ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT ASH LANDFILL GROUNDWATER MONITORING WELLS SPRINGERVILLE GENERATING STATION SPRINGERVILLE, ARIZONA

Prepared for

TUCSON ELECTRIC POWER COMPANY

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Prepared by

AMTECH Associates L.L.C. 8666 E. San Alberto Dr. Scottsdale, Arizona 85258

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Annual Groundwater Monitoring and Corrective Action Report Ash Landfill Groundwater Monitoring Wells Springerville Generating Station Tucson Electric Power Company Springerville, Arizona

The material and data in this report were prepared under the supervision and direction of the undersigned.

AMTECH Associates, L.L.C.

Goldman evin

Project Hydrogeologist



Tamara Jim Project Engineer



Syed S. Amanatullah, P.E. Managing Member



1	INTRODUCTION	1
	 1.1 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT 1.2 SITE DESCRIPTION AND LOCATION	1
2	1.2.1 Hydrogeology	2
2	ANNUAL KEPUKI KEQUIKEMENIS	
	2.1 CCR UNIT AND MONITORING WELLS MAP §257.90(E)(1)	3
	2.2 IDENTIFICATION OF INSTALLED MONITORING WELLS §257.90(E)(2)	
	2.3 SUMMARY OF GROUNDWATER MONITORING DATA §257.90(E)(3)	4
	2.3.1 Initial Groundwater Sampling Events (40 CFR §257.93(b))	5
	2.3.2 Establishing Numeric Limits (40 CFR §257.93(f))	5
	2.3.3 Revisions to Statistical Methods Employed	7
	2.4 TRANSITION BETWEEN MONITORING PROGRAMS §257.90(E)(4)	7
	2.4.1 Statistical Significant Increase Determination §257.93(h)	7
	2.5 Other Information §257.90(E)(5)	8
	2.6 CONCLUSION	8
3	RECORDKEEPING, NOTIFICATION, INTERNET POSTING	9
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TABLES

TABLE 1	SUMMARY OF GROUNDWATER ELEVATIONS
TABLE 2	SUMMARY OF INITIAL GROUNDWATER MONITORING RESULTS FOR STATISTICAL ANALYSES OF DETECTION MONITORING PARAMETERS
TABLE 3	SUMMARY OF GROUNDWATER MONITORING RESULTS FOR EVALUATION OF DETECTION MONITORING PARAMETERS
TABLE 4	SUMMARY OF GROUNDWATER MONITORING RESULTS FOR ASSESSMENT MONITORING PARAMETERS
FIGURE	
FIGURE 1	MONITORING WELL LOCATIONS AND GROUNDWATER CONTOUR MAP
APPENDIX	

APPENDIX A MONITORING WELL CONSTRUCTION SUMMARY



1 INTRODUCTION

The US Environmental Protection Agency (UESPA) published the final rule for the Coal Combustion Residues (CCR) Rules under the Resource Conservation and Recovery Act (RCRA) on April 17, 2015. The CCR Rules are published as Subpart D to Title 40 of the US Code of Federal Regulations (40 CFR) Part 257, Sections §257.50 to §257.107.

AMTECH Associates L.L.C. (AMTECH) has prepared this Annual Groundwater Monitoring and Corrective Action report to comply with the groundwater monitoring and corrective action requirements pursuant to the CCR Rules for Landfill and Surface Impoundments of electric utilities. The Springerville Generating Station (SGS) is a fourunit, pulverized coal-fired, steam electric generating facility and these standards are applicable to the facility's Ash Landfill as an "Existing CCR landfill" as defined in 40 CFR §257.53.

1.1 Annual Groundwater Monitoring and Corrective Action Report

This annual report documents the status of the groundwater monitoring and corrective action program for the CCR landfill, summarizes key actions completed, and if applicable, describes any problems encountered, and discusses actions to resolve the problems.

1.2 Site Description and Location

The SGS is a four-unit, pulverized coal-fired, steam electric generating facility, operated by Tucson Electric Power Company (TEP), that began operations in 1985 and consists of a combined net generating output of approximately 1600-megawatts.

