

Annual Groundwater Monitoring Report

Southwestern Electric Power Company

J. Robert Welsh Power Plant

CN 602843245; RN100213370

Bottom Ash Storage Pond CCR Management Unit

WMU 014

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Titus County

Pittsburg, Texas

January 2021

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An **AEP** Company

BOUNDLESS ENERGY™

Table of Contents

	<u>Page</u>
I. Overview.....	2
II. Groundwater Monitoring Well Locations and Identification Numbers.....	3
III. Monitoring Wells Installed or Decommissioned	4
IV. Groundwater Quality Data and Static Water Elevation Data, With Flow Rate and Direction and Discussion	4
V. Statistical Evaluations Completed in 2020	5
VI. Alternate Source Demonstrations Completed in 2020.....	5
VII. Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency.....	5
VIII. Other Information Required.....	5
IX. Description of Any Problems Encountered in 2020 and Actions Taken	6
X. A Projection of Key Activities for the Upcoming Year	6

Appendix I – Potentiometric Maps and Tables

Appendix II – Statistical Reports

Appendix III – Alternate Source Demonstrations

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), J. Robert 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, 2021.

In general, the following activities were completed:

- This CCR Unit began and remained in Detection Monitoring throughout 2020;
- Semi-Annual groundwater samples were collected and analyzed for detection monitoring Appendix III constituents, as specified in 40 CFR 257.94 *et seq.* and AEP's *Groundwater Sampling and Analysis Plan (2016)*;
- A statistical process in accordance with 40 CFR 257.93 to evaluate groundwater data was updated and certified (AEP's *Statistical Analysis Plan (Geosyntec 2020)*). The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance," USEPA, 2009);
- Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units;
- First semi-annual groundwater sampling event;
 - Statistically significant increases (SSIs) were determined for Sulfate and Total Dissolved Solids (TDS) in AD-4C and TDS in AD-16R
 - Successful alternate source demonstrations (ASDs) were conducted for the SSIs
 - Submitted to Texas Commission on Environmental Quality (TCEQ) notification of the SSIs and ASD
- Second semi-annual groundwater sampling event;
 - Statistical evaluation is underway
- Received TCEQ approval to extend the receipt of CCR waste and initiate closure activities April 11, 2021.

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;
- Statistically reports are located in Appendix II;
- ASDs 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 notification identifying the constituents detected at a statistically significant increase over background concentrations;
- Other information required to be included in the annual report such as program related notification or 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.

Bottom Ash Storage Pond Monitoring Wells	
Up Gradient	Down Gradient
AD-1	AD-3
AD-5	AD-4C
AD-17	AD-16R



III. Monitoring Wells Installed or Decommissioned

During 2020, 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 potentiometric maps with the static water elevation, groundwater flow direction for each monitoring event and tables showing groundwater velocity and the groundwater quality data collected under 40 CFR 257.90 through 257.98.

- The groundwater flow rate and direction for the first semi-annual confirmatory sampling event reflects that seen during the initial first semi-annual sampling event.
- The groundwater flow rate and direction for the second semi-annual confirmatory sampling event reflects that seen during the initial second semi-annual initial sampling.

V. Statistical Evaluations Completed in 2020

Background values for the BASP were previously calculated in January 2018. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the dataset was updated as appropriate. Revised and upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec’s *Statistical Analysis Summary* report, dated December 10, 2019.

First semi-annual groundwater sampling event May 20, 2020, with verification sampling on July 22, 2020:

- the following SSI were determined:
 - Sulfate and TDS in AD-4C
 - TDS in AD-16R
 - Submitted to TCEQ notification of the SSIs

Second semi-annual groundwater sampling event October 14, 2020, with verification sampling on December 10, 2020:

- Statistical evaluation for this data set is currently under way.

Statistical reports are found in Appendix II.

VI. Alternate Source Demonstrations Completed in 2020

A successful ASD confirmed that the all SSIs determined during the first semi-annual 2020 groundwater monitoring event were the result of natural variation, therefore the unit remained in detection monitoring.

The demonstrations are in Appendix III.

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

As of this annual groundwater report, the CCR Unit remains in detection monitoring.

VIII. Other Information Required

The sampling frequency of twice per year will be maintained for the current monitoring program.

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

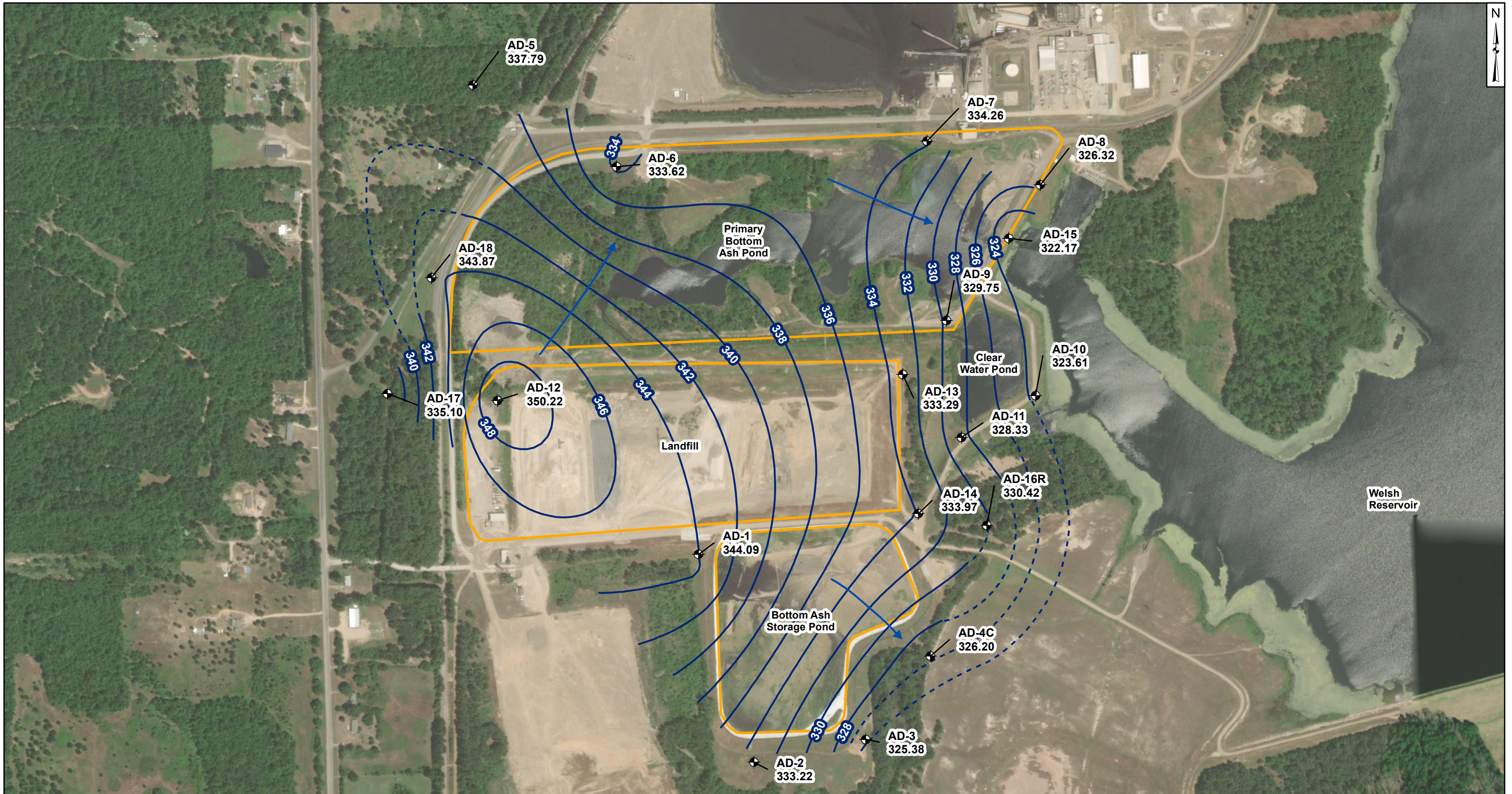
No significant problems were encountered.

X. A Projection of Key Activities for the Upcoming Year

- Detection monitoring on a twice per year schedule;
- Complete statistical analysis of the Second 2020 semi-annual groundwater monitoring data;
- Evaluation of the detection monitoring results from a statistical analysis viewpoint, looking for any SSIs;
- If needed, ASDs will be conducted to evaluate if the unit can remain in detection monitoring or the unit will move to an assessment monitoring;
- Responding to any new data received in light of CCR rule requirements;
- Preparation of the next annual groundwater report;
- Initiate closure of the unit.

APPENDIX I

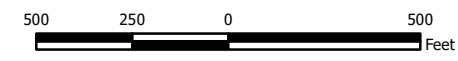
Potentiometric maps, Tables follow, showing the groundwater monitoring data collected, the rate and direction of groundwater flow, and a summary showing the number of samples collected per monitoring well. The dates that the samples were collected also is shown.



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

Notes

- Monitoring well coordinates and water level data (collected on May 19-20, 2020) 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.



