4.81-6.99																			
Intrawell Background Value (UPL) AD-8			35.68	38.3	1.034			236	569																
Intrawell Background Value (UPL) AD-9			350	139.3	0.7259			2527	3147																
Intrawell Background Value (UPL) AD-15			5.71	38.42	1			35.6	388																

NOTES:
All concentration data are provided in milligrams per liter (mg/L) unless otherwise noted.
J = Analyte was positively identified, though the quantitation was below Reporting Limit.
MCL = Maximum contaminant level
LPL = Lower prediction limit
UPL = Upper prediction limit
pCi/L = PicoCuries per liter.
-- = Not analyzed.
a = Calculated Upper Tolerance Limit is higher than MCL.
b = Data is "Combined Radium, Total".
Denotes groundwater sample collected by ARCADIS using low-flow sampling methods.
Unless otherwise noted, values shown are total (unfiltered) analyses.
Dissolved (0.45-micron lab filtered) parameter concentrations shown in italics.

FIGURES





J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1-1

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\Dec2017Update\fig 1 - site map.mxd

Legend

Coal Combustion Residual (CCR) Unit

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

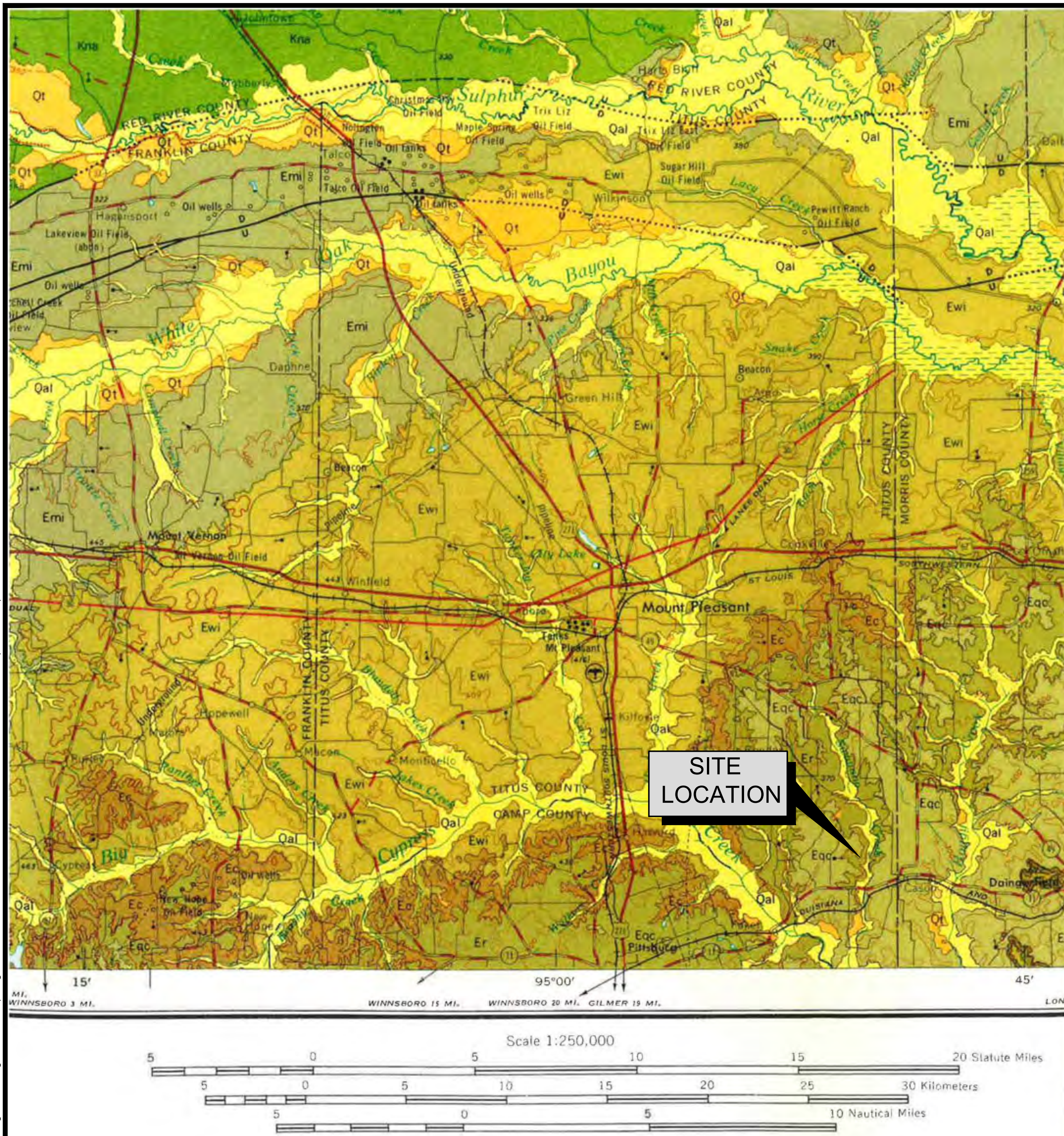
PLANT AND CCR UNIT LOCATION MAP

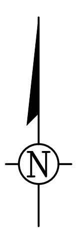
ARCADIS Design & Consultancy for natural and built assets

FIGURE 1-2

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\Dec2017Update\fig 1-2 - CCR location.mxd

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\November2018\Fig2-1-SoilBoring_MonitoringWellLocations.mxd





J. ROBERT WELSH POWER PLANT
PITTSBURG, TITUS COUNTY, TEXAS

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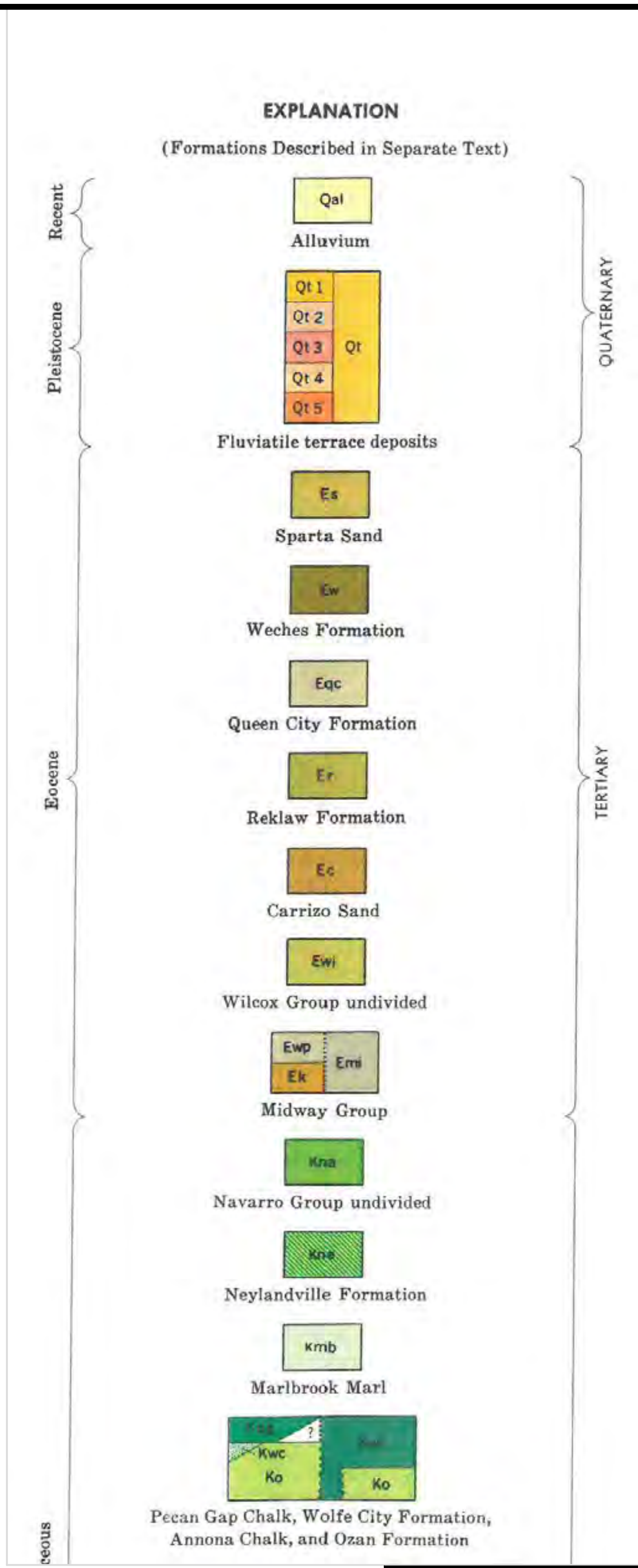
□EO□O□IC MA□

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-2A



J. ROBERT WELSH POWER PLANT
PITTSBURG, TITUS COUNTY, TEXAS

REGIONAL GEOLOGIC LEGEND

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-2B

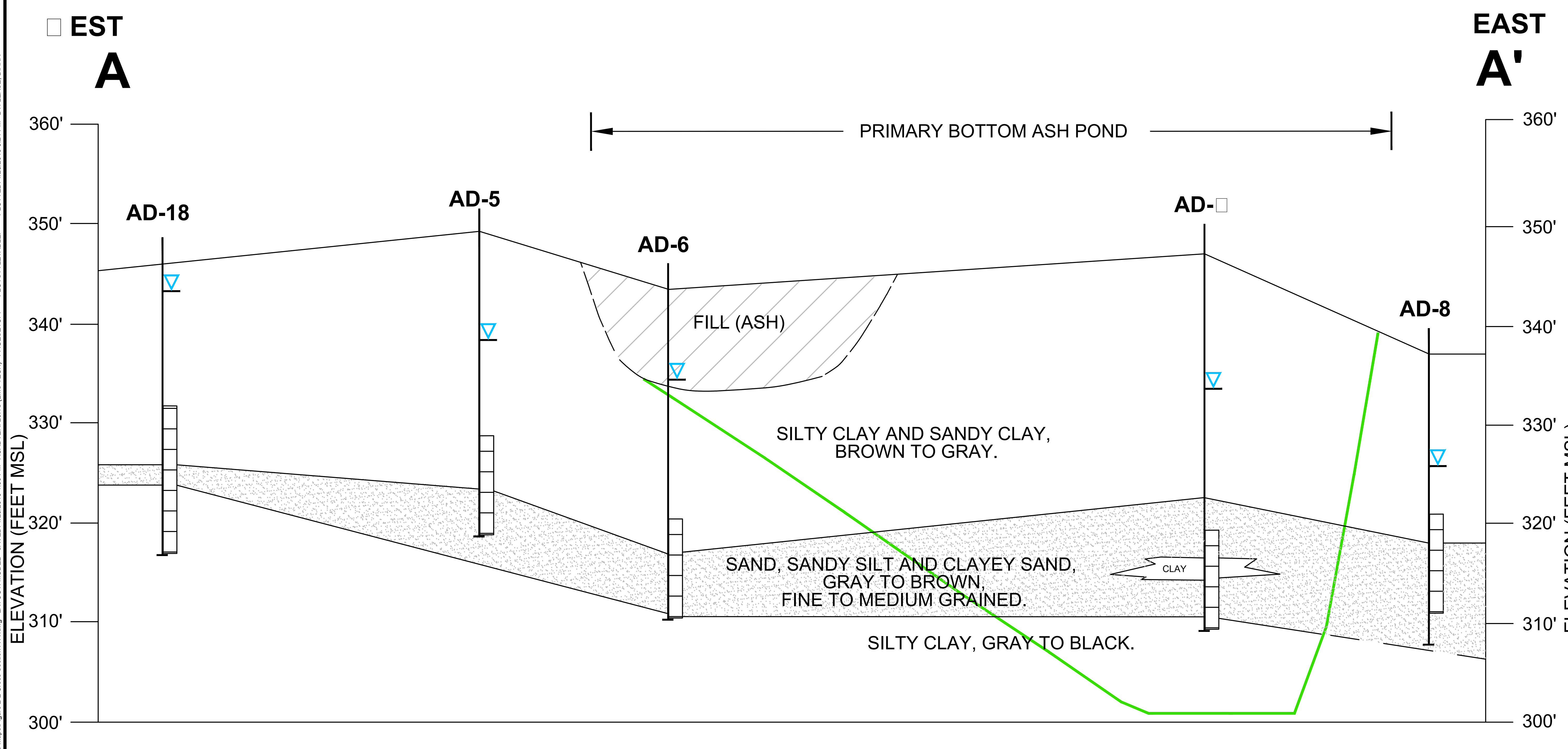
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE **2-3**

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Lithium_ASD_Report\Fig2-3-Cross Section LocationsREV.mxd



0 300'
HORIZONTAL SCALE

NOTE: BASE OF ASH POND TAKEN FROM "WELSH POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I " DRAWING ID WEPX-88, DATED 12-3-76; AND U.S. GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX QUADRANGLE, 1964 (PHOTO REVISED 1980).

LEGEND

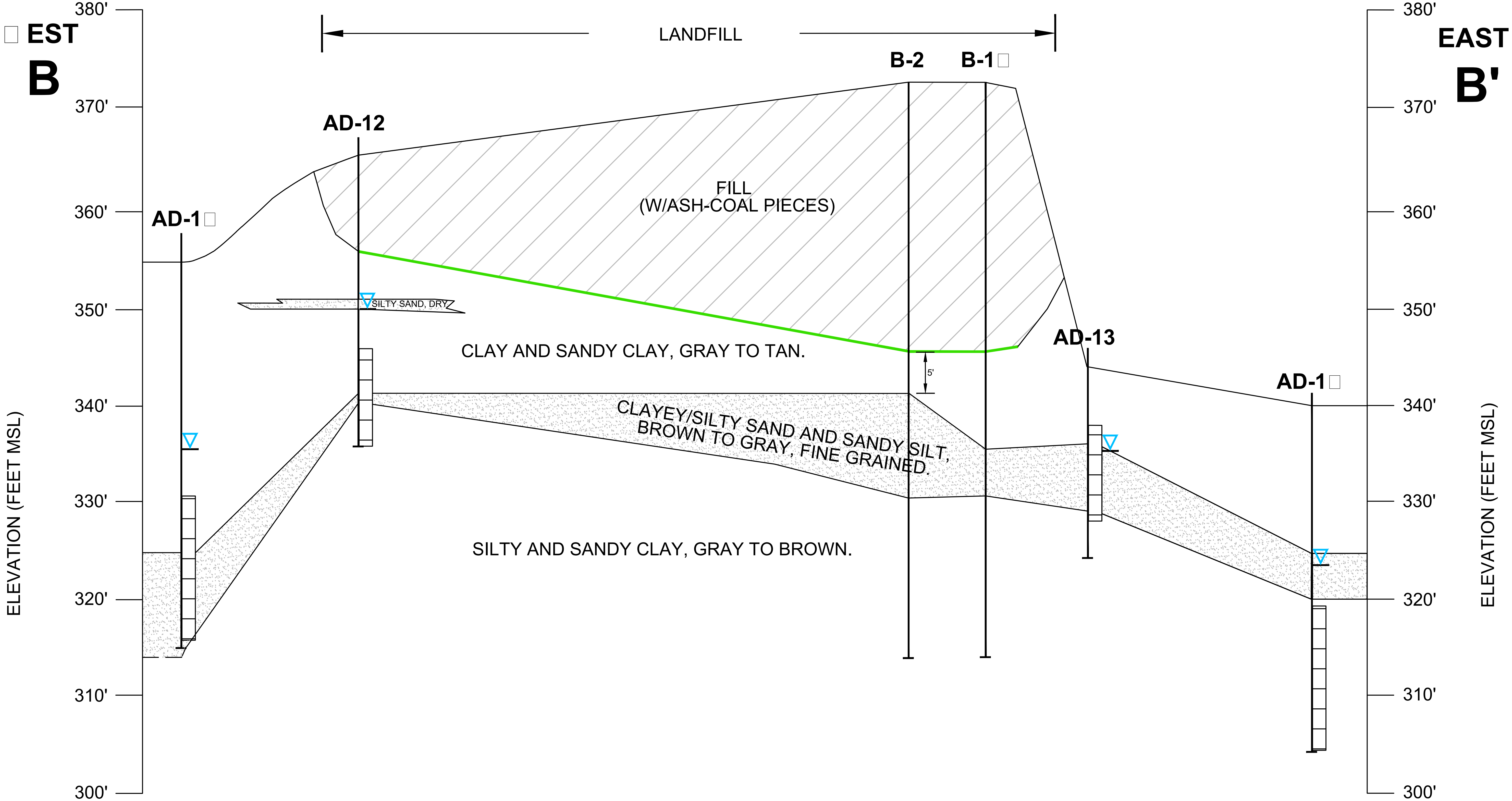
- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (3/4/16)
- PROJECTED BASE OF ASH POND (SEE NOTE)

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION
A - A'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-4



NOTE: BASE OF LANDFILL ELEVATION TAKEN FROM "WELSH POWER PLANT- UNIT 1 FLY ASH STORAGE AREA PHASE I" DRAWING ID WEPX-88, DATED 12/3/76.

LEGEND

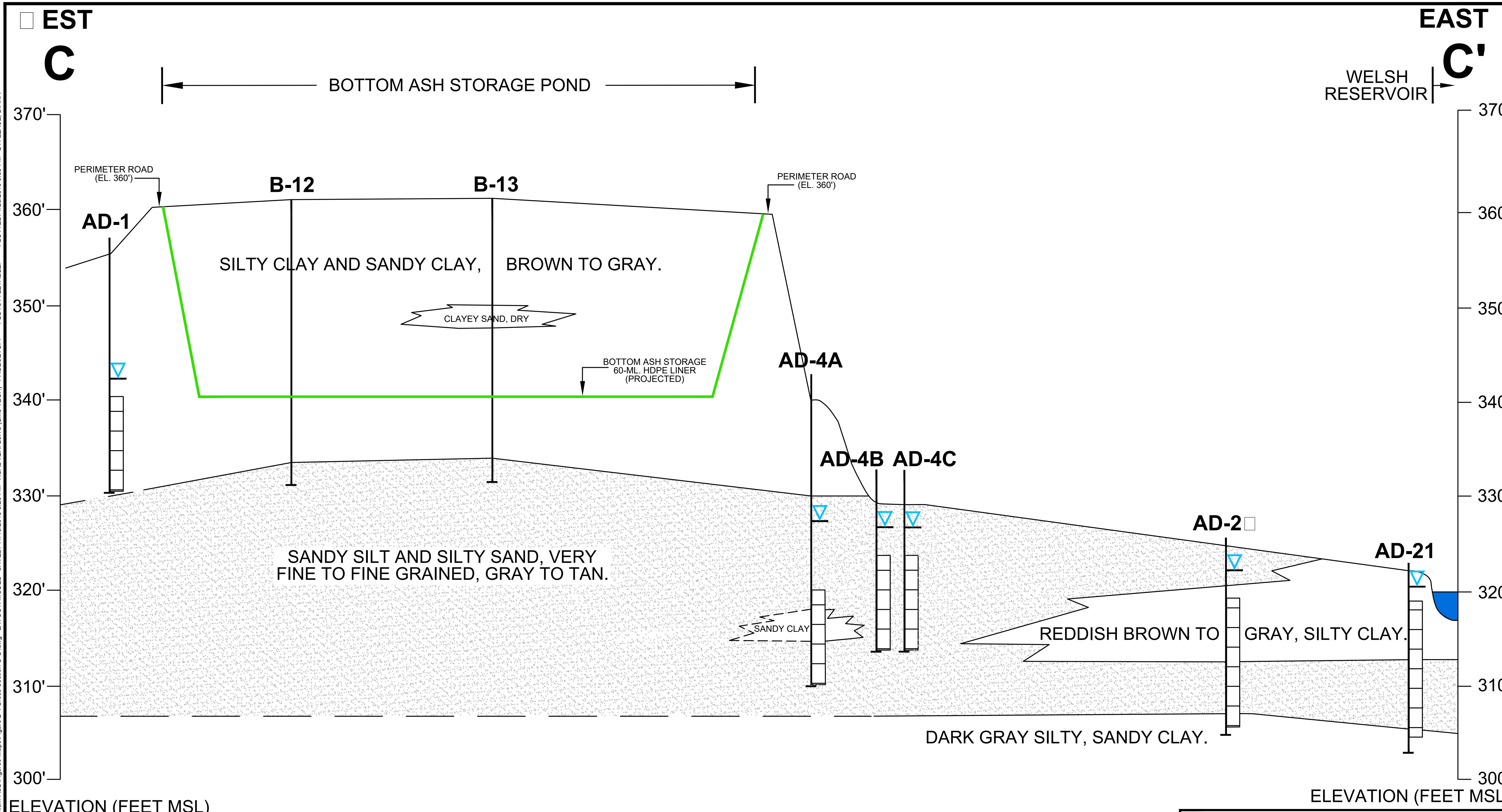
- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (3/4/16)
- BASE OF LANDFILL (SEE NOTE)

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION B - B'

ARCADIS Design & Consultancy for natural and built assets

FIGURE **2-5**



0 200'

HORIZONTAL SCALE

NOTE: BASE OF BOTTOM ASH STORAGE HAS A 60-ML. HDPE LINER AT ELEVATION 340.0', TAKEN FROM FREESE AND NICHOLS "HYDRAULIC ANALYSIS OF WELSH POWER PLANT ASH PONDS, AMERICAN ELECTRIC POWER COMPANY", DATED DECEMBER 2010.

LEGEND

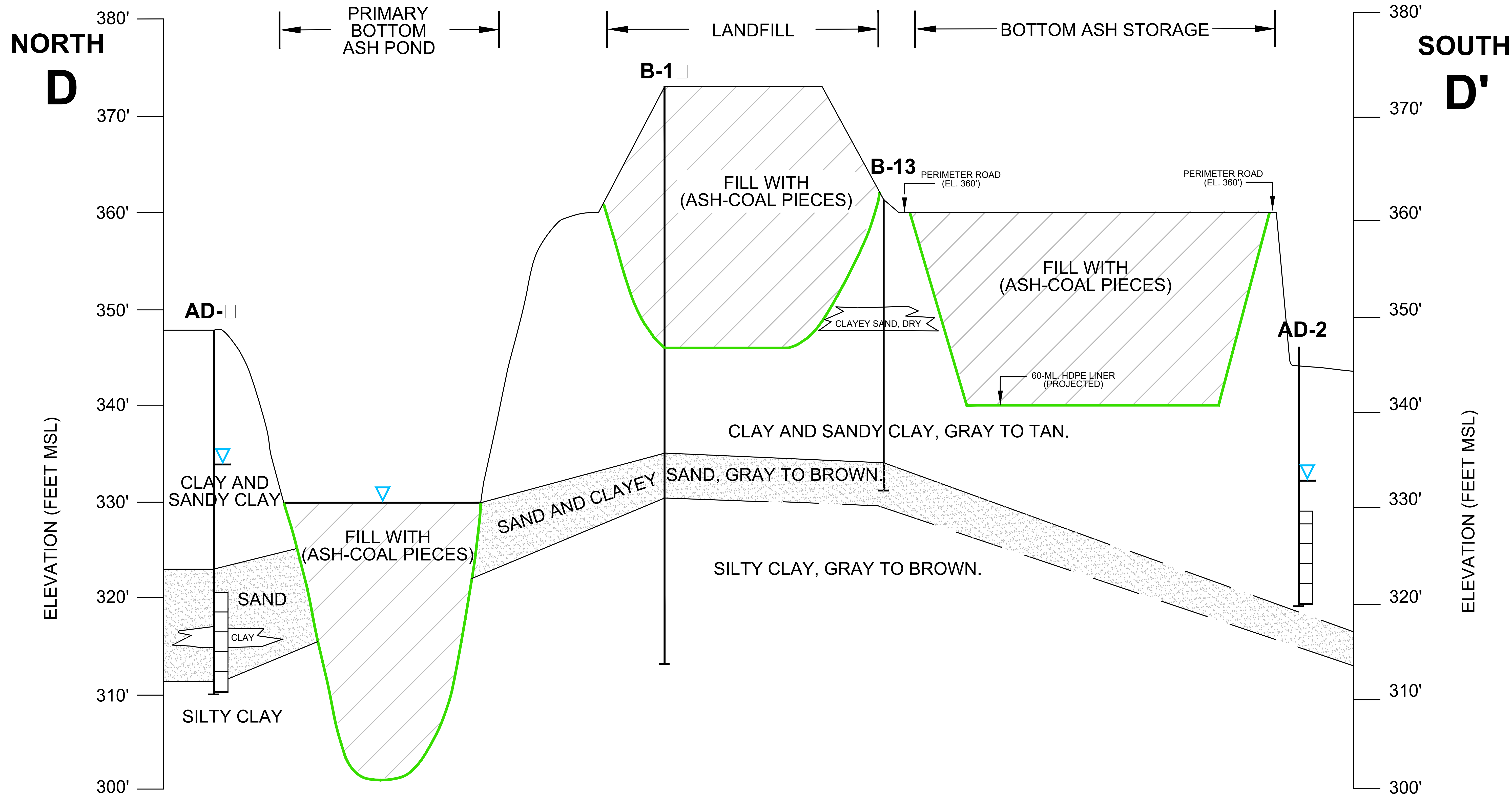
- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (10/29/18)
- PROJECTED BASE OF ASH STORAGE (SEE NOTE)

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION C - C'

ARCADIS Design & Consultancy for natural and built assets

FIGURE **2-6**



0 300'
HORIZONTAL SCALE

NOTE: BASE OF PRIMARY BOTTOM ASH POND TAKEN FROM "WELSH POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I " DRAWING ID WEPX-88, DATED 12-3-76; AND U.S. GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX QUADRANGLE, 1964 (PHOTO REVISED 1980).

LEGEND

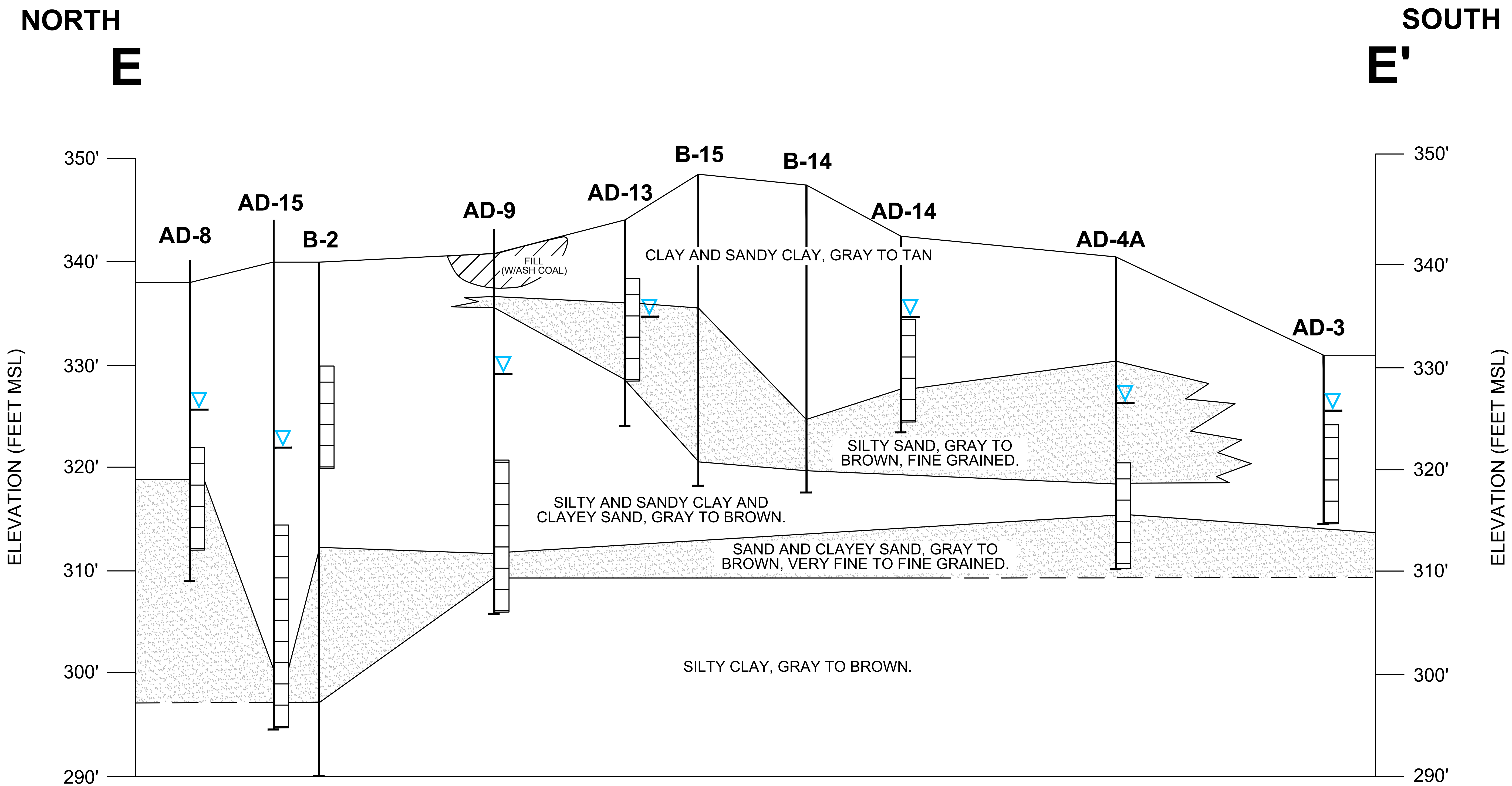
- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (5/12/15)
- BASE OF CCR UNIT

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION D - D'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-7



0 300'
HORIZONTAL SCALE

LEGEND

MONITORING WELL SCREENED INTERVAL

WATER LEVEL IN MONITORING WELL (3/4/16)

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION E - E'

ARCADIS Design & Consultancy for natural and built assets

FIGURE **2-8**

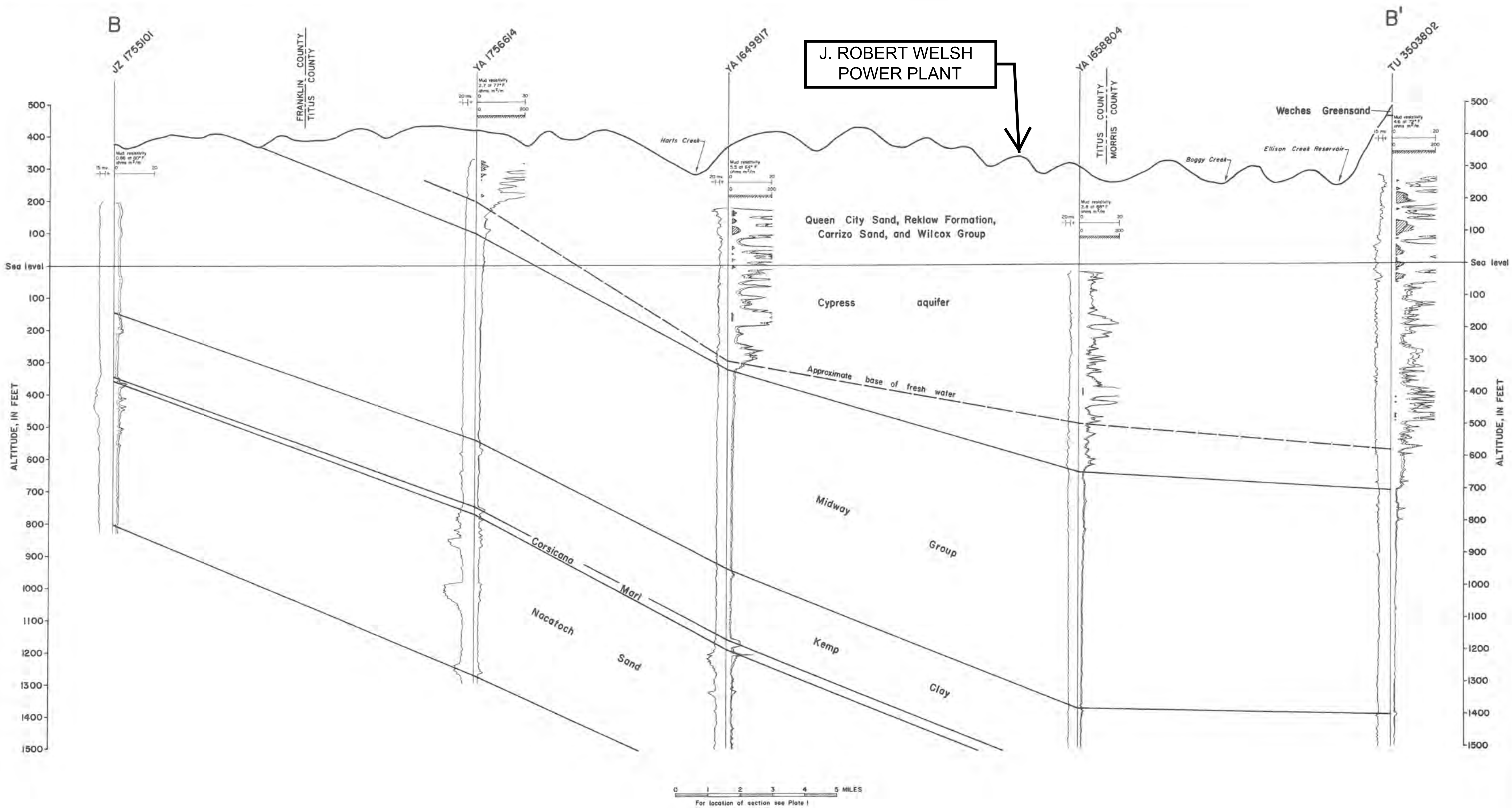


Plate 3

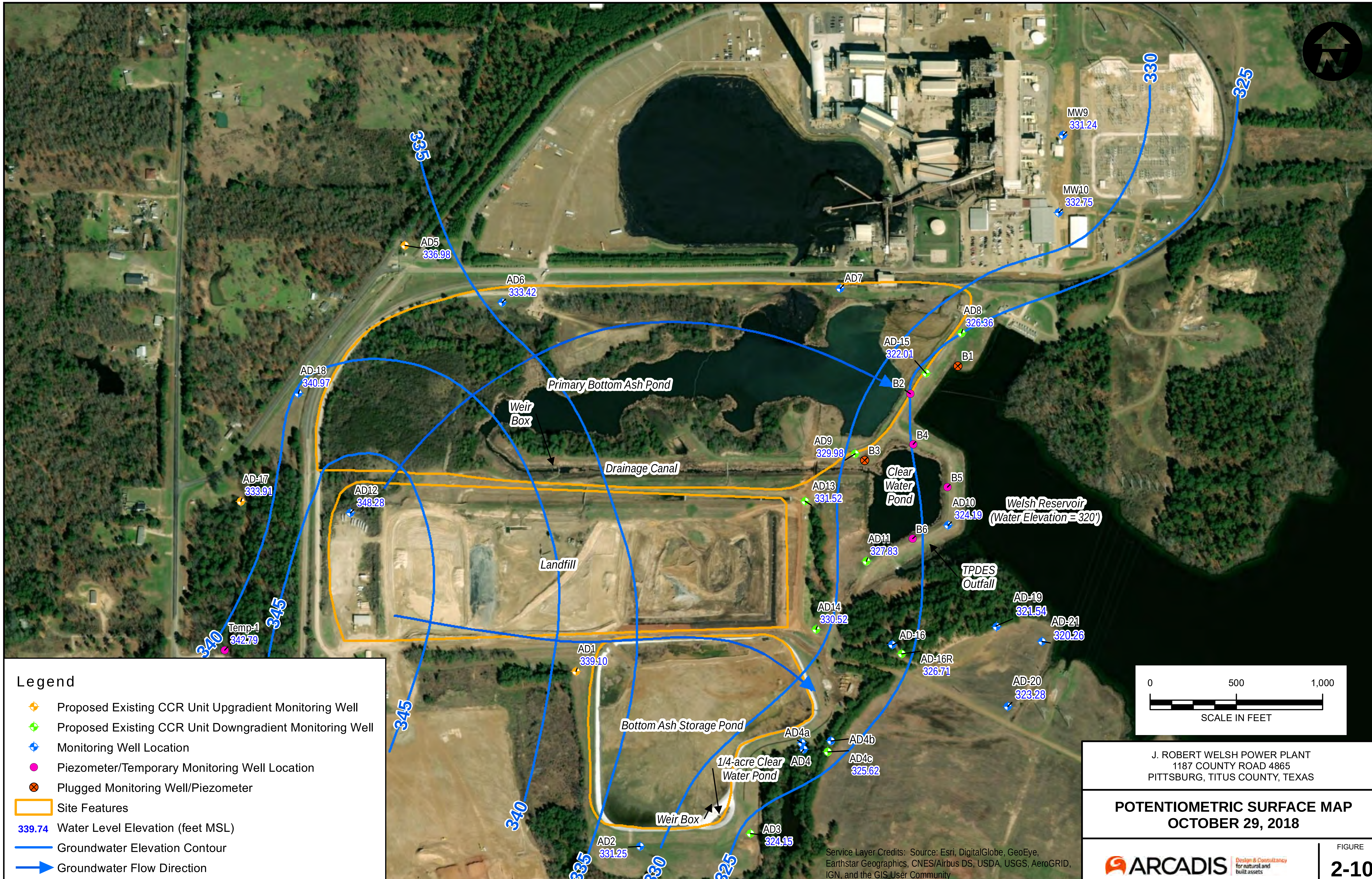
Geologic Section B – B', Franklin, Titus, and Morris Counties