SGS is located approximately 15 miles northeast of Springerville, in Apache County, Arizona. The power plant area of SGS is located in Sections 27, 28, 33, and 34, of Township 11 North, Range 30 East of the Salt and Gila River Baseline and Meridian. The SGS site occupies 15,777 acres, which includes the power plant area, ash landfill area and the east and west well fields.

The Ash Landfill, located southwest of the power plant area, is primarily used for the disposal of fly and bottom ash, products of the coal-fired units at the plant. A delineated portion of the Ash Landfill is used for the disposal of other items in lesser quantities (i.e., reactivator sludge, construction debris and power plant outage refuse, sump sludges, demineralizer resins, PCS, cooling tower sludge, lime, soda ash, sewage pond sludge, evaporation pond solids, miscellaneous pond clean-outs, cooling tower treated lumber, and



other inert and non-hazardous materials) pursuant to the facility's Aquifer Protection Permit (APP) No. P-101448, Section 2.2.4.3, as issued by the Arizona Department of Environmental Quality (ADEQ).

1.2.1 Hydrogeology

A brief listing of the primary hydrogeologic units present in the Ash Landfill area, includes from shallowest to deepest: Quaternary alluvium and travertine; Tertiary Bidahochi Formation; Triassic Chinle and Moenkopi Formations; Permian Kaibab Limestone; Permian Coconino Sandstone; and Permian Supai Formation. The Coconino Sandstone, underlying the Kaibab Limestone, comprises the regional C-Aquifer which is the uppermost aquifer beneath the Ash Landfill area.



2 ANNUAL REPORT REQUIREMENTS

Per 40 CFR §257.90(e), the owner or operator of an existing CCR landfill must prepare an annual groundwater monitoring and corrective action report. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR landfill, summarize key actions completed, and if applicable, describe any problems encountered, discuss actions to resolve the problems, and describes project key activities, if any, for the upcoming year.

In accordance with CFR §257 CFR 257.90(e), this groundwater monitoring report contains the following information:

- CCR Unit and Monitoring wells Map;
- Identification of installed monitoring wells;
- Summary of Groundwater Monitoring Data;
- Transition between Monitoring Programs; and
- Other Information.

As these requirements are applicable to the SGS Ash Landfill, this annual report provides the required groundwater monitoring and corrective action information.

2.1 CCR Unit and Monitoring Wells Map §257.90(e)(1)

A map of the SGS Ash Landfill (and aerial image) with the background (upgradient) wells, downgradient wells, and well identification numbers are shown on a Monitoring Well Locations and Groundwater Contour Map, included in Figure 1.

2.2 Identification of Installed Monitoring Wells §257.90(e)(2)

There were no monitoring wells installed or decommissioned during the preceding year.

The installation of the groundwater monitoring system at the SGS Ash Landfill was completed in 2016. The system consists of five (5) groundwater monitoring wells: two (2) upgradient wells and (3) downgradient wells:



- Well CCR-1U (upgradient);
- Well CCR-2U (upgradient);
- Well CCR-1D (downgradient);
- Well CCR-2D (downgradient); and
- Well CCR-3D (downgradient).

A Groundwater Monitoring System Certification report was completed in October 2017 to certify that the groundwater monitoring system installed at the SGS Ash Landfill meets the groundwater monitoring systems requirements of 40 CFR §257.91.

A summary of the CCR groundwater monitoring well construction is included in Appendix A.

2.3 Summary of Groundwater Monitoring Data §257.90(e)(3)

The CCR Rules require the collection of groundwater samples collected under Detection Monitoring, Assessment Monitoring, or during Corrective Actions Programs. These data are evaluated for statistically significant increases over statistically established numeric limits for the constituents listed in Appendix III (Detection Monitoring) or Appendix IV (Assessment Monitoring) of 40 CFR §257.

This report discusses collection of the 8 initial groundwater samples required by the CCR Rules (Detection and Assessment monitoring parameters), as well as the first semi-annual sample collected under the Detection Monitoring Program. Assessment Monitoring has not been initiated and Corrective Actions are not necessary at this time.