**Groundwater Potentiometric Map
May 2020**

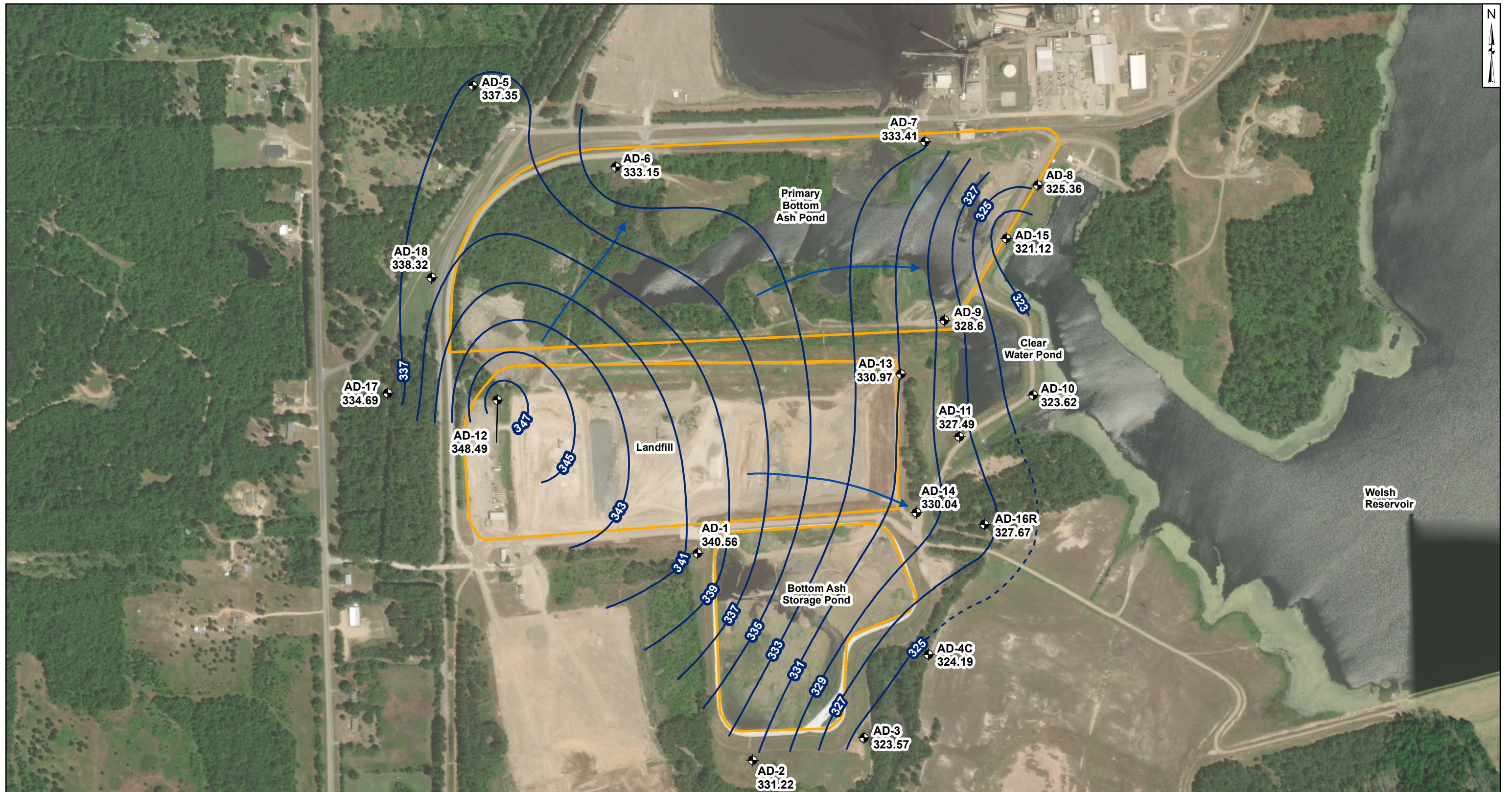
AEP Welsh Power Plant
Cason, Texas

Geosyntec
consultants

Columbus, Ohio

2020/11/04

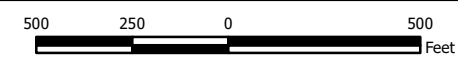
Figure
1



- Legend**
- ◆ Groundwater Monitoring Well
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)
 - ➔ Approximate Groundwater Flow Direction
 - ▭ CCR Units

Notes

- Monitoring well coordinates and water level data (collected on October 12-14, 2020) 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.



**Groundwater Potentiometric Map
October 2020**

AEP Welsh Power Plant
Cason, Texas

Geosyntec
consultants

Columbus, Ohio

2021/01/06

Figure

2

**Residence Time Calculation Summary Welsh
Bottom Ash Storage Pond**

Geosyntec Consultants, Inc.

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2020-02		2020-05		2020-07 ^[3]		2020-10	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Bottom Ash Storage Pond	AD-1 ^[1]	2.0	4.6	13.1	3.4	17.7	3.8	16.0	3.2	19.0
	AD-3 ^[2]	2.0	NC	NC	3.1	19.5	6.2	9.8	7.4	8.3
	AD-4C ^[2]	2.0	NC	NC	4.2	14.6	3.9	15.7	3.5	17.1
	AD-5 ^[1]	2.0	1.0	59.3	1.8	34.5	0.8	73.0	2.6	23.5
	AD-16R ^[2]	2.0	NC	NC	4.7	12.9	4.2	14.3	3.1	19.5
	AD-17 ^[1]	2.0	2.4	25.4	9.3	6.5	1.3	46.0	7.7	7.9

Notes:

[1] - Upgradient Well

[2] - Downgradient Well

[3] - Two-of-two verification sampling

NC - Not Calculated

**Residence Time Calculation Summary Welsh
Bottom Ash Storage Pond**

Geosyntec Consultants, Inc.

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2019-02		2019-04 ^[3]		2019-05		2019-07	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Bottom Ash Storage Pond	AD-1 ^[1]	2.0	2.7	22.4	NC	NC	5.3	11.5	4.1	14.9
	AD-3 ^[2]	2.0	4.9	12.4	0.5	127	5.7	10.7	5.1	11.9
	AD-4C ^[2]	2.0	4.0	15.3	0.5	127	5.2	11.6	4.2	14.4
	AD-5 ^[1]	2.0	1.5	40.2	NC	NC	2.4	25.4	2.1	29.2
	AD-16R ^[2]	2.0	3.7	16.3	3.7	16.4	6.5	9.4	4.6	13.3
	AD-17 ^[1]	2.0	8.9	6.9	NC	NC	4.7	13.0	3.5	17.5

Notes:

[1] - Upgradient Well

[2] - Downgradient Well

[3] - Upgradient wells were not gauged at the time of sampling, residence time estimates are based on available data.

NC - Not Calculated

**Residence Time Calculation Summary Welsh -
Bottom Ash Storage Pond**

Geosyntec Consultants, Inc.

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2018-05		2018-08		2018-11 ^[3]	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Bottom Ash Storage Pond	AD-1 ^[1]	2.0	3.7	16.7	3.4	17.6	NC	NC
	AD-3 ^[2]	2.0	6.5	9.4	5.1	11.9	0.4	158
	AD-4C ^[2]	2.0	3.0	20.1	3.3	18.6	0.4	158
	AD-5 ^[1]	2.0	3.7	16.6	1.5	40.5	NC	NC
	AD-16R ^[2]	2.0	2.9	20.8	1.6	37.6	0.4	162
	AD-17 ^[1]	2.0	1.6	37.4	3.2	18.8	NC	NC

Notes:

[1] - Upgradient Well

[2] - Downgradient Well

[3] - Upgradient wells were not gauged at the time of sampling, residence time estimates are based on available data.

NC - Groundwater residence time could not be calculated

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

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/26/2016	Background	0.346	36.5	5	< 0.083 U	5.9	42	252
7/29/2016	Background	0.35	39.6	4	< 0.083 U	5.3	36	239
9/30/2016	Background	0.332	15	5	< 0.083 U	5.4	35	173
10/21/2016	Background	0.398	19.1	4	< 0.083 U	5.2	42	192
12/14/2016	Background	0.394	8.74	4	< 0.083 U	5.2	40	200
1/20/2017	Background	0.656	129	4	< 0.083 U	7.1	68	538
2/24/2017	Background	0.7	147	9	< 0.083 U	6.9	68	612
6/8/2017	Background	0.449	15.1	4	< 0.083 U	5.1	42	176
10/6/2017	Detection	0.453	14.3	4	< 0.083 U	5.3	40	160
5/24/2018	Detection	0.345	10.2	4	< 0.083 U	2.2	43	150
8/14/2018	Detection	0.443	5.95	5	< 0.083 U	5.2	44	160
2/20/2019	Detection	0.504	142	2.82	0.24	7.3	49.2	522
5/30/2019	*	0.689	138	1.59	0.29	6.7	43.3	588
7/24/2019	Detection	0.644	62.7	2	0.106 J	6.0	58	180
2/17/2020	*	0.626	115	3.41	0.31	5.8	56.3	488
5/20/2020	Detection	0.801	126	1.83	0.20	7.2	51.4	508
10/14/2020	Detection	0.670	3.88	2.16	0.25	4.5	66.9	183

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

* Sample is not associated with a specific monitoring program

**Table 1 - Groundwater Data Summary: AD-1
Welsh - BASP
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	µg/L	pCi/L	mg/L	µg/L	mg/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

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: AD-3

Welsh - BASP

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	0.02	1.41	9	< 0.083 U	6.6	4	106
7/29/2016	Background	0.02	0.706	8	< 0.083 U	6.7	5	118
9/30/2016	Background	0.02	0.5	9	< 0.083 U	4.8	6	127
10/21/2016	Background	0.06	0.794	8	< 0.083 U	3.7	9	112
12/14/2016	Background	0.02	1.05	8	< 0.083 U	4.7	11	138
1/20/2017	Background	0.02	0.746	9	< 0.083 U	4.6	4	76
2/24/2017	Background	0.02	0.573	9	< 0.083 U	4.7	5	104
6/8/2017	Background	0.03326	0.543	9	0.2625 J	4.5	5	104
10/6/2017	Detection	0.02055	0.908	9	< 0.083 U	5.2	7	114
5/24/2018	Detection	0.0069 J	0.545	8	< 0.083 U	4.4	3	98
11/13/2018	Detection	0.009 J	0.684	8	< 0.083 U	5.2	4.05	114
2/20/2019	Detection	0.01 J	0.817	9.4	0.13	4.8	1.9	110
4/30/2019	Detection	0.007	--	9.34	--	4.1	--	--
5/30/2019	*	< 0.02 U	3.02	9.03	0.18	4.3	2.3	110
7/24/2019	Detection	< 0.02 U	1.35	7	0.09 J	4.6	6	116
11/25/2019	Detection	--	0.734	--	--	--	--	--
5/20/2020	Detection	< 0.02 U	0.724	7.99	0.11	4.6	2.7	236
7/22/2020	Detection	--	--	--	--	4.7	--	114
10/14/2020	Detection	< 0.02 U	0.705	7.31	0.16	4.6	3.5	116