U. S. Geological Survey in cooperation with the Texas Water Commission **(TWC BULLETIN 6517)**

201

REGIONAL GEOLOGIC CROSS SECTION

FIGURE 2-9



Legend

- Proposed Existing CCR Unit Upgradient Monitoring Well
- Proposed Existing CCR Unit Downgradient Monitoring Well
- Monitoring Well Location
- Piezometer/Temporary Monitoring Well Location
- Plugged Monitoring Well/Piezometer
- Site Features
- 339.74 Water Level Elevation (feet MSL)
- Groundwater Elevation Contour
- Groundwater Flow Direction

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

POTENTIOMETRIC SURFACE MAP
OCTOBER 29, 2018

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FIGURE
2-10

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Lithium_ASD_Report\Fig2-10-POT_Oct2018.mxd

Legend

- Existing CCR Unit Upgradient Monitoring Well
- Existing CCR Unit Downgradient Monitoring Well
- Monitoring Well Location
- Piezometer/Temporary Monitoring Well Location
- Plugged Monitoring Well/Piezometer
- Soil Boring (May 2018)
- G Geotechnical Soil Boring (October 2018)
- A Ash Pore Water Sample Location (May 2018)
- Site Features

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

LITHIUM CONCENTRATION IN SOIL (mg/kg)
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-1

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\May2018\Fig4-1-SoilBoring_LithiumConcentrationsSoilREV.mxd

Legend

- Existing CCR Unit Upgradient Monitoring Well
- Existing CCR Unit Downgradient Monitoring Well
- Monitoring Well Location
- Piezometer/Temporary Monitoring Well Location
- Plugged Monitoring Well/Piezometer
- Soil Boring (May 2018)
- Geotechnical Soil Boring (October 2018)
- A Ash Pore Water Sample Location (May 2018)
- Site Features

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

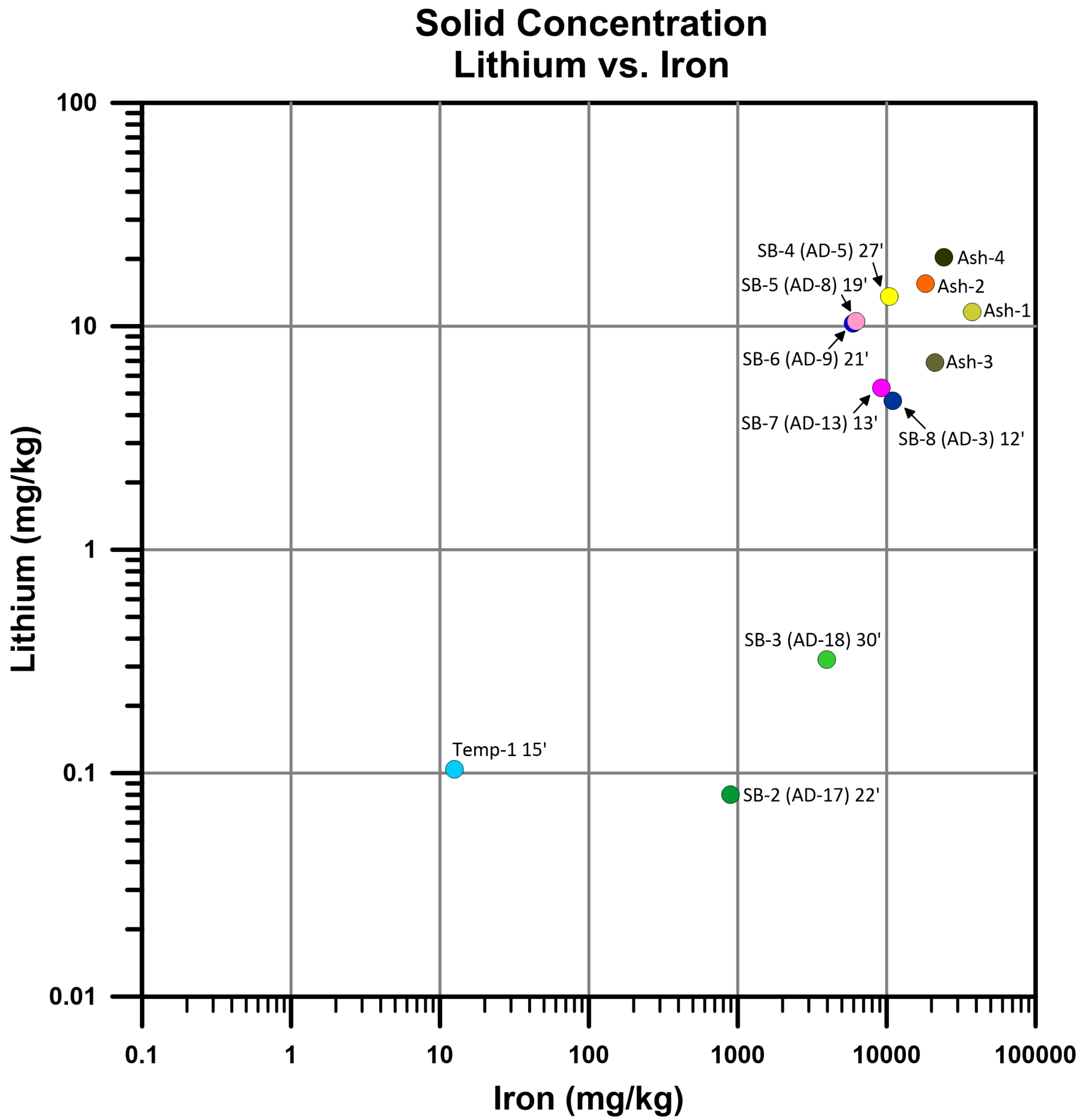
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

IRON CONCENTRATION IN SOIL (mg/kg)
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-2

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\May2018\Fig4-2-SoilBoring_IronConcentrationsSoil.mxd



Native Soil

Upgradient	Downgradient	Supplemental Sidegradient	Coal Ash
SB-2 (AD-17) 22'	SB-8 (AD-3) 12'	Temp-1 15'	Ash-1
SB-3 (AD-18) 30'	SB-5 (AD-8) 19'		Ash-2
SB-4 (AD-5) 27' Background	SB-6 (AD-9) 21'		Ash-3
	SB-7 (AD-13) 13'		Ash-4

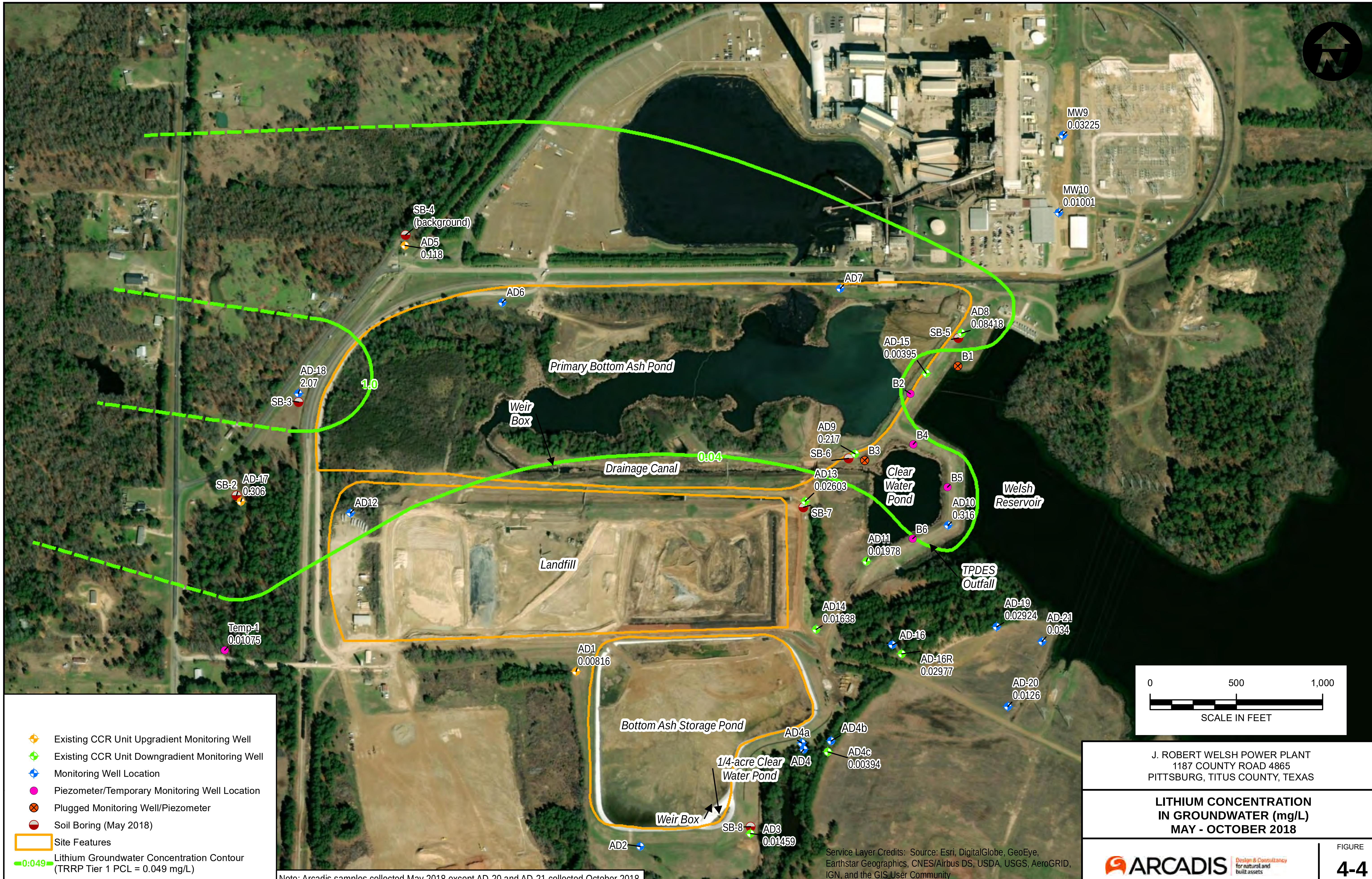
Notes:
mg/kg - milligrams per kilogram

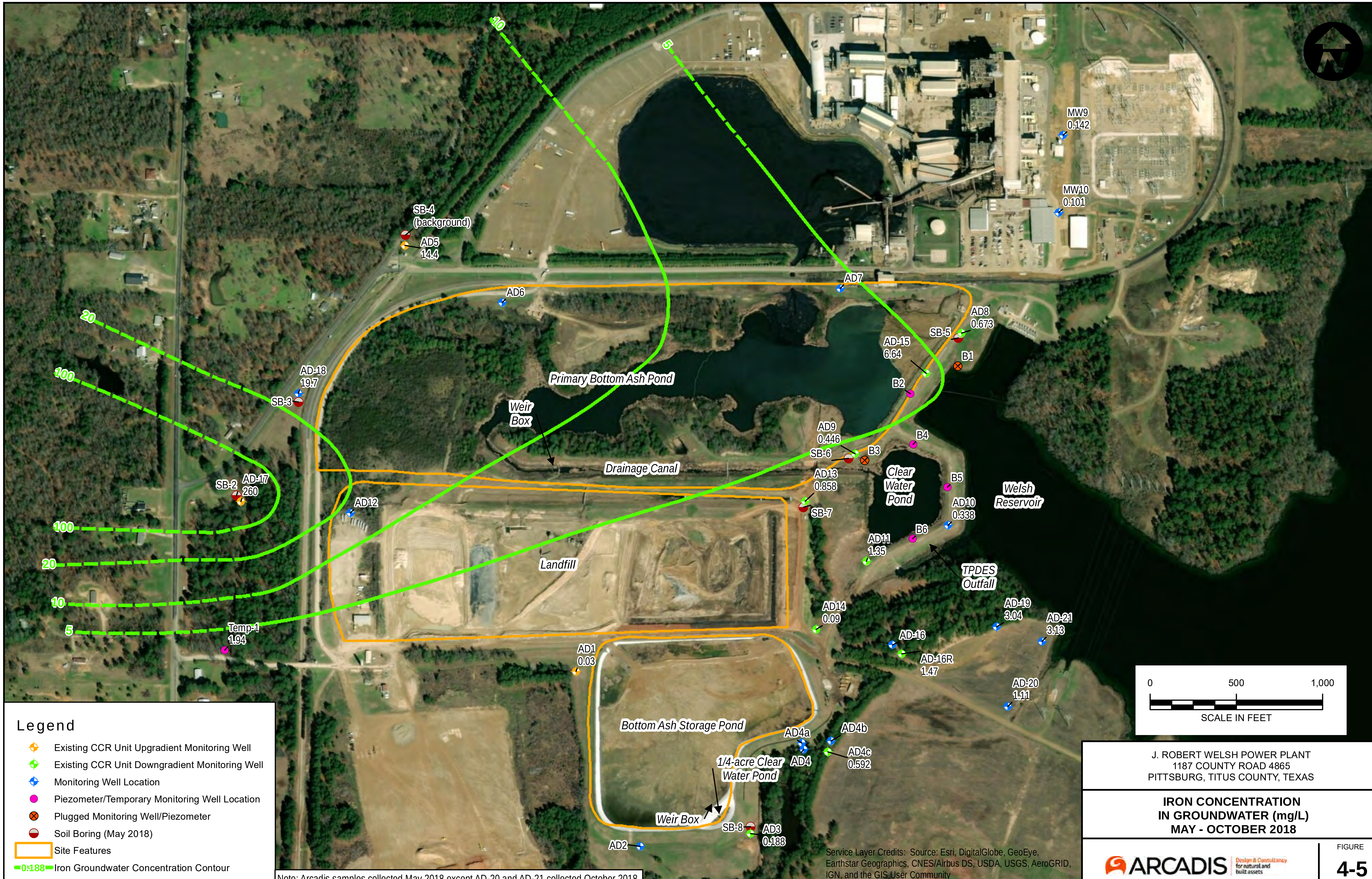
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

LITHIUM VS. IRON SOLIDS CONCENTRATION PLOT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-3


SB-4
(background)
AD5
0.118
MW9
0.03225
MW10
0.01001
AD7
AD6
AD8
0.08418
SB-5
AD-15
0.00395
B1
B2
AD-18
2.07
SB-3
1.0
Primary Bottom Ash Pond
Weir
Box
AD9
0.217
SB-6
B3
B4
0.04
Drainage Canal
AD13
0.02603
SB-7
Clear
Water
Pond
B5
AD10
0.316
Welsh
Reservoir
SB-2
AD-17
0.306
AD12
B6
AD11
0.01978
TPDES
Outfall
Landfill
AD14
0.01638
AD-19
0.02924
AD-21
0.034
AD-16
AD-16R
0.02977
Temp-1
0.01075
AD1
0.00816
AD-20
0.0126
0
500
1,000
SCALE IN FEET
Bottom Ash Storage Pond
AD4a
AD4b
AD4
AD4c
0.00394
1/4-acre Clear
Water Pond
Weir Box
SB-8
AD3
0.01459
AD2
Existing CCR Unit Upgradient Monitoring Well
Existing CCR Unit Downgradient Monitoring Well
Monitoring Well Location
Piezometer/Temporary Monitoring Well Location
Plugged Monitoring Well/Piezometer
Soil Boring (May 2018)
Site Features
0.049 Lithium Groundwater Concentration Contour
(TRRP Tier 1 PCL = 0.049 mg/L)
Note: Arcadis samples collected May 2018 except AD-20 and AD-21 collected October 2018.
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\May2018\Fig4-4-LithiumConcentrationsREV.mxd
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS
LITHIUM CONCENTRATION
IN GROUNDWATER (mg/L)
MAY - OCTOBER 2018
ARCADIS
Design & Consultancy for natural and built assets
FIGURE
4-4



Note: Arcadis samples collected May 2018 except AD-20 and AD-21 collected October 2018.

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

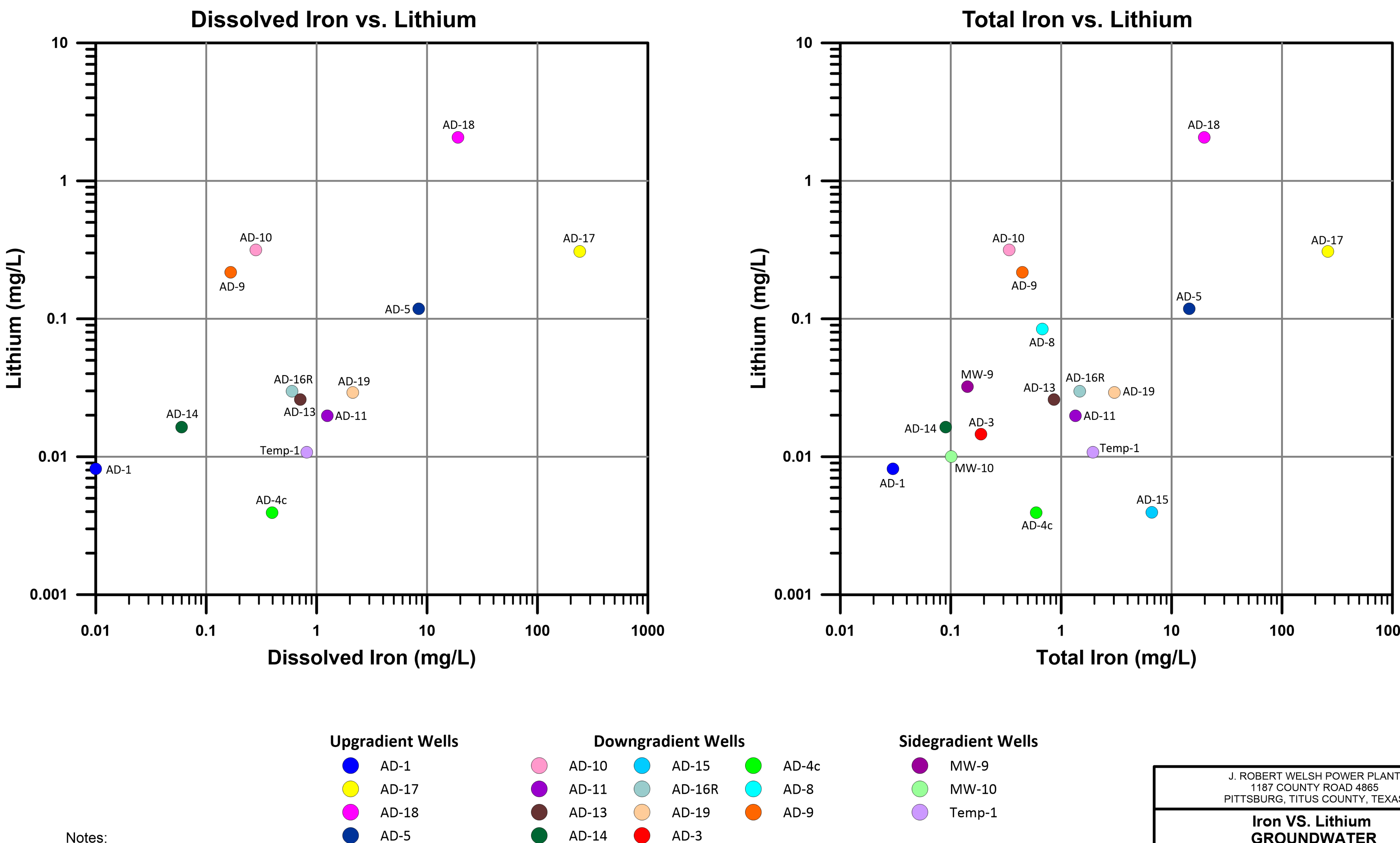
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

IRON CONCENTRATION IN GROUNDWATER (mg/L) MAY - OCTOBER 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-5

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\May2018\Fig4-5-IronConcentrationsREV.mxd



Notes:
TDS - total dissolve solids
mg/L - milligrams per liter
Concentrations of iron and lithium in coal ash were below detection
Concentrations of lithium in coal ash porewater were less than 0.02 mg/L

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

Iron VS. Lithium GROUNDWATER CONCENTRATION PLOT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-6

APPENDIX A

Springs of Texas Reference

Springs of Texas

VOLUME I

Gunnar Brune

Second edition

The paper used in this book meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials, Z39.48-1984. Binding materials have been chosen for durability.

The publisher gratefully acknowledges those whose grants helped make this edition possible:

Texas Parks and Wildlife Department
Lower Colorado River Authority
Wray Charitable Trust
Save Barton Creek Association
College of Agriculture and Life Sciences, Texas A&M University

Library of Congress Cataloging-in-Publication Data

Brune, Gunnar M., 1914–1995
Springs of Texas. Volume I/by Gunnar Brune; introduction by Helen C. Besse.—2nd ed.
p. cm. —(Texas A&M University agriculture series ; no. 5)
Includes bibliographical references and index.
ISBN 1-58544-196-1 (cloth : alk. paper)
1. Springs–Texas I. Title. II. Texas A&M University agriculture series ; no. 5.
GB1198.3T4 B78 2002
333.91'04'09764—dc21

2002017373

INTRODUCTION TO THE SECOND EDITION

Helen C. Besse

When Gunnar Brune self-published *Springs of Texas, Volume I,* in 1981, most of the state water planning agencies and local environmental communities either did not recognize the importance of his work or were not aware of its existence. Brune had spent the previous decade conducting research and field studies, and then writing this book that describes the physical characteristics of springs, the archeology and history of springs' use, the ecological setting of springs, and the local use and lore surrounding springs for 183 out of 254 Texas counties. Gunnar Brune died before he could complete volume II.

Gunnar Brune described many of the large springs across the state as well as innumerable small springs present along river and stream courses that provide the base flow for waterways across the state. Brune repeatedly stated in the 1981 edition of this book that many of the springs he described had failed or were failing. With the pronounced influx of population in the last twenty years and the increased agricultural and industrial activities around the state, one can only wonder how many of the more than 2,000 springs have gone dry since he described them through the 1970s.

Nevertheless, this book is even more important today. Its value to water planners, elected officials, policy makers, municipal, county, and state administrators, wildlife stewards, environmentalists, and water lovers has not diminished. Springs are "the canary in the coal mine." The health of our springs reflects the health of our underground water resources and is seen in the state's surface resources as well.

In the section "The Prehistoric Setting of Springs," Brune provided a quote from another book on the beliefs that early Americans had about springs. It is appropriate to repeat those words here:

> Gods and heroes were born out of springs, and ever afterward came and went between the above and below worlds through their pools. Every pueblo had sacred springs somewhere near-by. There was every reason to sanctify them – physical, as life depended upon water; spiritual, as they had natural mystery which suggested supernatural qualities; for how could it be that when water fell as rain, or as snow, and ran away, or dried up, there should be other water which came and came, secretly and sweetly, out of the ground and never failed (Horgan, 1954).

F. Halley's farm. According to Dr. John Klein, a nearby resident and writer, the Klein settlement began here in 1848. The Sellars store was at the springs. They issued from Montgomery silt with many iron concretions at about 0.72 lps on April 11, 1978. The pools, containing duckweed, pennywort, and water primrose, were home to a family of ducks and ducklings. Probably the flow formerly continued down Spring Gully past Klein cemetery, 0.6 kilometer downstream, but on this date, even after rains, the channel here was dry except for some standing water. Many wells pump nearby.

Magnolia Garden Springs (15) are four kilometers northeast of Sheldon along the San Jacinto River. At Martha Dempsey's Good Times marina several very small springs trickle from Deweyville sand, including one which flows 0.15 lps from a pipe. Near the entrance to the nearby Magnolia Gardens marina, according to Jean Manson, springs flowed until about 1923. They are quite dry now. Very small springs are said to feed Simms Lake, across the river and 0.6 kilometer farther east. This formerly popular swimming hole is now closed to the public.

At Beaumont Place northeast of Houston, near the intersection of Highways 90 and 526, is another Spring Gully. The channel is now a drainage ditch into which very small springs and seeps (14) drain from Beaumont silt and sand.

Eight kilometers west of La Porte is Willow Springs Bayou, also called Willow Springs Gully or Ditch. **Willow Springs (8)** are chiefly between North L Street and Spencer Road. On April 9, 1978, the discharge of Willow Springs Bayou at North L Street was 0.18 lps, and at Spencer Road it was 0.70 lps. Many willows still fringe the channel, along with cattails.

A third Spring Gully is located eight kilometers southwest of La Porte. Springs (9) in Beaumont silt produced a discharge of about 0.18 lps in 1978 in the gully at the Red Bluff road crossing. Cottonmouths hide here among the willows and cattails.

HARRISON COUNTY

Harrison County is endowed with numerous springs of all types, some highly mineralized and valued for their healing properties. Most appear to be flowing as strongly as ever, because there has been little demand on the groundwater reservoirs. However, water levels in the artesian sands are declining as much as 4.6 meters per year in some areas. Most of the Caddo Indian villages were located at springs. Early French and Spanish explorers, some over 400 years ago, visited many of the same springs that can be seen today.

The New Madrid earthquake of 1811 - 1812, which enlarged Caddo Lake, may have affected the flow of some springs. In general, however, the water-bearing formations were not greatly affected by the quake.

Most of the spring waters of the county issue from Eocene sands. They are usually fresh, soft, and acid, being of the sodium bicarbonate type. The iron content is often very high. Mineralized waters may also be high in aluminum and sulfate, may be slightly saline, and can be very hard. The analyses shown for 1942 in the table of Selected Chemical Analyses are probably too low in dissolved-solids content, perhaps because of high rainfall at the time the samples were collected. Most of the writer's field studies were made on January 23 - 28, 1976.

It was around **Locke Springs (1)** that the community of Marshall first appeared. In 1831 there were at least 20 springs flowing from the Reklaw sand near the intersection of Franklin and Houston Streets and up the hill toward the courthouse. In early times water was hauled from these springs in barrels to fill the cisterns on the town square. Most of the springs have now been paved over, but the remaining ones still flowed 1.4 liters per second in 1976.

Hynson Springs (10), also known as **Marshall, Noonday Camp**, and **Iron Springs**, are six kilometers north of Hallsville. They became very popular as a health resort about 1851. The waters are highly mineralized, containing much iron, sulfur, aluminum, and lithium. Originally there were said to be over 100 springs flowing from Queen City sand. Now not more than 20 can be found, possibly because the water table has fallen. During the Civil War the water from the springs was used in a leather-tanning factory. From 1891 to 1905 the large Hotel Randell accommodated thousands of visitors to the springs. Today there are an open-air auditorium and a number of cabins, but everything is in a sad state of disrepair. A historical marker is located at the springs. The discharge record, in liters per second, is as follows:

Jan. 28, 1942	0.13	
Jul 21, 1964	0.06	
Jan. 27, 1976	0.13 (main spring)	1.6 (all springs)

Rock Springs (7) are just east of the Rock Springs church on Highway 449 about 13 kilometers west of Marshall. This and several other springs upstream flowed 2.3 lps from the Queen City sand in 1976. The Frenchman Henri Joutel of La Salle's party may have stopped here for refreshment in 1687.

Mulberry Springs (9), nine kilometers south-southwest of Harleton, are 100 meters north of the

Welsh Power Plant
Primary Bottom Ash Pond
Alternate Source Demonstration

The Welsh Power Plant Primary Bottom Ash Pond initiated an assessment monitoring program in accordance with 40 CFR 257.95 on April 13, 2018. Groundwater protection standards (GWPS) were set in accordance with 257.95(d)(2) and a statistical evaluation of the assessment monitoring data was conducted. The statistical evaluation revealed an exceedance of the lithium GWPS on July 12, 2019. A successful alternate source demonstration (ASD) was completed per 257.95(g)(3), therefore, the Welsh Primary Bottom Ash Pond will remain in assessment monitoring. An ASD is documentation that shows a source other than the CCR unit was responsible for causing the statistics to exceed the GWPS. The ASD document will explain the alternate cause of the GWPS exceedance. The successful ASD is attached.

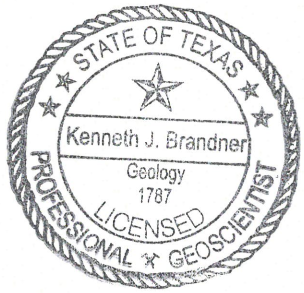
ALTERNATIVE SOURCE DEMONSTRATION - LITHIUM PRIMARY BOTTOM ASH POND

J. Robert Welsh Power Plant

1187 County Road 4865

Pittsburg, Titus County, Texas

September 24, 2019



ALTERNATIVE SOURCE DEMONSTRATION - LITHIUM PRIMARY BOTTOM ASH POND

J. Robert Welsh Power Plant
1187 County Road 4865
Pittsburg, Titus County, Texas

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ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
Arcadis	Arcadis U.S., Inc.
ASD	Alternate Source Demonstration
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
EPRI	Electric Power Research Institute
ft	feet
GWPS	groundwater protection standard
MCL	maximum contaminant limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
PBAP	Primary Bottom Ash Pond
SPLP	Synthetic Precipitation Leaching Procedure
SSI	statistically significant increase
SSL	statistically significant level
USDA	United States Department of Agriculture
USGS	United States Geologic Survey

1 INTRODUCTION

This Alternate Source Demonstration (ASD) report has been prepared on behalf of American Electric Power Service Company for lithium detected in groundwater at hydraulically downgradient monitoring well AD-9 at the Primary Bottom Ash Pond (PBAP) at the J. Robert Welsh Plant site located in Titus County, Texas. This ASD report was prepared in accordance with the Coal Combustion Residual (CCR) Rule (the Rule) specified in 40 Code of Federal Regulations (CFR) §257 and based on recommendations provided in the Electric Power Research Institute “Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites” (Electric Power Research Institute [EPRI] 2017). As part of the Rule, CCR facility owners are required to conduct detection and assessment monitoring of “Appendix III” and “Appendix IV” constituents, respectively, to ensure compliance with applicable groundwater standards (described further below). Because the monitored constituents also have natural sources and can be influenced by sampling methodology implementation, the Rule allows owners or operators to evaluate and demonstrate whether a source other than the CCR unit caused a statistically significant increase (SSI) over background levels for an Appendix III constituent or at statistically significant levels (SSLs) over groundwater protection standards for an Appendix IV constituent, such as natural variation in groundwater quality or sampling methodology error.

The owner or operator must complete the written ASD within 90 days of identifying the SSI or SSL and include the certification from a qualified professional engineer to verify the accuracy of the information in the report. This ASD report was prepared by Arcadis U.S., Inc. (Arcadis) on behalf of American Electric Power Service Company within the 90-day period and has been certified by a qualified professional engineer.

1.1 Facility History

The J. Robert Welsh Plant is located within southern Titus County, approximately eight miles northeast of Pittsburg, Texas, and approximately two miles northwest of Cason, Texas (**Figure 1-1**). The Plant began operations in 1977 with three coal-fired generating units (Units 1, 2, and 3). Throughout the life of the Plant, CCR materials (fly ash, bottom ash, economizer ash) have been generated. These byproducts were stored in the PBAP and in the adjacent Landfill that were constructed in the late 1970s. In 2000, the 22-acre Bottom Ash Storage Pond was installed south of the Landfill. The Bottom Ash Storage Pond was constructed with a 60-mil high-density polyethylene liner (**Figure 1-2**).

Presently bottom ash and economizer ash from the Plant are sluiced to the PBAP. Solids settle as the clear liquids flow through a drainage canal into the clear water pond (a non-CCR unit). Solids (bottom ash and economizer ash) in the PBAP are dredged and sluiced into the Bottom Ash Storage Pond. Marketable ash material from the PBAP is also temporarily stored in the western two thirds of the Landfill for processing, then loaded into trucks and sold for beneficial reuse (highway road base, etc.).

2 PHYSICAL SETTING

2.1 Regional Topography

The elevation at the Site ranges from approximately 300 feet (ft) above mean sea level (amsl) at Swauano Creek downstream of the Welsh Reservoir, to 360 ft amsl at a topographically high ridge at the west end of the Landfill. The PBAP is in a topographically low area that had been an un-named intermittent tributary of Swauano Creek prior to development of the Site. The Landfill is approximately 40 acres in size and is located in a topographically higher area directly south of the PBAP. The Bottom Ash Storage Pond is approximately 22 acres in size and in a topographically higher area directly south of the Landfill.

A topographically high ridge is present directly northwest of the Site where offsite monitoring wells AD-22 and AD-23 were installed along the FM 1735 right-of-way during June 2019. Ground surface elevation at these offsite monitoring wells ranges from approximately 361 ft amsl at AD-22 to 369 ft amsl at AD-23.

2.2 Geology and Soils

2.2.1 Regional and Local Geology

The Site area is located within the West Gulf Coastal Plain. Cretaceous formations crop out in belts that extend in a northeasterly direction parallel to the Gulf of Mexico, and dip gently to the southeast. The Site, including all three CCR Units (PBAP, Landfill, Bottom Ash Storage Pond), is located along the outcrop of the Eocene-age Reklaw Formation, which consists of very fine to fine grained sand and clay (Flawn 1966). The Reklaw Formation attains a thickness of approximately 110 ft in Titus County, and is underlain by the Eocene-age Carrizo Sand which consists of fine to coarse sand, silt, and clay (United States Geologic Survey [USGS] 1965). In the topographically low areas underlying the Welsh Reservoir to the east of the PBAP, Quaternary alluvial sediments associated with Swauano Creek are present (Flawn 1966).

All of the CCR monitoring wells at the Site are completed in the Reklaw Formation. The two offsite monitoring wells (AD-22, AD-23) west of the Site are completed in the overlying Queen City Formation. Monitoring well locations are shown on **Figure 2-1**.

As shown on the regional geologic map and legend (**Figure 2-2A** and **Figure 2-2B**), the Reklaw Formation outcrop (Er) at the Site is relatively narrow (less than 1 mile in width). The Reklaw Formation is overlain by the Eocene-age Queen City Formation, which outcrops in topographically higher areas west of the Site, including the area where monitoring wells AD-22 and AD-23 are located. The Queen City Formation consists of fine to medium grained sand, shale, silt, and impure lignite, and attains a thickness of approximately 210 ft in Titus County (USGS 1965). The Queen City Formation also contains ironstone concretions (Flawn 1966).

2.2.2 Regional and Local Soil Composition

Information gathered from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Services soil data provides a detailed inventory of the regional soils and their characteristics, including the widespread distribution of clay-bearing soils, that support data collected at the Site from soil borings and groundwater monitoring locations. Two main named soil layers are present in the Pittsburgh, TX, area in the vicinity of the Site:

- Norfolk sandy loam
- Susquehanna fine sandy loam

Both soils are similar in the uppermost 1.5 ft of material, generally grayish in color and containing fine sand, silt, and clay. However, the subsoils of both units have subtle differences from one another and are described herein. Observations from soil borings at the Site are consistent with the characteristics of one or both of these soil units, as described in the USDA Natural Resources Conservation Services document.