All groundwater samples collected during the 8 initial sampling events and the semiannual sampling event were collected in accordance with the Sampling and Analysis Plan (SAP) established for the SGS CCR Monitoring Network. Each well is fitted with its own dedicated, low-flow pump manufactured by QED Environmental Systems. Prior to pumping each well, groundwater levels were measured and documented along with well name and sample collection date.

Review of depth to groundwater measurements following the most recently collected groundwater samples and the initial 8 rounds of sampling show no significant changes in the aquifer. Groundwater level measurements fluctuated by no more than approximately 5 feet at each location. The groundwater-level contour map with the most recent water-level measurements is presented as **Figure 1**. Therefore, there is no change in the groundwater flow rate or flow direction.

All groundwater samples were collected following SAP procedures and guidelines. Generally, these included procedures for equipment decontamination, collecting field quality control samples (i.e., field duplicates), reviewing bottle orders for accuracy, labeling of sample bottles, daily calibration of field equipment that measure general water



quality parameters, sample handling and delivery, and chain-of-custody. All samples were analyzed using EPA-approved methods, in accordance with 40 CFR §136 and as referenced in the SAP.

A full copy of all sampling documentation and laboratory analytical reports for all sampling events is filed in the landfill's operating record and is available for review upon request to TEP. A full copy is not included herein due to its overall length.

A summary of measured groundwater elevations is included in **Table 1** of this report. A summary of the initial groundwater monitoring results (of detection monitoring parameters) for the statistical analysis is included in **Table 2** of this report. A summary of the groundwater monitoring results (of detection monitoring parameters) for evaluation with the numerical limits is included in **Table 3**. In addition, a summary of the groundwater monitoring results for the ambient assessment monitoring parameters is included in **Table 4** of this report.

2.3.1 Initial Groundwater Sampling Events (40 CFR §257.93(b))

To determine the initial groundwater quality conditions, a facility is required to collect a minimum of eight (8) groundwater samples from each well in the monitoring network, pursuant to 40 CFR §257.94(b). Sample collection began in November 2016 and was completed in June 2017.

Groundwater samples were collected from each of the five CCR wells by Confluence Environmental, Inc. Each round of samples were sent to TestAmerica Laboratories, Inc. (TestAmerica) and were analyzed for Detection and Assessment Monitoring constituents.

2.3.2 Establishing Numeric Limits (40 CFR §257.93(f))

Groundwater results from the 8 initial groundwater sampling events were used to statistically calculate numeric limits for the Detection Monitoring Program constituents at each CCR well. Prediction limits were calculated for intrawell statistical comparison, using 8 rounds of data for each constituent at each well. Prediction limits are similar to tolerance limits, which have historically been used by solid waste environmental programs in the state of Arizona; they are also recommended in the Unified Guidance Document that was authored by the USEPA.

In addition, a facility has the option to review historic data from existing wells that might be representative of the uncontaminated aquifer and to incorporate that data into the statistical analyses. No other wells in the vicinity of the Ash Landfill are suitable for this purpose, so no historical groundwater quality information could be incorporated into the statistical analysis.

A narrative description of the general procedure to establish numeric limits for Detection Monitoring constituents was given in the Sampling and Analysis Plan and as cited by



AMTECH in the Statistical Method Certification Report, dated October 17, 2017. Briefly, data was to be evaluated for:

- Type of data distribution;
- Potential outliers; and
- Spatial, temporal (i.e., autocorrelation), or seasonal trends.

First, AMTECH used the programs XLSTAT and Minitab 8.1 to evaluate results of the 8 initial sampling rounds. The normality test performed using XLSTAT determined that the data for each well-constituent pair (i.e., each Detection Monitoring constituent at each well) fit a normal data distribution except for sulfate in Wells 2D and 3D, which both fit a non-normal distribution. These well-constituent pairs might have been considered as statistical outliers, but AMTECH believes this would have been an incorrect interpretation of the data. No other well-constituent pairs were identified as outliers.