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

* Sample is not associated with a specific monitoring program

**Table 1 - Groundwater Data Summary: AD-3
Welsh - BASP
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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/31/2016	Background	< 0.93 U	1.56793 J	53	0.286352 J	< 0.07 U	0.464721 J	1.49214 J	1.018	< 0.083 U	< 0.68 U	0.01	0.85	< 0.29 U	0.995807 J	1.31537 J
7/29/2016	Background	3.21106 J	< 1.05 U	36	0.349485 J	< 0.07 U	0.515023 J	1.19046 J	0.183	< 0.083 U	< 0.68 U	0.024	0.589	1.43134 J	2.40188 J	< 0.86 U
9/30/2016	Background	2.70729 J	2.61987 J	43	0.188596 J	0.0802799 J	0.659763 J	1.44845 J	0.552	< 0.083 U	< 0.68 U	0.019	0.39	< 0.29 U	1.79734 J	< 0.86 U
10/21/2016	Background	2.47184 J	1.97572 J	41	0.451723 J	0.277085 J	0.818782 J	1.53187 J	1.589	< 0.083 U	< 0.68 U	0.018	0.351	6	< 0.99 U	< 0.86 U
12/14/2016	Background	< 0.93 U	< 1.05 U	45	0.262387 J	< 0.07 U	0.627352 J	1.34901 J	0.546	< 0.083 U	< 0.68 U	0.017	0.321	< 0.29 U	< 0.99 U	< 0.86 U
1/20/2017	Background	< 0.93 U	2.13113 J	41	0.235263 J	< 0.07 U	0.647294 J	1.6345 J	0.35	< 0.083 U	< 0.68 U	0.014	0.504	< 0.29 U	< 0.99 U	< 0.86 U
2/24/2017	Background	< 0.93 U	< 1.05 U	37	0.209151 J	< 0.07 U	< 0.23 U	1.1537 J	0.4592	< 0.083 U	< 0.68 U	0.014	0.501	< 0.29 U	< 0.99 U	< 0.86 U
6/8/2017	Background	< 0.93 U	1.91 J	38	0.24 J	0.08 J	0.75 J	1.28 J	0.459	0.2625 J	< 0.68 U	0.01503	0.365	< 0.29 U	< 0.99 U	< 0.86 U

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: AD-4C

Welsh - BASP

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	0.05	0.798	10	< 0.083 U	5.4	32	204
7/29/2016	Background	0.03	0.666	12	< 0.083 U	5.5	35	208
9/30/2016	Background	0.02	0.5	11	< 0.083 U	5.0	45	212
10/21/2016	Background	0.04	0.578	10	< 0.083 U	4.3	35	212
12/14/2016	Background	0.02	0.341	11	< 0.083 U	4.6	36	252
1/20/2017	Background	0.02	0.761	10	< 0.083 U	4.7	43	184
2/24/2017	Background	0.02	0.467	9	< 0.083 U	5.1	40	196
6/8/2017	Background	0.03331	0.573	10	< 0.083 U	4.9	39	228
10/6/2017	Detection	0.02565	0.654	11	< 0.083 U	5.4	44	226
5/24/2018	Detection	0.02505	0.434	14	< 0.083 U	5.2	42	224
8/14/2018	Assessment	--	--	15	--	5.0	--	--
11/13/2018	Detection	0.01 J	0.609	7.5	< 0.083 U	5.8	56	220
12/18/2018	Detection	--	--	--	--	4.9	58	--
2/20/2019	Detection	0.01 J	0.931	9.18	0.1 J	5.2	60.1	242
4/30/2019	Detection	0.014	--	--	--	4.8	56.2	--
5/30/2019	*	< 0.02 U	0.564	14.8	0.16	4.6	52.8	208
7/24/2019	Detection	< 0.02 U	0.586	13	< 0.083 U	3.9	52	284
12/19/2019	Detection	--	--	--	--	--	--	226
5/20/2020	Detection	< 0.02 U	0.679	15.1	0.11	5.1	69.0	268
7/22/2020	Detection	--	--	--	--	4.7	71.8	280
10/14/2020	Detection	< 0.02 U	0.613	13.1	0.18	4.9	76.1	278
12/10/2020	Detection	--	--	--	--	4.9	78.2	288

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

*Sample is not associated with a specific monitoring program

Table 1 - Groundwater Data Summary: AD-4C

Welsh - BASP

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/31/2016	Background	< 0.93 U	< 1.05 U	88	0.407928 J	< 0.07 U	9	1.19093 J	1.289	< 0.083 U	< 0.68 U	0.004	0.191	< 0.29 U	1.12526 J	< 0.86 U
7/29/2016	Background	< 0.93 U	< 1.05 U	59	0.335947 J	< 0.07 U	4	0.852951 J	0.571	< 0.083 U	< 0.68 U	0.015	0.185	1.09296 J	2.52271 J	< 0.86 U
9/30/2016	Background	< 0.93 U	1.51249 J	74	0.274296 J	< 0.07 U	8	0.986752 J	2.572	< 0.083 U	< 0.68 U	0.006	0.16	< 0.29 U	1.95938 J	< 0.86 U
10/21/2016	Background	< 0.93 U	1.74748 J	69	0.347477 J	0.0809157 J	9	1.08565 J	1.657	< 0.083 U	< 0.68 U	0.006	0.141	3.20217 J	1.18291 J	< 0.86 U
12/14/2016	Background	< 0.93 U	2.24683 J	21	0.133622 J	< 0.07 U	0.944028 J	0.305391 J	0.685	< 0.083 U	< 0.68 U	0.004	0.143	< 0.29 U	1.27423 J	< 0.86 U
1/20/2017	Background	< 0.93 U	1.85604 J	75	0.221609 J	< 0.07 U	4	1.02773 J	2.045	< 0.083 U	< 0.68 U	0.005	0.125	< 0.29 U	< 0.99 U	< 0.86 U
2/24/2017	Background	< 0.93 U	< 1.05 U	30	0.102645 J	< 0.07 U	0.421354 J	0.364739 J	0.517	< 0.083 U	< 0.68 U	0.004	0.098	< 0.29 U	< 0.99 U	< 0.86 U
6/8/2017	Background	< 0.93 U	1.19 J	51.42	0.19 J	0.08 J	4.03	0.75 J	0.953	< 0.083 U	< 0.68 U	0.00482	0.147	< 0.29 U	< 0.99 U	< 0.86 U

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: AD-5

Welsh - BASP

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	0.03	36.9	15	0.3469 J	6.4	123	337
7/29/2016	Background	0.04	44.7	16	< 0.083 U	5.4	163	360
9/30/2016	Background	0.04	46.3	15	0.2436 J	5.3	190	416
10/21/2016	Background	0.05	50.7	14	< 0.083 U	5.9	267	448
12/14/2016	Background	0.05	49.6	13	< 0.083 U	6.2	233	484
1/20/2017	Background	0.04	49.8	14	< 0.083 U	6.3	234	438
2/24/2017	Background	0.04	33	15	< 0.083 U	5.5	127	286
6/8/2017	Background	0.05281	49.7	14	< 0.083 U	6.0	82	300
10/6/2017	Detection	0.04322	33.1	16	< 0.083 U	5.6	82	258
5/24/2018	Detection	0.05007	28.1	22	< 0.083 U	6.2	60	242
8/15/2018	Detection	0.050	40.5	19	< 0.083 U	6.2	240	428
2/21/2019	Detection	0.033	33.9	24.7	0.21	5.4	46.5	220
5/30/2019	*	0.03 J	30.0	22.3	0.29	6.3	51.3	238
7/24/2019	Detection	0.04 J	41.1	18	0.112 J	6.3	90	354
2/17/2020	*	0.03 J	39.8	19.8	0.22	5.5	43.7	248
5/20/2020	Detection	0.03 J	40.2	22.3	0.18	6.8	55.5	264
10/14/2020	Detection	0.04 J	36.6	18.8	0.18	6.5	148	338

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

*Sample is not associated with a specific monitoring program

**Table 1 - Groundwater Data Summary: AD-5
Welsh - BASP
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	µg/L	pCi/L	mg/L	µg/L	mg/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