The Norfolk sandy loam is a widely distributed soil unit that is uniformly developed in the lowland areas and is derived from weathering Eocene-aged deposits. It is a generally porous soil, allowing infiltrating water to migrate downward toward the water table. The soil layer is generally yellowish-gray in color, however the subsoil at greater depths is characterized by increased clay content and a mottled red and yellow appearance. As noted in the USDA soil descriptions, the soil and subsoils of the Norfolk sandy loam may be broken down into the grain size distributions presented in **Table 2-1**.

The Susquehanna fine sandy loam is also widely distributed and generally resembles the Norfolk sandy loam at the surface. Subsoils of the Susquehanna contain a greater component of clay, and likely contain increased iron content, as evidenced by observed iron concretions and iron crust formation within the subsoil. This soil is often mottled in appearance, ranging from red and yellow to a reddish brown or gray. Despite the greater clay content, the soil and subsoil is not impervious to infiltrating water that migrates toward the water table. As noted in the USDA soil descriptions, the soil and subsoils of the Susquehanna fine sandy loam may be broken down into the grain size distributions presented in **Table 2-2**.

These soil descriptions are important for the understanding of contributing sources of key constituents, such as lithium to the groundwater system. Lithium can occur in soils through natural weathering processes and the development of clay minerals. In particular, lithium can be incorporated into the structure of clays in the smectite group through cation substitution, which is further influenced by the presence of iron within the clay structure (Drever 2002; Stucki 2005). The widespread distribution of clay deposits in the native soils in and near the Site and the propensity for clays to contain trace constituents of potential concern supports the potential for natural sources of lithium.

Geologic cross-sections were generated to evaluate the stratigraphy in the area of the PBAP. The lines of geologic cross-section are shown on **Figure 2-3** and the cross-section details for cross-sections A-A' through E-E' are shown on **Figures 2-4** through **2-8**, respectively. As shown on **Figure 2-4**, an unsaturated brown to gray clay and sandy clay stratum is present in the area of the PBAP from the surface to a depth of approximately 20 ft below ground surface. The clay stratum is underlain by a saturated fine to medium grained clayey and silty sand stratum with an average thickness of approximately 10 ft and is consistent with the soils of the Susquehanna fine sandy loam deposits. As discussed below in Section 2.3.2, this saturated sand stratum is the uppermost water-bearing unit in the area of the PBAP. This sand stratum is underlain by an unsaturated gray to black silty clay stratum that locally serves as a lower confining layer (aquitard) for the uppermost water-bearing unit.

As shown on **Figures 2-2A** and **2-4**, the Queen City Formation outcrops in the topographically high area to the northwest of the Site. The geologic contact between the Queen City Formation, in which offsite monitoring wells AD-22 and AD-23 are completed, and the Reklaw Formation, in which the CCR monitoring wells are completed, is located near an elevation of 340 ft amsl as shown on **Figure 2-4**. The Queen City Formation directly west of the Site consists predominantly of clayey sand, and the underlying Reklaw Formation consists of interbedded sand, silt, and clay strata.

2.3 Hydrology

2.3.1 Regional Hydrology

The Reklaw Formation, which outcrops at the Site, and the overlying Queen City Formation, which outcrops west of the Site, are part of the Cypress Aquifer, which also includes the underlying Carrizo Sand and Wilcox Formation (USGS 1965). As shown on **Figure 2-9,** the Cypress Aquifer is approximately 900 ft thick in the Site area, and the base of fresh water in the Cypress Aquifer is approximately 800 ft below ground surface.

Regional groundwater characteristics are presented in Texas Water Commission Bulletin 6517 "*Ground-Water Resources of Camp, Franklin, Morris, and Titus Counties, Texas, Texas*" (USGS 1965). All of the regional aquifer units are combined in this document, and considered as one interconnected unit, referred to as the "Cypress aquifer". This singular aquifer unit, composed of all water bearing units of similar character, was divided into three zones based on water quality characteristics of each zone rather than lithology. The following three zones were identified, in order of increasing relative depth:

- Zone A: characterized by minimal iron content and low pH, ranging from 4.5 to 6.5.
- Zone B: characterized by increased dissolved iron content and pH ranging from 5.0 to 7.0
- Zone C: characterized by iron concentrations of less than 0.3 milligrams per liter (mg/L) and neutral to alkaline pH (7.0 to 8.0)

Groundwater at the Site is generally assumed to be influenced by groundwater from Zones A and B. As described in USGS, 1965, Zones A and B can be more simply described as:

- Zone A: zone of oxidation and acidic groundwater
- Zone B: intermediate zone

The dissolved iron content in the A and B zones (ranging from non-detect to greater than 10 mg/L; USGS 1965) is likely influenced by iron present in the soils and sediments, which are described in Section 2.2. Slow recharge rates and transmissive properties of these zones contributes to longer residence times whereby the infiltrating groundwater may react with soil and sediments, allowing for the oxidation of sulfides to generate sulfate and mobilizing ferrous iron into solution. In addition, groundwater from several wells completed in shallow (less than 60 ft in depth) sediments contained sulfate concentrations above

1,000 mg/L. Sulfate concentrations observed at the Site are consistent with the range of data for other similar depth wells in the four-county area (USGS 1965).

Additional regional groundwater information is provided in the 107th Annual Meeting of the Texas Academy of Science abstract titled “Natural Sources of Poor Water Quality in Streams of East Texas” (Ledger et. al. 2004). This study characterized surface water streams associated with the regional groundwater in the Eocene-aged Reklaw Formation as acidic with high concentrations of sulfate, and arsenic concentrations greater than 0.01 mg/L.

An observed decline in surface water quality was also noted if springs from the Reklaw Formation discharge to surface water bodies. Abundant sulfur is noted in the Reklaw formation and sediments undergo acid-sulfate weathering, as evidenced in the red-stained soils and sulfate concentrations of greater than 1,000 mg/L (Ledger et. al. 2004). In streams associated with the Reklaw Formation, sulfate levels may exceed 1,000 mg/L.

2.3.2 Local Hydrology

Groundwater flow direction at the Site is generally from west to east, following surface topography towards the Welsh Reservoir. Groundwater elevations and well construction information from monitoring wells completed in the uppermost water-bearing unit at the Site are summarized on **Table 2-3**. Depth to groundwater in the monitoring wells in the area of the PBAP ranges from approximately 10 to 15 ft below ground surface.

Figure 2-10 is a potentiometric surface map for the uppermost water-bearing unit at the Site based on June 19, 2019 water level data. As shown on **Figure 2-10**, shallow groundwater flow direction in the area of the CCR Units is in a general easterly direction toward the Welsh Reservoir at an average hydraulic gradient of approximately 0.01 foot per foot. Shallow groundwater flow direction in the area of monitoring wells AD-22 and AD-23, which are completed in the Queen City Formation, is southeasterly toward the CCR monitoring wells, which are completed in the Reklaw Formation. The groundwater flow direction and downward vertical flow indicates shallow groundwater in the Queen City Formation likely is hydraulically connected to the underlying Reklaw Formation. This is consistent with Texas Water Commission Bulletin 6517 description of the Cypress Aquifer: “The Wilcox Group and the Carrizo Sand, Reklaw Formation, and Queen City Sand of the Claiborne Group have similar hydrologic properties and are the principal source of freshwater in the four-county area. The units probably are interconnected hydraulically and they function as single aquifer” (USGS 1965). **Figure 2-11** is a regional hydrologic cross section of the site area.

The hydraulic conductivity of the uppermost water-bearing unit at the Site was determined by conducting aquifer tests. A constant-rate pumping test was conducted at monitoring well AD-6 on September 21, 2017. Based on the AD-6 pumping test data, the hydraulic conductivity for the uppermost water-bearing unit was calculated at 0.05 ft per day (1.83 x 10^{-5} centimeters per second).

To provide a broader understanding of the hydraulic conductivity distribution across the Site, bail down slug tests were performed in October 2018 on a total of 5 wells; 1 up gradient well (AD-17) and 4 down gradient wells (AD-6, AD-9, AD-13 and AD-19) on October 30 and 31, 2018. These wells are all screened in the uppermost water-bearing unit and were chosen based on their distribution across the Site. The hydraulic conductivity estimates from the five monitoring wells tested ranged from 0.15 ft per day (AD-6) to 2.0 ft per day (AD-13). The overall mean hydraulic conductivity estimate was 0.84 ft per day, while the overall geometric mean was 0.60 ft per day.

2.4 Surface Water

The Site is located directly west of Swauano Creek, which was dammed near the southern end of the Site during plant development to form the Welsh Reservoir. The PBAP normal operating water level is near the weir box which has a bottom elevation of 325 ft amsl. The surface water elevation of the Welsh Reservoir, located east of the PBAP, is maintained at approximately 320 ft amsl. The Welsh Reservoir is likely a gaining surface water feature, and groundwater elevations at the Site are higher than the normal stage elevation of the Welsh Reservoir (approximately 320 ft amsl) as shown on **Figure 2-10**.

There are no current or historic gauging stations on Swauano Creek; however, there was a historic gauging station on adjacent Boggy Creek, which has a drainage basin area of 72 square miles versus 21.2 square miles for Swauano Creek. The average annual flow of the Boggy Creek gauging station during the driest year on record (1956) was 10.65 cubic feet per second, which corresponds to a flow of approximately 3 cubic feet per second for Swauano Creek.

3 DETECTION AND ASSESSMENT MONITORING STATISTICAL EVALUATION

3.1 General

The groundwater monitoring network for the uppermost water-bearing unit at the PBAP consists of three upgradient monitoring wells (AD-1, AD-5, AD-17) and three downgradient monitoring wells (AD-8, AD-9, AD-15). Additional details regarding the groundwater monitoring network are provided in the August 22, 2017 report entitled "*Primary Bottom Ash Pond – CCR Groundwater Monitoring Well Network Evaluation*" (Arcadis 2017).

3.2 Detection Monitoring Results

Detection monitoring at the Site involves collection of groundwater samples from the groundwater monitoring network upgradient and downgradient monitoring wells for analyses of Appendix III CCR constituents, which includes boron, calcium, chloride, fluoride, sulfate, pH, and total dissolved solids. Following the baseline monitoring program, which included a minimum collection of eight independent samples from each of the background and downgradient wells that are part of the certified monitoring network, the first round of Detection Monitoring was conducted. Based on detection monitoring conducted at the PBAP in 2017, 2018, and 2019, an SSI over the background concentration was calculated for boron in AD-8 (Geosyntec 2019b). Because of the SSIs noted for boron in groundwater samples from AD-8, an Alternate Source Demonstration was completed which did not identify an alternate source for the boron SSI (Geosyntec 2018).

3.3 Assessment Monitoring Results

Groundwater protection standards (GWPSs) were established for the Appendix IV parameters in accordance with 40 CFR Part 257.95(h). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or regional screening level for each Appendix IV parameter.

Confidence intervals were calculated for Appendix IV parameters at the compliance wells (AD-8, AD-9, AD-15) to assess whether Appendix IV parameters were present at an SSL above the GWPS. An SSL was identified for lithium in January 2019, which exceeded the GWPS of 0.390 mg/L at monitoring well AD-9 (0.935 mg/L), despite no observed SSIs in Appendix III parameters for this well (Geosyntec 2019a). An additional statistical analysis was completed from an assessment monitoring event in February and verification sampling April 2019 at downgradient wells AD-8 and AD-9 for Appendix III parameters. An update to the statistical analysis was completed in July to re-establish the GWPSs for Appendix IV parameters. The results similarly identified an SSL for lithium updated for AD-9 at 0.957 ug/L (Geosyntec 2019b). Additional details regarding the statistical evaluations of the groundwater monitoring data is provided in the January 8, 2019 and July 11, 2019 reports both entitled "*Statistical Analysis Summary, Primary Bottom Ash Pond*" (Geosyntec 2019a, 2019b).

Because the native soils have the potential to be a natural source of lithium in the regional and local groundwater and soil composition, an ASD report was prepared in February 2019 to provide additional information on the sources and distribution of lithium in groundwater at the Site from the data that was available (Arcadis 2019). The conclusions from the February 2019 ASD indicated several lines of evidence demonstrating that the lithium concentration in groundwater at AD-9 is from naturally occurring sources (ASD Type V), with some additional contributions from sampling methodology error (ASD Type I). This ASD report updates the previous report based on the recently collected Site-specific soil and groundwater data, including soil and groundwater analytical data collected outlined in Section 4.

4 SOIL AND GROUNDWATER ANALYTICAL DATA EVALUATION

4.1 General

In addition to the detection and assessment monitoring groundwater sampling events conducted at the PBAP in 2017, 2018, and February 2019 for statistical evaluation, a comprehensive site-wide groundwater sampling event was conducted by Arcadis during May 2018, and an offsite soil and groundwater sampling event was conducted by Arcadis during June 2019 to evaluate alternate potential sources of lithium detected in downgradient monitoring well AD-9. The May 2018 evaluation included the following tasks:

- Collection of groundwater samples from the PBAP upgradient monitoring wells (AD-1, AD-5, AD-17), the PBAP downgradient monitoring wells (AD-8, AD-9, AD-15), and other monitoring wells in the area completed in the uppermost water-bearing unit, including upgradient monitoring well AD-18; sidegradient monitoring wells MW-9, MW-10, and Temp-1; and downgradient monitoring wells AD-3, AD-4c, AD-10, AD-11, AD-13, AD-14, AD-16R, and AD-19.
- Collection of soil samples from eight soil borings (Temp-1, SB-2 through SB-8) around the perimeter of the CCR units at the site.
- Collection of three CCR material samples from the PBAP (Sample IDs: Ash-1, Ash-2, Ash-3) and one CCR material sample from the HDPE-lined Bottom Ash Storage Pond (Sample ID: Ash-4) for analysis of total metals, pore water concentrations, and leachate water using the Synthetic Precipitation Leaching Procedure (SPLP) (**Table 4-1**).

The June 2019 evaluation included the following tasks:

- Installation of two offsite monitoring wells (AD-22, AD-23) in the Queen City Formation northwest (hydraulically upgradient) of the Site. Monitoring well completion diagrams are provided in **Appendix A**.
- Collection of soil and groundwater samples from the Queen City Formation monitoring wells for Appendix III and Appendix IV parameter analyses.

Additionally, two sentinel downgradient monitoring wells (AD-20, AD-21) were installed in the uppermost water-bearing unit (Reklaw Formation) near the shoreline of the Welsh Reservoir east (hydraulically downgradient) of the CCR units during October 2018.

4.2 Soil and Groundwater Analytical Data Evaluation

4.2.1 Soil Evaluation

The soil evaluation results demonstrate a correlation between lithium and iron in soil. Boring logs from Site area monitoring locations highlight similarities with observations provided in the county-wide soil survey reports. For example, boring locations SB-04 (adjacent to AD-5), SB-05 (adjacent to AD-8), AD-22, and AD-23 contain a greater content of the reddish-brown clay subsoils as noted in the Susquehanna fine sandy loam, which directly overlie the water table in these locations. The reddish brown color generally denotes the presence of iron in these locations, which can be either incorporated directly into the clay mineral structure (e.g. smectite), or as a secondary mineral (e.g. iron hydroxide) that is also present in the aquifer matrix (Stucki 2005). The role of iron incorporated into the clay structure is important to localized geochemical processes, such as cation exchange, redox conditions, and hydrophilic properties, which can influence weathering characteristics and the mobility of trace constituents (i.e. lithium) in groundwater (Stucki 2005). Specifically, in the event that geochemical conditions are or become conducive to iron dissolution (e.g., if conditions become microbially/geochemically reducing), then the mobilization of iron associated with soil can result in the co-mobilization of trace constituents.

As shown on **Table 4-1** and **Figure 4-1**, the highest concentrations of lithium in soil were detected from 3 to 5 feet below ground surface in hydraulically upgradient and offsite Queen City Formation monitoring well AD-22 (up to 18 milligrams per kilogram [mg/kg]), and onsite Reklaw Formation soil boring SB-4 (13.6 mg/kg) located adjacent to monitoring well AD-5 which is hydraulically upgradient (northwest) of the PBAP. This upgradient (background) data indicates lithium concentrations in soil in the area of the PBAP are naturally occurring and not the result of impacts from CCR materials. This is one line of evidence that the lithium detected in groundwater at monitoring well AD-9 is from a naturally occurring source, and not the CCR unit. As shown on **Table 4-1** and **Figure 4-2**, the highest iron concentrations in soil are from soil borings AD-22 and AD-23 (17,600 to 85,500 mg/kg) which are located in the Queen City Formation upgradient of the Site; SB-4 (AD-5; 10,400 mg/kg), located in the Reklaw Formation upgradient (northwest) of the PBAP; and soil boring SB-8 (AD-3; 11,000 mg/kg), located in the Reklaw Formation over 1,000 ft south (side gradient) of the PBAP. **Figure 4-3** shows an apparent correlation between the iron and lithium content in the coal ash, upgradient locations, and downgradient locations. However, SPLP and pore water results from the coal ash samples show that the iron and lithium present in the coal ash is not in a mobile (leachable) form. Therefore, it is more likely that the regional groundwater interaction with naturally occurring lithium and iron in soil is responsible for the observed lithium concentrations and variability across the Site. As detailed below in Section 4.2.2, iron and lithium concentrations in groundwater at the Site show a similar distribution to iron and lithium concentrations in soil, indicating naturally occurring sources for iron and lithium.

4.2.2 Groundwater Evaluation

Groundwater analytical results for the PBAP, the landfill, and the bottom ash storage pond are summarized on **Tables 4-2**, **4-3**, and **4-4**, respectively. As shown on **Figure 4-4**, the highest lithium concentration in the most recent (2019) groundwater samples is at monitoring well AD-18 (1.27 mg/L), which is west (upgradient) relative to the PBAP. This data indicates lithium concentrations in groundwater in the area of the PBAP are from a source other than the PBAP.

As shown on **Figure 4-5**, iron concentrations in groundwater are also elevated upgradient (west) relative to the PBAP. **Figure 4-6** shows the relationship of total and dissolved iron concentrations to lithium concentrations in upgradient, side-gradient, and downgradient monitoring wells. These results demonstrate a clear correlation between aqueous iron and lithium, with higher lithium concentrations associated with elevated iron. The greatest concentrations of both iron and lithium are observed in the upgradient monitoring wells AD-17 and AD-18. As identified in **Table 4-1** and noted on **Figure 4-6**, SPLP leachate and pore water analyzed from coal ash samples contain lithium in concentrations below detection, or at very low concentrations less than 0.02 mg/L. This data indicates lithium concentrations in groundwater in the area of the PBAP are from a source other than the PBAP. As discussed above in Section 2.2.1, the Queen City Formation, which overlies the Reklaw Formation, is located directly west of the Site. Therefore, groundwater from the Queen City Formation west (upgradient) of the CCR units may be the source of lithium and iron detected in soils and groundwater in the area of the CCR units. As discussed above in Section 2.3.1, elevated naturally occurring iron is documented in the Cypress Aquifer, and as discussed above in Section 2.2.1, the Queen City Formation contains naturally-occurring iron concretions and correspondingly high iron concentrations in soil samples.

Another line of evidence the lithium detected in groundwater in the area of the PBAP is from a naturally occurring source is provided in the 2002 Publication “Springs of Texas” (Gunnar Brune 1981). The Springs of Texas publication states “*Hynson Springs, also known as Marshall, Noonday Camp, and Iron Springs, are six kilometers north of Hallsville. They became very popular as a health resort about 1851. The waters are highly mineralized, containing much iron, sulfur, aluminum, and lithium. Originally there were said to be over 100 springs flowing from the Queen City Formation*.” This spring, which contains naturally-occurring lithium, is located approximately 35 miles southeast of the Site. A copy of this reference is provided in **Appendix B**.

When reviewing historical and recent datasets, a broad relationship was noted between trace metal chemistry and turbidity. Where turbidity values were greatest, greater concentrations of selected CCR monitored constituents were also observed (e.g. arsenic and cadmium) and in some cases, in exceedance of Federal MCLs. As a result, low-flow sampling methodology was employed to reduce the amount of turbidity in the groundwater sample.

A comprehensive groundwater sampling event was conducted at the Site by Arcadis during May 2018 using low-flow methodology. A clean stainless steel low-flow sampling pump with new, well-dedicated polyethylene piping was slowly lowered into the mid-point of the water column at each monitoring well, and groundwater was then pumped at a low flow rate of less than 0.1 liters per minute until the produced water was visually clear. The turbidity of the produced water was measured using calibrated field instruments during well development, and groundwater samples were not collected until the turbidity measurements declined and stabilized. Once low-flow groundwater sampling techniques were properly followed by Arcadis during May 2018, water quality results indicated concentrations of selected constituents to be much less than previously reported and did not exceed criteria. Therefore, it was determined that the sediment disturbances generated during well purging and improper (turbid) groundwater sampling were causing most of the Federal MCL groundwater exceedances. Specifically, since CCR Rule monitoring requires analysis of unfiltered samples, the results suggest that the exceedances were associated with constituents present in undissolved suspended solid particulates rather than in a dissolved form, on a location by location basis. The May 2018 groundwater analytical results are most representative of groundwater quality at the Site because proper low-flow sampling protocols were adhered to and sediment contributions to the analytical results were minimized.

The most recently collected groundwater samples from PBAP downgradient monitoring well AD-9 support improper (turbid) groundwater sampling as a contributor to the lithium Federal MCL exceedance in February 2019. The lithium concentration in the May 2019 groundwater sample from monitoring well AD-9 (0.225 mg/L) is over 4 times lower than the lithium concentration in the February 2019 groundwater sample (1.12 mg/L), and correspondingly the field-measured turbidity in the May 2019 groundwater sample (27.2 nephelometric turbidity units) is over 4 times lower than the field-measured turbidity in the February 2019 groundwater sample (115 nephelometric turbidity units).

5 SUMMARY AND CONCLUSIONS

This ASD has been prepared in consultation with the Electric Power Research Institute “Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites”. The following lines of evidence indicate the SSL related to the lithium concentration in groundwater at AD-9 is from naturally occurring sources (ASD Type V), with some additional contributions from sampling methodology error (ASD Type I):

- An SSI was confirmed for boron within monitoring well AD-8 followed by a failed Alternate Source Demonstration for boron, triggering the assessment monitoring program for the PBAP. Under the assessment monitoring program, an SSL was identified for lithium which exceeded the GWPS of 0.390 mg/L at monitoring well AD-9 (0.957 mg/L), despite no observed SSIs in Appendix III parameters for this well. SSIs would be expected for Appendix III parameters if there was a CCR unit source for the lithium exceedance of the SSL, indicating that there may be an alternate source of lithium.
- As demonstrated in this ASD report, iron and lithium are associated in the sediments and in groundwater. The subsoils at the Site, particularly the Susquehanna fine sandy loam, contain naturally occurring high clay content. The role of iron incorporated into the clay structure is important to localized geochemical processes, such as cation exchange, redox conditions, and hydrophilic properties, which can influence weathering characteristics and the mobility of trace constituents (i.e. lithium) in groundwater (Stucki, 2005). This is a supporting line of evidence.
- The highest lithium concentrations in the soil samples collected during the Arcadis May 2018 and June 2019 investigations was from background soil samples (AD-22, 3-5 ft depth; SB-4, 27 ft depth) located upgradient (northwest) of the PBAP. This is a key line of evidence that the PBAP is not the source of elevated lithium concentrations in soil at the Site.
- Leachate and pore water analyzed from coal ash samples contain lithium in concentrations below detection, or at very low concentrations less than 0.02 mg/L. This data indicates lithium concentrations in groundwater in the area of the PBAP are from a source other than the PBAP. This is a key line of evidence.
- The highest lithium concentration in groundwater samples collected during the Arcadis May 2018 investigation was from an upgradient (background) monitoring well (AD-18) located west of the PBAP. This is a key line of evidence that the PBAP is not the source of elevated lithium concentrations in groundwater at the Site.
- Iron and lithium concentrations in soil and groundwater at the Site show a similar distribution, indicating there is likely a common source for these metals. The 1965 USGS publication “*Ground-Water Resources of Camp, Franklin, Morris and Titus Counties, Texas”* documents naturally occurring high iron concentrations within zones of the Cypress Aquifer, in which the monitoring wells at the Site are completed. The University of Texas at Austin Bureau of Economic Geology 1966 publication “*Geologic Atlas of Texas, Texarkana Sheet*” documents naturally occurring iron concretions in the Queen City Formation, which outcrops directly west (upgradient) of the PBAP. This is a supporting line of evidence.

- The 1981 Gunnar Brune publication "*Springs of Texas"* documents naturally occurring elevated lithium in groundwater in the Queen City Formation at Hynson Springs, which is approximately 35 miles from the Site. The publication states "*Hynson Springs, also known as Marshall, Noonday Camp, and Iron Springs, are six kilometers north of Hallsville. They became very popular as a health resort about 1851. The waters are highly mineralized, containing much iron, sulfur, aluminum, and lithium. Originally there were said to be over 100 springs flowing from Queen City sand".* This publication, along with soil and groundwater analytical data at the Site, supports the conclusion that the primary source of lithium in groundwater at the PBAP is from the Queen City Formation, which outcrops directly west (upgradient) of the PBAP. This is a key line of evidence.
- The water quality sample exhibiting elevated lithium at AD-9 in February 2019 also showed elevated turbidity. Upon resampling in May 2019, both the lithium concentration and turbidity decreased, indicating that the elevated lithium observed in February 2019 was likely associated with suspended particulates and not entirely in a dissolved form. Effective well development and proper low flow sampling techniques minimize the potential for groundwater analyses to be unrepresentative of formation groundwater. This is a supporting line of evidence.
- This ASD report provides a strong demonstration of naturally occurring sources of lithium in groundwater (ASD Type V) as supported by five key lines of evidence and three supporting lines of evidence.

6 PROFESSIONAL ENGINEER'S CERTIFICATION

I, Kenneth J. Brandner, certify that this report was prepared under my direction and supervision, and that the information contained herein is true and accurate to the best of my knowledge. Based on my experience and knowledge of the site, the alternate source demonstration for lithium at the Primary Bottom Ash Pond meets the requirements of 40 CFR Part 257.95.

STATE OF TEXAS
KENNETH J. BRANDNER
69586
REGISTERED
PROFESSIONAL ENGINEER

Kenneth J. Brandner

Printed Name of Registered Professional Engineer

Kenneth J Brandner

Signature

69586	Texas	9-24-19
Registration No.	Registration State	Date

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TABLES

Table 2-1
Grain Size Distribution in Soil and Subsoil of the Norfolk Sandy Loam
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Grain Size	Soil	Subsoil
Fine Gravel	0.0%	0.0%
Coarse Sand	0.2%	0.1%
Medium Sand	0.4%	0.3%
Fine Sand	29.4%	29.9%
Very Fine Sand	37.9%	24.0%
Silt	25.9%	25.1%
Clay	5.9%	20.2%

Table 2-2
Grain Size Distribution in Soil and Subsoil of the Susquehanna Fine Sandy Loam
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Grain Size	Soil	Subsoil
Fine Gravel	0.4%	0.0%
Coarse Sand	0.7%	0.2%
Medium Sand	0.9%	0.8%
Fine Sand	53.4%	36.6%
Very Fine Sand	16.0%	10.8%
Silt	21.2%	19.0%
Clay	7.2%	32.8%

Table 2-3
Well Construction and Water Level Data - CCR Units
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Well ID	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Borehole Depth ft. bls	Date Installed	Screen Material	Well Diameter inches	Top of Screen Depth ft. bls	Top of Screen Elevation ft. msl	Bottom of Screen Depth ft. bls	Bottom of Screen Elevation ft. msl	6/7/2011 GW Elev. ft. msl	12/6/2011 GW Elev. ft. msl	5/2/2012 GW Elev. ft. msl	11/1/2012 GW Elev. ft. msl
Monitoring Wells																
AD-1 (c)	33° 02' 48"	94° 50' 47"	355.57	357.57	25.0	1/11/01	Sch. 40 PVC	2	15.0	340.57	25.0	330.57	338.46	334.92	337.88	337.18
AD-2 (c)	33° 02' 37"	94° 50' 44"	344.16	346.16	25.0	4/26/01	Sch. 40 PVC	2	15.0	329.16	25.0	319.16	330.16	329.07	330.00	329.26
AD-3 (c)	33° 02' 38"	94° 50' 37"	331.10	333.10	17.0	4/26/01	Sch. 40 PVC	2	7.0	324.10	17.0	314.10	323.81	323.19	323.99	323.29
AD-4 (c)	33° 02' 43"	94° 50' 33"	340.61	342.61	30.0	4/26/01	Sch. 40 PVC	2	19.0	321.61	29.0	311.61	324.81	324.84	324.62	324.40
AD-4a (a)	33.04527	94.84258	340.19	342.85	30.0	9/22/09	Sch. 40 PVC	2	20.0	320.19	30.0	310.19	325.01	324.19	325.24	322.90
AD-4b (a)	33.04531	94.84230	329.55	333.23	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.55	15.0	314.55	324.35	324.32	324.50	324.30
AD-4c (a)	33.04507	94.84244	329.15	333.28	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.15	15.0	314.15	324.18	324.50	324.64	324.37
AD-5 (c)	33° 03' 13"	94° 51' 00"	349.00	351.00	30.0	1/11/01	Sch. 40 PVC	2	20.0	329.00	30.0	319.00	336.34	336.58	336.82	336.99
AD-6 (a)	33.05235	94.84757	343.31	346.33	33.0	9/23/09	Sch. 40 PVC	2	23.0	320.31	33.0	310.31	333.04	333.02	332.83	333.02
AD-7 (a)	33.05257	94.84219	347.86	350.82	38.0	9/24/09	Sch. 40 PVC	2	28.0	319.86	38.0	309.86	334.32	334.12	334.19	334.20
AD-8 (a)	33.05187	94.84026	337.53	340.01	29.0	9/21/09	Sch. 40 PVC	2	16.0	321.53	26.0	311.53	325.41	324.09	325.69	325.15
AD-9 (a)	33.04995	94.84196	340.32	343.09	35.0	9/21/09	Sch. 40 PVC	2	20.0	320.32	35.0	305.32	328.46	328.53	328.63	328.44
AD-10 (a)	33.04881	94.84047	340.23	343.01	35.0	9/22/09	Sch. 40 PVC	2	20.0	320.23	35.0	305.23	323.44	322.55	323.27	323.35
AD-11 (a)	33.04824	94.84177	339.61	342.18	20.0	9/22/09	Sch. 40 PVC	2	10.0	329.61	20.0	319.61	327.99	328.37	327.82	327.93
AD-12 (a)	33.04901	94.84977	366.27	369.33	30.0	9/24/09	Sch. 40 PVC	2	20.0	346.27	30.0	336.27	348.30	348.29	349.86	349.56
AD-13 (a)	33.04918	94.84275	344.12	347.00	20.0	9/22/09	Sch. 40 PVC	2	6.0	338.12	16.0	328.12	332.36	332.24	333.09	332.26
AD-14 (a)	33.04715	94.84256	342.32	345.43	19.0	9/22/09	Sch. 40 PVC	2	8.0	334.32	18.0	324.32	330.40	329.80	331.67	330.34
AD-15 (d)	33° 03' 04"	94° 50' 27"	340.21	343.29	46.0	12/12/15	Sch. 40 PVC	2	25.5	314.71	45.5	294.71	---	---	---	---
AD-16 (d)	33° 02' 49"	94° 50' 29"	350.86	353.97	21.0	12/10/15	Sch. 40 PVC	2	11.0	339.86	21.0	329.86	---	---	---	---
AD-16R (e)	33° 02' 49"	94° 50' 28.9"	350.55	353.49	27.0	4/12/17	Sch. 40 PVC	2	12.0	338.55	27.0	323.55	---	---	---	---
AD-17 (d)	33° 02' 57"	94° 51' 06"	353.99	357.10	40.0	12/10/15	Sch. 40 PVC	2	24.0	329.99	39.0	314.99	---	---	---	---
AD-18 (d)	33° 03' 03"	94° 51' 03"	346.17	349.28	29.0	12/11/15	Sch. 40 PVC	2	14.0	332.17	29.0	317.17	---	---	---	---
AD-19	33.047201°	94.839694°	323.58	326.35	15.0	5/8/18	Sch. 40 PVC	2	5.0	318.58	15.0	308.58	---	---	---	---
AD-20	33° 02' 45.6"	94° 50' 22.8"	324.85	327.65	20.0	10/23/18	Sch. 40 PVC	2	4.0	320.85	19.0	305.85	---	---	---	---
AD-21	33° 02' 49.6"	94° 50' 20"	322.04	325.29	20.0	10/23/18	Sch. 40 PVC	2	3.5	318.54	18.5	303.54	---	---	---	---
AD-22	33° 03' 35"	94° 51' 09"	360.94	360.22	20.0	6/18/19	Sch. 40 PVC	2	5.0	355.94	20.0	340.94	---	---	---	---
AD-23	33° 03' 56"	94° 51' 08"	369.37	368.82	20.0	6/18/19	Sch. 40 PVC	2	5.0	364.37	20.0	349.37	---	---	---	---
Piezometers																
B-2 (b)	33° 03.078'	94° 50.449'	339.7	339.7	50.0	10/28/09	Sch. 40 PVC	2	10.0	329.70	20.0	319.70	NM	NM	NM	NM
B-4 (b)	33° 03.011'	94° 50.462'	340.6	340.6	50.0	10/27/09	Sch. 40 PVC	2	8.0	332.60	18.0	322.60	NM	NM	NM	NM
B-5 (b)	33° 02.964'	94° 50.428'	340.0	340.0	50.0	10/27/09	Sch. 40 PVC	2	10.0	330.00	20.0	320.00	NM	NM	NM	NM
B-6 (b)	33° 02.912'	94° 50.462'	340.1	340.1	50.0	10/28/09	Sch. 40 PVC	2	12.0	328.10	22.0	318.10	NM	NM	NM	NM
Temp-1	33.046864°	94.852059°	356.36	358.17	28.0	5/8/18	Sch. 40 PVC	2	8.0	348.36	28.0	328.36	---	---	---	---
MW-9	33° 03' 18"	94° 50' 19.4"	342.00	344.54	18.0	11/19/01	Sch. 40 PVC	2	3.0	339.00	18.0	324.00	---	---	---	---
MW-10	33° 03' 13.6"	94° 50' 19.4"	341.96	344.80	19.0	11/19/01	Sch. 40 PVC	2	4.0	337.96	19.0	322.96	---	---	---	---