AMTECH believes that the 2D-Sulfate and 3D-Sulfate constituent pairs would actually fall within a normal distribution and that an apparent lack of variation in sulfate concentrations in wells 2D and 3D, which likely resulted from TestAmerica's choice to round sulfate concentrations to two significant digits, is the cause for these two well-constituent pairs not fitting a normal distribution. A comparative, visual review of sulfate concentrations demonstrate that those of Wells 2D and 3D fall within the same range of values (and likely within a similar degree of variation) as those in the other CCR wells (**Table 2**), which suggests that additional sampling alone may have produced a normal distribution of values. TestAmerica was informed to begin reporting sulfate concentrations to three significant digits to prevent another, seemingly false, non-normal distribution as an artifact of reporting concentrations rounded to values that are too imprecise for statistical purposes.

Next, AMTECH considered potential trends in the data. The intrawell technique evaluated each well-constituent pair independently of the other wells, which eliminated any potential spatial trends. Preliminary analysis of temporal trends suggest there may be a trend for some well-constituent pairs, however, these can be better evaluated with additional data. Similarly, eight months of consecutive trends does not allow for a robust analysis of seasonal trends. Initial datasets for each well will be augmented with future sampling data, which is a common practice for sampling programs designed around prediction intervals, so temporal and seasonal trends will be addressed after additional data have been collected.

Finally, AMTECH performed the statistical analyses to establish prediction limits from the initial rounds of data. Without another statistical method immediately available to determine non-normal prediction limits for the 2D-Sulfate and 3D-Sulfate well-constituent pairs, AMTECH used Minitab 8.1 to calculate an upper tolerance limit with a non-normal distribution for each of these well-constituent pairs. Minitab 8.1 was also used to calculate two-sided upper tolerance limits for the upper and lower bounds of pH for each well.

For all other well-constituent pairs, prediction limits were calculated for normally distributed data at the 99% confidence level using the equation below:



$$PL = x_{mean} + t_{1-\alpha/m, n-1} s \sqrt{1 + \frac{1}{n}}$$

PL = *Prediction Limit*

 x_{mean} = mean of sample concentrations (for each well-constituent pair)

t = Student t test quantiles at 99% confidence level

 $1 - \alpha = confidence \ level$

m = degrees of freedom (n-1)

n = *number* of *samples* (excludes non-detects)

s = *standard deviation*

The calculated prediction limits and tolerance limits are presented in **Table 2** with the laboratory results from all eight initial groundwater samples. AMTECH believes that the 2D-Sulfate and 3D-Sulfate well-constituent pairs will fit a normal distribution upon incorporation of additional data from future sample collection, which will allow prediction limits to be calculated for these well-constituent pairs at a later time.

2.3.3 Revisions to Statistical Methods Employed

TEP may revise the statistical method(s) employed to any of those identified in 40 CFR \$257.93(f) or any other that can meet the performance standards 40 CFR \$257.93(g). If the statistical analysis method(s) are revised or replaced, the Statistical Method Certification, which is required by 40 CFR \$257.93(f)(6), will be revised.

2.4 Transition between Monitoring Programs §257.90(e)(4)

Throughout the life of the Facility, TEP is required to execute the Detection Monitoring program in accordance with 40 CFR §257.94. Should a statistically significant increase (SSI) be confirmed in any of the compliance (i.e., downgradient) wells, the Assessment Monitoring program will be initiated in accordance with 40 CFR §257.95. At this time, the SGS Ash Landfill is only required to perform Detection Monitoring.

2.4.1 Statistical Significant Increase Determination §257.93(h)

The Detection Monitoring Program was initiated following completion of the initial 8 rounds of groundwater sampling in accordance with 40 CFR §257.94(a). The first semiannual sample in the Detection Monitoring Program was collected on July 18, 2017, and analyzed by TestAmerica. A review of the results presented in **Table 3** demonstrate that none of the well-constituent pair concentrations exceed the numeric limits in the



compliance wells (i.e., Wells 1D, 2D, and 3D); therefore, this data indicates that there has been no SSI for any well-constituent pair from the July 18, 2017, sampling event. In accordance with 40 CFR §257.93(h), the Facility will continue monitoring under the Detection Monitoring Program.