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: AD-16R

Welsh - BASP

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
6/8/2017	Background	0.04198	2.75	7	0.3438 J	3.7	54	204
6/28/2017	Background	0.06398	1.24	6	0.2512 J	3.9	55	200
7/7/2017	Background	0.02699	2.07	36	< 0.083 U	3.4	52	184
7/14/2017	Background	0.04415	2.39	6	0.2516 J	3.5	44	160
7/28/2017	Background	0.03237	2.5	7	0.2615 J	3.5	54	180
8/2/2017	Background	0.03177	1.92	7	< 0.083 U	3.0	49	174
8/11/2017	Background	0.06192	1.83	8	< 0.083 U	4.1	44	164
8/18/2017	Background	0.0304	1.44	7	< 0.083 U	3.4	46	160
9/1/2017	Background	0.02841	1.33	7	< 0.083 U	3.9	63	152
10/6/2017	Detection	0.04672	0.896	7	< 0.083 U	3.3	82	152
1/18/2018	Detection	--	--	--	--	4.0	58.6	--
5/23/2018	Detection	0.03202	2.53	6	< 0.083 U	3.8	67	204
8/14/2018	Detection	--	--	--	--	3.9	44	--
11/13/2018	Detection	0.02 J	0.467	6.5	< 0.083 U	5.6	54	186
2/20/2019	Detection	0.03 J	2	6.78	0.2	4.7	52.8	200
4/30/2019	Detection	0.015	--	--	--	3.9	--	--
5/30/2019	*	< 0.02 U	1.36	5.43	0.19	3.9	41.6	80
7/24/2019	Detection	0.03 J	1.50	7	0.13 J	3.6	70	250
12/19/2019	Detection	--	--	--	--	--	--	134
5/20/2020	Detection	0.02 J	1.54	7.09	0.16	3.4	71.4	242
7/22/2020	Detection	--	--	--	--	3.2	--	224
10/14/2020	Detection	0.02 J	0.550	6.50	0.14	3.3	53.1	183

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

* Sample is not associated with a specific monitoring program

Table 1 - Groundwater Data Summary: AD-16R

Welsh - BASP

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	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
6/8/2017	Background	< 0.93 U	7.07	46.4	2.21	1.03	1.76	41.74	6.66	0.3438 J	< 0.68 U	0.0293	< 0.005 U	< 0.29 U	1.98 J	< 0.86 U
6/28/2017	Background	< 0.93 U	5.28	41.43	2.16	0.92 J	0.95 J	40.87	12.11	0.2512 J	< 0.68 U	0.02932	< 0.005 U	< 0.29 U	< 0.99 U	< 0.86 U
7/7/2017	Background	< 0.93 U	4.13 J	44.56	2.08	0.97 J	1.44	41.75	25.16	< 0.083 U	< 0.68 U	0.02846	< 0.005 U	< 0.29 U	2.09 J	1.2 J
7/14/2017	Background	< 0.93 U	6.31	54.35	2.01	1.09	0.84 J	37.88	9.12	0.2516 J	< 0.68 U	0.02391	0.009 J	< 0.29 U	< 0.99 U	< 0.86 U
7/28/2017	Background	< 0.93 U	3.88 J	51.06	2.09	1.02	1.43	40.86	9.81	0.2615 J	< 0.68 U	0.02653	< 0.005 U	< 0.29 U	1 J	< 0.86 U
8/2/2017	Background	< 0.93 U	4.46 J	49.61	2.17	1.28	1.07	45.33	5.45	< 0.083 U	< 0.68 U	0.02617	0.006 J	< 0.29 U	1.74	2.02
8/11/2017	Background	< 0.93 U	4.93 J	47.52	1.89	1.13	0.96 J	40.37	--	< 0.083 U	< 0.68 U	0.02347	0.008 J	< 0.29 U	1.36 J	< 0.86 U
8/18/2017	Background	< 0.93 U	2.35 J	43.85	1.91	1.08	0.8 J	40.05	5.56	< 0.083 U	< 0.68 U	0.02466	0.009 J	< 0.29 U	< 0.99 U	0.92 J
9/1/2017	Background	< 0.93 U	2.12 J	44.14	1.75	1.04	1.18	37.56	6.68	< 0.083 U	< 0.68 U	0.02429	0.006 J	< 0.29 U	< 0.99 U	< 0.86 U

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

pCi/L: picocuries per liter

Table 1 - Groundwater Data Summary: AD-17

Geosyntec Consultants, Inc.

Welsh - BASP

Appendix III Constituents

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/26/2016	Background	0.121	200	43	0.4023 J	7.2	1,166	1,810
7/29/2016	Background	0.119	195	32	0.4135 J	5.7	1,005	1,576
9/30/2016	Background	0.111	191	36	0.3055 J	6.2	1,055	1,663
10/21/2016	Background	0.124	194	32	0.583 J	6.1	1,163	1,612
12/14/2016	Background	0.135	196	31	0.5399 J	6.0	1,096	1,560
1/20/2017	Background	0.101	196	33	< 0.083 U	5.9	1,445	1,686
2/24/2017	Background	0.135	189	30	< 0.083 U	5.7	1,055	1,628
6/8/2017	Background	0.121	188	30	< 0.083 U	5.8	1,105	1,578
10/6/2017	Detection	0.183	183	31	< 0.083 U	5.9	1,090	1,548
5/24/2018	Detection	0.239	193	39	< 0.083 U	6.3	1,067	1,836
8/15/2018	Detection	0.118	187	--	--	5.6	--	--
2/21/2019	Detection	0.151	207	43.2	0.18	6.9	1,060	1,722
5/30/2019	*	0.158	202	41.7	< 0.04 U	6.1	1,120	1,546
7/24/2019	Detection	0.113	216	37	0.085 J	6.0	1,127	1,864
2/17/2020	*	0.104	184	36.0	0.16	5.9	1,070	1,750
5/20/2020	Detection	0.115	250	47.7	0.15	5.7	1,190	1,890
10/14/2020	Detection	0.100	185	35.7	0.17	5.4	1,060	1,720

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

* Sample is not associated with a specific monitoring program

**Table 1 - Groundwater Data Summary: AD-17
Welsh - BASP
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	µg/L	pCi/L	mg/L	µg/L	mg/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	10.33	< 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

mg/L: milligrams per liter

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

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.

Memorandum

Date: August 18, 2020

To: David Miller (AEP)

Copies to: Jill Parker-Witt (AEP)

From: Allison Kreinberg (Geosyntec)

Subject: Evaluation of Detection Monitoring Data at
Welsh Plant's Bottom Ash Storage Pond (BASP)

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257 Subpart D, "CCR rule"), the first semi-annual detection monitoring event at the Bottom Ash Storage Pond (BASP), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas, was completed on May 20, 2020. Based on the results, a two-of-two verification sampling was completed on July 22, 2020.

Background values for the BASP were previously calculated in January 2018. After a minimum of four detection monitoring events, the results of those events were compared to the existing background and the dataset was updated as appropriate. Revised and upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Details on the calculation of these revised background values are described in Geosyntec's *Statistical Analysis Summary* report, dated December 10, 2019.

To achieve an acceptably high statistical power while maintaining a site-wide false-positive rate (SWFPR) of 10% per year or less, prediction limits were calculated based on a one-of-two retesting procedure. With this procedure, a statistically significant increase (SSI) is only concluded if both samples in a series of two exceeds the UPL (or are below the LPL for pH). In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

Detection monitoring results and the relevant background values are compared in Table 1 and noted exceedances are described in the list below.

- Sulfate concentrations exceeded the intrawell UPL of 63.7 mg/L in both the initial (69.0 mg/L) and second (71.8 mg/L) samples collected at AD-4C. Thus, an SSI over background is concluded for sulfate at AD-4C.
- Total dissolved solids (TDS) concentrations exceeded the intrawell UPL of 255 mg/L in both the initial (268 mg/L) and second (280 mg/L) samples collected at AD-4C and also exceeded the intrawell UPL of 221 mg/L in both the initial (242 mg/L) and second (224 mg/L) samples collected at AD-16R.

In response to the exceedance noted above, the Welsh BASP CCR unit will either transition to assessment monitoring or an alternative source demonstration (ASD) for sulfate and TDS will be conducted in accordance with 40 CFR 257.94(e)(2). If the ASD is successful, the Welsh BASP will remain in detection monitoring.

The statistical analysis was conducted within 90 days of completion of sampling and analysis in accordance with 40 CFR 257.93(h)(2). A certification of these statistics by a qualified professional engineer is provided in Attachment A.

**Table 1: Detection Monitoring Data Evaluation
Welsh Plant - Bottom Ash Storage Pond**

Parameter	Unit	Description	AD-3		AD-4C		AD-16R	
			5/20/2020	7/22/2020	5/20/2020	7/22/2020	5/20/2020	7/22/2020
Boron	mg/L	Intrawell Background Value (UPL)	0.0580		0.0529		0.0638	
		Detection Monitoring Result	0.02	--	0.02	--	0.02	--
Calcium	mg/L	Intrawell Background Value (UPL)	1.32		0.961		3.15	
		Detection Monitoring Result	0.724	--	0.679	--	1.54	--
Chloride	mg/L	Intrawell Background Value (UPL)	9.40		15.6		8.02	
		Detection Monitoring Result	7.99	--	15.1	--	7.09	--
Fluoride	mg/L	Intrawell Background Value (UPL)	1.00		1.00		1.00	
		Detection Monitoring Result	0.11	--	0.11	--	0.16	--
pH	SU	Intrawell Background Value (UPL)	6.6		5.8		5.0	
		Intrawell Background Value (LPL)	3.1		4.2		2.6	
		Detection Monitoring Result	4.6	--	5.1	--	3.4	--
Sulfate	mg/L	Intrawell Background Value (UPL)	10.6		63.7		73.2	
		Detection Monitoring Result	2.7	--	69.0	71.8	71.4	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	140		255		221	
		Detection Monitoring Result	236	114	268	280	242	224

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

Bold values exceed the background value.

Background values are shaded gray.

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected statistical method, described above and in the December 10, 2019 *Statistical Analysis Summary* report, is appropriate for evaluating the groundwater monitoring data for the Welsh BASP 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

License Number

TEXAS

Licensing State

08.18.2020

Date

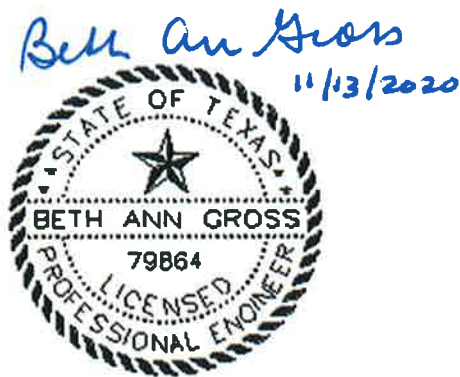
APPENDIX III

Alternate source demonstration(s) 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.