Well ID	5/14/2013 GW Elev. ft. msl	11/19/2013 GW Elev. ft. msl	5/12/2014 GW Elev. ft. msl	11/16/2014 GW Elev. ft. msl	5/12/2015 GW Elev. ft. msl	3/4/2016 GW Elev. ft. msl	5/26/2016 GW Elev. ft. msl	7/27/2016 GW Elev. ft. msl	10/19/2016 GW Elev. ft. msl	12/12/2016 GW Elev. ft. msl	1/17/2017 GW Elev. ft. msl	2/23/2017 GW Elev. ft. msl	10/6/2017 GW Elev. ft. msl	5/15/2018 GW Elev. ft. msl	10/29/2018 GW Elev. ft. msl	6/19/2019 GW Elev. ft. msl
Monitoring Wells																
AD-1 (c)	337.43	336.73	338.03	337.64	340.82	342.83	344.89	342.89	341.23	340.58	341.18	339.74	337.70	340.57	339.10	345.37
AD-2 (c)	329.83	329.70	330.09	329.69	332.56	332.32	---	---	---	---	---	---	---	331.50	331.25	333.61
AD-3 (c)	323.77	323.98	324.12	323.28	325.58	325.12	324.59	323.70	323.47	323.78	325.04	324.92	323.24	324.30	324.15	325.42
AD-4 (c)	324.74	325.52	325.44	325.13	327.00	326.90	---	---	---	---	---	---	---	---	---	---
AD-4a (a)	324.86	324.68	325.64	325.34	327.19	327.12	---	---	---	---	---	---	---	---	---	---
AD-4b (a)	324.30	325.21	325.22	324.90	326.58	326.67	---	---	---	---	---	---	---	---	---	---
AD-4c (a)	324.11	325.06	325.01	324.71	326.50	326.19	325.89	324.01	323.76	325.07	326.39	324.89	324.20	324.95	325.62	325.98
AD-5 (c)	336.78	336.47	336.80	336.01	339.07	338.04	337.62	337.24	337.74	337.01	338.34	336.17	337.40	337.25	336.98	337.18
AD-6 (a)	333.11	332.81	333.11	332.81	333.38	334.00	---	---	---	---	---	---	---	---	333.42	333.42
AD-7 (a)	334.13	334.58	333.77	333.98	334.09	333.61	---	---	---	---	---	---	---	---	---	335.00
AD-8 (a)	325.79	325.75	325.98	325.77	326.05	325.70	325.68	325.05	325.29	325.92	326.76	324.27	326.12	325.63	326.36	326.17
AD-9 (a)	328.74	329.38	NM	330.18	329.98	329.74	329.28	329.53	328.92	329.31	330.50	328.05	329.47	329.40	329.98	330.01
AD-10 (a)	323.51	323.76	323.57	323.88	323.95	323.55	---	---	---	---	---	---	---	323.53	324.19	324.06
AD-11 (a)	327.94	328.13	328.20	327.97	328.96	328.13	328.39	328.14	327.87	328.20	328.90	328.25	327.85	327.61	327.83	328.72
AD-12 (a)	349.99	349.65	349.89	350.01	350.65	350.39	---	---	---	---	---	---	---	349.52	348.28	350.81
AD-13 (a)	332.68	333.25	333.35	332.01	337.58	334.76	334.54	332.93	332.39	332.84	334.54	331.83	331.42	331.83	331.52	332.98
AD-14 (a)	330.94	331.69	332.12	330.17	336.63	334.83	334.51	331.71	330.94	330.79	332.63	330.87	329.91	330.76	330.52	333.94
AD-15 (d)	---	---	---	---	---	322.14	321.93	321.28	321.42	321.71	321.64	322.81	322.07	321.74	322.01	322.24
AD-16 (d)	---	---	---	---	---	337.09	335.84	332.14	331.52	331.43	330.96	330.71	---	---	---	---
AD-16R (e)	---	---	---	---	---	---	---	---	---	---	---	---	327.12	328.68	326.71	335.13
AD-17 (d)	---	---	---	---	---	334.64	334.26	334.30	334.45	334.64	334.05	333.94	334.17	334.35	333.91	335.39
AD-18 (d)	---	---	---	---	---	343.66	343.26	340.81	339.92	339.38	338.97	340.38	339.43	342.75	340.97	343.70
AD-19	---	---	---	---	---	---	---	---	---	---	---	---	---	321.24	321.54	322.65
AD-20	---	---	---	---	---	---	---	---	---	---	---	---	---	---	323.28	322.89
AD-21	---	---	---	---	---	---	---	---	---	---	---	---	---	---	320.26	320.72
AD-22	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	358.24
AD-23	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	364.98
Piezometers																
B-2 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-4 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-5 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
B-6 (b)	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Temp-1	---	---	---	---	---	---	---	---	---	---	---	---	---	345.55	342.79	350.08
MW-9	---	---	---	---	---	---	---	---	---	---	---	---	---	331.34	331.24	NM
MW-10	---	---	---	---	---	---	---	---	---	---	---	---	---	332.29	332.75	337.26

NOTES:
NM = Not measured
(a) Source: Eagle Environmental Services Well Logs (2009).
(b) Source: ETTL Engineers & Consultants Inc. (June 21, 2010).
(c) Source: Southwest Electric Power, State of Texas Well Report (2001).
(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-15 through AD-18 installed during December 2015.
(e) Monitoring well installed by ARCADIS on April 12, 2017 as a replacement for monitoring well AD-16.
Groundwater Elevation Source: AEP, Shallow Groundwater Data Summary through February 2017.
1983 State Plane Lambert Coordinate System
Datum: NAD 83
ft bls = feet below land surface
ft msl = feet above mean sea level
Elev. = Elevation
---- = No record

Table 4-1
Soil and Coal Ash Sample Analytical Results (mg/kg) - CCR Units
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Sample ID	Date Sampled	Sample Depth (feet)	Units	Appendix III Parameters						Appendix IV Parameters															
				Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Soil Samples																									
Temp-1	5/8/18	15'	mg/kg	14.3	43.3	15	<1	5.0	93	<0.25	1.77	16.8	<0.05	<0.05	5.22	0.28	1.77	0.104	0.004	1.18	<0.25	1.26	0.273	<12.5	5.4
SB-2	5/10/18	22'	mg/kg	11.9	35.8	13	2	3.9	878	<0.25	<0.25	18.3	0.08	<0.05	3.53	0.551	3.98	0.08	0.005	0.287	0.684	<0.25	0.159	890	4.46
(AD-17)																									
SB-3	5/10/18	30'	mg/kg	3.05	90.2	94	1	3.8	1,194	<0.25	3.83	13.6	<0.05	0.132	9.21	0.649	4.22	0.322	0.009	1.64	<0.25	<0.25	0.593	3,960	6.87
(AD-18)																									
SB-4	5/9/18	5'	mg/kg	(FOC = 0.00723 g/g)			---	4.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
(AD-5)		27'	mg/kg	7.76	634	8	1	6.4	724	<0.25	1.81	20.4	0.115	0.417	6.73	4.76	3.2	13.6	0.006	0.561	0.536	<0.25	0.657	10,400	65.5
(Background)		27'	mg/kg	(FOC = 0.00688 g/g)																					
SB-5	5/9/18	19'	mg/kg	5.45	655	16	3	7.2	69	<0.25	1.11	8.53	0.109	0.241	3.75	3.58	2.96	10.5	0.044	0.313	0.297	<0.25	0.216	6,210	35.5
(AD-8)																									
SB-6	5/9/18	21'	mg/kg	5.33	397	20	2	7.8	116	<0.25	1.11	17.9	0.09	0.24	3.5	3.37	2.67	10.3	0.051	0.299	0.471	<0.25	2.502	5,970	38.4
(AD-9)																									
SB-7	5/9/18	13'	mg/kg	8.11	1,360	19	<1	5.0	198	<0.25	10.1	65	0.154	0.356	6.87	3.21	3.14	5.3	0.004	1.39	<0.25	<0.25	0.262	9,220	28.4
(AD-13)																									
SB-8	5/9/18	12'	mg/kg	16.6	6,150	13	1	5.2	24	<0.25	3.3	213	0.409	0.452	8.22	4.13	9.05	4.63	0.013	0.488	<0.25	<0.25	0.433	11,000	25.4
(AD-3)																									
AD-20	10/23/18	15-17	mg/kg	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.567	---	---
AD-21	10/23/18	15-17	mg/kg	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.424	---	---
AD-22	6/18/19	3-5	mg/kg	16.7	110	---	---	4.84	---	<0.25	8.43	136	0.544	0.935	29.9	13	18.9	18	0.053	0.711	1.81	<0.25	---	25,800	---
		6-8	mg/kg	10.2	18.7	---	---	4.1	---	<0.25	20.9	30.4	0.246	0.723	17.7	9.65	8.95	2.9	0.009	0.446	1.08	<0.25	---	22,500	---
		11-13	mg/kg	8.83	219	---	---	4.26	---	<0.25	5.96	77.1	0.293	0.571	16.5	8.75	6.57	4.4	0.045	0.536	0.885	<0.25	---	17,600	---
AD-23	6/18/19	3-5	mg/kg	32.7	115	---	---	4.64	---	<0.25	14.1	45.5	0.805	3.23	49	30.8	11	7.74	0.035	1.14	4.27	<0.25	---	85,500	---
		5-7	mg/kg	10.2	22.7	---	---	4.25	---	<0.25	6.3	31.7	0.288	0.775	19	9.74	8.56	4.83	0.014	0.378	1.12	<0.25	---	22,700	---
		10-12	mg/kg	9.16	200	---	---	4.21	---	<0.25	4.13	28.3	0.288	0.613	23.9	8.19	7.03	3.41	0.015	1.03	0.635	<0.25	---	18,500	---
Coal Ash Samples																									
Ash-1	5/10/18	1-2'	mg/kg	34.4	33,800	30.5	8.21	7.1	219	<0.877	14.6	607	1.02	0.464	31.8	5.55	16.9	11.6	0.0473	2.66	2.27	<0.54	*2.92*	37,500	139
		SPLP:	*mg/L*	*0.594*	*30.2*	---	---	---	---	*<0.00344*	*<0.00411*	*0.284*	*<0.000333*	*<0.000164*	*0.00273*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0176*	*<0.00363*	*<0.00287*	*0.0991*	*<0.0305*	*<0.00267*
		Pore Water:	*mg/L*	*0.643*	*113*	*20.1*	*1.86*	*7.4*	*6.6*	*<0.00344*	*0.0095*	*3.43*	*<0.000333*	*<0.000164*	*0.00396*	*<0.000553*	*<0.00285*	*0.0123*	*<0.0000653*	*0.00484*	*<0.00363*	*<0.00287*	0.755	---	*0.357*
Ash-2	5/10/18	1-2'	mg/kg	92.6	96,000	53.8	11.2	7.3	293	<1.56	19.4	2,760	1.64	1.56	41.2	9.63	24.5	15.5	0.0967	2.08	5.25	<0.957	*2.32*	18,300	365
		SPLP:	*mg/L*	*0.526*	*24.1*	---	---	---	---	*<0.00344*	*<0.00411*	*0.192*	*<0.000333*	*<0.000164*	*0.00222*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0165*	*<0.00363*	*<0.00287*	*0.112*	*<0.0305*	*<0.00267*
		Pore Water:	*mg/L*	*0.772*	*143*	*20.4*	*0.28*	*7.6*	*8.73*	*<0.00344*	*0.0106*	*3.99*	*<0.000333*	*<0.000164*	*0.00196*	*<0.000553*	*0.00346*	*0.0173*	*<0.0000653*	*0.00428*	*<0.00363*	*<0.00287*	0.508	---	*0.376*
Ash-3	5/10/18	1-2'	mg/kg	29	14,300	11.5	10.7	7.4	152	<0.687	11.8	766	0.845	0.394	19.2	5.77	12.2	6.87	0.0403	1.79	1.44	<0.423	*1.754*	21,100	110
		SPLP:	*mg/L*	*0.958*	*19.8*	---	---	---	---	*<0.00344*	*<0.00411*	*0.0315*	*<0.000333*	*<0.000164*	*0.00389*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0222*	*<0.00363*	*<0.00287*	*<0.256*	*0.471*	*<0.00267*
		Pore Water:	*mg/L*	*1.000*	*103*	*13.0*	*0.998*	*7.6*	*51.1*	*<0.00344*	*0.0108*	*1.54*	*<0.000333*	*<0.000164*	*0.00110*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0111*	*<0.00363*	*<0.00287*	0.594	---	*0.715*
Ash-4	5/10/18	1-2'	mg/kg	281	106,000	27.6	1.34	10.5	961	<0.757	9.72	3,390	2.23	1.06	35.1	16.2	16.3	20.4	0.0340	2.21	1.30	<0.466	*3.18*	24,200	177
		SPLP:	*mg/L*	*1.3*	*25.1*	---	---	---	---	*<0.00344*	*<0.00411*	*0.0216*	*<0.000333*	*<0.000164*	*0.00329*	*<0.000553*	*<0.00285*	*<0.0086*	*<0.0000653*	*<0.00281*	*<0.00363*	*<0.00287*	*<0.407*	*<0.0305*	*<0.00267*
		Pore Water:	*mg/L*	*4.75*	*63.5*	*28.8*	*0.697*	*10.8*	*381*	*<0.00344*	*0.00745*	*0.217*	*<0.000333*	*<0.000164*	*0.00225*	*0.00093*	*<0.00285*	*<0.0086*	*<0.0000653*	*0.0798*	*<0.00363*	*<0.00287*	0.259	---	*0.00814*

NOTES:
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
FOC = Fraction organic carbon (Walkley Black)
--- = Not analyzed
SPLP = Synthetic precipitation leaching procedure (concentrations shown in milligrams per liter)
Total concentrations (mg/kg) shown in normal font, SPLP and Pore Water concentrations (mg/L) shown in italics.
Radium concentrations for soil shown in picoCuries per gram. SPLP concentrations shown in picoCuries per liter.

Table 4-2
Groundwater Sampling Analytical Results (mg/L) - Primary Bottom Ash Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

ARCADIS Design & Consultancy for natural and built assets

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Background (Upgradient) Wells																									
AD-1	05/26/16	0.346	36.5	5	<1	5.93	--	42	252	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.010	0.000033	<0.005	<0.005	<0.002	1.18	--	--
	07/27/16	0.350	39.6	4	<1	5.93	--	36	239	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.019	<0.000025	<0.005	<0.005	<0.002	0.9952	--	--
	09/29/16	0.332	15	5	<1	5.37	--	35	173	<0.005	<0.005	0.141	<0.001	<0.001	0.005	<0.005	<0.005	0.014	<0.000025	<0.005	<0.005	<0.002	1.38	--	--
	10/19/16	0.398	19.1	4	<1	5.15	--	42	192	<0.005	<0.005	0.114	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	1.141	--	--
	12/12/16	0.394	8.74	4	<1	5.18	--	40	200	<0.005	<0.005	0.072	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	0.719	--	--
	01/17/17	0.656	129	4	<1	7.13	--	68	538	<0.005	<0.005	0.410	<0.001	<0.001	<0.001	<0.005	<0.005	<0.001	<0.000025	<0.005	<0.005	<0.002	3.009	--	--
	02/23/17	0.700	147	9	<1	6.88	--	68	612	<0.005	<0.005	0.488	<0.001	<0.001	<0.001	<0.005	<0.005	0.001	<0.000025	<0.005	<0.005	<0.002	4.309	--	--
	06/07/17	0.449	15.1	4	<0.083	5.06	109	42	176	<0.00093	0.00114	0.09346	0.00037	<0.00007	0.00066	0.00077	<0.00068	0.00902	0.000007	<0.00029	0.0021	<0.00086	0.676	--	--
	10/06/17	--	--	--	--	5.25	97.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.352	12.1	3	<0.083	4.82	8.4	--	174	<0.00093	<0.00105	0.08823	0.00048	<0.00007	<0.00023	0.0008	<0.00068	0.00816	<0.000005	<0.00029	<0.00099	<0.00086	0.837	0.03	0.025
	Dissolved	*0.35*	*12*	--	--	4.82	8.4	--	--	*<0.00093*	*<0.00105*	*0.08582*	*0.00044*	*<0.00007*	*<0.00023*	*0.00083*	*<0.00068*	*0.00799*	*<0.000005*	*<0.00029*	*0.00197*	*<0.00086*	*0.531*	0.01	0.026
	05/24/18	0.345	10.2	4	<0.083	5.19	118	43	150	0.00317 J	<0.00105	0.0799	0.00039 J	<0.00007	<0.00023	0.00035 J	<0.00068	0.00814	0.000006 J	<0.00029	0.00138 J	<0.00086	1.983	--	--
	08/14/18	0.443	5.95	5	<0.083	5.18	102	44	160	0.00003 J	0.00021	0.063	0.000482	0.00002	0.00016	0.000797	0.000238	0.00708	0.000013 J	0.00021	0.0017	0.00003 J	1.10	--	--
	02/20/19	0.504	142	2.82	0.24	7.31	113	49.2	522	0.00016	0.00046	0.457	0.00009 J	0.00001 J	0.000306	0.000399	0.000124	0.00155	<0.000025	0.001 J	0.0007	<0.0005	3.16	--	--
	05/30/19	0.689	--	1.59	0.29	--	61.3	43.3	588	0.00016	0.00060	0.512	0.000244	0.00001 J	0.0001 J	0.000756	0.000197	<0.009	<0.000005	0.00243	0.0014	<0.0001	--	0.099	0.0625
AD-5	05/31/16	0.03	36.9	15	<1	6.38	--	123	337	<0.005	<0.005	0.057	<0.001	<0.001	<0.001	0.014	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	1.63	--	--
	07/28/16	0.04	44.7	16	<1	6.38	--	163	360	<0.005	<0.005	0.093	<0.001	<0.001	<0.001	0.015	<0.005	0.191	<0.000025	<0.005	<0.005	<0.002	4.75	--	--
	09/29/16	0.04	46.3	15	<1	5.29	--	190	416	<0.005	<0.005	0.087	<0.001	<0.001	<0.001	0.014	<0.005	0.186	<0.000025	<0.005	<0.005	<0.002	3.33	--	--
	10/20/16	0.05	50.7	14	<1	5.92	--	267	448	<0.005	<0.005	0.07	<0.001	<0.001	<0.001	0.009	<0.005	0.225	<0.000025	<0.005	<0.005	<0.002	2.319	--	--
	12/13/16	0.05	49.6	13	<1	6.29	--	233	484	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	0.013	<0.005	0.199	<0.000025	<0.005	<0.005	<0.002	2.182	--	--
	01/17/17	0.04	49.8	14	<1	6.27	--	234	438	<0.005	<0.005	0.047	<0.001	<0.001	<0.001	0.012	<0.005	0.239	<0.000025	<0.005	<0.005	<0.002	1.023	--	--
	02/23/17	0.04	33.0	15	<1	5.48	--	127	286	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	0.013	<0.005	0.166	<0.000025	<0.005	<0.005	<0.002	1.788	--	--
	06/07/17	0.05281	49.7	14	<0.083	5.96	867	82	300	<0.00093	0.00385	0.0877	0.00008	0.00039	0.00028	0.01193	<0.00068	0.124	<0.000005	<0.00029	<0.00099	<0.00086	2.32	--	--
	10/06/17	--	--	--	--	5.59	249	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.05063	30.1	21	<0.083	5.79	<100	--	248	<0.00093	<0.00105	0.07627	0.00014	0.00037	<0.00023	0.01907	<0.00068	0.118	<0.000005	<0.00029	<0.00099	<0.00086	1.495	14.4	0.45
	Dissolved	*0.03752*	*29.1*	--	--	5.79	<100	--	--	*<0.00093*	*<0.00105*	*0.06865*	*<0.00002*	*<0.00007*	*<0.00023*	*0.01747*	*<0.00068*	*0.119*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.043*	*2.051*	8.38	0.43
	05/24/18	0.05007	28.1	22	<0.083	6.22	17.8	60	242	<0.00093	<0.00105	0.07116	<0.00002	0.00023 J	0.0008 J	0.01424	<0.00068	0.121	<0.000005	<0.00029	<0.00099	<0.00086	1.946	--	--
	08/15/18	0.05	40.5	19	<0.083	6.23	57.1	240	428	0.00001 J	0.00169	0.0637	0.000055	0.000008 J	0.000072	0.0114	0.000079	0.147	<0.000005	0.00013	0.00008 J	<0.00005	0.316	--	--
	02/21/19	0.033	33.9	24.7	0.21	5.38	164	46.5	220	0.00002 J	0.00159	0.0694	0.00008 J	<0.00005	0.000432	0.00858	0.000147	0.0807	<0.000025	<0.002	0.0001 J	<0.0005	1.27	--	--
	05/30/19	0.03 J	--	22.3	0.29	--	150	51.3	238	<0.00002	0.00305	0.0605	0.00008 J	<0.00001	0.00006 J	0.0118	0.00005 J	0.104	0.000006	<0.0004	0.00005 J	<0.0001	--	23.4	0.331
AD-17	05/26/16	0.121	200	43	<1	7.17	--	1,166	1,810	<0.005	<0.005	0.021	<0.001	0.002	0.001	0.063	<0.005	0.370	0.000032	<0.005	<0.005	<0.002	1.53	--	--
	07/27/16	0.119	195	32	<1	7.17	--	1,005	1,576	<0.005	<0.005	0.020	<0.001	0.004	0.001	0.068	<0.005	0.374	<0.000025	<0.005	<0.005	<0.002	2.78	--	--
	09/29/16	0.111	191	36	<1	6.17	--	1,055	1,663	<0.005	<0.005	0.031	<0.001	<0.001	0.003	0.058	<0.005	0.354	<0.000025	<0.005	<0.005	<0.002	2.358	--	--
	10/20/16	0.124	194	32	1.0	6.14	--	1,163	1,612	<0.005	<0.005	0.034	<0.001	0.002	0.004	0.065	<0.005	0.394	<0.000025	<0.005	<0.005	<0.002	2.224	--	--
	12/13/16	0.135	196	31	<1	6.03	--	1,096	1,560	<0.005	<0.005	0.017	<0.001	0.003	<0.001	0.068	<0.005	0.323	<0.000025	<0.005	<0.005	<0.002	2.384	--	--
	01/17/17	0.101	196	33	<1	5.96	--	1,445	1,686	<0.005	<0.005	0.014	<0.001	0.003	0.068	0.068	<0.005	0.341	<0.000025	<0.005	<0.005	<0.002	2.436	--	--
	02/22/17	0.135	189	30	<1	5.67	--	1,055	1,628	<0.005	<0.005	0.020	<0.001	0.002	0.001	0.073	<0.005	0.331	<0.000025	<0.005	<0.005	<0.002	2.288	--	--
	06/06/17	0.121	188	30	<0.083	5.81	156	1,105	1,578	<0.00093	<0.00105	0.01033	<0.00002	0.00606	<0.00023	0.0748	<0.00068	0.329	0.000013	<0.00029	<0.00099	<0.00086	1.598	--	--
	10/05/17	--	--	--	--	5.92	598	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.247	213	45	<0.083	5.51	<100	--	1,846	<0.00093	<0.00105	0.00978	<0.00002	0.00915	<0.00023	0.07451	<0.00068	0.306	<0.000005	<0.00029	0.00414	<0.00086	1.514	260	3.72
	Dissolved	*0.231*	*205*	--	--	5.51	<100	--	--	*<0.00093*	*<0.00105*	*0.00737*	*<0.00002*	*0.00609*	*<0.00023*	*0.07938*	*<0.00068*	*0.301*	*<0.000005*	*<0.00029*	*0.00515*	*0.02*	*1.57*	241	3.56
	05/24/18	0.239	193	39	<0.083	6.28	7.8	1,067	1,836	<0.00093	<0.00105	0.00965	<0.00002	0.00646	<0.00023	0.07173	<0.00068	0.308	<0.000005	<0.00029	<0.00099	<0.00086	1.939	--	--
	08/15/18	0.118	187	40	<0.083	5.60	418	1,170	1,750	0.00002 J	0.00183	0.0128	0.000069	0.00025	0.000604	0.0435	0.0011	0.243	0.000011 J	0.00035	0.0003	0.000074	2.35	--	--
	02/21/19	0.151	207	43.2	0.180	6.93	274	1,060	1,720	0.00008 J	0.00251	0.120	0.00024	0.00027	0.00334	0.0645	0.00249	0.268	0.000007 J	0.0007 J	0.0008	<0.0005	2.66	--	--
	05/30/19	0.158	--	41.7	<0.04	--	176	1,120	1,546	<0.00002	0.00041	0.0196	0.00002 J	0.00003 J	0.000246	0.0511	0.00003 J	0.341	<0.000005	<0.0004	0.00006 J	<0.0001	--	145	3.40
Offsite Background (Upgradient) Monitoring Wells																									
AD-22	06/19/19	0.04 J	2.61	17.3	0.1 J	5.59	<100	17.4	148	<0.0002	0.00163	0.104	0.0004 J	<0.0001	0.002 J	0.0181	0.0007 J	0.03 J	0.000003 J	<0.004	0.0006 J	<0.001	1.403	16.2	--
AD-23	06/19/19	0.03 J	1.16	6.04	0.05 J	5.72	44.1	0.8	52	<0.0002	0.00201	0.082	0.0006 J	<0.0001	0.00911	0.0111	0.001 J	<0.009	0.000004 J	<0.004	0.0009 J	<0.001	0.617	6.54	--
Background Statistical Evaluation Summary - Upper Prediction Limits:[a]										0.005	0.005	0.58	0.00073	0.01	0.0036	0.075	0.005	0.39	0.000033	0.002	0.005	0.0013	4.18	--	--

Table 4-2
Groundwater Sampling Analytical Results (mg/L) - Primary Bottom Ash Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Point of Compliance Wells																									
AD-8	05/31/16	1.46	32.6	36	1	6.91	--	217	524	<0.005	<0.005	0.034	<0.001	<0.001	0.002	0.007	<0.005	0.122	<0.000025	<0.005	<0.005	<0.002	1.046	--	--
	07/28/16	1.44	25.9	26	<1	6.91	--	202	469	<0.005	<0.005	0.026	<0.001	<0.001	<0.001	0.009	<0.005	0.098	<0.000025	<0.005	<0.005	<0.002	1.584	--	--
	09/29/16	1.51	24.3	28	<1	7.65	--	186	432	<0.005	<0.005	0.023	<0.001	<0.001	<0.001	0.007	<0.005	0.111	<0.000025	<0.005	<0.005	<0.002	6.3	--	--
	10/20/16	1.54	25.9	30	<1	6.07	--	184	424	<0.005	<0.005	0.024	<0.001	<0.001	<0.001	0.007	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	0.345	--	--
	12/12/16	1.53	23.6	27	<1	5.62	--	168	442	<0.005	<0.005	0.021	<0.001	<0.001	<0.001	0.007	<0.005	0.11	<0.000025	<0.005	<0.005	<0.002	1.083	--	--
	01/19/17	1.53	18.7	24	1	6.21	--	153	352	<0.005	<0.005	0.02	<0.001	<0.001	<0.001	0.006	<0.005	0.094	<0.000025	<0.005	<0.005	<0.002	0.823	--	--
	02/22/17	1.67	19.3	22	<1	6.78	--	163	356	<0.005	<0.005	0.019	<0.001	<0.001	<0.001	0.006	<0.005	0.092	<0.000025	<0.005	<0.005	<0.002	0.536	--	--
	06/06/17	1.39	17.4	22	0.6628	5.63	54	151	368	<0.00093	<0.00105	0.01908	<0.00002	<0.00007	<0.00023	0.00386	<0.00068	0.09491	0.000008	<0.00029	<0.00099	<0.00086	1.0735	--	--
	10/05/17	--	--	--	--	6.68	41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/18	1.29	17.2	22	0.716	6.07	3.0	--	368	<0.00093	<0.00105	0.02283	0.00004	<0.00007	<0.00023	0.00521	<0.00068	0.08418	0.000009	<0.00029	<0.00099	<0.00086	1.106	0.673	0.388
	Dissolved	*1.31*	*17.1*	--	--	6.07	3.0	--	--	*<0.00093*	*<0.00105*	*0.02046*	*<0.00002*	*<0.00007*	*<0.00023*	*0.00513*	*<0.00068*	*0.08356*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*0.5773*	< 0.01	0.363
	05/23/18	--	--	--	0.501 J	6.20	*48.2*	--	--	0.00319 J	<0.00105	0.02212	<0.00002	<0.00007	<0.00023	0.00319 J	<0.00068	0.0956	<0.000005	<0.00029	0.00175 J	<0.00086	0.3366	--	--
	8/15/18[b]	1.30	15.0	24	0.615 J	6.77	104	122	288	0.00001 J	0.00031	0.0212	0.000008 J	0.000002 J	0.00005	0.00536	0.000039	0.0555	0.000007 J	0.00016	0.00007 J	0.000129	3.44	--	--
	02/21/19	1.47	17.6	23.2	0.660	6.40	88.2	163	352	<0.0001	0.00057	0.0281	0.00003 J	0.00003 J	0.000456	0.00288	0.000223	0.0911	<0.000025	<0.002	0.0001 J	<0.0005	0.417	--	--
	05/29/19	1.07	--	19.5	0.89	--	76.4	150	324	<0.00002	0.00037	0.0303	<0.00002	0.00002 J	0.0001 J	0.00603	0.00007 J	0.067	<0.000005	<0.0004	0.00006 J	0.0001 J	--	1.07	0.457
AD-9	05/31/16	0.12	229	88	<1	6.32	--	1,352	2,541	<0.005	<0.005	0.051	<0.001	0.001	<0.001	0.027	<0.005	1.32	<0.000025	<0.005	<0.005	<0.002	2.95	--	--
	07/28/16	0.105	255	98	<1	6.32	--	1,464	2,564	<0.005	<0.005	0.031	<0.001	0.002	<0.001	0.022	<0.005	1.38	0.000045	<0.005	0.008	<0.002	1.447	--	--
	09/29/16	0.115	220	86	<1	4.72	--	1,301	2,448	<0.005	<0.005	0.033	<0.001	<0.001	<0.001	0.012	<0.005	1.17	<0.000025	<0.005	<0.005	<0.002	3.199	--	--
	10/19/16	0.109	228	76	1	5.22	--	1,350	2,494	<0.005	<0.005	0.026	<0.001	<0.001	<0.001	0.016	<0.005	1.44	<0.000025	<0.005	<0.005	<0.002	1.311	--	--
	12/12/16	0.108	250	92	<1	5.72	--	1,639	2,667	<0.005	<0.005	0.027	<0.001	0.002	<0.001	0.024	<0.005	1.33	<0.000025	<0.005	<0.005	<0.002	3.0	--	--
	01/19/17	0.312	91.1	54	<1	5.43	--	884	1,360	<0.005	<0.005	0.098	0.002	<0.001	<0.001	0.042	<0.005	0.634	<0.000025	<0.005	<0.005	<0.002	2.349	--	--
	02/22/17	0.1	258	86	<1	5.77	--	1,774	2,662	<0.005	<0.005	0.022	<0.001	<0.001	<0.001	0.024	<0.005	1.41	<0.000025	<0.005	<0.005	<0.002	2.32	--	--
	06/06/17	0.146	191	19	<0.083	4.61	100	105	308	<0.00093	<0.00105	0.04227	0.00077	0.00222	<0.00023	0.02416	<0.00068	1.00	0.000006	<0.00029	<0.00099	<0.00086	1.586	--	--
	10/05/17	--	--	--	--	5.78	102	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	0.08607	10.5	85	<0.083	4.20	<100		1,972	<0.00093	<0.00105	0.04937	0.00134	0.00023	<0.00023	0.01628	<0.00068	0.217	<0.000005	<0.00029	<0.00099	<0.00086	1.582	0.446	0.378
	Dissolved	*0.07126*	*10.2*	--	--	4.20	<100	--	--	*<0.00093*	*<0.00105*	*0.04695*	*0.00122*	*0.00012*	*<0.00023*	*0.01592*	*<0.00068*	*0.204*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.549*	0.166	0.369
	05/23/18	--	--	--	<0.083	5.30	44.6	--	--	<0.00093	<0.00105	0.03045	0.00032 J	0.00288	<0.00023	0.0267	<0.00068	1.20	<0.000005	<0.00029	<0.00099	0.00846	2.556	--	--
	8/15/18[b]	0.198	230	103	<0.083	4.96	237	1,910	2,694	<0.01	0.00168	0.0242	0.000268	0.00006	0.00042	0.0111	0.000262	0.851	0.000013 J	0.00011	0.0003	0.000062	1.864	--	--
	02/21/19	1.39	211	89	0.19	4.98	115	1,350	2,240	<0.0001	0.00118	0.0524	0.000474	0.00009	0.000313	0.0148	0.00008 J	1.12	0.00001 J	<0.002	0.0003	0.0001 J	2.51	--	--
	05/29/19	0.06 J	--	44	0.16	--	27.2	503	1,758	<0.00002	0.0002	0.0497	0.000941	0.00021	0.000346	0.0159	0.00007 J	0.225	<0.000005	<0.0004	0.0002	0.0002 J	--	0.485	0.363
AD-15	05/31/16	0.329	5.09	30	<1	5.58	--	24	188	<0.005	0.012	0.215	<0.001	<0.001	0.017	0.011	0.007	0.017	0.000054	<0.005	<0.005	<0.002	2.28	--	--
	07/28/16	0.407	3.83	34	<1	5.58	--	28	196	<0.005	0.006	0.124	<0.001	<0.001	0.004	0.006	<0.005	0.021	<0.000025	<0.005	<0.005	<0.002	1.322	--	--
	09/29/16	0.360	13.7	28	<1	4.57	--	23	367	<0.005	0.131	1.93	0.015	0.007	0.28	0.134	0.161	0.149	0.000707	<0.005	0.014	<0.002	9.92	--	--
	10/19/16	0.152	4.57	26	<1	4.35	--	17	152	<0.005	0.023	0.415	0.002	<0.001	0.054	0.019	0.022	0.036	0.0001	<0.005	<0.005	<0.002	3.567	--	--
	12/12/16	0.334	3.60	26	<1	4.67	--	19	204	<0.005	0.006	0.184	<0.001	<0.001	0.015	0.010	<0.005	0.013	0.000026	<0.005	<0.005	<0.002	3.36	--	--
	01/19/17	0.413	3.35	32	<1	5.77	--	25	176	<0.005	0.006	0.153	<0.001	<0.001	0.009	0.007	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	2.386	--	--
	02/22/17	0.100	4.21	20	<1	4.95	--	8	88	<0.005	0.020	0.353	0.002	<0.001	0.049	0.020	0.019	0.025	0.000058	<0.005	<0.005	<0.002	2.261	--	--
	06/06/17	0.321	3.57	27	<0.083	4.83	246	19	184	<0.00093	0.00854	0.166	0.00061	0.00048	0.01235	0.00844	0.00298	0.0108	0.000022	<0.00029	0.00271	<0.00086	2.491	--	--
	10/05/17	--	--	--	--	5.94	208	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/18	0.08009	2.49	22	<0.083	4.60	7.32		94	<0.00093	0.00222	0.08419	0.00024	<0.00007	<0.00023	0.00403	<0.00068	0.00395	<0.000005	<0.00029	<0.00099	<0.00086	1.749	6.64	0.036
	Dissolved	*0.05773*	*2.49*	--	--	4.60	7.32	--	--	*<0.00093*	*<0.00105*	*0.08405*	*0.00019*	*<0.00007*	*<0.00023*	*0.00346*	*<0.00068*	*0.00378*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*0.748*	< 0.01	0.034
	Field Filtered[c]	*0.301*	*3.03*	*35*	*<0.083*	4.60	7.32	--	*8*	*<0.00093*	*0.00216*	*0.08611*	*0.00012*	*<0.00007*	*<0.00023*	*0.00421*	*<0.00068*	*0.00498*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.630*	7.09	0.061
	FF Dissolved[c]	*0.309*	*3*	--	--	4.60	7.32	--	--	*<0.00093*	*<0.00105*	*0.08373*	*0.00024*	*<0.00007*	*<0.00023*	*0.0038*	*<0.00068*	*0.00516*	*<0.000005*	*0.00048*	*<0.00099*	*<0.00086*	*5.743*	<0.01	0.062
	05/23/18	--	--	--	<0.083	4.76	147	--	--	<0.00093	0.00256 J	0.102	0.00003 J	0.0001 J	0.00263	0.00474 J	<0.00068	0.00562	<0.000005	<0.00029	0.00154 J	0.00137 J	1.46	--	--
	8/15/18[b]	0.341	3.04	37	<0.083	4.59	249	24	174	0.00003 J	0.00326	0.0852	0.000116	0.00001 J	0.000481	0.00371	0.000438	0.00338	0.000008 J	0.00005 J	0.0009	0.00009	1.076	--	--
	02/21/19	0.169	2.67	28.2	0.09	4.98	116	10.6	150	<0.0001	0.00221	0.0766	0.000208	0.00001 J	0.000225	0.0029	0.000104	0.00294	<0.000025	<0.002	0.0004	<0.0005	0.841	--	--
	05/29/19	<0.02	--	21.4	0.06	--	185	2.1	34	<0.0001	0.00410	0.199	0.00186	0.00008 J	0.0103	0.00595	0.0101	0.01 J	0.000081	<0.002	0.0057	<0.0005	--	18.4	0.0423

Table 4-2
Groundwater Sampling Analytical Results (mg/L) - Primary Bottom Ash Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Supplemental Downgradient Monitoring Wells																									
AD-10	5/16/2018	0.08311	15.5	40	<0.083	3.72	<100	--	280	<0.00093	0.0022	0.03855	0.00166	0.00033	<0.00023	0.02432	<0.00068	0.316	<0.000005	<0.00029	<0.00099	0.00098	1.704	0.338	0.25
	Dissolved	*0.07733*	*15.3*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.03712*	*0.00149*	*0.00009*	*<0.00023*	*0.02412*	*<0.00068*	*0.296*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.505*	0.282	0.251
Supplemental Sidegradient Monitoring Wells																									
MW-9	5/15/2018	0.578	44.8	93	<0.083	4.74	57.4	--	780	0.00097	<0.00105	0.01661	0.00021	0.00019	<0.00023	0.03083	<0.00068	0.03225	0.000127	<0.00029	<0.00099	<0.00086	0.779	0.142	0.306
	Dissolved	*0.556*	*44.7*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.01588*	*0.00015*	*0.00036*	*<0.00023*	*0.03189*	*0.00813*	*0.03151*	*0.00015*	*<0.00029*	*<0.00099*	*<0.00086*	*0.2578*	< 0.01	0.308
MW-10	5/15/2018	0.707	59.3	5	<0.083	6.68	1.7	--	346	<0.00093	0.00128	0.08634	0.00006	<0.00007	<0.00023	0.00385	<0.00068	0.01001	<0.000005	0.00079	0.01898	<0.00086	0.969	0.101	0.054
	Dissolved	*0.689*	*59.8*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.08253*	*<0.00002*	*<0.00007*	*<0.00023*	*0.00064*	*<0.00068*	*0.00924*	*<0.000005*	*0.00082*	*0.01651*	*<0.00086*	*1.026*	< 0.01	0.002
EPA MCLs:																									
MCL					4					0.006	0.01	2	0.004	0.005	0.1				0.002		0.05	0.002	5[e]		
Rule Specified																0.006	0.015	0.04		0.1					
Background Limit					1					0.005	0.005	0.36	0.00077	0.0065[d]	0.004	0.075[d]	0.005	0.39[d]	0.000033	0.005	0.005	0.0013	4.21[e]		
Interwell Background Value(s) (UPL, LPL where applicable) AD-8, AD-9, AD-15		0.775				4.8-7.1																			
Intrawell Background Value (UPL) AD-8			35.7	38.3	1.03			236	569																
Intrawell Background Value (UPL) AD-9			350	139	0.73			2527	3147																
Intrawell Background Value (UPL) AD-15			5.71	38.4	1.00			35.6	388																

NOTES:
All concentration data are provided in milligrams per liter (mg/L) unless otherwise noted.
J = Analyte was positively identified, though the quantitation was below Reporting Limit.
MCL - Maximum contaminant level
LPL = Lower prediction limit
UPL = Upper prediction limit
pCi/L = PicoCuries per liter
-- = Not analyzed
a = Data taken from Geosyntec "Statistical Analysis Summary, Primary Bottom Ash Pond" dated July 11, 2019.
b = Some inorganic analyte groundwater samples collected 9/17/18.
c = Sample ID "AD-15 DUP" was field filtered (FF) using a 5 micron filter.
d = Calculated Upper Tolerance Limit is higher than MCL.
e = Data is "Combined Radium, Total".
Denotes groundwater sample collected by ARCADIS using low-flow methods.
Unless otherwise noted, values shown are total (unfiltered) analyses.
Dissolved (0.45-micron lab filtered) parameter concentrations shown in italics.