2.5 Other Information §257.90(e)(5)

No additional information is required at this time.

2.6 Conclusion

TEP completed the initial 8 rounds of groundwater sampling prior to the October 17, 2017 deadline as required by 40 CFR §257.94(b). Numeric limits were established for all Detection Monitoring constituents in each well based on statistical analyses meeting the requirements of 40 CFR §257.94(f) and (g), Following establishment of numeric limits, the Detection Monitoring Program was initiated and TEP conducted the first semi-annual sampling event in July, 2017. Review of those results demonstrate that there was no SSI for Detection Monitoring constituents, therefore, the TEP SGS Ash Landfill remains in compliance with CCR Rule and will continue to monitor under the Detection Monitoring Program.



3 RECORDKEEPING, NOTIFICATION, INTERNET POSTING

As per CFR Part 40 CFR §257.90(f), the owner or operator of the CCR landfill must comply with the recordkeeping requirements specified in 40 CFR §257.105(h)(1), the notifications requirements specified in 40 CFR §257.106(h)(1), and the internet requirements specified in 40 CFR §257.107(h)(1).

In accordance with CFR Part 40 CFR §257.105(h)(1), TEP will place this Annual Groundwater Monitoring and Corrective Action report in the facility's operating record.

In accordance with CFR Part 40 CFR §257.106(h)(1), TEP will notify the State Director when this Annual Groundwater Monitoring and Corrective Action report has been placed in the operating record and on the owner or operator's publicly accessible internet site.

In accordance with CFR Part 40 CFR §257.107(h)(1), TEP will place this Annual Groundwater Monitoring and Corrective Action report on TEP's CCR web site.



TABLES



TABLE 1.SUMMARY OF MEASURED GROUNDWATER LEVELSSGS Ash Landfill Groundwater Monitoring Wells

	WELL IDENTIFICATION										
	CCR-1U	CCR-2U	CCR-1D	CCR-2D	CCR-3D						
SAMPLING EVENT	(feet)	(feet)	(feet)	(feet)	(feet)						
November 15, 2016	804.20	790.82	835.12	895.98	828.22						
December 20, 2016	804.38	773.73	834.15	894.96	828.41						
January 31, 2017	805.07	773.20	833.63	898.00	830.68						
February 21, 2017	804.25	783.25	833.65	902.75	828.50						
March 28, 2017	804.40	779.10	833.68	902.81	828.10						
April 26, 2017	803.85	780.00	831.33	901.50	828.18						
May 24, 2017	May 24, 2017 801.01		829.15	900.26	825.63						
June 21, 2017	804.47	779.22	833.66	902.92	828.20						
July 18, 2017 803.88		784.85	831.74	901.63	828.05						

Note: All depths reflect measurements below ground surface.



TABLE 2. SUMMARY OF INITIAL GROUNDWATER MONITORING RESULTS FOR STATISTICAL ANALYSES OF DETECTION MONITORING PARAMETERS SGS Ash Landfill Groundwater Monitoring Wells