ALTERNATIVE SOURCE DEMONSTRATION REPORT FEDERAL CCR RULE

J. Robert Welsh Plant Bottom Ash Storage Pond Pittsburg, Texas

Submitted to



Geosyntec Consultants
Texas Registered Engineering Firm
No. F-1182



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TABLE OF CONTENTS

SECTION 1 Introduction and Summary..... 1-1
 1.1 CCR Rule Requirements..... 1-1
 1.2 Demonstration of Alternative Sources..... 1-2
SECTION 2 Alternative Source Demonstration..... 2-1
 2.1 Proposed Alternative Source 2-1
 2.1.1 Sulfate..... 2-1
 2.1.2 TDS..... 2-2
 2.2 Sampling Requirements..... 2-3
SECTION 3 Conclusions and Recommendations 3-1
SECTION 4 References 4-1

LIST OF ATTACHMENTS

Attachment A Certification by a Qualified Professional Engineer

LIST OF TABLES

Table 1 Detection Monitoring Data Evaluation

LIST OF FIGURES

Figure 1 Site Layout
Figure 2 Groundwater Potentiometric Map
Figure 3 Sulfate Time Series Graph at AD-4C and Upgradient Background Well
 AD-1
Figure 4 Boron Time Series Graph
Figure 5 Piper Diagram – Mixing Model
Figure 6 TDS Time Series Graph at AD-16R
Figure 7 TDS Time Series Graph



Geosyntec Consultants
Texas Registered Engineering Firm
No. F-1182

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
BASP	Bottom Ash Storage Pond
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
LPL	Lower Prediction Limit
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SWFPR	Site-Wide False Positive Rate
TCEQ	Texas Commission on Environmental Quality
TPDES	Texas Pollutant Discharge Elimination System
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency

SECTION 1

INTRODUCTION AND SUMMARY

This Alternative Source Demonstration (ASD) report has been prepared to address statistically significant increases (SSIs) for sulfate and total dissolved solids (TDS) in the groundwater monitoring network at the J. Robert Welsh Plant Bottom Ash Storage Pond (BASP) following the first semiannual detection monitoring event of 2020. The BASP is a wastewater pond permitted under the Texas Commission on Environmental Quality (TCEQ) Texas Pollutant Discharge Elimination System Permit No. WQ0001811000 as Pond No. 3.

Background values for the BASP were initially calculated in January 2018 with data from at least eight monitoring events. After a minimum of four detection monitoring events, the results of those events were compared to the existing background values, and the dataset was updated as appropriate (Geosyntec, 2019a). Revised upper prediction limits (UPLs) were calculated for each Appendix III parameter to represent background values. Lower prediction limits (LPLs) were also calculated for pH. Prediction limits were calculated based on a one-of-two retesting procedure to maintain an appropriate site-wide false positive rate (SWFPR). With this procedure, a statistically significant increase (SSI) is concluded only if both samples in a series of two exceed the UPL, or in the case of pH are below the LPL. In practice, if the initial result did not exceed the UPL, a second sample was not collected or analyzed.

The first semi-annual detection monitoring event of 2020 was performed in May 2020 (initial sampling event), and the results were compared to the calculated prediction limits. Where initial exceedances were identified, verification resampling was completed in July 2020. Following verification resampling, SSIs were identified for sulfate at well AD-4C by intrawell analysis, and total dissolved solids (TDS) at wells AD-4C and AD-16R by intrawell analysis. A summary of the detection monitoring analytical results and the calculated prediction limits to which they were compared is provided in **Table 1**.

1.1 CCR Rule Requirements

United States Environmental Protection Agency (USEPA) regulations (USEPA, 2015) regarding detection monitoring programs for coal combustion residuals (CCR) landfills and surface impoundments provide owners and operators with the option to make an alternative source demonstration (ASD) when an SSI is identified (40 CFR 257.94(e)(2)):

The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to

*include obtaining a certification from a qualified professional engineer...
verifying the accuracy of the information in the report.*

The SSIs were identified for the detection monitoring events conducted on May 20, 2020, and July 22, 2020. Pursuant to 40 CFR 257.94(e)(2) of the CCR Rule (40 CFR 257), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report, which documents that the SSIs should not be attributed to the BASP at the Welsh Plant.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which the identified SSI could be attributed. Alternative sources were identified from amongst five types:

- ASD Type I: Sampling Causes;
- ASD Type II: Laboratory Causes;
- ASD Type III: Statistical Evaluation Causes;
- ASD Type IV: Natural Variation; and
- ASD Type V: Alternative Sources.

A demonstration was conducted to assess whether the increases in sulfate concentrations at well AD-4C and TDS concentrations at wells AD-4C and AD-16R were based on Type IV causes (natural variation) and not by a release from the BASP.

SECTION 2

ALTERNATIVE SOURCE DEMONSTRATION

The methods used to assess possible alternative sources of the SSIs for sulfate at AD-4C and TDS at AD-4C and AD-16R and the proposed alternative source are described below.

2.1 Proposed Alternative Source

An initial review of field forms, site geochemistry, and site historical data did not identify alternative sources due to a Type I issue (sampling causes). A review of the laboratory and statistical analyses did not identify any Type II (laboratory causes) or Type III (statistical evaluation causes) issues. Groundwater sampling, laboratory analysis, and statistical evaluations were generally completed in accordance with draft TCEQ guidance for groundwater monitoring (TCEQ, 2020). An initial review of site geochemistry did not identify evidence of any Type V (anthropogenic) impacts. As described below, the SSIs at AD-4C and AD-16R were attributed to natural variation, which is a Type IV cause.

2.1.1 Sulfate

An SSI for sulfate was identified at monitoring well AD-4C. A site map showing the location of AD-4C and other network well locations is presented in **Figure 1**. The monitoring network includes background locations AD-1, AD-5, and AD-17 and compliance wells AD-3, AD-4C, and AD-16R. Groundwater flow beneath the BASP is generally toward the southeast, as shown in **Figure 2**.

Sulfate concentrations at background well AD-1, which is located immediately upgradient of the BASP and upgradient of AD-4C, have historically been above those observed at AD-4C (**Figure 3**). Prior to 2009, sulfate concentrations at AD-1 were generally higher and subject to significant variability, including a peak value of 616 milligrams per liter (mg/L) sulfate on June 2007. Since background monitoring was initiated in 2016, sulfate concentrations at both AD-1 and AD-4C appear to trend upwards at a similar rate. Thus, recent increases in sulfate concentrations at AD-4C may represent the migration of groundwater with higher concentrations of sulfate from upgradient locations.

Likewise, boron concentrations at AD-1 are consistently higher than those observed at AD-4C (**Figure 4**). Boron is a conservative parameter which functions as a ‘tracer’ for potential CCR unit releases due to its lack of attenuation by chemical processes in groundwater flow and its high relative concentration in CCR. Generally, boron concentrations at AD-4C have slightly decreased since the October 2017 sampling event and have been relatively consistent compared to upgradient well AD-1. If BASP water, which has a boron concentration approximately one order of magnitude greater than at AD-1 (reported October 2020 concentration of 4.58 mg/L), was impacting groundwater quality at downgradient monitoring wells, an increase in boron concentrations would be expected. The current boron concentrations at AD-4C do not display an increasing or decreasing

trend, which suggests that groundwater quality changes should not be attributed to a release from the BASP.

A mixing model was created to further illustrate how concentrations at AD-4C would be expected to change if the groundwater at AD-4C was affected by infiltration from the BASP. Groundwater data at AD-4C collected under the Federal CCR program in October 2016 was used to represent initial conditions at the monitoring location (100% groundwater), and BASP water data collected in August 2020 was used to represent the conditions in the BASP. A geochemical model (PHREEQC) was used to mix the groundwater sample with the BASP water at varying ratios in order to evaluate the changes in groundwater geochemistry under BASP water infiltration conditions. The output was compared to the reported groundwater concentrations at AD-4C in October 2020, which was the most recent sample collected containing the necessary major ion data. The mixing model output is included in a Piper Diagram presented as **Figure 5**, which visually represents the relative concentrations of major cations and anions in the analytical samples and mixing model outputs.

As illustrated in **Figure 5**, the mixing model predicts greater relative concentrations of calcium as the percent of BASP water added to the 2016 groundwater sample increases. However, the cation composition of groundwater at AD-4C appears unchanged between the 2016 and 2020 samples. Additionally, with greater inputs of the BASP water, the model predicts an increase in the relative percentage of sulfate as the relative percentage of chloride declines. However, the change in anion distribution between 2016 and 2020 in groundwater at AD-4C indicates that the chloride contribution has remained consistent while the relative concentration of alkalinity has declined.

The inconsistency of recently collected data at AD-4C with modeled outputs indicates that changes in sulfate concentrations should not be attributed to mixing with BASP water. Rather, the elevated sulfate and boron concentrations at upgradient background well AD-1 suggest that changes in sulfate concentration at AD-4C are attributable to natural variation. This same conclusion was noted in a previously completed ASD for sulfate at well AD-4C (Geosyntec, 2019b).

2.1.2 TDS

SSIs for TDS were identified at AD-16R and AD-4C. The second semi-annual detection sampling event was conducted on October 14, 2020. The reported TDS concentration for the sample from well AD-16R was 183 mg/L, which is below the calculated UPL (**Figure 6**). Based on the three results for AD-16R during the 2020 groundwater monitoring events, a positive trend is not demonstrated for TDS. Additionally, no other Appendix III exceedances were observed for AD-16R during the first semi-annual event, which was completed in May and July 2020. Thus, the observed TDS concentrations during the first semi-annual event are not considered indicative of a release from the BASP and are instead likely due to natural variability in the aquifer.