Table 4-3
Groundwater Sampling Analytical Results (mg/L) - Landfill
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

ARCADIS Design & Consultancy for natural and built assets

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Background (Upgradient) Wells																									
AD-5	05/31/16	0.03	36.9	15	<1	6.38	--	123	337	<0.005	<0.005	0.057	<0.001	<0.001	<0.001	0.014	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	1.63	--	--
	07/28/16	0.04	44.7	16	<1	6.38	--	163	360	<0.005	<0.005	0.093	<0.001	<0.001	<0.001	0.015	<0.005	0.191	<0.000025	<0.005	<0.005	<0.002	4.75	--	--
	09/29/16	0.04	46.3	15	<1	5.29	--	190	416	<0.005	<0.005	0.087	<0.001	<0.001	<0.001	0.014	<0.005	0.186	<0.000025	<0.005	<0.005	<0.002	3.33	--	--
	10/20/16	0.05	50.7	14	<1	5.92	--	267	448	<0.005	<0.005	0.07	<0.001	<0.001	<0.001	0.009	<0.005	0.225	<0.000025	<0.005	<0.005	<0.002	2.319	--	--
	12/13/16	0.05	49.6	13	<1	6.29	--	233	484	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	0.013	<0.005	0.199	<0.000025	<0.005	<0.005	<0.002	2.182	--	--
	01/17/17	0.04	49.8	14	<1	6.27	--	234	438	<0.005	<0.005	0.047	<0.001	<0.001	<0.001	0.012	<0.005	0.239	<0.000025	<0.005	<0.005	<0.002	1.023	--	--
	02/23/17	0.04	33.0	15	<1	5.48	--	127	286	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	0.013	<0.005	0.166	<0.000025	<0.005	<0.005	<0.002	1.788	--	--
	06/07/17	0.05281	49.7	14	<0.083	5.96	867	82	300	<0.00093	0.00385	0.0877	0.00008	0.00039	0.00028	0.01193	<0.00068	0.124	<0.000005	<0.00029	<0.00099	<0.00086	2.32	--	--
	10/06/17	--	--	--	--	5.59	249	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.05063	30.1	21	<0.083	5.79	<100	--	248	<0.00093	<0.00105	0.07627	0.00014	0.00037	<0.00023	0.01907	<0.00068	0.118	<0.000005	<0.00029	<0.00099	<0.00086	1.495	14.4	0.45
	Dissolved	*0.03752*	*29.1*	--	--	5.79	<100	--	--	*<0.00093*	*<0.00105*	*0.06865*	*<0.00002*	*<0.00007*	*<0.00023*	*0.01747*	*<0.00068*	*0.119*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.043*	*2.051*	8.38	0.43
	05/24/18	0.05007	28.1	22	<0.083	6.22	17.8	60	242	<0.00093	<0.00105	0.07116	<0.00002	0.00023 J	0.0008 J	0.01424	<0.00068	0.121	<0.000005	<0.00029	<0.00099	<0.00086	1.946	--	--
	08/15/18	0.05	40.5	19	<0.083	6.23	57.1	240	428	0.00001 J	0.00169	0.0637	0.000055	0.000008 J	0.000072	0.0114	0.000079	0.147	<0.000005	0.00013	0.00008 J	<0.01	0.316	--	--
	02/21/19	0.033	33.9	24.7	0.21	5.38	164	46.5	220	0.00002 J	0.00159	0.0694	0.00008 J	<0.00005	0.000432	0.00858	0.000147	0.0807	<0.000025	<0.002	0.0001 J	<0.0005	1.27	--	--
	05/30/19	0.03 J	--	22.3	0.29	--	150	51.3	238	<0.00002	0.00305	0.0605	0.00008 J	<0.00001	0.00006 J	0.0118	0.00005 J	0.104	0.000006	<0.0004	0.00005 J	<0.0001	--	23.4	0.331
AD-18[d]	05/26/16	0.146	409	422	<1	5.1	--	5,135	10,000	<0.005	<0.005	0.012	0.014	0.003	<0.001	0.922	<0.005	2.07	0.000168	<0.005	0.006	0.003	12.58	--	--
	07/27/16	0.148	457	432	2	5.1	--	4,930	9,476	<0.005	<0.005	0.019	0.005	0.002	<0.001	0.734	<0.005	1.94	0.000091	<0.005	0.007	0.003	10.62	--	--
	09/29/16	0.156	469	637	4	5.59	--	4,632	9,569	<0.005	<0.005	0.02	0.004	<0.001	<0.001	0.666	<0.005	1.86	0.000117	<0.005	0.007	<0.002	7.05	--	--
	10/20/16	0.188	498	876	0.8664	5.7	--	5,537	9,540	<0.005	<0.005	0.021	0.002	0.001	<0.001	0.569	<0.005	2.06	0.000053	<0.005	<0.005	<0.002	5.82	--	--
	12/13/16	0.178	510	695	5	5.75	--	4,382	8,912	<0.005	<0.005	0.021	0.007	0.001	<0.001	0.641	<0.005	1.74	0.00005	<0.005	<0.005	<0.002	9.6	--	--
	01/17/17	0.050	412	159	5	4.49	--	5,414	8,562	<0.005	0.01	0.014	0.022	0.001	<0.001	0.929	<0.005	1.95	0.000224	<0.005	<0.005	0.002	22.51	--	--
	02/22/17	0.090	401	151	6	4.37	--	5,169	8,412	<0.005	<0.005	0.014	0.026	0.002	<0.001	0.961	<0.005	1.82	0.000107	<0.005	<0.005	0.00228	19.11	--	--
	06/06/17	0.125	428	304	6.53	4.27	121	5,920	9,394	<0.00093	0.00331	0.01038	0.01883	0.00303	<0.00023	0.940	<0.00068	2.15	0.000113	<0.00029	0.00212	<0.00086	16.12	--	--
	10/05/17	--	--	--	--	5.87	165	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.163	433	362	9.4	3.61	104.1	--	9,952	0.00224	0.00276	0.00813	0.01733	0.0036	0.00098	0.928	<0.00068	2.07	0.000043	<0.00029	0.00194	0.00144	19.95	19.7	14.1
	Dissolved	*0.153*	*423*	--	--	--	--	--	--	*0.00467*	*0.00189*	*0.00748*	*0.01676*	*0.00316*	*<0.00023*	*0.898*	*<0.00068*	*2.06*	*0.000012*	*<0.00029*	*0.00135*	*0.01466*	*18.09*	19.1	13.7
	05/30/19	0.09 J	--	390	3.56	--	91.3	6,120	9,564	<0.0002	0.040	0.009 J	0.021	0.004 J	<0.004	1.130	0.005 J	1.27	0.000035	<0.04	0.103	<0.01	--	11.2	7.53
Background Statistical Evaluation Summary - Upper Prediction Limits:[a]										0.005	0.005	0.36	0.00077	0.0065	0.004	0.075	0.005	0.39	0.000033	0.005	0.005	0.002	4.21	--	--
Point of Compliance Wells																									
AD-11	05/31/16	2.47	8.47	9	2	5.21	--	518	388	<0.005	<0.005	0.014	0.004	<0.001	0.003	0.026	<0.005	0.032	<0.000025	<0.005	<0.005	<0.002	1.77	--	--
	07/28/16	2.83	8.88	10	2	5.21	--	596	1,000	<0.005	<0.005	0.012	0.004	<0.001	<0.001	0.026	<0.005	0.047	<0.000025	<0.005	<0.005	<0.002	2.23	--	--
	09/29/16	3.4	10.7	12	2	4.08	--	683	1,065	<0.005	<0.005	0.052	0.005	<0.001	0.007	0.03	<0.005	0.047	<0.000025	<0.005	<0.005	<0.002	3.92	--	--
	10/19/16	3.77	8.78	11	<1	3.68	--	706	1,024	<0.005	<0.005	0.02	0.005	<0.001	0.002	0.027	<0.005	0.047	<0.000025	<0.005	<0.005	<0.002	2.56	--	--
	12/12/16	3.36	8.98	10	2	3.75	--	548	1,044	<0.005	<0.005	0.013	0.004	<0.001	<0.001	0.025	<0.005	0.041	<0.000025	<0.005	<0.005	<0.002	1.569	--	--
	01/17/17	2.81	10.3	11	2	4.41	--	760	1,048	<0.005	<0.005	0.013	0.004	<0.001	<0.001	0.025	<0.005	0.046	<0.000025	<0.005	<0.005	<0.002	1.082	--	--
	02/22/17	2.88	9.31	10	2	4.34	--	558	876	<0.005	<0.005	0.019	0.004	<0.001	0.002	0.024	<0.005	0.035	<0.000025	<0.005	<0.005	<0.002	1.45	--	--
	06/06/17	2.79	9.93	10	1.366	3.86	219	556	960	<0.00093	0.00123	0.01012	0.00279	0.00041	0.00032	0.02216	<0.00068	0.03654	<0.000005	<0.00029	<0.00099	<0.00086	1.902	--	--
	10/05/17	--	--	--	--	4.43	162	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	1.48	4.37	10	<0.083	3.77	75.3		558	0.00417	0.00127	0.01281	0.00148	0.00053	0.00041	0.00935	<0.00068	0.01978	<0.000005	0.00094	0.00103	<0.00086	1.264	1.35	0.063
	Dissolved	*1.45*	*4.28*	--	--	3.77	75.3	--	--	*<0.00093*	*0.00278*	*0.01202*	*0.00098*	*<0.00007*	*<0.00023*	*0.00877*	*<0.00068*	*0.01836*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.656*	1.25	0.062
	05/23/18	--	--	--	<0.083	*4.05*	*49.8*	--	--	<0.00093	0.0026 J	0.01627	0.00089 J	0.00018 J	0.0008 J	0.00863	<0.00068	0.01875	0.000007 J	<0.00029	0.00134 J	0.046	1.912	--	--
	08/15/18	1.84	6.61	15	<0.083	4.73	112	410	720	--	0.00105	0.0119	0.00118	0.00037	0.000257	0.0153	--	0.0175	<0.000005	--	0.0024	0.0002	2.6	--	--
	05/29/19	1.40	--	6.96	0.47	--	67.6	367	680	<0.0001	0.00113	0.0182	0.00138	0.0002 J	0.0004 J	0.00969	0.000804	0.02 J	<0.000005	<0.002	0.0022	<0.0005	--	1.46	0.0669
AD-13	05/31/16	1.19	8.02	12	<1	6.05		177	900	<0.005	<0.005	0.062	<0.001	<0.001	<0.001	<0.005	<0.005	0.011	<0.000025	<0.005	<0.005	<0.002	1.22	--	--
	07/27/16	1.23	3.7	15	1	6.05		187	--	<0.005	<0.005	0.036	<0.001	<0.001	<0.001	<0.005	<0.005	0.026	<0.000025	<0.005	<0.005	<0.002	1.601	--	--
	09/29/16	1.37	2.7	17	1	4.56		207	431	<0.005	<0.005	0.04	<0.001	<0.001	<0.001	<0.005	<0.005	0.02	<0.000025	<0.005	<0.005	<0.002	2.213	--	--
	10/19/16	1.67	3.66	19	1	4.34		226	482	<0.005	<0.005	0.03	<0.001	<0.001	<0.001	<0.005	<0.005	0.022	<0.000025	<0.005	<0.005	<0.002	3.662	--	--
	12/05/16	--	--	--	--	--		--	532	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/13/16	1.96	3.77	18	1	4.79		287	596	<0.005	<0.005	0.051	0.001	<0.001	0.007	0.007	<0.005	0.025	<0.000025	<0.005	<0.005	<0.002	2.27	--	--
	01/19/17	0.402	33.5	7	<1	5.38		90	222	<0.005	0.006	0.112	<0.001	<0.001	0.004	<0.005	<0.005	0.004	<0.000025	<0.005	<0.005	<0.002	2.228	--	--
	02/23/17	1.27	10.3	13	<1	5.06		183	392	<0.005	<0.005	0.041	<0.001	<0.001	<0.001	<0.005	<0.005	0.015	<0.000025	<0.005	<0.005	<0.002	1.556	--	--
	06/06/17	1.68	3.03	15	0.6679	4.22	171	244	494	0.00153	<0.00105	0.01712	0.00089	0.00014	<0.00023	0.00624	<0.00068	0.02082	<0.000005	<0.00029	0.00103	<0.00086	1.565	--	--
	10/06/17	--	--	--	--	4.61	173	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	1.42	7.48	10	0.5362	4.20	1.4		532	<0.00093	<0.00105	0.0216	0.00088	0.00011	<0.00023	0.00809	<0.00068	0.02603	<0.000005	<0.00029	<0.00099	<0.00086	2.064	0.858	0.046
	Dissolved	*1.41*	*7.31*	--	--	4.20	1.4	--	--	*<0.00093*	*<0.00105*	*0.02097*	*0.0008*	*<0.00007*	*<0.00023*	*0.00784*	*<0.00068*	*0.02439*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.407*	0.712	0.045
	05/23/18	--	--	--	0.6534 J	*4.52*	*52.7*	--	--	<0.00093	<0.00105	0.02653	0.00087 J	<0.00007	0.00073 J	0.00937	<0.00068	0.0291	0.000008 J	<0.00029	<0.00099	<0.043	2.16	--	--
	08/14/18	1.49	10.1	18	0.7442	4.82	131	316	620	--	0.00137	0.0169	0.000971	0.00031	0.000503	0.0131	--	0.0321	<0.000005	--	0.0017	0.000277	4.0	--	--
	05/30/19	0.477	--	3.6	0.53	--	83.6	94	196	0.00003 J	0.00032	0.0609	0.000385	0.00007	0.00031	0.00315	0.00005 J	0.009 J	<0.000005	<0.0004	0.0004	<0.0001	--	0.086	0.0141

Table 4-3
Groundwater Sampling Analytical Results (mg/L) - Landfill
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

ARCADIS Design & Consultancy for natural and built assets

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
AD-14	05/31/16	1.28	2.88	4	<1	4.75	--	115	285	<0.005	<0.005	0.031	<0.001	<0.001	<0.001	0.010	<0.005	0.012	0.00003	<0.005	<0.005	<0.002	0.87	--	--
	07/27/16	1.14	2.51	5	<1	4.75	--	111	267	<0.005	<0.005	0.084	<0.001	<0.001	0.001	0.009	<0.005	0.024	<0.000025	<0.005	<0.005	<0.002	1.487	--	--
	09/29/16	1.14	1.19	5	<1	4.17	--	111	252	<0.005	<0.005	0.03	<0.001	<0.001	<0.001	0.009	<0.005	0.015	<0.000025	<0.005	<0.005	<0.002	4.817	--	--
	10/19/16	1.25	2.48	4	<1	3.88	--	118	276	<0.005	<0.005	0.039	<0.001	0.001	<0.001	0.009	<0.005	0.014	<0.000025	<0.005	<0.005	<0.002	1.972	--	--
	12/12/16	1.25	2.41	5	<1	4.11	--	101	296	<0.005	<0.005	0.047	<0.001	0.001	0.001	0.009	<0.005	0.013	0.000037	<0.005	<0.005	<0.002	1.271	--	--
	01/17/17	0.915	10.3	4	<1	6.07	--	92	254	<0.005	<0.005	0.038	<0.001	<0.001	<0.001	<0.005	<0.005	0.013	<0.000025	<0.005	<0.005	<0.002	1.825	--	--
	02/22/17	1.06	9.48	4	<1	5.39	--	90	212	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	<0.005	<0.005	0.012	<0.000025	<0.005	<0.005	<0.002	0.512	--	--
	06/06/17	1.26	7.69	6	<0.083	4.77	167	108	256	<0.00093	<0.00105	0.04483	0.00038	0.00067	0.00127	0.00678	<0.00068	0.0127	0.000021	<0.00029	0.00261	<0.00086	1.138	--	--
	10/06/17	--	--	--	--	4.57	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	1.61	4.67	11	<0.083	4.11	5.1	--	332	<0.00093	<0.00105	0.03161	0.00094	0.00204	<0.00023	0.01501	<0.00068	0.01638	0.000137	<0.00029	0.00221	<0.00086	1.097	0.09	0.008
	Dissolved	*1.56*	*4.55*	--	--	4.11	5.1	--	--	*<0.00093*	*<0.00105*	*0.02938*	*0.00094*	*0.00193*	*<0.00023*	*0.01476*	*<0.00068*	*0.01523*	*0.000149*	*<0.00029*	*0.00387*	*<0.00086*	*0.5903*	0.06	0.007
	05/23/18	--	--	--	<0.083	4.17	43.2	--	--	<0.00093	<0.00105	0.02817	0.00078 J	0.00161	<0.00023	0.01434	<0.00068	0.0152	0.000145	<0.00029	0.00362	<0.043	1.601	--	--
	08/14/18	1.51	4.51	12	<0.083	4.27	198	204	384	--	0.00039	0.024	0.000854	0.00199	0.000276	0.0176	--	0.011	0.000181	--	0.0037	0.000242	1.5	--	--
	05/29/19	1.21	--	3.65	0.19	--	20.6	122	274	<0.0001	0.0005	0.0434	0.000709	0.00087	0.0002 J	0.00774	0.0001 J	0.02 J	0.000181	<0.0002	0.0019	<0.0005		0.005 J	0.00023
Supplemental Downgradient Monitoring Well																									
AD-10	5/16/2018	0.08311	15.5	40	<0.083	3.72	<100	--	280	<0.00093	0.0022	0.03855	0.00166	0.00033	<0.00023	0.02432	<0.00068	0.316	<0.000005	<0.00029	<0.00099	0.00098	1.704	0.338	0.25
	Dissolved	*0.07733*	*15.3*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.03712*	*0.00149*	*0.00009*	*<0.00023*	*0.02412*	*<0.00068*	*0.296*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*1.505*	0.282	0.251
Supplemental Sidegradient Monitoring Wells																									
Temp-1	5/17/2018	0.662	26.2	34	<0.083	4.90	23.8	--	556	<0.00093	<0.00105	0.07752	0.00058	<0.00007	0.00102	0.01058	<0.00068	0.01075	<0.000005	<0.00029	<0.00099	<0.00086	1.277	1.94	0.203
	Dissolved	*0.621*	*24.6*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.06778*	*0.00042*	*<0.00007*	*<0.00023*	*0.00946*	*<0.00068*	*0.00986*	*<0.000005*	*<0.00029*	*<0.00099*	*0.00191*	*2.278*	0.813	0.192
AD-12	6/19/2019	0.569	34.1	44.1	0.32	6.3	40.1	131	436	<0.0001	0.00123	0.0581	0.0004 J	0.00005 J	0.0003 J	0.0126	<0.0001	0.042	<0.000002	<0.002	0.0005 J	<0.0005	2.007	25.9	--
EPA MCLs:																									
MCL					4					0.006	0.01	2	0.004	0.005	0.1				0.002		0.05	0.002	5[c]		
Rule Specified																0.006	0.015	0.04		0.1					
Background Limit					1					0.005	0.005	0.36	0.00077	0.0065[b]	0.004	0.075[b]	0.005	0.39[b]	0.000033	0.005	0.005	0.0013	4.21[c]		
Interwell Background Value(s) (UPL, LPL where applicable) AD-8, AD-9, AD-15		0.775				4.8-7.1																			
Intrawell Background Value (UPL) AD-8			35.7	38.3	1.03			236	569																
Intrawell Background Value (UPL) AD-9			350	139	0.73			2527	3147																
Intrawell Background Value (UPL) AD-15			5.71	38.4	1.00			35.6	388																

NOTES:
All concentration data are provided in milligrams per liter (mg/L) unless otherwise noted.
J = Analyte was positively identified, though the quantitation was below Reporting Limit.
MCL = Maximum contaminant level
LPL = Lower prediction limit
UPL = Upper prediction limit
pCi/L = PicoCuries per liter
-- = Not analyzed
a = Data taken from Geosyntec "Statistical Analysis Summary, Primary Bottom Ash Pond" dated July 11, 2019.
b = Calculated Upper Tolerance Limit is higher than MCL.
c = Data is "Combined Radium, Total".
d = AD-18 is not part of the designated CCR Monitoring Well Network and used for background understanding only
Denotes groundwater sample collected by ARCADIS using low-flow methods.
Unless otherwise noted, values shown are total (unfiltered) analyses.
Dissolved (0.45-micron lab filtered) parameter concentrations shown in italics.

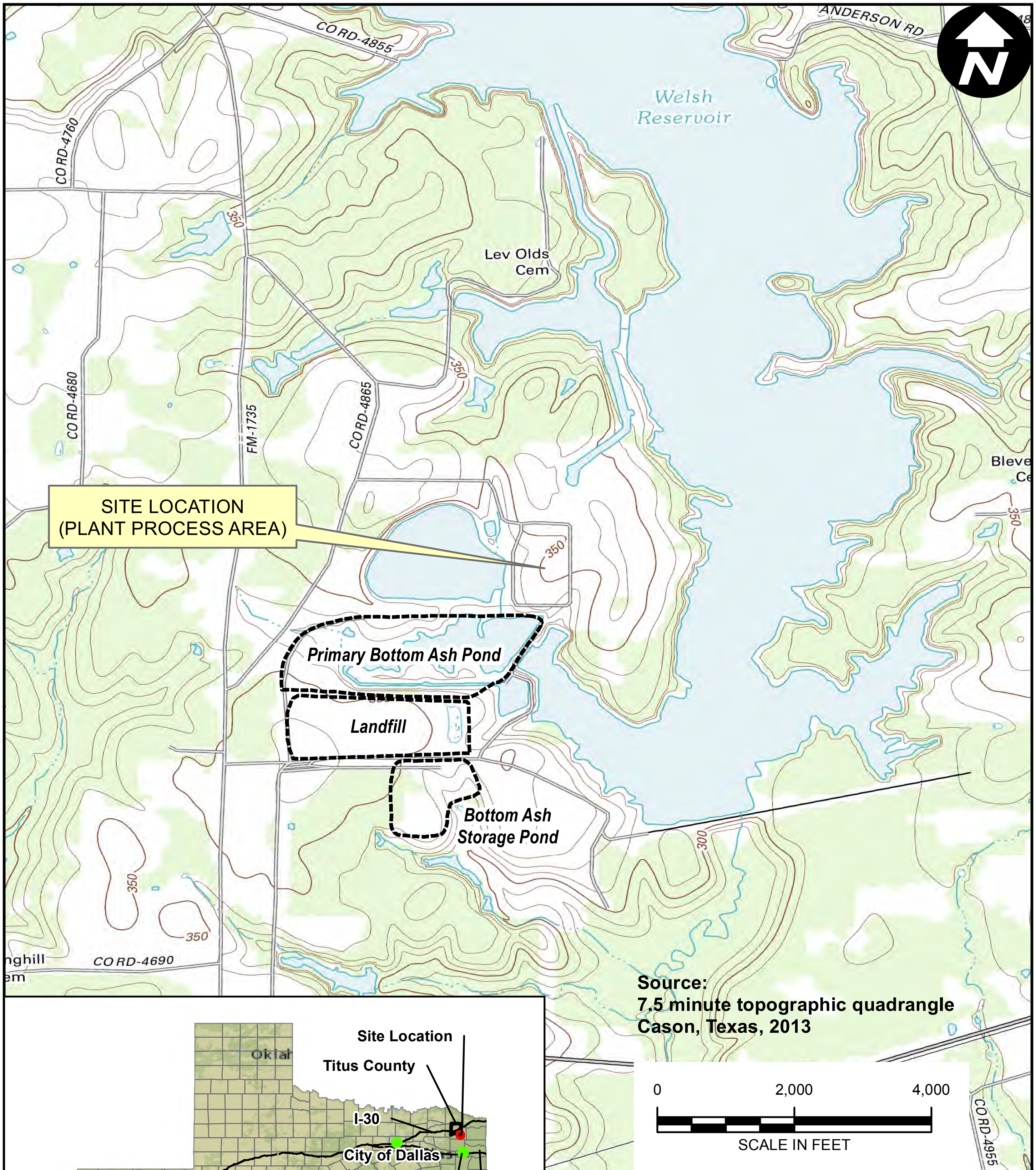
		Appendix III Parameters								Appendix IV Parameters															
Well	Date Sampled	Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Background (Upgradient) Wells																									
AD-1	05/26/16	0.346	36.5	5	<1	5.93	--	42	252	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.010	0.000033	<0.005	<0.005	<0.002	1.18	--	--
	07/27/16	0.350	39.6	4	<1	5.93	--	36	239	<0.005	<0.005	0.191	<0.001	<0.001	<0.001	<0.005	<0.005	0.019	<0.000025	<0.005	<0.005	<0.002	0.9952	--	--
	09/29/16	0.332	15	5	<1	5.37	--	35	173	<0.005	<0.005	0.141	<0.001	<0.001	0.005	<0.005	<0.005	0.014	<0.000025	<0.005	<0.005	<0.002	1.38	--	--
	10/19/16	0.398	19.1	4	<1	5.15	--	42	192	<0.005	<0.005	0.114	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	1.141	--	--
	12/12/16	0.394	8.74	4	<1	5.18	--	40	200	<0.005	<0.005	0.072	<0.001	<0.001	<0.001	<0.005	<0.005	0.008	<0.000025	<0.005	<0.005	<0.002	0.719	--	--
	01/17/17	0.656	129	4	<1	7.13	--	68	538	<0.005	<0.005	0.410	<0.001	<0.001	<0.001	<0.005	<0.005	<0.001	<0.000025	<0.005	<0.005	<0.002	3.009	--	--
	02/23/17	0.700	147	9	<1	6.88	--	68	612	<0.005	<0.005	0.488	<0.001	<0.001	<0.001	<0.005	<0.005	0.001	<0.000025	<0.005	<0.005	<0.002	4.309	--	--
	06/07/17	0.449	15.1	4	<0.083	5.06	109	42	176	<0.00093	0.00114	0.09346	0.00037	<0.00007	0.00066	0.00077	<0.00068	0.00902	0.000007	<0.00029	0.0021	<0.00086	0.676	--	--
	10/06/17	--	--	--	--	5.25	97.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.352	12.1	3	<0.083	4.82	8.4	--	174	<0.00093	<0.00105	0.08823	0.00048	<0.00007	<0.00023	0.0008	<0.00068	0.00816	<0.000005	<0.00029	<0.00099	<0.00086	0.837	0.03	0.025
	Dissolved	*0.35*	*12*	--	--	4.82	8.4	--	--	*<0.00093*	*<0.00105*	*0.08582*	*0.00044*	*<0.00007*	*<0.00023*	*0.00083*	*<0.00068*	*0.00799*	*<0.000005*	*<0.00029*	*0.00197*	*<0.00086*	*0.531*	0.01	0.026
	05/24/18	0.345	10.2	4	<0.083	5.19	118	43	150	0.00317 J	<0.00105	0.0799	0.00039 J	<0.00007	<0.00023	0.00035 J	<0.00068	0.00814	0.000006 J	<0.00029	0.00138 J	<0.00086	1.983	--	--
	08/14/18	0.443	5.95	5	<0.083	5.18	102	44	160	0.00003 J	0.00021	0.063	0.000482	0.00002	0.00016	0.000797	0.000238	0.00708	0.000013 J	0.00021	0.0017	0.00003 J	1.10	--	--
	02/20/19	0.504	142	2.82	0.24	7.31	113	49.2	522	0.00016	0.00046	0.457	0.00009 J	0.00001 J	0.000306	0.000399	0.000124	0.00155	<0.000025	0.001 J	0.0007	<0.0005	3.16	--	--
	05/30/19	0.689	--	1.59	0.29	--	61.3	43.3	588	0.00016	0.00060	0.512	0.000244	0.00001 J	0.0001 J	0.000756	0.000197	<0.009	<0.000005	0.00243	0.0014	<0.0001	--	0.099	0.0625
AD-5	05/31/16	0.03	36.9	15	<1	6.38	--	123	337	<0.005	<0.005	0.057	<0.001	<0.001	<0.001	0.014	<0.005	0.135	<0.000025	<0.005	<0.005	<0.002	1.63	--	--
	07/28/16	0.04	44.7	16	<1	6.38	--	163	360	<0.005	<0.005	0.093	<0.001	<0.001	<0.001	0.015	<0.005	0.191	<0.000025	<0.005	<0.005	<0.002	4.75	--	--
	09/29/16	0.04	46.3	15	<1	5.29	--	190	416	<0.005	<0.005	0.087	<0.001	<0.001	<0.001	0.014	<0.005	0.186	<0.000025	<0.005	<0.005	<0.002	3.33	--	--
	10/20/16	0.05	50.7	14	<1	5.92	--	267	448	<0.005	<0.005	0.07	<0.001	<0.001	<0.001	0.009	<0.005	0.225	<0.000025	<0.005	<0.005	<0.002	2.319	--	--
	12/13/16	0.05	49.6	13	<1	6.29	--	233	484	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	0.013	<0.005	0.199	<0.000025	<0.005	<0.005	<0.002	2.182	--	--
	01/17/17	0.04	49.8	14	<1	6.27	--	234	438	<0.005	<0.005	0.047	<0.001	<0.001	<0.001	0.012	<0.005	0.239	<0.000025	<0.005	<0.005	<0.002	1.023	--	--
	02/23/17	0.04	33.0	15	<1	5.48	--	127	286	<0.005	<0.005	0.042	<0.001	<0.001	<0.001	0.013	<0.005	0.166	<0.000025	<0.005	<0.005	<0.002	1.788	--	--
	06/07/17	0.05281	49.7	14	<0.083	5.96	867	82	300	<0.00093	0.00385	0.0877	0.00008	0.00039	0.00028	0.01193	<0.00068	0.124	<0.000005	<0.00029	<0.00099	<0.00086	2.32	--	--
	10/06/17	--	--	--	--	5.59	249	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.05063	30.1	21	<0.083	5.79	<100	--	248	<0.00093	<0.00105	0.07627	0.00014	0.00037	<0.00023	0.01907	<0.00068	0.118	<0.000005	<0.00029	<0.00099	<0.00086	1.495	14.4	0.45
	Dissolved	*0.03752*	*29.1*	--	--	5.79	<100	--	--	*<0.00093*	*<0.00105*	*0.06865*	*<0.00002*	*<0.00007*	*<0.00023*	*0.01747*	*<0.00068*	*0.119*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.043*	*2.051*	8.38	0.43
	05/24/18	0.05007	28.1	22	<0.083	6.22	17.8	60	242	<0.00093	<0.00105	0.07116	<0.00002	0.00023 J	0.0008 J	0.01424	<0.00068	0.121	<0.000005	<0.00029	<0.00099	<0.00086	1.946	--	--
	08/15/18	0.05	40.5	19	<0.083	6.23	57.1	240	428	0.00001 J	0.00169	0.0637	0.000055	0.000008 J	0.000072	0.0114	0.000079	0.147	<0.000005	0.00013	0.00008 J	<0.01	0.316	--	--
	02/21/19	0.033	33.9	24.7	0.21	5.38	164	46.5	220	0.00002 J	0.00159	0.0694	0.00008 J	<0.00005	0.000432	0.00858	0.000147	0.0807	<0.000025	<0.002	0.0001 J	<0.0005	1.27	--	--
	05/30/19	0.03 J	--	22.3	0.29	--	150	51.3	238	<0.00002	0.00305	0.0605	0.00008 J	<0.00001	0.00006 J	0.0118	0.00005 J	0.104	0.000006	<0.0004	0.00005 J	<0.0001	--	23.4	0.331
AD-17	05/26/16	0.121	200	43	<1	7.17	--	1,166	1,810	<0.005	<0.005	0.021	<0.001	0.002	0.001	0.063	<0.005	0.370	0.000032	<0.005	<0.005	<0.002	1.53	--	--
	07/27/16	0.119	195	32	<1	7.17	--	1,005	1,576	<0.005	<0.005	0.020	<0.001	0.004	0.001	0.068	<0.005	0.374	<0.000025	<0.005	<0.005	<0.002	2.78	--	--
	09/29/16	0.111	191	36	<1	6.17	--	1,055	1,663	<0.005	<0.005	0.031	<0.001	<0.001	0.003	0.058	<0.005	0.354	<0.000025	<0.005	<0.005	<0.002	2.358	--	--
	10/20/16	0.124	194	32	1.0	6.14	--	1,163	1,612	<0.005	<0.005	0.034	<0.001	0.002	0.004	0.065	<0.005	0.394	<0.000025	<0.005	<0.005	<0.002	2.224	--	--
	12/13/16	0.135	196	31	<1	6.03	--	1,096	1,560	<0.005	<0.005	0.017	<0.001	0.003	<0.001	0.068	<0.005	0.323	<0.000025	<0.005	<0.005	<0.002	2.384	--	--
	01/17/17	0.101	196	33	<1	5.96	--	1,445	1,686	<0.005	<0.005	0.014	<0.001	0.003	0.068	0.068	<0.005	0.341	<0.000025	<0.005	<0.005	<0.002	2.436	--	--
	02/22/17	0.135	189	30	<1	5.67	--	1,055	1,628	<0.005	<0.005	0.020	<0.001	0.002	0.001	0.073	<0.005	0.331	<0.000025	<0.005	<0.005	<0.002	2.288	--	--
	06/06/17	0.121	188	30	<0.083	5.81	156	1,105	1,578	<0.00093	<0.00105	0.01033	<0.00002	0.00606	<0.00023	0.0748	<0.00068	0.329	0.000013	<0.00029	<0.00099	<0.00086	1.598	--	--
	10/05/17	--	--	--	--	5.92	598	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.247	213	45	<0.083	5.51	<100	--	1,846	<0.00093	<0.00105	0.00978	<0.00002	0.00915	<0.00023	0.07451	<0.00068	0.306	<0.000005	<0.00029	0.00414	<0.00086	1.514	260	3.72
	Dissolved	*0.231*	*205*	--	--	5.51	<100	--	--	*<0.00093*	*<0.00105*	*0.00737*	*<0.00002*	*0.00609*	*<0.00023*	*0.07938*	*<0.00068*	*0.301*	*<0.000005*	*<0.00029*	*0.00515*	*0.02*	*1.57*	241	3.56
	05/24/18	0.239	193	39	<0.083	6.28	7.8	1,067	1,836	<0.00093	<0.00105	0.00965	<0.00002	0.00646	<0.00023	0.07173	<0.00068	0.308	<0.000005	<0.00029	<0.00099	<0.00086	1.939	--	--
	08/15/18	0.118	187	40	<0.083	5.6	418	1,170	1,750	0.00002 J	0.00183	0.0128	0.000069	0.00025	0.000604	0.0435	0.0011	0.243	0.000011 J	0.00035	0.0003	0.000074	2.35	--	--
	02/21/19	0.151	207	43.2	0.180	6.93	274	1,060	1,720	0.00008 J	0.00251	0.120	0.00024	0.00027	0.00334	0.0645	0.00249	0.268	0.000007 J	0.0007 J	0.0008	<0.0005	2.66	--	--
	05/30/19	0.158	--	41.7	<0.04	--	176	1,120	1,546	<0.00002	0.00041	0.0196	0.00002 J	0.00003 J	0.000246	0.0511	0.00003 J	0.341	<0.000005	<0.0004	0.00006 J	<0.0001	--	145	3.40
AD-18[c]	05/26/16	0.146	409	422	<1	5.1	--	5,135	10,000	<0.005	<0.005	0.012	0.014	0.003	<0.001	0.922	<0.005	2.07	0.000168	<0.005	0.006	0.003	12.58	--	--
	07/27/16	0.148	457	432	2	5.1	--	4,930	9,476	<0.005	<0.005	0.019	0.005	0.002	<0.001	0.734	<0.005	1.94	0.000091	<0.005	0.007	0.003	10.62	--	--
	09/29/16	0.156	469	637	4	5.59	--	4,632	9,569	<0.005	<0.005	0.02	0.004	<0.001	<0.001	0.666	<0.005	1.86	0.000117	<0.005	0.007	<0.002	7.05	--	--
	10/20/16	0.188	498	876	0.8664	5.7	--	5,537	9,540	<0.005	<0.005	0.021	0.002	0.001	<0.001	0.569	<0.005	2.06	0.000053	<0.005	<0.005	<0.002	5.82	--	--
	12/13/16	0.178	510	695	5	5.75	--	4,382	8,912	<0.005	<0.005	0.021	0.007	0.001	<0.001	0.641	<0.005	1.74	0.00005	<0.005	<0.005	<0.002	9.60	--	--
	01/17/17	0.050	412	159	5	4.49	--	5,414	8,562	<0.005	0.01	0.014	0.022	0.001	<0.001	0.929	<0.005	1.95	0.000224	<0.005	<0.005	0.002	22.51	--	--
	02/22/17	0.090	401	151	6	4.37	--	5,169	8,412	<0.005	<0.005	0.014	0.026	0.002	<0.001	0.961	<0.005	1.82	0.000107	<0.005	<0.005	0.00228	19.11	--	--
	06/06/17	0.125	428	304	6.53	4.27	121	5,920	9,394	<0.00093	0.00331	0.01038	0.01883	0.00303	<0.00023	0.940	<0.00068	2.15	0.000113	<0.00029	0.00212	<0.00086	16.12	--	--
	10/05/17	--	--	--	--	5.87	165	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/17/18	0.163	433	362	9.4	3.61	104.1	--	9,952	0.00224	0.00276	0.00813	0.01733	0.0036	0.00098	0.928	<0.00068	2.07	0.000043	<0.00029	0.00194	0.00144	19.95	19.7	14.1
	Dissolved	*0.153*	*423*	--	--	--	--	--	--	*0.00467*	*0.00189*	*0.00748*	*0.01676*	*0.00316*	*<0.00023*	*0.898*	*<0.00068*	*2.06*	*0.000012*	*<0.00029*	*0.00135*	*0.01466*	*18.09*	19.1	13.7
	05/30/19	0.09 J	--	390	3.56	--	91.3	*6,120*	9,564	<0.0002	0.04	0.009 J	0.021	0.004 J	<0.004	1.130	0.005 J	1.27	0.000035	<0.04	0.103	<0.01	--	11.2	7.53