				Analytial Laboratory Report ID								
			550-73080-1	550-74730-1	550-76756-1	550-78056-1	550-79968-1	550-81776-1	550-83310-1	550-84857-1		
						Sama	line Data					
Well ID	Parameter	Units	11/15/2016	Sampling Date						6/21/2017	Numeric Limits	11
	Paran		11/13/2010	12/20/2010	01/31/2017	02/21/2017	3/20/2017	4/2//2017	5/23/2017	0/21/2017	(Detection Monitoring)	Units
10	Calaium	mg/L	0.07	0.04	0.00	0.04	0.03	0.90	0.07	0.69	0.96	mg/L
10	Calcium	nig/L	540	430	470	440	440	460	450	400	492	mg/L
10	Chioride	mg/L	510	470	520	520	500	480	470	460	800	mg/L
10	Fluonde	nig/L	2.9	3.0	2.7	2.0	2.0	0.7	2.0	2.9	5.5	
10	pH Culfete	50	7.0	0.0	6.9	6.9	7.0	0.7	0.7	0.0	5.8-7.3	50
10	Suilate	mg/L	1200	1200	1300	1200	1300	1200	1300	1300	1420	mg/L
10	Danar	mg/L	3000	3100	3100	2000	3000	3000	3200	2000	3450	mg/L
20	Boron	mg/L	1.1	1.2	1.1	1.1	1.1	710	1.1	1.2	1.30	mg/L
20	Calcium	mg/L	660	690	680	680	670	710	690	710	742	mg/L
20		mg/L	450	410	460	460	440	420	450	410	505	mg/L
20	Fluoride	mg/L	2.4	2.5	2.1	2.1	2.1	2.7	2.2	2.3	3.0	mg/L
20	рн	50	6.8	6.4	6.7	6.7	6.6	6.5	6.5	6.4	6.0-7.6	50
20	Suitate	mg/L	1900	1800	1900	1800	1900	1900	2000	2000	2140	mg/L
20		mg/L	4000	4000	4000	3900	3900	3900	3900	3900	4102	mg/L
1D	Boron	mg/L	0.78	0.86	0.78	0.83	0.82	0.87	0.85	0.89	0.96	mg/L
1D		mg/L	350	450	440	420	450	430	420	440	528	mg/L
1D		mg/L	480	450	490	490	500	460	440	490	545	mg/L
1D	Fluoride	mg/L	2.9	1.9	2.7	2.8	2.7	2.9	2.8	2.8	3.7	mg/L
1D	pH	SU	7.1	6.5	6.9	6.7	6.9	6.8	6.6	6.6	5.8-7.7	SU
1D	Sulfate	mg/L	960	1200	1100	1100	1200	1200	1100	1300	1471	mg/L
1D	Total Dissolved Solids	mg/L	2600	3000	2800	2900	3000	3000	2900	3100	3406	mg/L
2D	Boron	mg/L	0.91	0.86	0.85	0.89	0.88	0.91	0.94	0.95	1.01	mg/L
2D	Calcium	mg/L	630	610	660	630	620	630	650	640	685	mg/L
2D	Chloride	mg/L	530	480	530	530	530	480	510	490	584	mg/L
2D	Fluoride	mg/L	2.5	1.8	2.4	2.4	2.4	2.8	2.4	2.8	3.4	mg/L
2D	pH	SU	6.8	6.5	6.9	6.8	6.9	6.6	6.5	6.6	5.9-7.5	SU
2D	Sulfate	mg/L	1700	1700	1700	1700	1700	1700	1800	1800	1963	mg/L
2D	Total Dissolved Solids	mg/L	3600	3700	3700	3800	3700	3700	3700	3700	3870	mg/L
3D	Boron	mg/L	0.83	0.85	0.87	0.87	0.83	0.90	0.89	0.90	0.96	mg/L
3D	Calcium	mg/L	410	430	400	440	420	430	450	430	477	mg/L
3D	Chloride	mg/L	530	470	530	540	540	490	480	500	600	mg/L
3D	Fluoride	mg/L	2.7	2.1	2.9	2.8	2.9	3.1	2.9	3.0	3.8	mg/L
3D	рН	SU	6.8	6.6	6.9	6.8	6.8	6.7	6.6	6.6	6.2-7.3	SU
3D	Sulfate	mg/L	1300	1200	1300	1300	1300	1200	1300	1300	1527	mg/L
3D	Total Dissolved Solids	mg/L	2900	3100	3000	3100	3000	3100	3100	3200	3354	mg/L

TABLE 3.