TDS concentrations at all wells within the BASP network are displayed on **Figure 7**. TDS concentrations at background wells AD-1, AD-5, and AD-17 are all generally higher than either of the two monitoring wells with TDS exceedances (AD-16R and AD-4C). The TDS

concentrations of these background wells indicate TDS is highly variable within the aquifer unit. TDS concentrations at AD-1, which is directly upgradient of AD-4C, have been greater than TDS at AD-4C and AD-16R for four of the past five monitoring events. Even greater TDS concentrations are observed at AD-17, which is located further upgradient.

As mentioned in Section 2.1.1, boron is a conservative parameter which functions as a ‘tracer’ for potential CCR unit releases due to its lack of attenuation by chemical processes in groundwater flow and its high relative concentration in CCR. Boron concentrations in compliance wells AD-16R and AD-4C and background well AD-1 are displayed in **Figure 7**. The lack of increasing boron concentrations at AD-4C was previously discussed in Section 2.1.1. A similar trend is observed for boron concentrations at AD-16R, which have been relatively consistent compared to upgradient well AD-1. If infiltration from BASP water, which has a boron concentration approximately one order of magnitude greater than at AD-1, was impacting groundwater quality at downgradient monitoring wells, an increase in boron concentrations would be expected. The current boron concentrations at both AD-16R and AD-4C do not display an increasing or decreasing trend, which suggests that groundwater quality changes should not be attributed to a release from the BASP.

The recent SSIs for TDS at AD-16R and AD-4C are best attributed to natural variations in the groundwater chemistry within the aquifer.

2.2 Sampling Requirements

The ASD described above supports the determination that the identified SSIs are from natural variation and not due to a release from the Welsh BASP. Therefore, the unit will remain in the detection monitoring. Groundwater at the unit will continue to be sampled for Appendix III parameters on a semi-annual basis.

SECTION 3

CONCLUSIONS AND RECOMMENDATIONS

The preceding information serves as the ASD prepared in accordance with 40 CFR 257.94(e)(2) and supports the position that the identified sulfate and TDS SSIs should be attributed to natural variation and are not due to a release from the Welsh BASP. Therefore, no further action is warranted, and the Welsh BASP will remain in the detection monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment A**.

SECTION 4

REFERENCES

- Geosyntec, 2019a. Statistical Analysis Summary – Background Update Calculations. Bottom Ash Storage Pond – J. Robert Welsh Plant. December 2019.
- Geosyntec, 2019b. Alternative Source Demonstration Report – Federal CCR Rule. J. Robert Welsh Plant – Bottom Ash Storage Pond. May 2019.
- TCEQ, 2020. Coal Combustion Residuals Groundwater Monitoring and Corrective Action Draft Technical Guideline No. 32. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action. Waste Permits Division. May 2020.
- USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March 2009.
- USEPA, 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (Final Rule). Fed. Reg. 80 FR 21301, pp. 21301-21501, 40 CFR Parts 257 and 261, April.

TABLES

**Table 1: Detection Monitoring Data Evaluation
Welsh Plant - Bottom Ash Storage Pond**

Parameter	Unit	Description	AD-3		AD-4C		AD-16R	
			5/20/2020	7/22/2020	5/20/2020	7/22/2020	5/20/2020	7/22/2020
Boron	mg/L	Intrawell Background Value (UPL)	0.0580		0.0529		0.0638	
		Detection Monitoring Result	<0.02	--	<0.02	--	0.02 J	--
Calcium	mg/L	Intrawell Background Value (UPL)	1.32		0.961		3.15	
		Detection Monitoring Result	0.724	--	0.679	--	1.54	--
Chloride	mg/L	Intrawell Background Value (UPL)	9.40		15.6		8.02	
		Detection Monitoring Result	7.99	--	15.1	--	7.09	--
Fluoride	mg/L	Intrawell Background Value (UPL)	1.00		1.00		1.00	
		Detection Monitoring Result	0.11	--	0.11	--	0.16	--
pH	SU	Intrawell Background Value (UPL)	6.6		5.8		5.0	
		Intrawell Background Value (LPL)	3.1		4.2		2.6	
		Detection Monitoring Result	4.6	--	5.1	--	3.4	--
Sulfate	mg/L	Intrawell Background Value (UPL)	10.6		63.7		73.2	
		Detection Monitoring Result	2.7	--	69.0	71.8	71.4	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	140		255		221	
		Detection Monitoring Result	236	114	268	280	242	224

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

Background values are shaded gray.

Bold values exceed the background value.

Value which were not detected are shown as less than the Method Detection Limit.

'J' represented an estimated value which was detected above the Method Detection Limit but below the Reporting Limit.

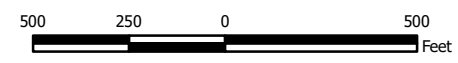
FIGURES



- Monitoring Well Network**
- ◆ Downgradient Sampling Location
 - ◆ Background Sampling Location
 - Bottom Ash Storage Pond

Notes

- Monitoring well coordinates provided by AEP.
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluations (Arcadis, 2016).



**Site Layout
Bottom Ash Storage Pond**

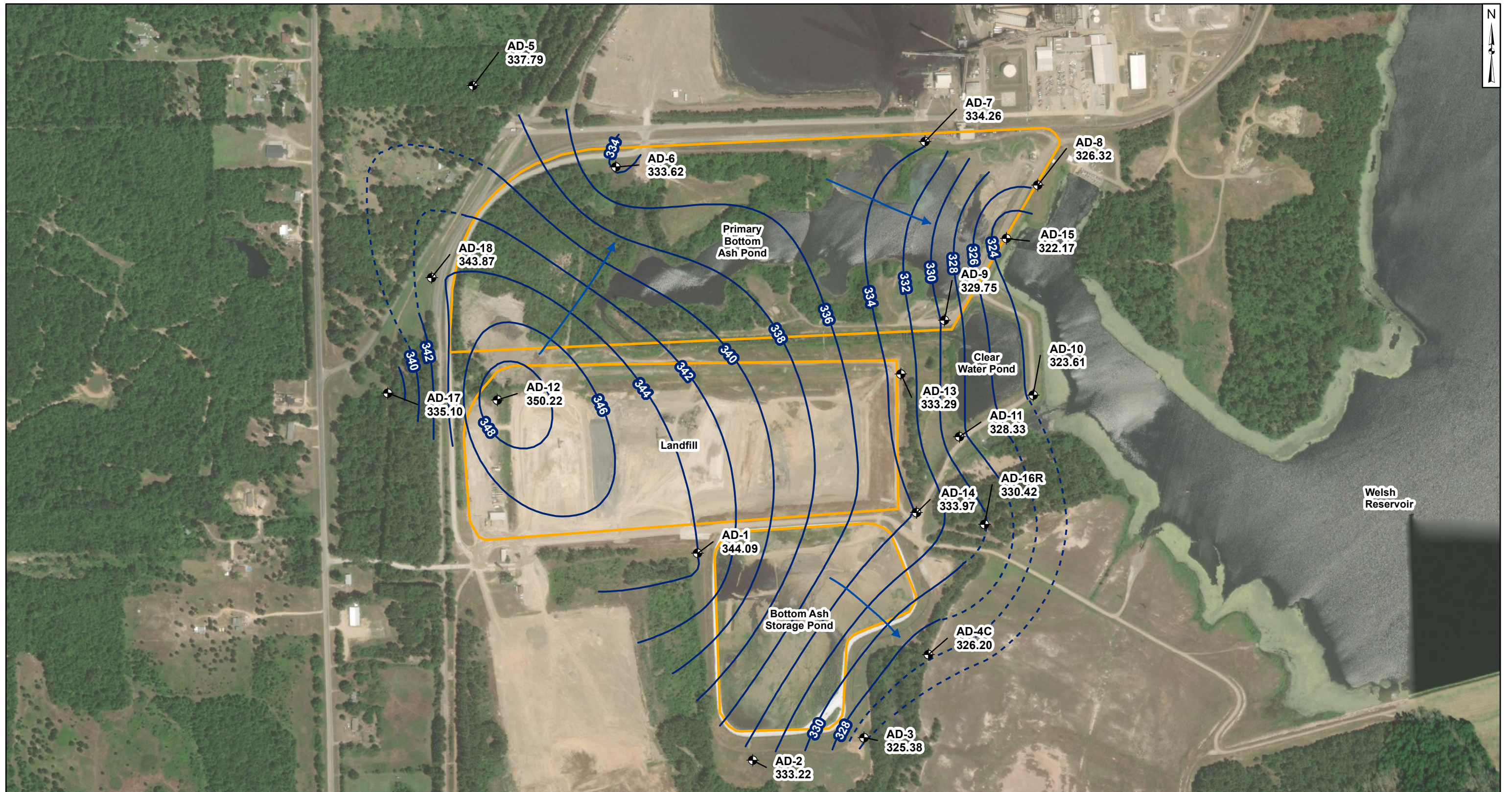
AEP Welsh Power Plant
Cason, Texas

Geosyntec
consultants

Columbus, Ohio

2020/09/23

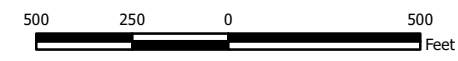
Figure
1



- 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 May 19-20, 2020) 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.