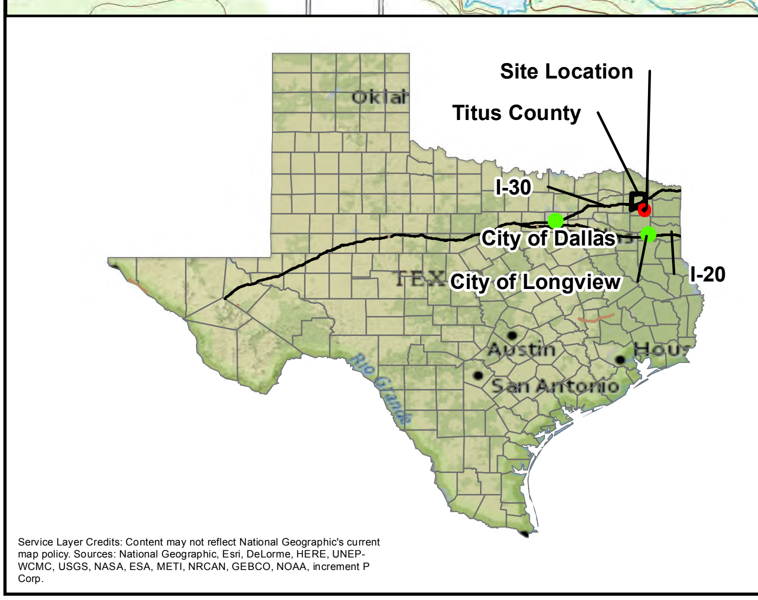
Table 4-4
Groundwater Sampling Analytical Results (mg/L) - Bottom Ash Storage Pond
AEP J. Robert Welsh Power Plant
Pittsburg, Titus County, Texas

Well	Date Sampled	Appendix III Parameters								Appendix IV Parameters															
		Boron (total)	Calcium (total)	Chloride	Fluoride	pH (field)	Turbidity (field)	Sulfate	TDS	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Radium 226 and 228 (pCi/L)	Iron	Manganese
Point of Compliance Wells																									
AD-3	05/31/16	0.02	1.41	9	<1	6.58	--	4	106	<0.005	<0.005	0.053	<0.001	<0.001	<0.001	<0.005	<0.005	0.010	0.00085	<0.005	<0.005	<0.002	1.02	--	--
	07/27/16	0.02	0.706	8	<1	6.58	--	5	118	<0.005	<0.005	0.036	<0.001	<0.001	<0.001	<0.005	<0.005	0.024	0.000589	<0.005	<0.005	<0.002	0.1786	--	--
	09/30/16	0.02	<0.5	9	<1	4.75	--	6	127	<0.005	<0.005	0.043	<0.001	<0.001	<0.001	<0.005	<0.005	0.019	0.00039	<0.005	<0.005	<0.002	0.552	--	--
	10/19/16	0.06	0.794	8	<1	3.71	--	9	112	<0.005	<0.005	0.041	<0.001	<0.001	<0.001	<0.005	<0.005	0.018	0.000351	0.006	<0.005	<0.002	1.589	--	--
	12/12/16	0.02	1.05	8	<1	4.67	--	11	138	<0.005	<0.005	0.045	<0.001	<0.001	<0.001	<0.005	<0.005	0.017	0.000321	<0.005	<0.005	<0.002	0.546	--	--
	01/19/17	0.02	0.746	9	<1	4.60	--	4	76	<0.005	<0.005	0.041	<0.001	<0.001	<0.001	<0.005	<0.005	0.014	0.000504	<0.005	<0.005	<0.002	0.229	--	--
	02/23/17	0.02	0.573	9	<1	4.69	--	5	104	<0.005	<0.005	0.037	<0.001	<0.001	<0.001	<0.005	<0.005	0.014	0.000501	<0.005	<0.005	<0.002	0.4592	--	--
	06/07/17	0.03326	0.543	9	0.2625	4.49	56.6	5	104	<0.00093	0.00191	0.038	0.00024	0.00008	0.00075	0.00128	<0.00068	0.01503	0.000365	<0.00029	<0.00099	<0.00086	0.459	--	--
	10/06/17	--	--	--	--	5.15	65.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/15/18	0.01869	0.56	9	<0.083	4.31	11.1		132	0.00166	0.0016	0.0365	0.00034	0.00008	<0.00023	0.00136	<0.00068	0.01459	0.00037	<0.00029	0.00323	0.00127	0.016	0.188	0.004
	Dissolved	*0.01132*	*0.595*	--	--	4.31	11.1	--	--	*<0.00093*	*<0.00105*	*0.0361*	*0.00023*	*<0.00007*	*<0.00023*	*0.00133*	*<0.00068*	*0.01445*	*0.000379*	*<0.00029*	*<0.00099*	*<0.00086*	*0.242*	< 0.01	0.004
	05/24/18	0.0069 J	0.545	8	<0.083	4.58	8.50	3	98	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/19	<0.02	--	9.03	0.18	--	57.2	2.3	110	0.00006 J	0.00103	0.0632	0.000158	0.00005 J	0.000316	0.00171	0.000382	0.03 J	0.000245	<0.0004	0.0003	<0.0001	--	*1.54*	0.011
AD-4c	05/31/16	0.05	0.798	10	<1	5.41	--	32	204	<0.005	<0.005	0.088	<0.001	<0.001	0.009	<0.005	<0.005	0.004	0.000191	<0.005	<0.005	<0.002	1.29	--	--
	07/27/16	0.03	0.666	12	<1	5.41	--	35	208	<0.005	<0.005	0.059	<0.001	<0.001	0.004	<0.005	<0.005	0.015	0.000185	<0.005	<0.005	<0.002	0.5075	--	--
	09/29/16	0.02	<0.5	11	<1	4.96	--	45	212	<0.005	<0.005	0.074	<0.001	<0.001	0.008	<0.005	<0.005	0.006	0.00016	<0.005	<0.005	<0.002	2.572	--	--
	10/19/16	0.04	0.578	10	<1	4.30	--	35	212	<0.005	<0.005	0.069	<0.001	<0.001	0.009	<0.005	<0.005	0.006	0.000141	<0.005	<0.005	<0.002	1.657	--	--
	12/12/16	0.02	0.341	11	<1	4.62	--	36	252	<0.005	<0.005	0.021	<0.001	<0.001	<0.001	<0.005	<0.005	0.004	0.000143	<0.005	<0.005	<0.002	0.685	--	--
	01/19/17	0.02	0.761	10	<1	4.67	--	43	184	<0.005	<0.005	0.075	<0.001	<0.001	0.004	<0.005	<0.005	0.005	0.000125	<0.005	<0.005	<0.002	2.045	--	--
	02/23/17	0.02	0.467	9	<1	5.10	--	40	196	<0.005	<0.005	0.030	<0.001	<0.001	<0.001	<0.005	<0.005	0.004	0.000098	<0.005	<0.005	<0.002	0.517	--	--
	06/07/17	0.03331	0.573	10	<0.083	4.88	351	39	228	<0.00093	0.00119	0.05142	0.00019	0.00008	0.00403	0.00075	<0.00068	0.00482	0.000147	<0.00029	<0.00099	<0.00086	0.953	--	--
	10/06/17	--	--	--	--	5.38	308	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/16/18	0.0186	0.498	14	<0.083	4.67	6.40		232	<0.00093	<0.00105	0.02572	0.0001	<0.00007	0.00044	0.00049	<0.00068	0.00394	0.000228	<0.00029	<0.00099	<0.00086	0.435	0.592	< 0.001
	Dissolved	*0.02017*	*0.468*	--	--	4.67	6.40	--	--	*<0.00093*	*<0.00105*	*0.02223*	*0.00006*	*<0.00007*	*<0.00023*	*0.00043*	*<0.00068*	*0.0039*	*0.000031*	*<0.00029*	*<0.00099*	*<0.00086*	*0.354*	0.394	0.002
	05/24/18	0.02505	0.434	14	<0.083	*5.17*	*48.1*	42	224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/14/18	--	--	15	--	--	125	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/29/19	<0.02	--	14.8	0.16	--	158	52.8	208	<0.0004	0.0006 J	0.0295	<0.0004	<0.0002	<0.0008	<0.0004	<0.0004	<0.009	0.000206	<0.008	<0.0006	<0.002	--	0.327	0.0007 J
AD-16	01/26/16	0.05	2.81	6	<1	3.84	--	49	180	<0.005	0.02	0.198	0.002	<0.001	0.054	0.013	0.016	0.015	0.000259	<0.005	<0.005	<0.002	4.478	--	--
	03/21/16	0.04	2.04	6	<1	4.20	--	47	104	<0.005	<0.005	0.119	<0.001	<0.001	0.009	<0.005	<0.005	0.007	0.000114	<0.005	<0.005	<0.002	4.44	--	--
	05/31/16	0.03	1.55	6	<1	4.44	--	40	96	<0.005	<0.005	0.127	<0.001	<0.001	0.001	<0.005	<0.005	0.002	0.000037	<0.005	<0.005	<0.002	5.99	--	--
	07/27/16	0.04	3.42	7	<1	4.44	--	70	184	<0.005	0.01	0.123	0.002	<0.001	0.011	0.022	<0.005	0.035	0.000212	<0.005	<0.005	<0.002	7.21	--	--
AD-16R	06/06/17	0.04198	2.75	7	0.3438	3.68	46.9	54	204	<0.00093	0.00707	0.0464	0.00221	0.00103	0.00176	0.04174	<0.00068	0.0293	<0.000005	<0.00029	0.00198	<0.00086	6.66	--	--
	06/28/17	0.06398	1.24	6	0.2512	3.91	--	55	200	<0.00093	0.00528	0.04143	0.00216	0.00092	0.00095	0.04087	<0.00068	0.02932	<0.000005	<0.00029	<0.00099	<0.00086	12.11	--	--
	07/28/17	0.02841	1.92	7	<0.083	2.77	--	48	162	<0.00093	0.0037	0.04851	0.00217	0.00128	0.00107	0.04533	<0.00068	0.02617	0.000006	<0.00029	0.00127	0.00143	8.52	--	--
	08/02/17	0.03177	1.86	7	<0.083	3.00	--	49	174	<0.00093	0.00446	0.04961	0.00206	0.00122	0.00095	0.04311	<0.00068	0.02498	<0.000005	<0.00029	0.00174	0.00202	5.45	--	--
	10/06/17	--	--	--	--	3.29	31.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/15/18	0.04030	2.73	6	<0.083	3.18	0.0		212	0.00269	0.0074	0.04301	0.00278	0.00129	0.0007	0.04123	<0.00068	0.02977	<0.000005	0.00103	<0.00099	<0.00086	5.89	1.47	0.053
	Dissolved	*0.02614*	*2.59*	--	--	3.18	0.0	--	--	*<0.00093*	*0.00294*	*0.04155*	*0.0022*	*0.00071*	*0.00025*	*0.03996*	*<0.00068*	*0.0278*	*<0.000005*	*<0.00029*	*<0.00099*	*<0.00086*	*5.90*	0.599	0.05
	05/23/18	0.03202	2.53	6	<0.083	*3.79*	*36.9*	67	204	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/14/18	--	--	--	--	--	142	44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/19	<0.02	--	5.43	0.19	--	77.1	41.6	80	0.00002 J	0.00176	0.0724	0.000424	0.00008	0.000334	0.00438	0.00006 J	0.01 J	0.000296	<0.0004	0.0006	0.0002 J	--	0.072	0.0079
Supplemental Downgradient Monitoring Wells																									
AD-19	5/17/2018	0.07234	9.4	34	<0.083	5.72	42.1	--	372	<0.00093	<0.00105	0.05026	0.00073	<0.00007	0.00117	0.0111	<0.00068	0.02924	<0.000005	0.00078	0.00194	<0.00086	1.421	3.04	0.089
	Dissolved	*0.06293*	*8.76*	--	--	--	--	--	--	*<0.00093*	*<0.00105*	*0.04*	*0.00025*	*<0.00007*	*<0.00023*	*0.00965*	*<0.00068*	*0.02842*	*<0.000005*	*0.00041*	*<0.00099*	*0.012*	*2.577*	2.13	0.08
AD-20	10/31/18	0.029	3.14	18.4	0.09	4.88	13	12.5	140	0.00004	0.00185	0.205	0.000651	0.00114	0.000514	0.0161	0.000425	0.0126	<0.00005	<0.0004	0.0008	0.0003	4.16	1.11	0.0742
AD-21	10/30/18	0.025	5.0	17	0.23	5.04	0.0	27.4	180	0.00006	0.00124	0.0868	0.00181	0.00065	0.000263	0.0337	0.000148	0.034	<0.00005	<0.0004	0.0011	0.0002	3.76	3.13	0.154
EPA MCLs:																									
MCL					4					0.006	0.01	2	0.004	0.005	0.1				0.002	N/A	0.05	0.002	5[b]		
Rule Specified																0.006	0.015	0.04		0.1					
Background Limit					1					0.005	0.005	0.36	0.00077	0.0065[a]	0.004	0.075[a]	0.005	0.39[a]	0.000033	0.005	0.005	0.0013	4.21[b]		
Interwell Background Value(s) (UPL, LPL where applicable) AD-8, AD-9, AD-15		0.775				4.8-7.1																			
Intrawell Background Value (UPL) AD-8			35.7	38.3	1.03			236	569																
Intrawell Background Value (UPL) AD-9			350	139	0.73			2527	3147																
Intrawell Background Value (UPL) AD-15			5.71	38.4	1.00			35.6	388																

NOTES:
All concentration data are provided in milligrams per liter (mg/L) unless otherwise noted.
J = Analyte was positively identified, though the quantitation was below Reporting Limit.
MCL = Maximum contaminant level
LPL = Lower prediction limit
UPL = Upper prediction limit
pCi/L = PicoCuries per liter.
-- = Not analyzed.
a = Calculated Upper Tolerance Limit is higher than MCL.
b = Data is "Combined Radium, Total".
c = AD-18 is not part of the designated CCR Monitoring Well Network and used for background understanding only
Denotes groundwater sample collected by ARCADIS using low-flow sampling methods.
Unless otherwise noted, values shown are total (unfiltered) analyses.
Dissolved (0.45-micron lab filtered) parameter concentrations shown in italics.

FIGURES





J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1-1

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\Dec2017Update\fig 1 - site map.mxd

Legend

Coal Combustion Residual (CCR) Unit

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

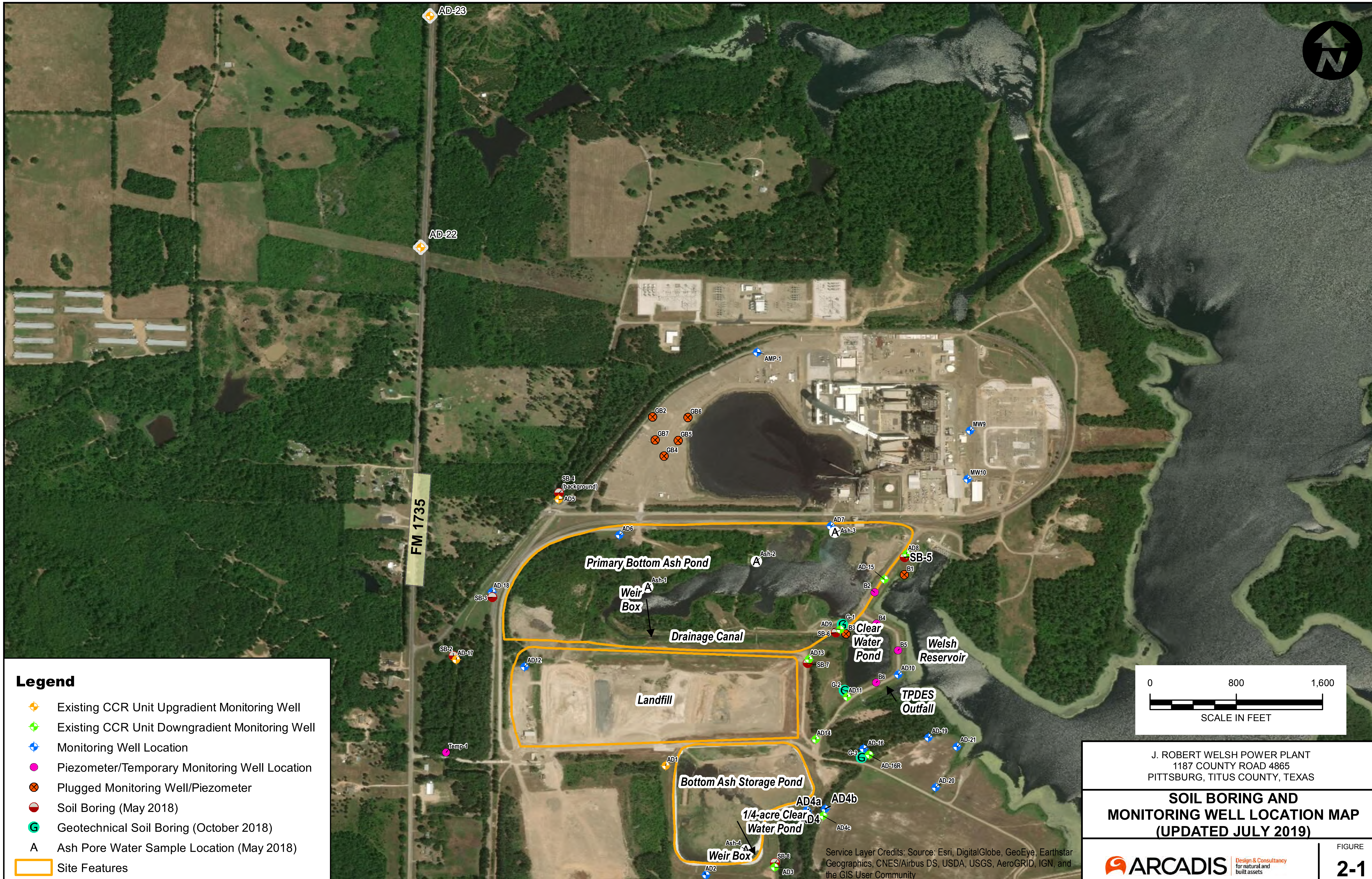
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

PLANT AND CCR UNIT LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1-2

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\Dec2017Update\fig 1-2 - CCR location.mxd



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PITTSBURG, TITUS COUNTY, TEXAS

SOIL BORING AND MONITORING WELL LOCATION MAP (UPDATED JULY 2019)

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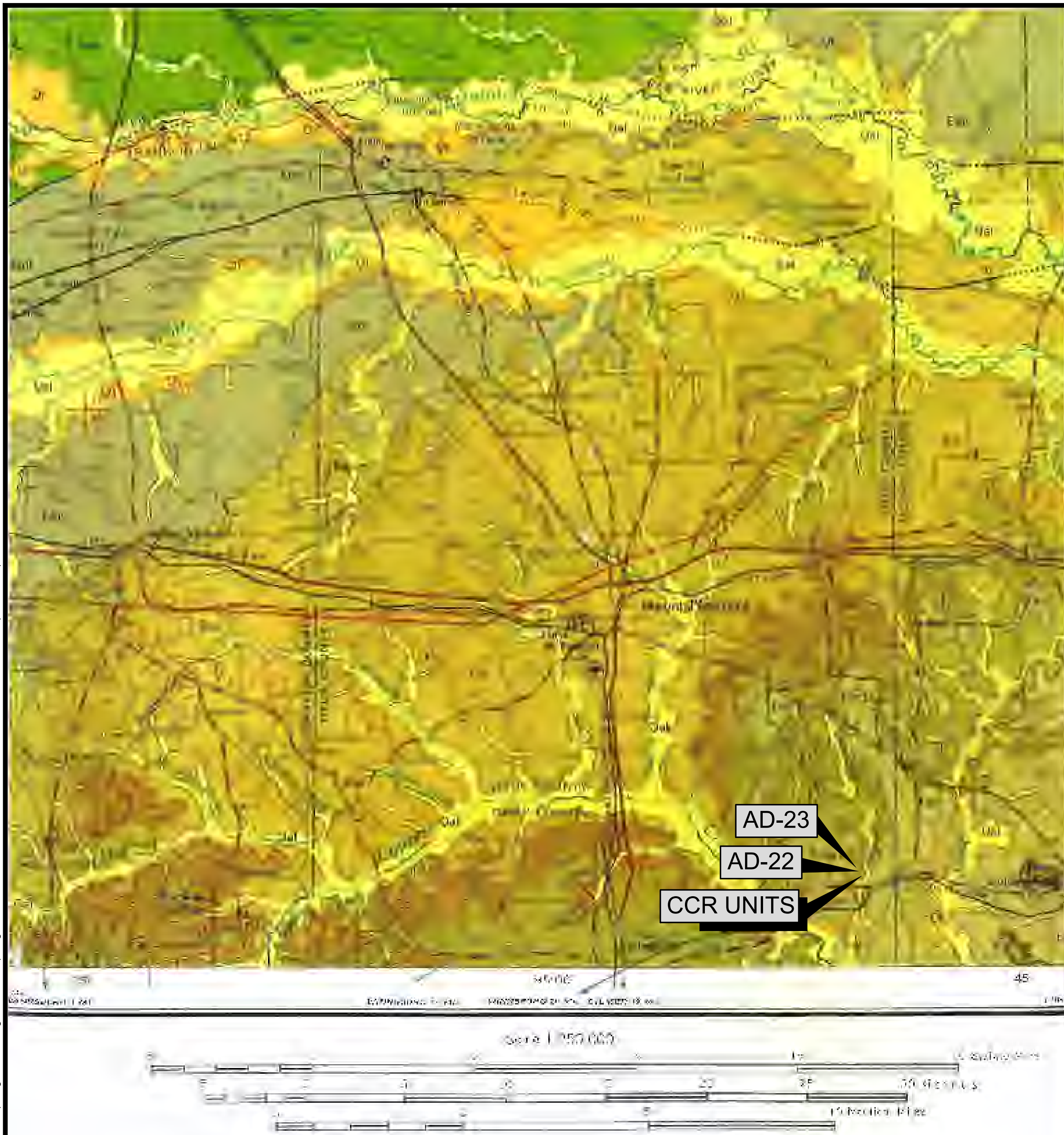
FIGURE 2-1

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\September 2019\Fig 2-1-SoilBoring_MonitoringWellLocations.mxd



REF: "GEOLOGIC ATLAS OF TEXAS, TEXARKANA SHEET", UNIVERSITY OF TEXAS AT AUSTIN BUREAU OF ECONOMIC GEOLOGY, 1966.

J. ROBERT WELSH POWER PLANT
PITTSBURG, TITUS COUNTY, TEXAS

RE□IONA□ □EO□O□IC MA□

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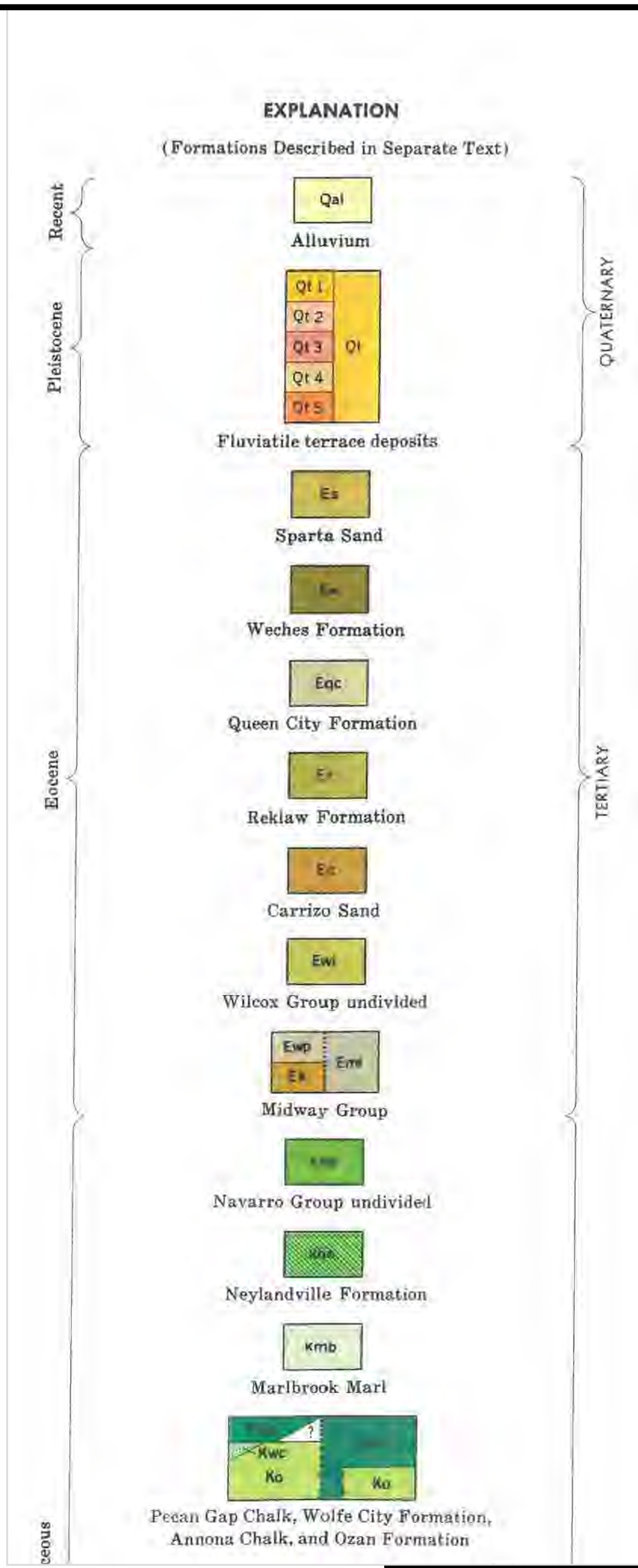
FIGURE
2-2A



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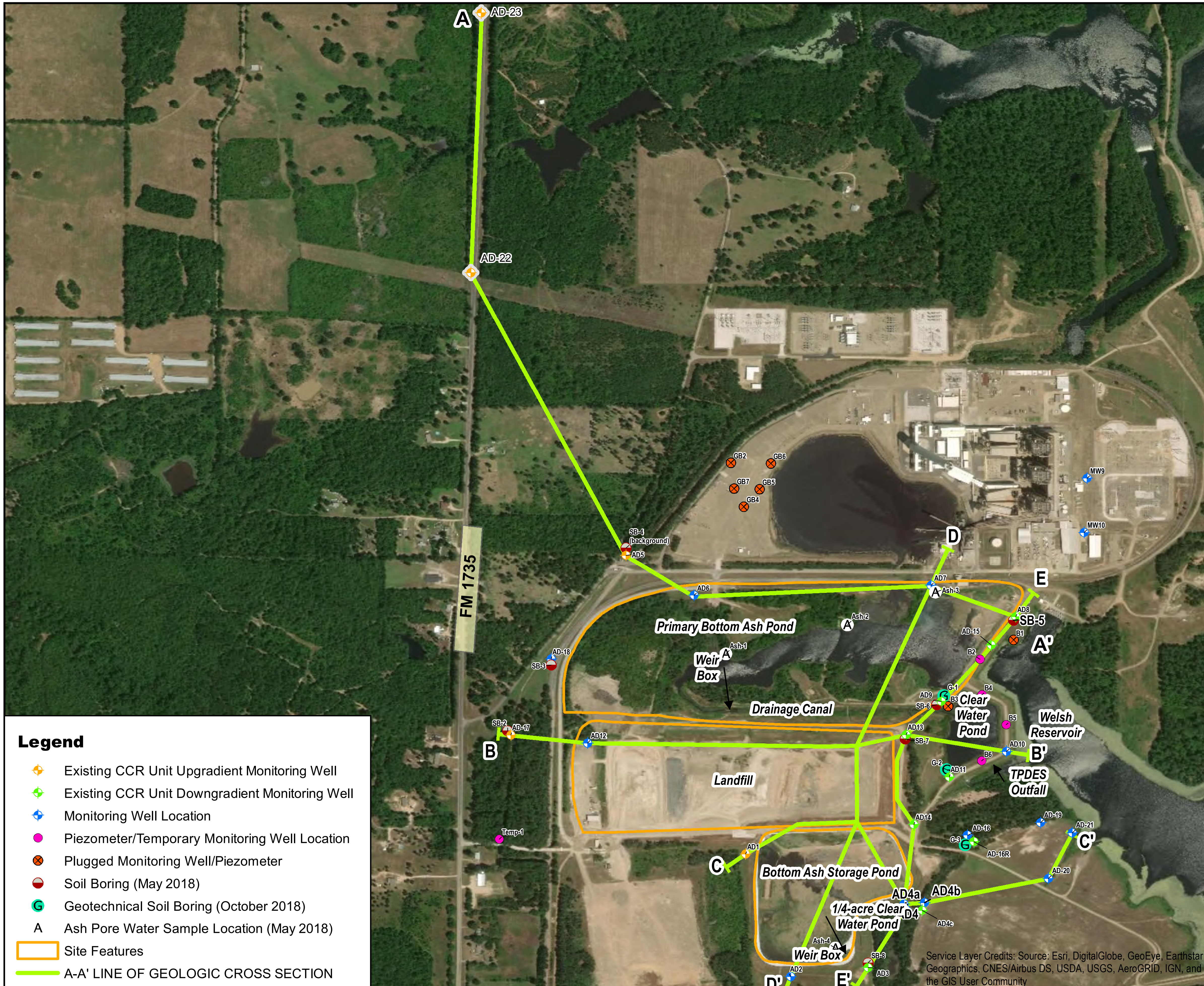
RE□IONA□
□EO□O□IC MA□ □E□END

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-2B



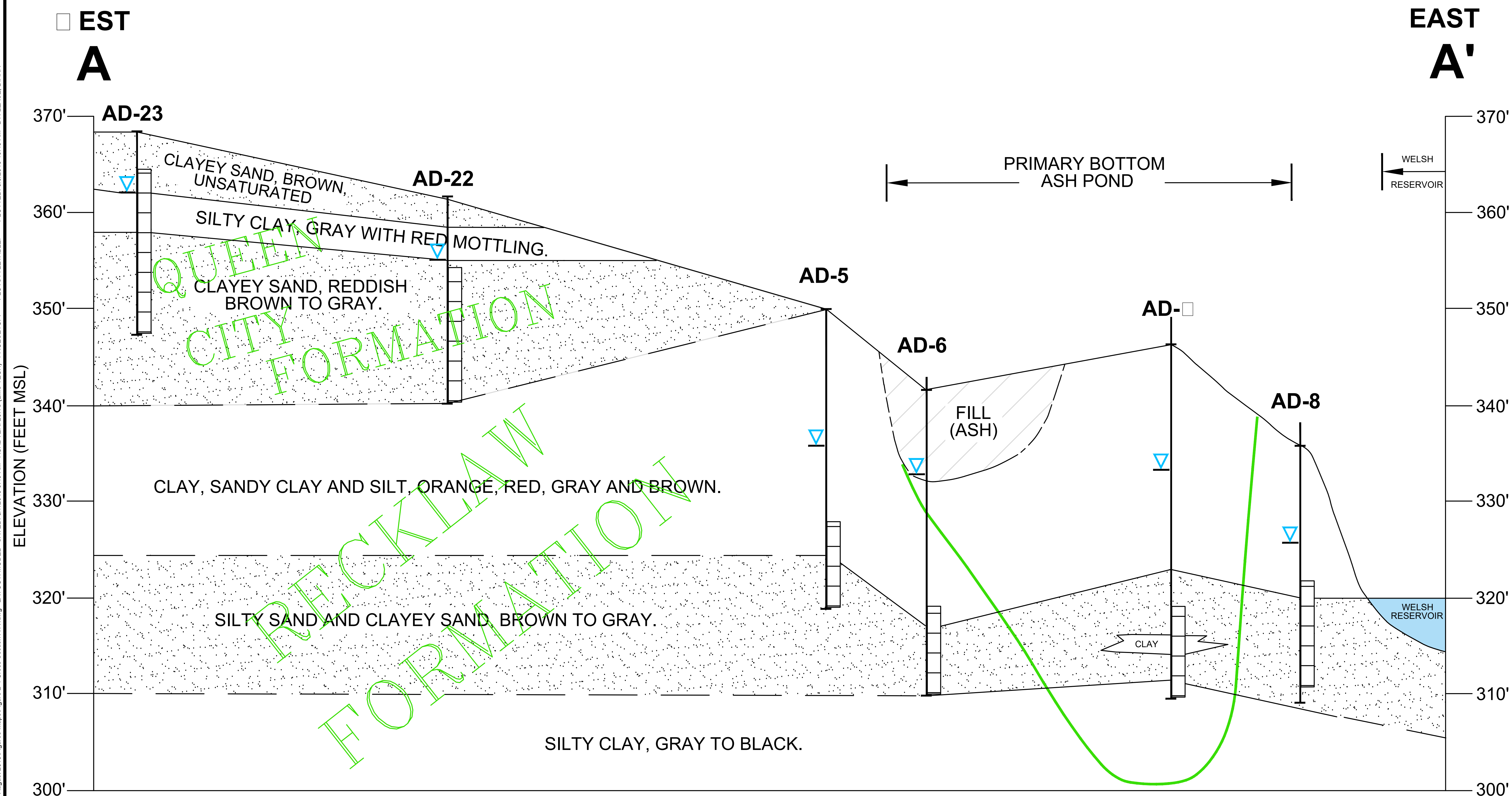
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-3

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\September 2019\Fig2-3-Cross Section LocationsREV.mxd



0 600'
HORIZONTAL SCALE

NOTE: BASE OF ASH POND TAKEN FROM "WELSH POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I " DRAWING ID WEPX-88, DATED 12-3-76; AND U.S. GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX QUADRANGLE, 1964 (PHOTO REVISED 1980).