SUMMARY OF GROUNDWATER MONITORING RESULTS FOR EVALUATION OF DETECTION MONITORING PARAMETERS

SGS Ash Landfill Groundwater Monitoring Wells

			Sample Date 7/8/2017		
Well ID	Parameter	Units	Results	Numeric Limits (Detection Monitoring)	Units
1U	Boron	mg/L	0.85	0.96	mg/L
1U	Calcium	mg/L	440	492	mg/L
1U	Chloride	mg/L	500	568	mg/L
1U	Fluoride	mg/L	3.0	3.3	mg/L
1U	рН	SU	6.6	5.8-7.3	SU
1U	Sulfate	mg/L	1300	1420	mg/L
1U	Total Dissolved Solids	mg/L	3300	3450	mg/L
2U	Boron	mg/L	1.1	1.30	mg/L
2U	Calcium	mg/L	690	742	mg/L
2U	Chloride	mg/L	440	505	mg/L
2U	Fluoride	mg/L	2.6	3.0	mg/L
2U	рН	SU	6.5	6.0-7.6	SU
2U	Sulfate	mg/L	2000	2140	mg/L
2U	Total Dissolved Solids	mg/L	4000	4102	mg/L
1D	Boron	mg/L	0.86	0.96	mg/L
1D	Calcium	mg/L	450	528	mg/L
1D	Chloride	mg/L	290	545	mg/L
1D	Fluoride	mg/L	2.4	3.7	mg/L
1D	рН	SU	6.6	5.8-7.7	SU
1D	Sulfate	mg/L	1300	1471	mg/L
1D	Total Dissolved Solids	mg/L	3200	3406	mg/L
2D	Boron	mg/L	0.88	1.01	mg/L
2D	Calcium	mg/L	630	685	mg/L
2D	Chloride	mg/L	490	584	mg/L
2D	Fluoride	mg/L	2.8	3.4	mg/L
2D	рН	SU	6.6	5.9-7.5	SU
2D	Sulfate	mg/L	1800	1963	mg/L
2D	Total Dissolved Solids	mg/L	3800	3870	mg/L
3D	Boron	mg/L	0.89	0.96	mg/L
3D	Calcium	mg/L	450	477	mg/L
3D	Chloride	mg/L	500	600	mg/L
3D	Fluoride	mg/L	3.1	3.8	mg/L
3D	рН	SU	6.6	6.2-7.3	SU
3D	Sulfate	mg/L	1300	1527	mg/L
3D	Total Dissolved Solids	mg/L	3200	3354	mg/L



TABLE 4.

SUMMARY OF GROUNDWATER MONITORING RESULTS FOR ASSESSMENT MONITORING PARAMETERS SGS Ash Landfill Groundwater Monitoring Wells