**Groundwater Potentiometric Map
May 2020**

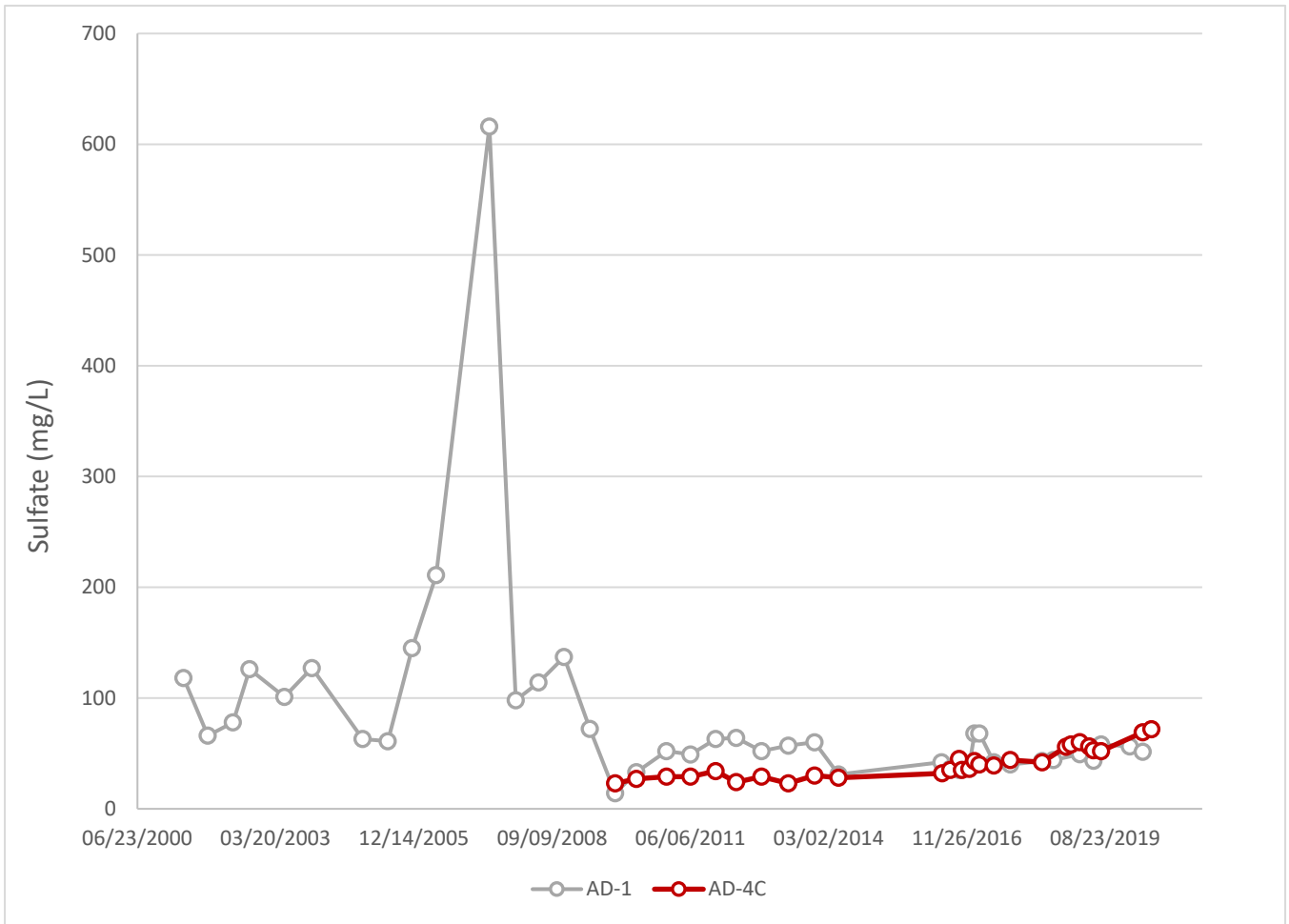
AEP Welsh Power Plant
Cason, Texas

Geosyntec
consultants

Columbus, Ohio

2020/11/04

Figure
2



Notes: Sulfate time series diagram for BASP upgradient well AD-1 and downgradient well AD-4C. Data for AD-1 was collected as part of state and Federal CCR programs. Data for AD-4C was collected under the Federal CCR program.

Sulfate Time Series Graph at AD-4C and Upgradient Background Well AD-1

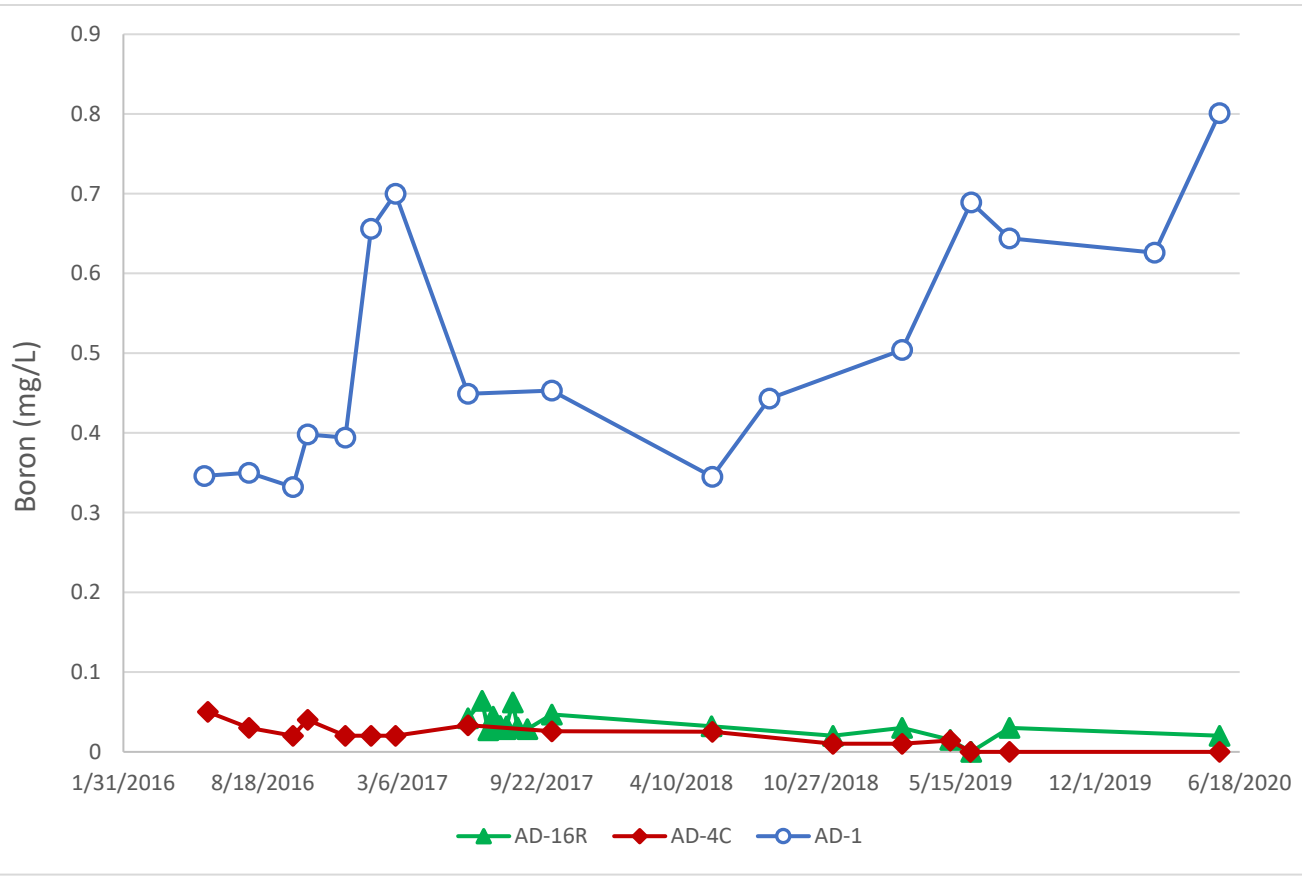
Welsh Bottom Ash Storage Pond



Figure 3

Columbus, Ohio

12-December-2020



Notes: Boron data were collected under the Federal CCR program. Concentrations are shown in milligrams per liter (mg/L).

Boron Time Series Graph
Welsh Bottom Ash Storage Pond

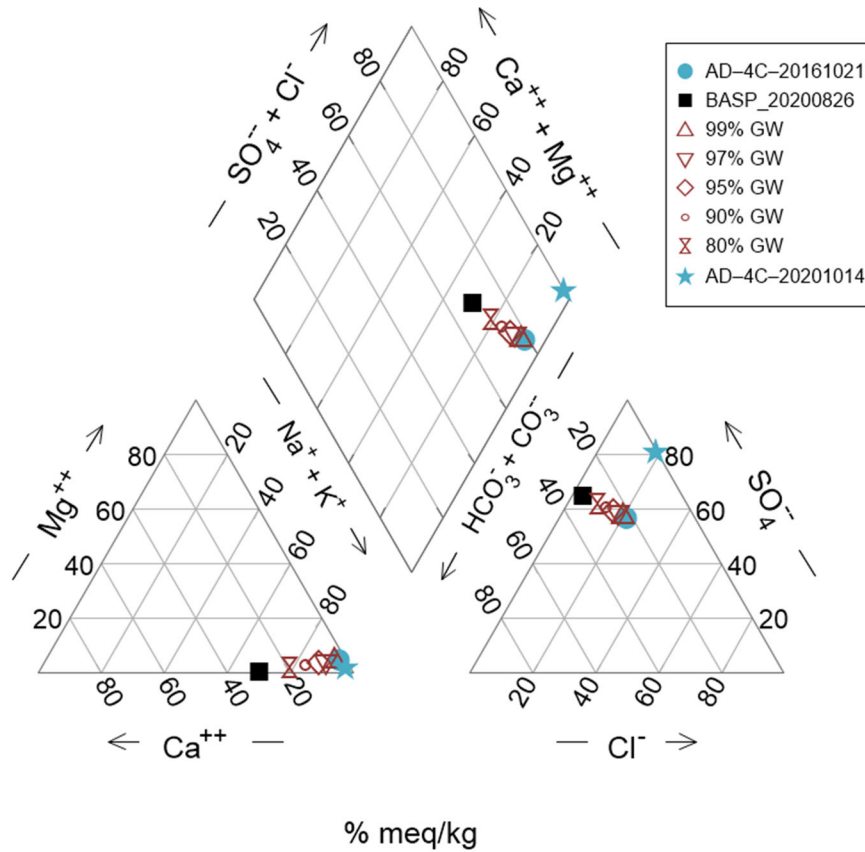
Geosyntec
consultants



Figure
4

Columbus, Ohio

03-November-2020



Notes: The October 2016 AD-4C groundwater sample the and October 2020 BASP sample were used as mixing model end members. The percentage input of the October 2020 BASP sample was varied, and the modeled output was compared to the October 2020 AD-4C groundwater sample. Results are shown in the relative percentage of milliequivalents per kilogram (meq/kg).