LEGEND

- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN EVALUATION (6/19/19)
- PROJECTED BASE OF PRIMARY BOTTOM ASH POND (SEE NOTE)

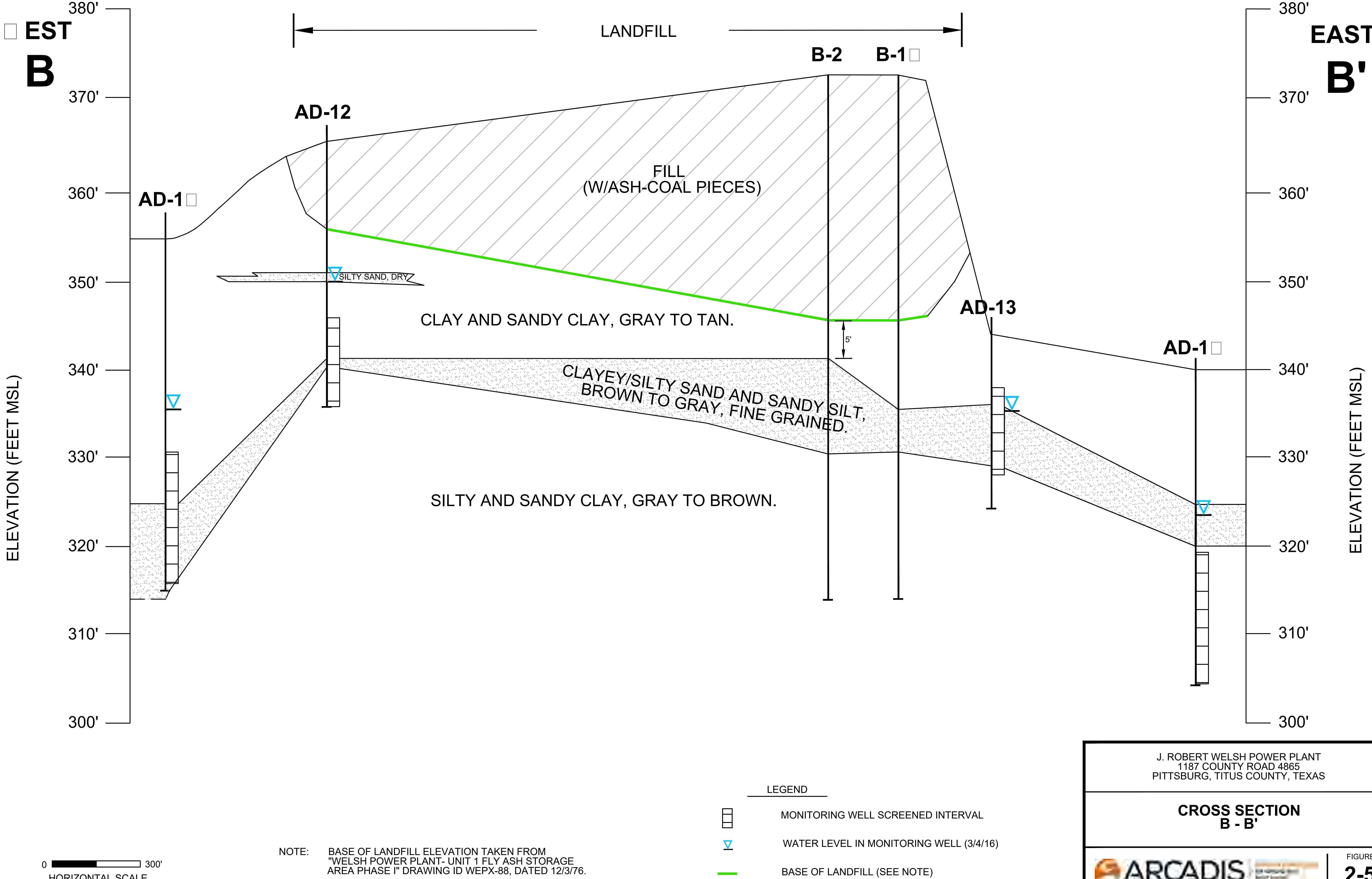
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION A - A'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-4

CITY: DIV/GROUP: DB: LD: AM: PD: TM: TR: LYR:ON=*;OFF=*REF*
G:\Active Projects\AEP\30034022 - Welsh Lithium ASD August 2019\Figures-Maps\Figure 2-4 Cross Section A-A'.dwg LAYOUT: MODEL SAVED: 8/7/2019 9:49 AM ACADVER: 20.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 9/9/2019 10:45 AM BY: LEASE, DIANA



NOTE: BASE OF LANDFILL ELEVATION TAKEN FROM "WELSH POWER PLANT- UNIT 1 FLY ASH STORAGE AREA PHASE I" DRAWING ID WEPX-88, DATED 12/3/76.

LEGEND

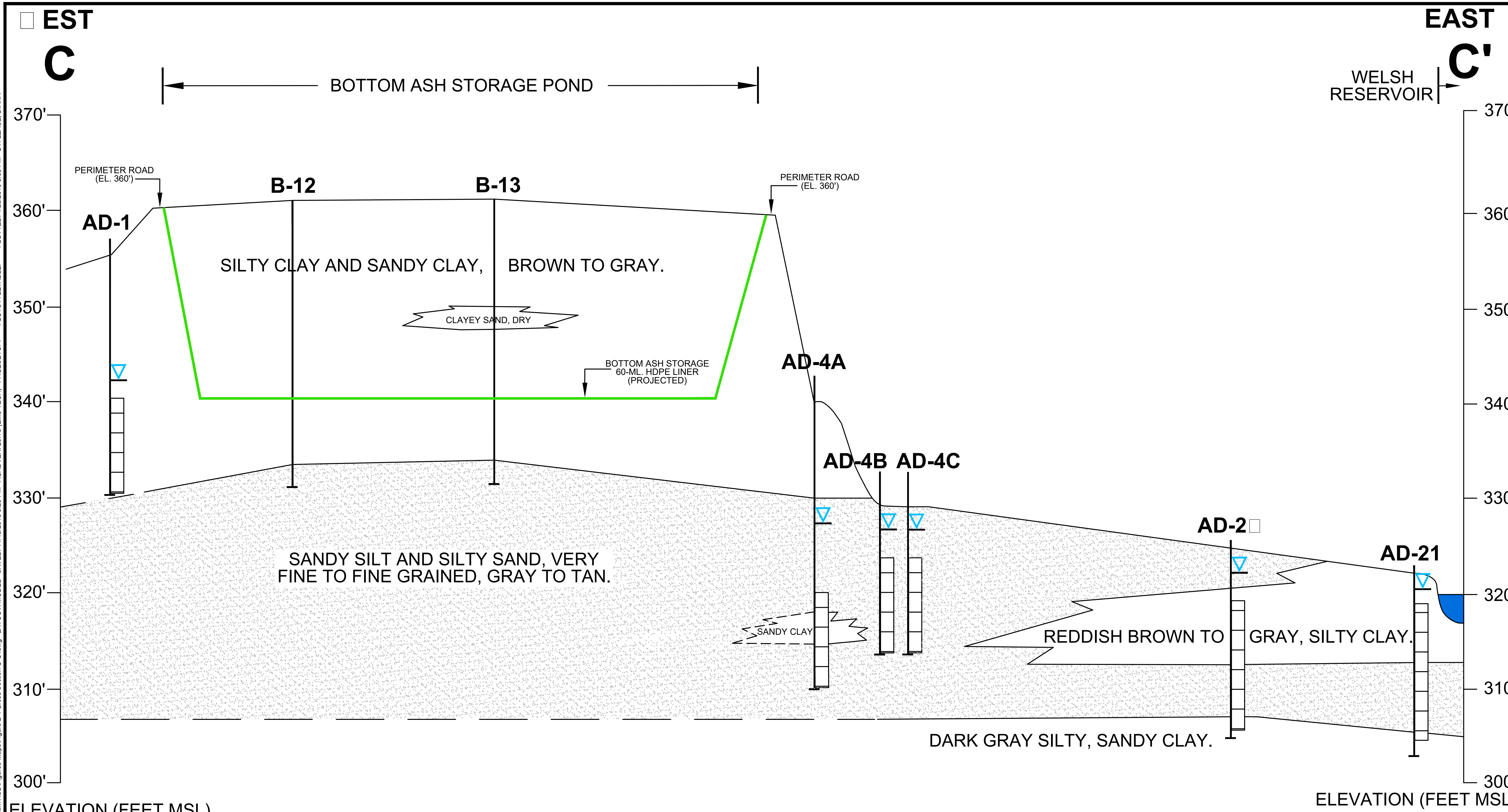
- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (3/4/16)
- BASE OF LANDFILL (SEE NOTE)

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION B - B'

ARCADIS

FIGURE
2-5



0 200'

HORIZONTAL SCALE

NOTE: BASE OF BOTTOM ASH STORAGE HAS A 60-ML. HDPE LINER AT ELEVATION 340.0', TAKEN FROM FREESE AND NICHOLS "HYDRAULIC ANALYSIS OF WELSH POWER PLANT ASH PONDS, AMERICAN ELECTRIC POWER COMPANY", DATED DECEMBER 2010.

LEGEND

MONITORING WELL SCREENED INTERVAL

WATER LEVEL IN MONITORING WELL (10/29/18)

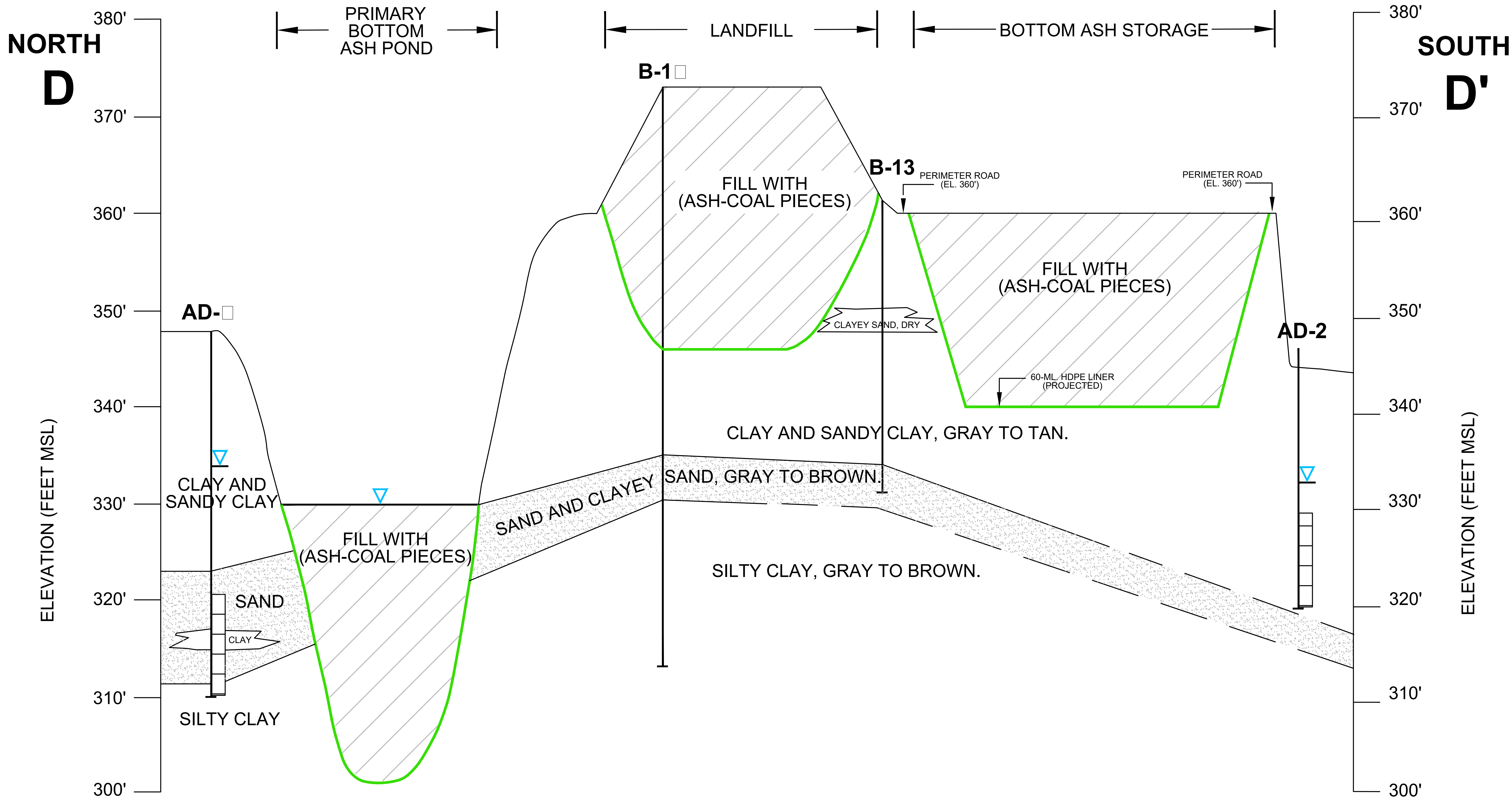
PROJECTED BASE OF ASH STORAGE (SEE NOTE)

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION
C - C'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-6



0 300'
HORIZONTAL SCALE

NOTE: BASE OF PRIMARY BOTTOM ASH POND TAKEN FROM "WELSH POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I " DRAWING ID WEPX-88, DATED 12-3-76; AND U.S. GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX QUADRANGLE, 1964 (PHOTO REVISED 1980).

LEGEND

- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (5/12/15)
- BASE OF CCR UNIT

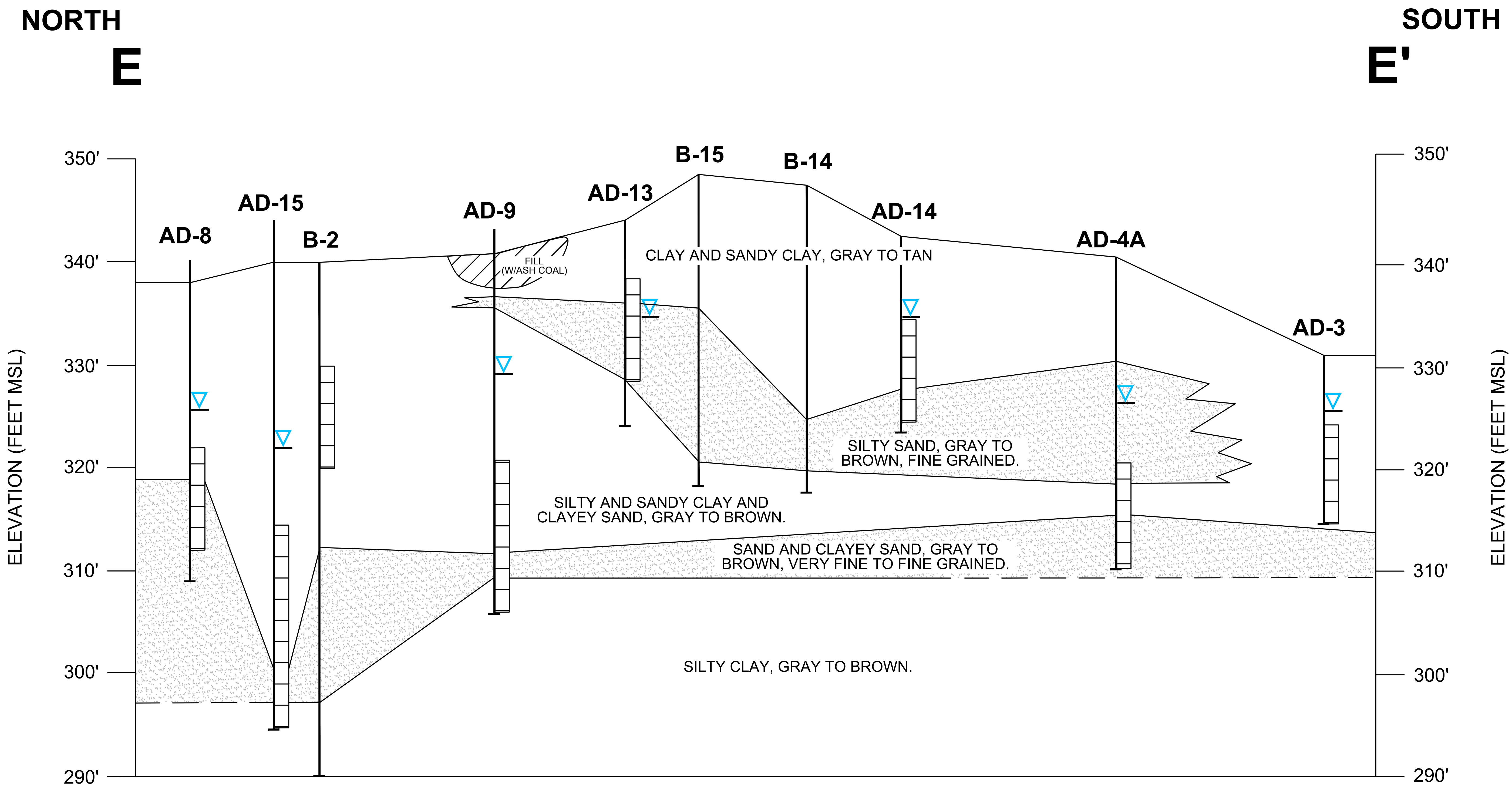
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION D - D'

ARCADIS

FIGURE
2-7

CITY: DIV/GROUP: DB: LD: AM: PD: TM: TR: LYR:ON=*;OFF=*REF*
G:\Active Projects\AEP\TX015976.0005 - Welsh Lithium ASD\Figures-Maps\Figure 2-5 Cross Section D-D'.dwg LAYOUT: MODEL SAVED: 6/23/2016 9:39 AM ACADVER: 20.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 1/28/2019 3:41 PM BY: LEASE, DIANA



0 300'
HORIZONTAL SCALE

LEGEND

MONITORING WELL SCREENED INTERVAL

WATER LEVEL IN MONITORING WELL (3/4/16)

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

CROSS SECTION
E - E'

ARCADIS

FIGURE
2-8

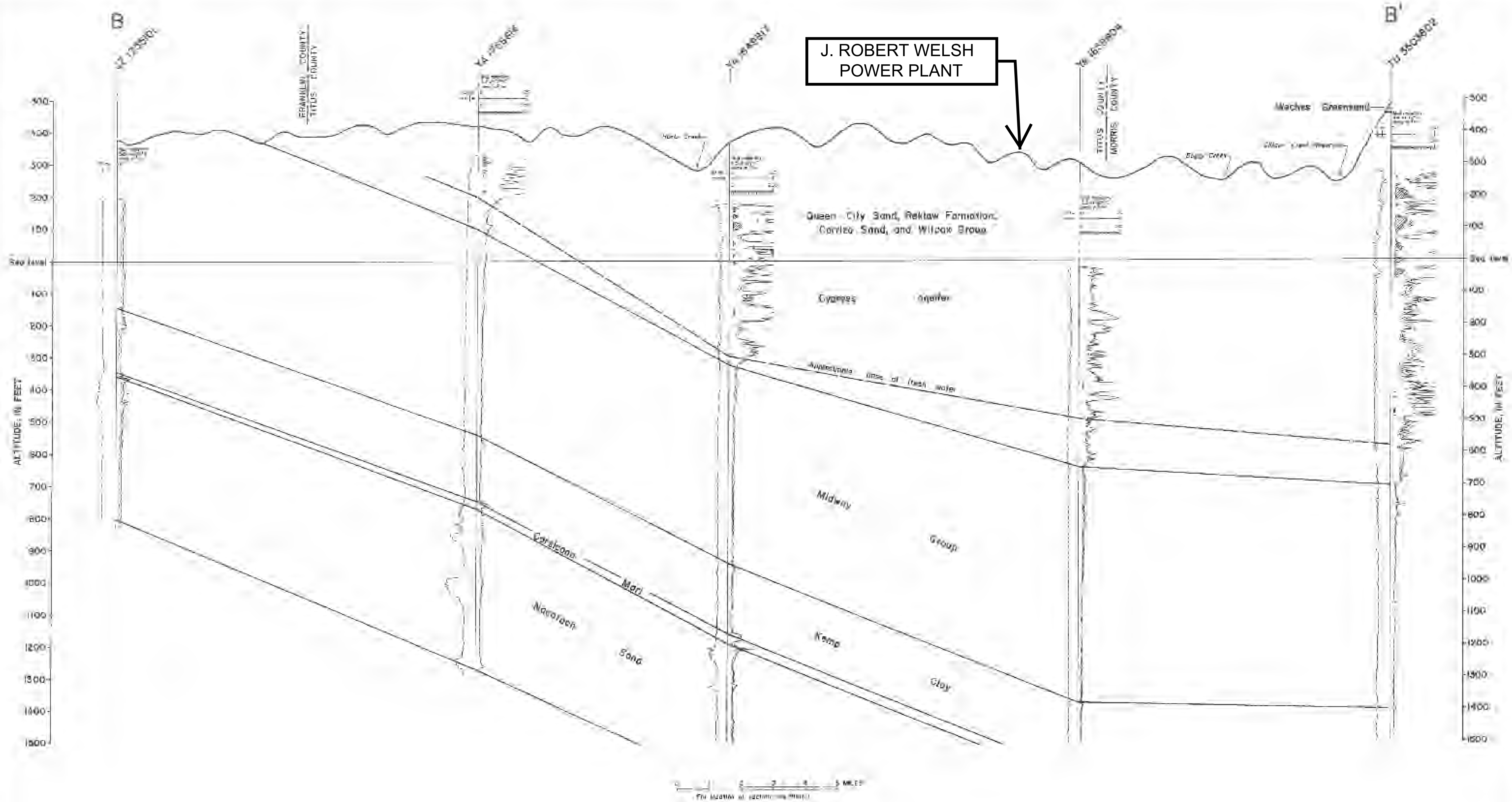


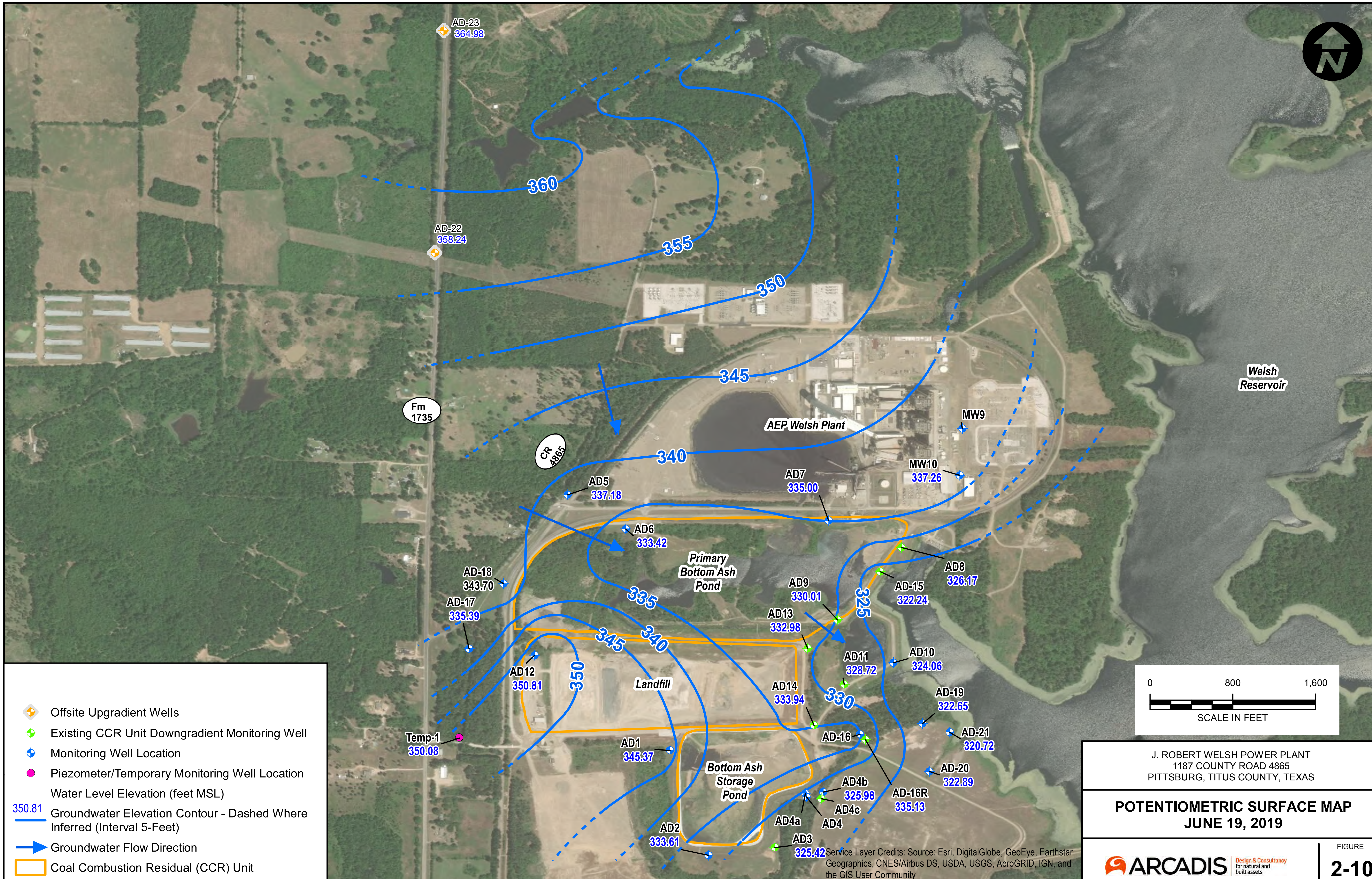
Plate 3

Geologic Section B – B', Franklin, Titus, and Morris Counties

U. S. Geological Survey in cooperation with the Texas Water Commission (TWC BULLETIN 6517)

REGIONAL GEOLOGIC CROSS SECTION

FIGURE 2-9



Offsite Upgradient Wells

Existing CCR Unit Downgradient Monitoring Well

Monitoring Well Location

Piezometer/Temporary Monitoring Well Location

350.81 Water Level Elevation (feet MSL)

Groundwater Elevation Contour - Dashed Where Inferred (Interval 5-Feet)

Groundwater Flow Direction

Coal Combustion Residual (CCR) Unit

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

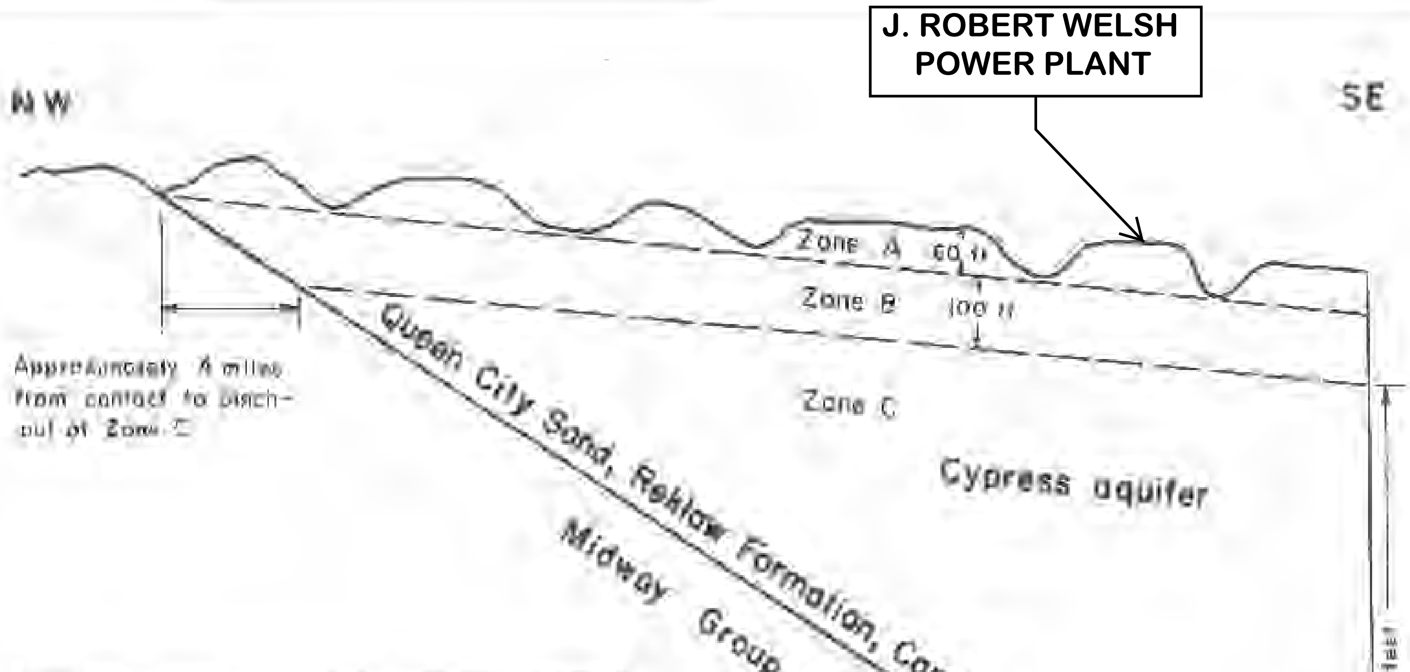
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

POTENTIOMETRIC SURFACE MAP
JUNE 19, 2019

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-10

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\September 2019\fig 2-10 - Potentiometric June2019.mxd



Zone	Approximate thickness (feet)	General ranges of iron content, pH, and hardness of water samples		
		Iron (Fe) ppm	pH	Hardness
A	0-60	less than 0.3	4.5-6.5	Soft to very hard
B	0-100	more than 0.3	5.0-7.0	Soft to moderately hard
C	0-850	less than 0.3	7.0-8.0	Soft

Figure 12

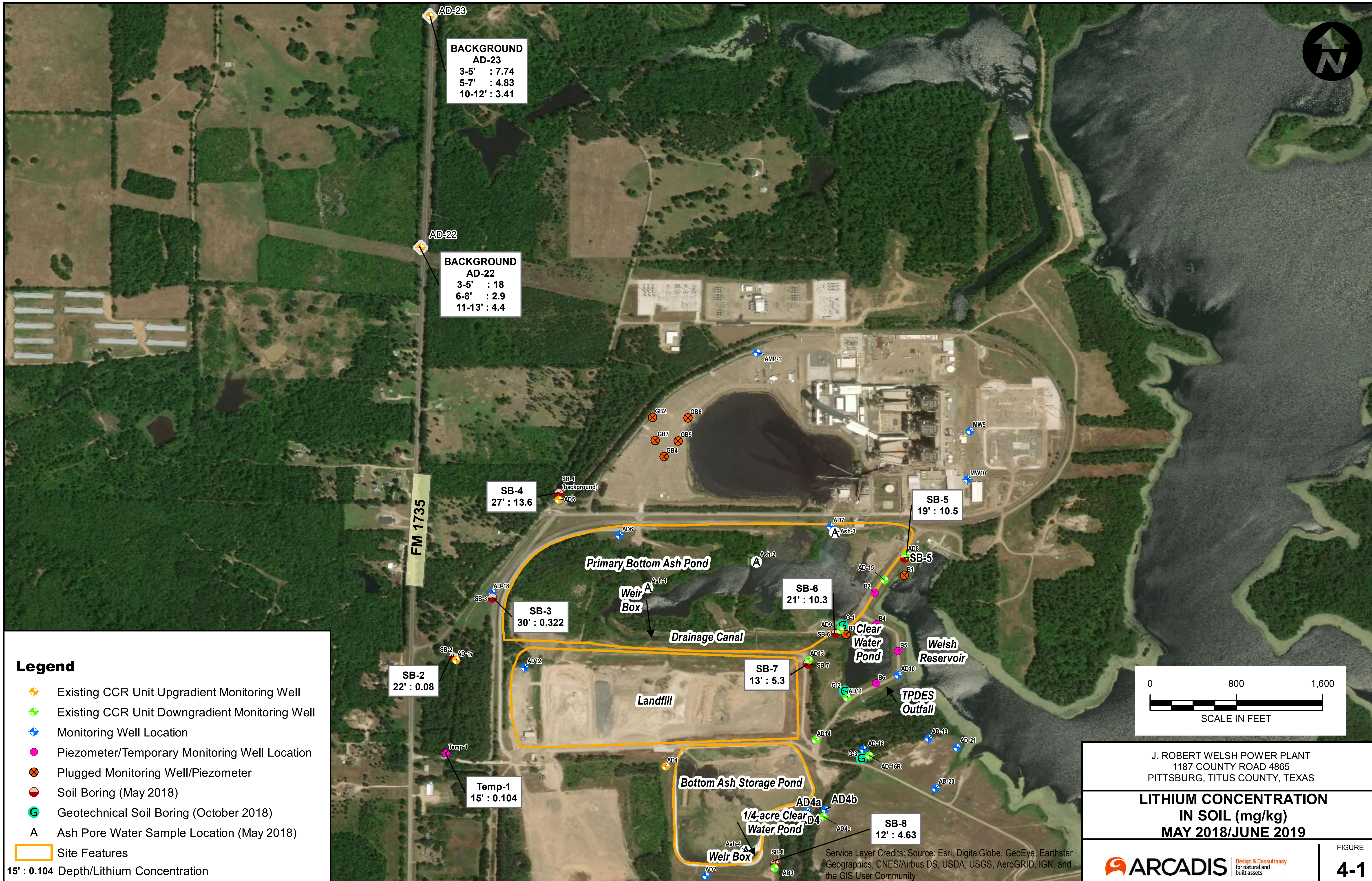
Diagrammatic Section Showing Zones A, B, and C in the Cypress Aquifer

U.S. Geological Survey in cooperation with the Texas Water Commission

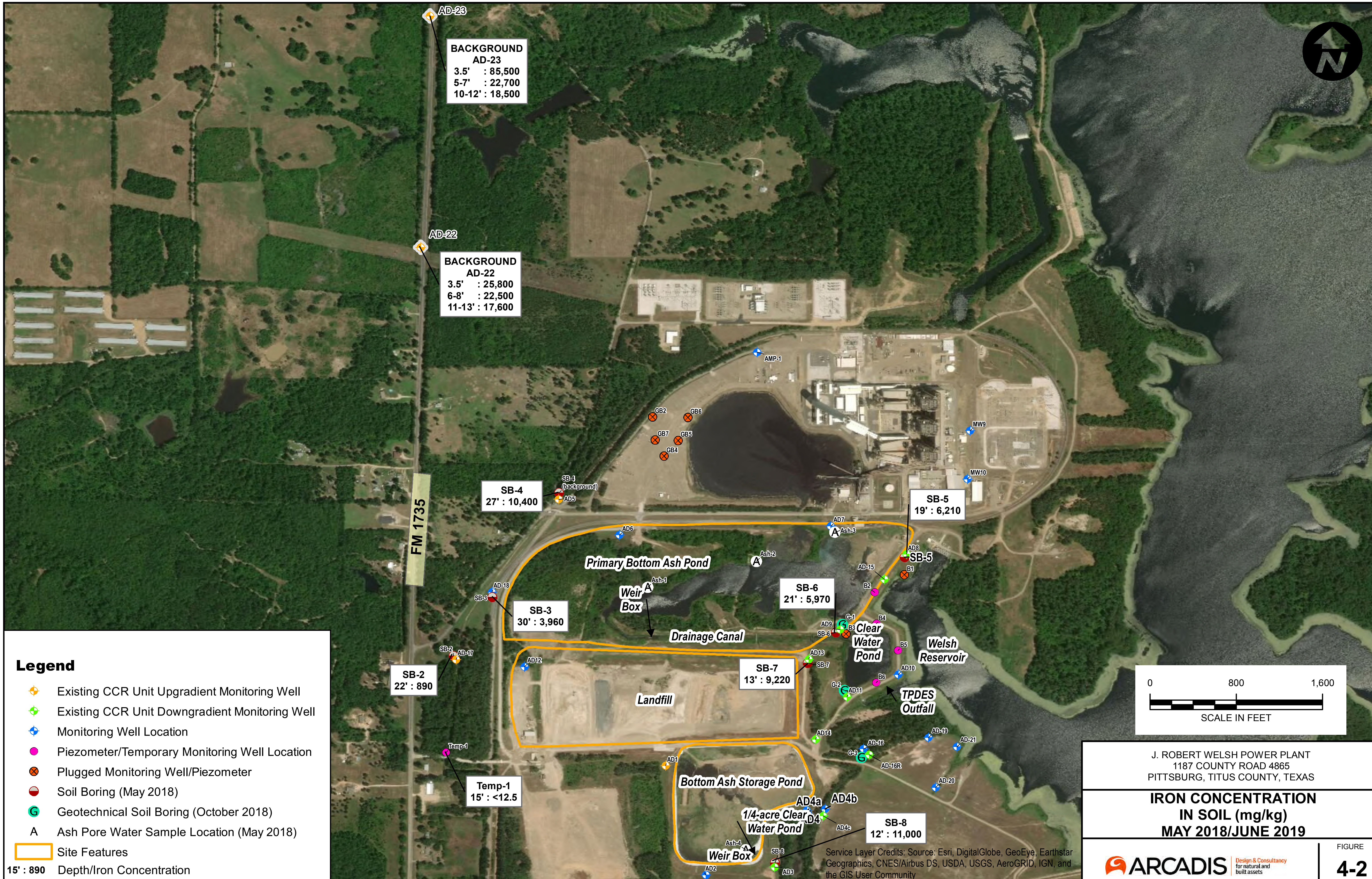
(TWC BULLETIN 6517)

REGIONAL HYDROLOGIC CROSS SECTION

FIGURE 2-11

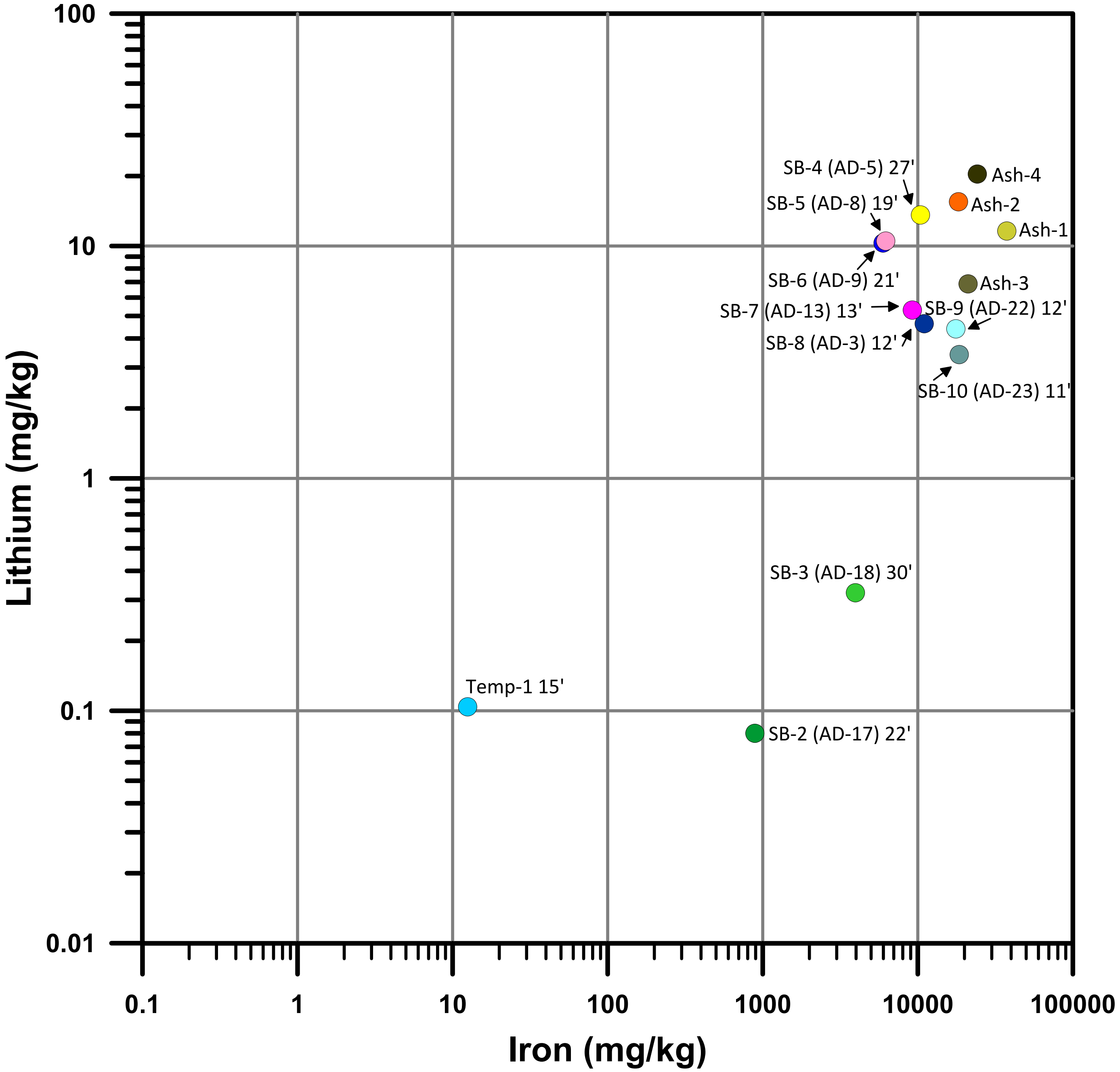


Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\September 2019\Fig 4-1-SoilBoring_LithiumresultsMay2018-June2018.mxd



Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\September 2019\Fig 4-2-SoilBoring_IronresultsMay2018-June2019.mxd

Solid Concentration
Lithium vs. Iron



Native Soil

Upgradient	Downgradient	Supplemental Sidegradient	Coal Ash
SB-2 (AD-17) 22'	SB-8 (AD-3) 12'	Temp-1 15'	Ash-1
SB-3 (AD-18) 30'	SB-5 (AD-8) 19'		Ash-2
SB-4 (AD-5) 27' Background	SB-6 (AD-9) 21'		Ash-3
SB-9 (AD-22) 12'	SB-7 (AD-13) 13'		Ash-4
SB-10 (AD-23) 11'			

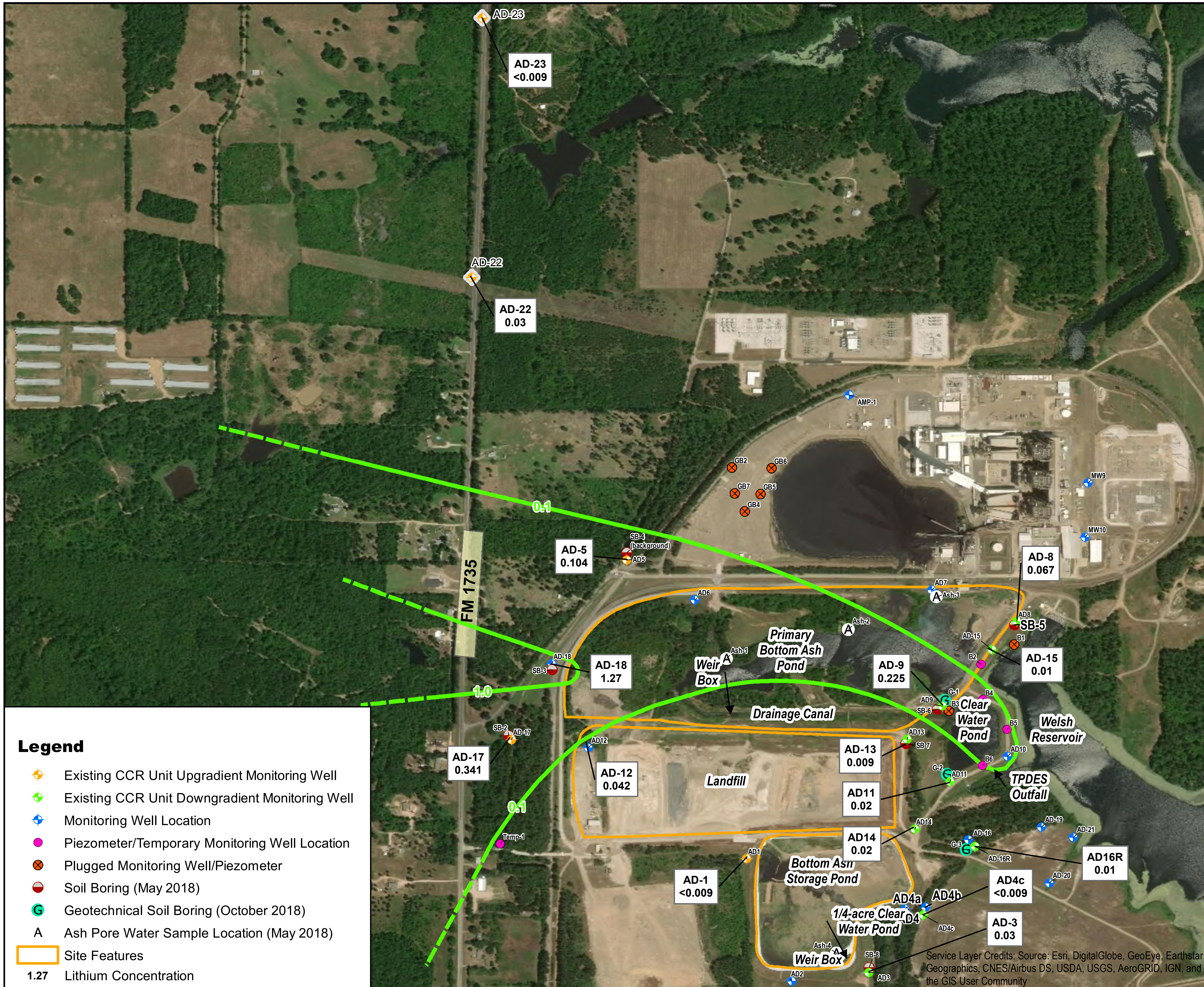
Notes:
mg/kg - milligrams per kilogram

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

LITHIUM VS. IRON SOLIDS CONCENTRATION PLOT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-3



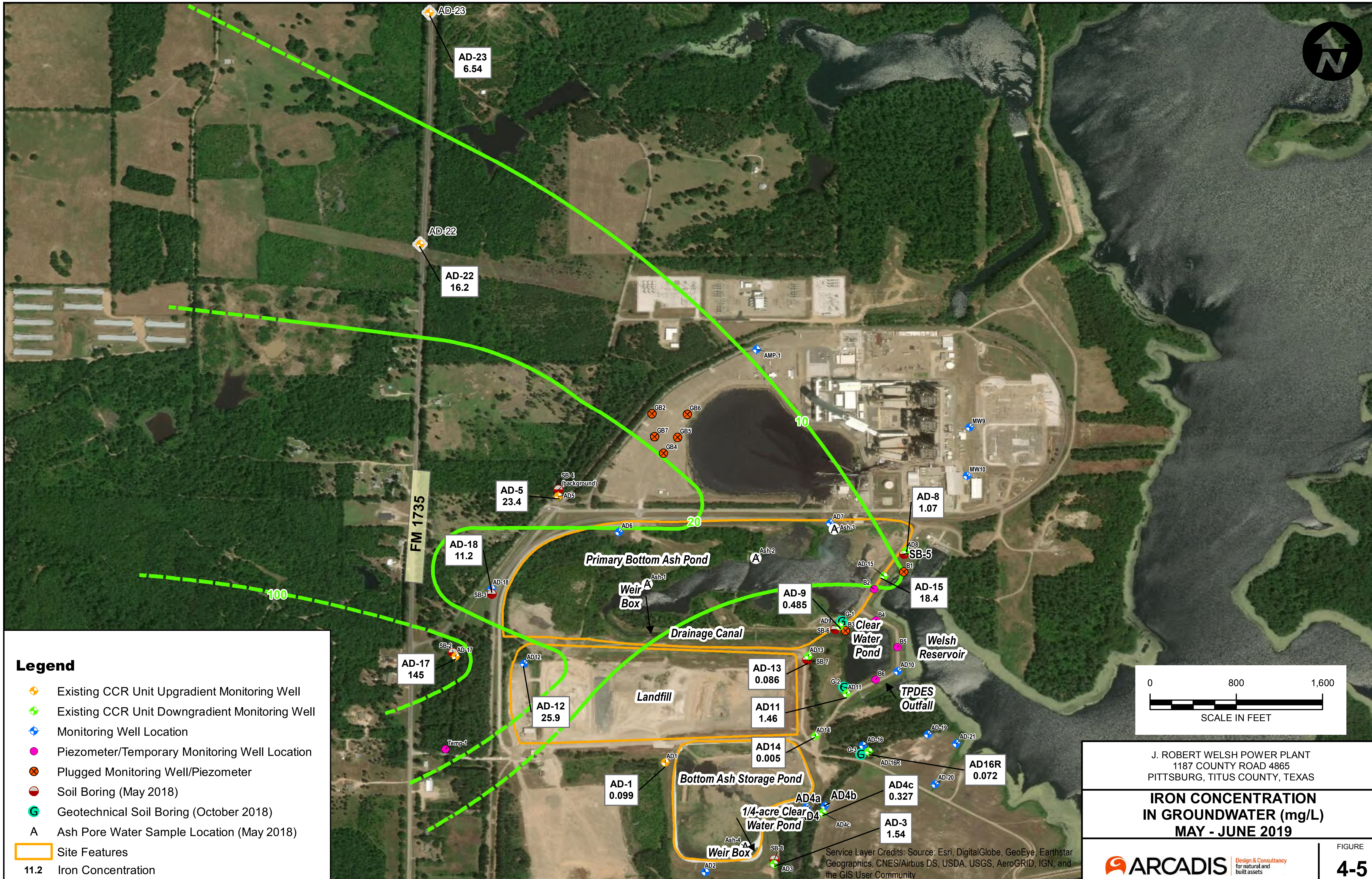
J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

LITHIUM CONCENTRATION IN GROUNDWATER (mg/L) MAY - JUNE 2019

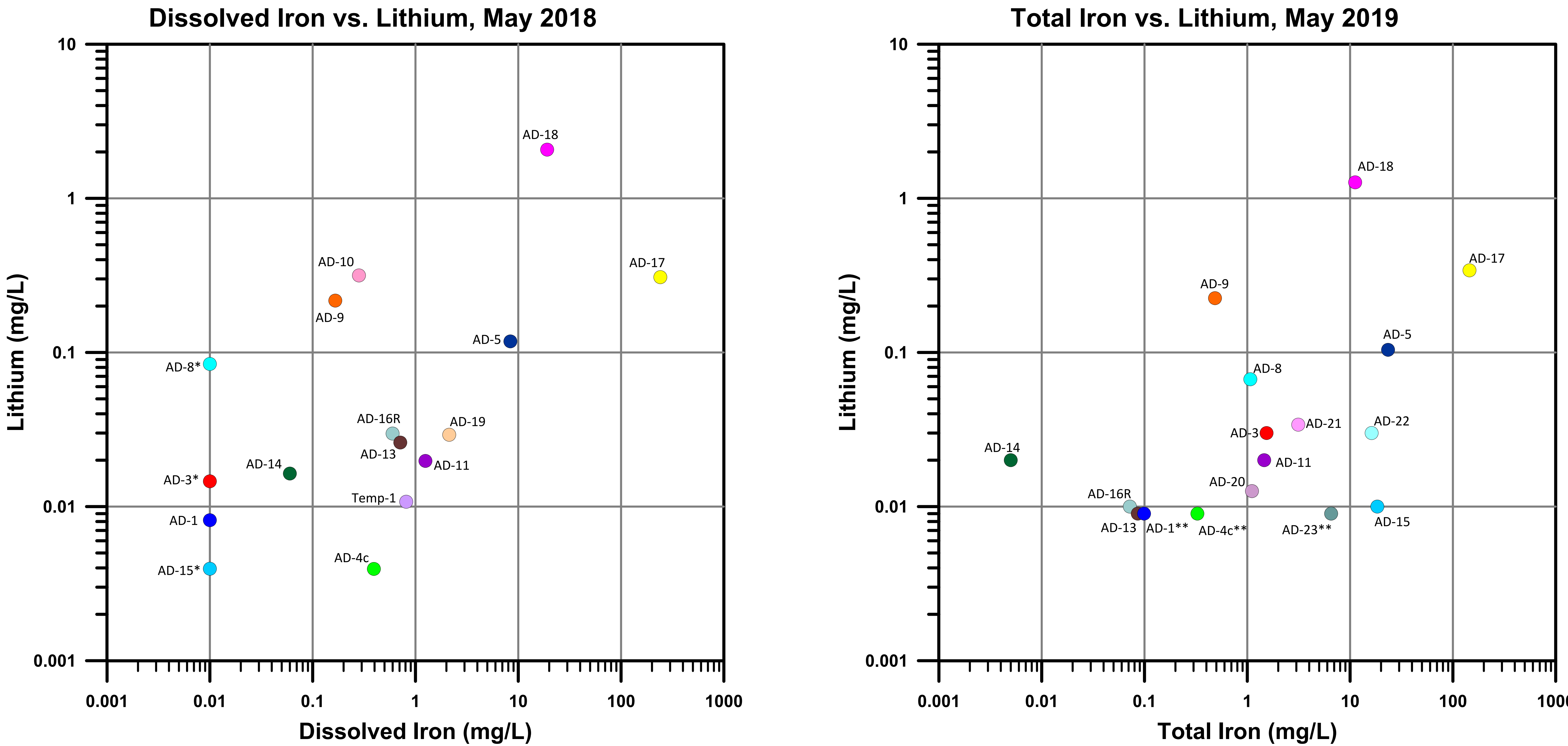
ARCADIS Design & Consultancy for natural and built assets

FIGURE 4-4

Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\September 2019\Fig 4-4-SoilBoring_LithiumGWresultsMay2018-June2019.mxd



Document Path: Z:\GISProjects_ENV\AEP\Welsh Plant\MXD\Landfill report\September 2019\Fig 4-5-SoilBoring_IronGWresultsMay2018-June2019.mxd



Upgradient Wells
- AD-1
- AD-17
- AD-18
- AD-5
- AD-22 (installed Jun 2019)
- AD-23 (installed Jun 2019)

Downgradient Wells
- AD-10
- AD-11
- AD-13
- AD-14
- AD-15
- AD-16R
- AD-19
- AD-3
- AD-4c
- AD-8
- AD-9
- AD-20 (installed Oct 2018)
- AD-21 (installed Oct 2018)

Sidegradient Wells
- MW-9
- MW-10
- Temp-1

Notes:
TDS - total dissolve solids
mg/L - milligrams per liter
Concentrations of iron and lithium in coal ash were below detection
Concentrations of lithium in coal ash porewater were less than 0.02 mg/L
AD-22 and AD-23 groundwater concentrations are total only
*Iron was not detected, result is plotted at the reporting limit
**Lithium was not detected, result is plotted at the reporting limit

J. ROBERT WELSH POWER PLANT
1187 COUNTY ROAD 4865
PITTSBURG, TITUS COUNTY, TEXAS

IRON VS. LITHIUM GROUNDWATER CONCENTRATION PLOT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-6

APPENDIX A

Monitoring Well Completion Diagrams – 2019 Monitoring Wells

WELL LOG

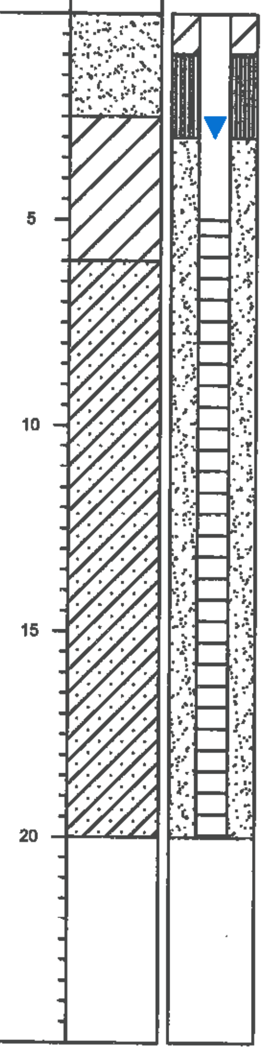
DEPTH	SAMPLE	ANALYZED	TYPE	SAMPLE DESCRIPTION
				(0-2.5') SAND (SP), BROWN, FINE GRAINED.
			SB	(2.5-6') SILTY CLAY (CL), GRAY WITH RED MOTTLING AND IRON NODULES.
5				
				(6-20') CLAYEY SAND (SC), GRAY WITH RED MOTTLING, FINE GRAINED, WET @ 9.5'.
			SB	
10				
			SB	
15				
			SB	
20				

STATE OF TEXAS
Kenneth J. Brandner
Geology
1787
LICENSED
PROFESSIONAL GEOSCIENTIST

Kenneth J. Brandner
8-7-19

TOTAL DEPTH = 20 FEET BGS

SYMBOL | COMPLETION



AD-22
WELL

AEP
CLIENT

TX015976.0004
PROJECT

WELSH POWER PLANT
LOCATION

6/18/19
DATE

HSA
DRILLING METHOD

2" PVC, 0-5' BGS
CASING

5-20' BGS, 2" PVC MILL-SLOT
SCREEN

0-1' BGS
CEMENT

1-3' BGS
BENTONITE

3-20' BGS
SAND PACK

360.94' / 360.22'
GROUND ELEV. / TOP OF CASING ELEV.

CT - CUTTINGS
SB - SPLIT BARREL (5')
SS - SPLIT SPOON (2')

▽ HC LEVEL
▼ WATER LEVEL

SAND
SILT
CLAY
FILL/CONCRETE
BENTONITE
GRAVEL

711 N. CARANCAHUA, #1080
CORPUS CHRISTI, TEXAS 78401
TEL: (361) 883-1353 FAX: (361) 883-7565
ARCADIS Design & Consultancy for natural and built assets

STATE OF TEXAS WELL REPORT for Tracking #515172

Owner:	AEP	Owner Well #:	AD-22
Address:	1187 County Road 4865 Pittsburg, TX 75686	Grid #:	16-58-4
Well Location:	FM 1735 Pittsburg, TX 75686	Latitude:	33° 03' 35" N
	In ROW along west side of FM 1735, WNW of the AEP - Welsh Plant	Longitude:	094° 51' 09" W
		Elevation:	No Data
Well County:	Titus		
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **6/18/2019** Drilling End Date: **6/18/2019**

	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
Borehole:	7.25	0	20

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Screened**

	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
Annular Seal Data:	0	1	Concrete
	1	3	Bentonite
	3	20	Sand

Seal Method: **Gravity**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	Strata Depth (ft.)	*Water Type*
Water Quality:	**No Data**	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **WEST Drilling**

101 Industrial Drive
Waxahachie, TX 75165

Driller Name: **Robert Williams** License Number: **59501**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**2.5**	**brown sand**
2.5	**6**	**gray and red, mottled, silty clay with Fe nodules**
6	**20**	**gray, clayey sand**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**5**
2	**Screen**	**New Plastic (PVC)**	**40 0.010**	**5**	**20**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

WELL LOG

DEPTH	SAMPLE / ANALYZED	TYPE	SAMPLE DESCRIPTION
0		SB	(0-1') SAND (SP), BROWN, FINE GRAINED. (1-6') CLAYEY SAND (SC), BROWN TO RED.
5		SB	(6-10') SILTY CLAY (CL), GRAY WITH RED MOTTLING AND IRON NODULES.
10		SB	(10-20') CLAYEY SAND (SC), REDDISH-BROWN, FINE GRAINED, WET @ 10'.
15		SB	
20			TOTAL DEPTH = 20 FEET BGS

STATE OF TEXAS
Kenneth J. Brandner
Geology
1787
LICENSED
PROFESSIONAL GEOSCIENTIST

Kenneth J. Brandner
8-7-19

SYMBOL | COMPLETION

AD-23
WELL

AEP
CLIENT

TX015976.0004
PROJECT

WELSH POWER PLANT
LOCATION

6/18/19
DATE

HSA
DRILLING METHOD

2" PVC, 0-5' BGS
CASING

5-20' BGS, 2" PVC MILL-SLOT
SCREEN

0-1' BGS
CEMENT

1-3' BGS
BENTONITE

3-20' BGS
SAND PACK

369.37' / 368.82'
GROUND ELEV. / TOP OF CASING ELEV.

CT - CUTTINGS
SB - SPLIT BARREL (5')
SS - SPLIT SPOON (2')

HC LEVEL
WATER LEVEL

SAND
SILT
CLAY
FILL/CONCRETE
BENTONITE
GRAVEL

711 N. CARANCAHUA, #1080
CORPUS CHRISTI, TEXAS 78401
TEL: (361) 883-1353 FAX: (361) 883-7565
ARCADIS Design & Consultancy for natural and built assets

STATE OF TEXAS WELL REPORT for Tracking #515173

Owner:	AEP	Owner Well #:	AD-23
Address:	1187 County Road 4865 Pittsburg, TX 75686	Grid #:	16-58-4
Well Location:	FM 1735 Pittsburg, TX 75686	Latitude:	33° 03' 56" N
	In ROW along west side of FM 1735, WNW of the AEP - Welsh Plant	Longitude:	094° 51' 08" W
		Elevation:	No Data
Well County:	Titus		
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **6/18/2019** Drilling End Date: **6/18/2019**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	7.25	0	20

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Screened**

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
Annular Seal Data:	0	1	Concrete
	1	3	Bentonite
	3	20	Sand

Seal Method: **Gravity**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	Strata Depth (ft.)	*Water Type*
Water Quality:	**No Data**	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: **The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.**

Company Information: **WEST Drilling**

101 Industrial Drive
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Driller Name: **Robert Williams** License Number: **59501**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	1	brown sand
1	6	gray and red, clayey sand
6	10	gray and red, mottled, silty clay with Fe nodules
10	20	reddish brown, clayey sand

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	Riser	New Plastic (PVC)	40	0	5
2	Screen	New Plastic (PVC)	40 0.010	5	20

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

APPENDIX B

Springs of Texas Reference

Springs of Texas

VOLUME I

Gunnar Brune

Second edition

The paper used in this book meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials, Z39.48-1984. Binding materials have been chosen for durability.

The publisher gratefully acknowledges those whose grants helped make this edition possible:

Texas Parks and Wildlife Department
Lower Colorado River Authority
Wray Charitable Trust
Save Barton Creek Association
College of Agriculture and Life Sciences,
Texas A&M University

Library of Congress Cataloging-in-Publication Data

Brune, Gunnar M., 1914–1995.
Springs of Texas. Volume I/by Gunnar Brune; introduction by Helen C. Besse.—2nd ed.
p. cm.—(Texas A&M University agriculture series ; no. 5)
Includes bibliographical references and index.
ISBN 1-58544-196-1 (cloth : alk. paper)
1. Springs–Texas. I. Title. II. Texas A&M University agriculture series ; no. 5.
GB1198.3T4 B78 2002
333.91'04'09764—dc21
2002017373

INTRODUCTION TO THE SECOND EDITION

Helen C. Besse

When Gunnar Brune self-published *Springs of Texas, Volume I*, in 1981, most of the state water planning agencies and local environmental communities either did not recognize the importance of his work or were not aware of its existence. Brune had spent the previous decade conducting research and field studies, and then writing this book that describes the physical characteristics of springs, the archeology and history of springs' use, the ecological setting of springs, and the local use and lore surrounding springs for 183 out of 254 Texas counties. Gunnar Brune died before he could complete volume II.

Gunnar Brune described many of the large springs across the state as well as innumerable small springs present along river and stream courses that provide the base flow for waterways across the state. Brune repeatedly stated in the 1981 edition of this book that many of the springs he described had failed or were failing. With the pronounced influx of population in the last twenty years and the increased agricultural and industrial activities around the state, one can only wonder how many of the more than 2,000 springs have gone dry since he described them through the 1970s.

Nevertheless, this book is even more important today. Its value to water planners, elected officials, policy makers, municipal, county, and state administrators, wildlife stewards, environmentalists, and water lovers has not diminished. Springs are "the canary in the coal mine." The health of our springs reflects the health of our underground water resources and, it seems, the state's surface resources as well.

In the section "The Prehistoric Setting of Springs," Brune provided a quote from another book on the beliefs that early Americans had about springs. It is appropriate to repeat those words here.

> Gods and heroes were born out of springs, and ever afterward came and went between the above and below worlds through their pools. Every pueblo had sacred springs somewhere nearby. There was every reason to sanctify them – physical, as life depended upon water; spiritual, as they had natural mystery which suggested supernatural qualities; for how could it be that when water fell as rain, or as snow, and ran away, or dried up, there should be other water which constantly came, secretly and sweetly, out of the ground and never failed (Horgan, 1954).

F. Halley's farm. According to Dr. John Klein, a nearby resident and writer, the Klein settlement began here in 1848. The Sellars store was at the springs. They issued from Montgomery silt with many iron concretions at about 0.72 lps on April 11, 1978. The pools, containing duckweed, pennywort, and water primrose, were home to a family of ducks and ducklings. Probably the flow formerly continued down Spring Gully past Klein cemetery, 0.5 kilometer downstream, but on this date, even after rains, the channel here was dry except for some standing water. Many wells pump nearby.

Magnolia Garden Springs (15) are four kilometers northeast of Sheldon along the San Jacinto River. At Martha Dempsey's Good Times marina several very small springs trickle from Deweyville sand, including one which flows 0.15 lps from a pipe. Near the entrance to the nearby Magnolia Gardens marina, according to Jean Manson, springs flowed until about 1923. They are quite dry now. Very small springs are said to feed Simms Lake, across the river and 0.6 kilometer farther east. This formerly popular swimming hole is now closed to the public.

At Beaumont Place northeast of Houston, near the intersection of Highways 90 and 526, is another Spring Gully. The channel is now a drainage ditch into which very small springs and seeps (14) drain from Beaumont silt and sand.

Eight kilometers west of La Porte is Willow Springs Bayou, also called Willow Springs Gully or Ditch. **Willow Springs (8)** are chiefly between North L Street and Spencer Road. On April 9, 1978, the discharge of Willow Springs Bayou at North L Street was 0.18 lps, and at Spencer Road it was 0.70 lps. Many willows still fringe the channel, along with cattails.

A third Spring Gully is located eight kilometers southwest of La Porte. Springs (9) in Beaumont silt produced a discharge of about 0.18 lps in 1978 in the gully at the Red Bluff road crossing. Cottonmouths hide here among the willows and cattails.

HARRISON COUNTY

Harrison County is endowed with numerous springs of all types, some highly mineralized and valued for their healing properties. Most appear to be flowing as strongly as ever, because there has been little demand on the groundwater reservoirs. However, water levels in the artesian sands are declining as much as 4.6 meters per year in some areas. Most of the Caddo Indian villages were located at springs. Early French and Spanish explorers, some over 400 years ago, visited many of the same springs that can be seen today.

The New Madrid earthquake of 1811 - 1812, which enlarged Caddo Lake, may have affected the flow of some springs. In general, however, the water-bearing formations were not greatly affected by the quake.

Most of the spring waters of the county issue from Eocene sands. They are usually fresh, soft, and acid, being of the sodium bicarbonate type. The iron content is often very high. Mineralized waters may also be high in aluminum and sulfate, may be slightly saline, and can be very hard. The analyses shown for 1942 in the table of Selected Chemical Analyses are probably too low in dissolved-solids content, perhaps because of high rainfall at the time the samples were collected. Most of the writer's field studies were made on January 23 - 28, 1976.

It was around **Locke Springs (11)** that the community of Marshall first appeared. In 1831 there were at least 20 springs flowing from the Reklaw sand near the intersection of Franklin and Houston Streets and up the hill toward the courthouse. In early times water was hauled from these springs in barrels to fill the cisterns on the town square. Most of the springs have now been paved over, but the remaining ones still flowed 1.4 liters per second in 1976.

Hynson Springs (10), also known as **Marshall, Noonday Camp**, and **Iron Springs**, are six kilometers north of Hallsville. They became very popular as a health resort about 1851. The waters are highly mineralized, containing much iron, sulfur, aluminum, and lithium. Originally there were said to be over 100 springs flowing from Queen City sand. Now not more than 20 can be found, possibly because the water table has fallen. During the Civil War the water from the springs was used in a leather-tanning factory. From 1891 to 1905 the large Hotel Randall accommodated thousands of visitors to the springs. Today there are an open-air auditorium and a number of cabins, but everything is in a sad state of disrepair. A historical marker is located at the springs. The discharge record, in liters per second, is as follows:

[illegible]	[illegible]	
[illegible]	[illegible]	
Jan 27, 1976	0.11 (one spring)	1.4 (all springs)

Rock Springs (7) are just east of the Rock Springs church on Highway 449 about 13 kilometers west of Marshall. This and several other springs upstream flowed 2.3 lps from the Queen City sand in 1976. The Frenchman Henri Joutel of La Salle's party may have stopped here for refreshment in 1687.

Mulberry Springs (9), nine kilometers south-southwest of Harleton, are 100 meters north of the

APPENDIX IV

Notices of groundwater monitoring programs are included in this appendix.

SOUTHWESTERN ELECTRIC POWER COMPANY

An AEP Company

BOUNDLESS ENERGY

NOTE:
Pulled from the OR because ASD was completed w/in 30 days of SSL negating the need for placing this notification into the OR.

Welsh Power Plant

Notice of Statistically Significant Levels (SSLs) above the Groundwater Protection Standard (GWPS)

CCR Unit – Primary Bottom Ash Pond

As required by 40 CFR 257.95(g), this is a notification that on January 8, 2019 lithium was detected at an SSL above the GWPS. This notification is being placed in the plant's operating record, as required by 40 CFR 257.105(h)(8).

SOUTHWESTERN ELECTRIC POWER COMPANY

An AEP Company

BOUNDLESS ENERGY

Welsh Power Plant

Notice of Statistically Significant Levels (SSLs) above the Groundwater Protection Standard (GWPS)

CCR Unit – Primary Bottom Ash Pond

As required by 40 CFR 257.95(g), this is a notification that on July 11, 2019 lithium was detected at an SSL above the GWPS. This notification is being placed in the plant's operating record, as required by 40 CFR 257.105(h)(8).

APPENDIX V- NA

Reports documenting monitoring well plugging and abandonment or well installation are included in the appendix.