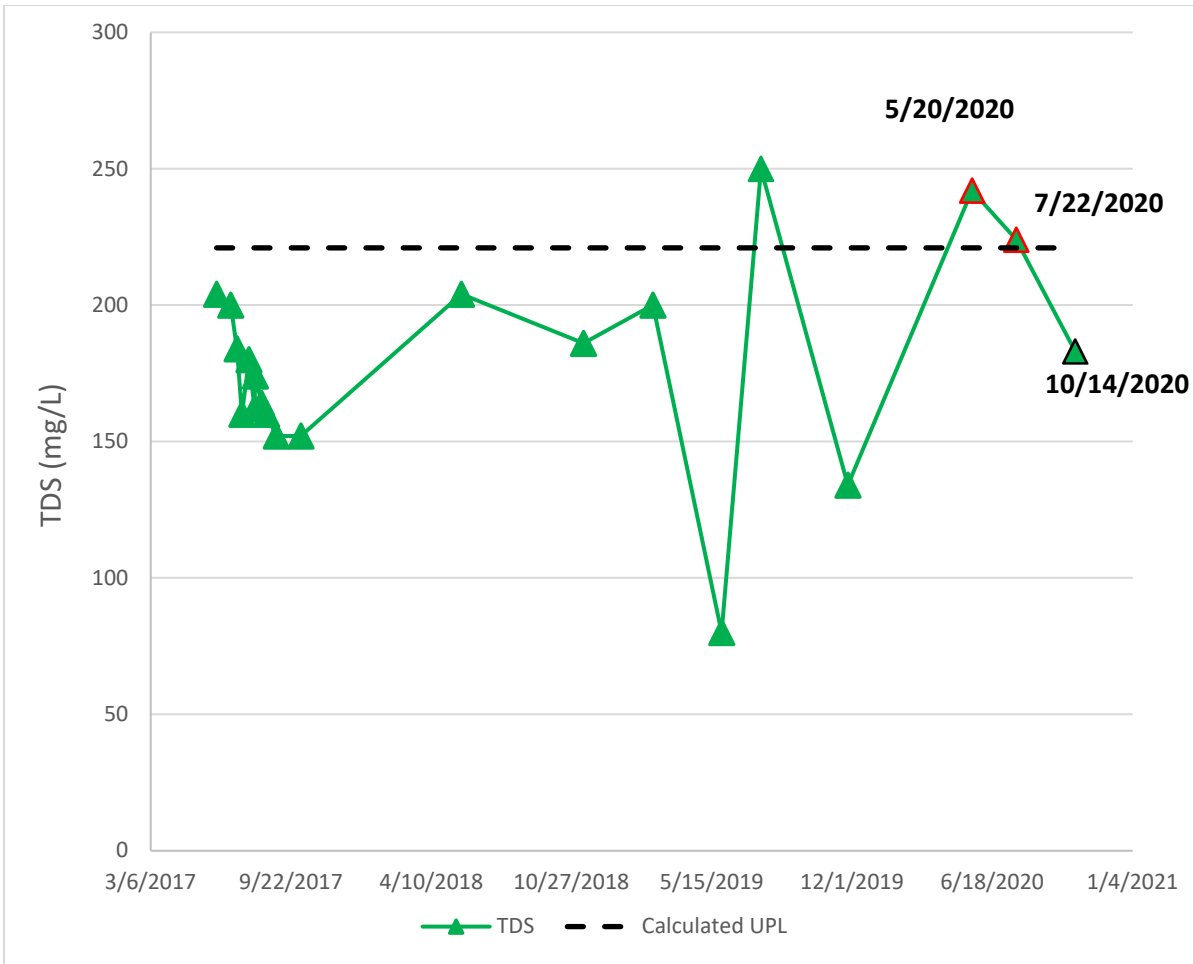
Piper Diagram – Mixing Model
Welsh Bottom Ash Storage Pond



Figure
5

Columbus, OH

2020/11/10



Notes: Initial sampling for the first semi-annual detection monitoring event occurred on 5/20/2020. Verification resampling for the first semi-annual event occurred on 7/22/2020. Initial sampling for the second semi-annual event occurred on 10/14/2020. The upper prediction limit (UPL) was calculated using intrawell analyses.

TDS Time Series Graph at AD-16R
Northeastern Landfill

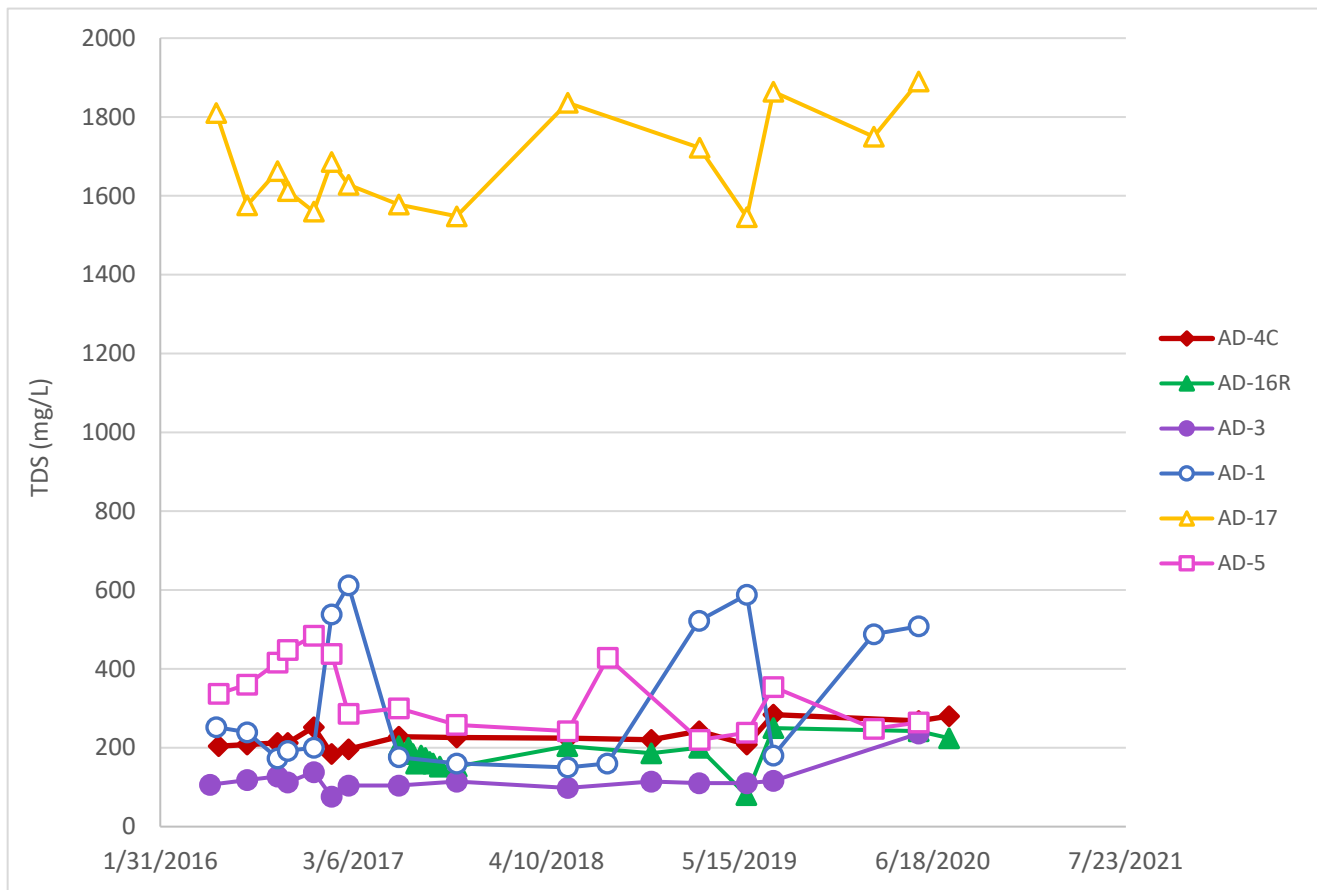
Geosyntec
consultants



Figure
6

Columbus, Ohio

05-November-2020



Notes: TDS data was collected under the Federal CCR rule. Monitoring wells AD-1, AD-5, and AD-17 are background wells, whereas AD-3, AD-4C, and AD-16R are compliance wells. Concentrations are shown in milligrams per liter (mg/L).

TDS Time Series Graph
Welsh Bottom Ash Storage Pond

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Figure
7

Columbus, Ohio

3-November-2020

ATTACHMENT A

Certification by a Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the selected and above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Welsh Bottom Ash Storage Pond CCR management area and that the requirements of 40 CFR 257.94(e)(2) have been met.

Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature



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November 13, 2020
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