			SAMPLE DATE								
			11/15/2016	12/20/2016	01/31/2017	02/21/2017	3/28/2017	4/27/2017	5/23/2017	6/21/2017	7/18/2017
					•				0/20/2011	•	.,
Well ID	Parameter	Units	Results								
1U	Fluoride	mg/L	2.9	3.0	2.7	2.8	2.8	3.1	2.8	2.9	3.0
1U	Beryllium	mg/L	0	0.00036	0.00026	0.00039	0.00033	0.00037	0.00047	0.00073	0.00048
1U	Lithium	mg/L	0.53	0.51	0.51	0.53	0.52	0.54	0.50	0.50	0.52
1U	Antimony	mg/L	0	0.00028	0.00025	0.000081	0.000059	0.000064	0.000061	0.000065	0.000059
1U	Arsenic	mg/L	0.45	0.31	0.29	0.30	0.31	0.33	0.29	0.34	0.29
1U	Barium	mg/L	0.027	0.040	0.029	0.024	0.023	0.024	0.022	0.023	0.024
1U	Cadmium	mg/L	0	0	0	0	0	0	0	0	0
1U	Chromium	mg/L	0.010	0.0016	0	0	0	0	0	0	0
1U	Cobalt	mg/L	0.0083	0.014	0.016	0.015	0.014	0.014	0.014	0.015	0.013
1U	Lead	mg/L	0	0	0	0	0	0.00051	0	0	0
1U	Molybdenum	mg/L	0.011	0.0088	0.0083	0.0079	0.0077	0.0079	0.0074	0.0085	0.0074
1U	Selenium	mg/L	0	0.00012	0	0.00012	0	0	0	0.000093	0.00016
1U	Thallium	mg/L	0	0.00012	0.00017	0.00021	0.00014	0.00020	0.00021	0.00022	0.00024
10	Mercury	ma/L	0	0	0	0	0	0	0	0	0
1U	Radium 226 and 228 Combined	pCi/L	0.6	0.4	0.8	0	0	0.6	0	0.6	0.6
2U	Fluoride	mg/L	2.4	2.5	2.1	2.1	2.1	2.7	2.2	2.3	2.6
2U	Beryllium	mg/L	0	0.0011	0.0011	0.0011	0.00095	0.0011	0.0012	0.0016	0.0012
2U	Lithium	mg/L	0.62	0.64	0.67	0.63	0.61	0.65	0.61	0.58	0.61
2U	Antimony	mg/L	0	0.00012	0.00022	0.000072	0	0	0	0.000053	0.000044
2U	Arsenic	mg/L	0.057	0.06	0.061	0.060	0.060	0.060	0.056	0.060	0.058
2U	Barium	mg/L	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011
2U	Cadmium	mg/L	0	0	0.000041	0	0	0	0	0	0.000038
2U	Chromium	mg/L	0	0.015	0	0	0.0014	0.00056	0	0	0
2U	Cobalt	mg/L	0	0.00030	0.00019	0	0.00014	0.00015	0.00015	0.00022	0.00016
2U	Lead	mg/L	0	0	0	0	0	0	0	0	0.00022
2U	Molybdenum	mg/L	0.0016	0.0018	0.0018	0.0017	0.0017	0.0016	0.0016	0.0017	0.0017
2U	Selenium	mg/L	0	0	0.00014	0.00012	0.00011	0	0	0.00014	0.00030
2U	Thallium	mg/L	0.00043	0.00043	0.00048	0.00041	0.00040	0.00040	0.00038	0.00043	0.00043
2U	Mercury	mg/L	0	0	0	0	0	0	0	0	0
2U	Radium 226 and 228 Combined	pCi/L	16.6	15.1	19.2	6.6	19.9	18.9	13.9	16.2	17.5
1D	Fluoride	mg/L	2.9	1.9	2.7	2.8	2.7	2.9	2.8	2.8	2.4
1D	Beryllium	mg/L	0	0.00059	0.00060	0.00066	0.00072	0.00060	0.00068	0.0011	0.00066
1D	Lithium	mg/L	0.50	0.53	0.49	0.52	0.52	0.51	0.49	0.47	0.51
1D	Antimony	mg/L	0	0.00024	0.00094	0	0.000059	0.000043	0	0	0
1D	Arsenic	mg/L	0.032	0.017	0.031	0.020	0.019	0.019	0.018	0.020	0.022
1D	Barium	mg/L	0.017	0.021	0.026	0.019	0.020	0.025	0.017	0.021	0.020



TABLE 4.

SUMMARY OF GROUNDWATER MONITORING RESULTS FOR ASSESSMENT MONITORING PARAMETERS SGS Ash Landfill Groundwater Monitoring Wells

			SAMPLE DATE								
			11/15/2016	12/20/2016	01/31/2017	02/21/2017	3/28/2017	4/27/2017	5/23/2017	6/21/2017	7/18/2017
			11/13/2010	12/20/2010	01/01/2017	02/21/2017	5/20/2011	4/21/2011	5/25/2011	0/21/2011	1/10/2011
Well ID	Parameter	Units	Results								
1D	Cadmium	mg/L	0	0	0.000025	0	0	0	0	0	0.000031
1D	Chromium	mg/L	0.0048	0.0083	0.0022	0.00054	0.0058	0	0	0	0
1D	Cobalt	mg/L	0.0065	0.0013	0.014	0.00062	0.0013	0.00085	0.00033	0.0012	0.0024
1D	Lead	mg/L	0	0	0.0011	0	0	0	0	0	0
1D	Molybdenum	mg/L	0.0046	0.0039	0.0069	0.0026	0.0038	0.0037	0.0032	0.0041	0.0042
1D	Selenium	mg/L	0	0.000076	0.00039	0	0.00012	0	0	0	0.00037
1D	Thallium	mg/L	0.00011	0.00012	0.00049	0.000090	0.000077	0.000058	0.000032	0.000088	0.00015
1D	Mercury	mg/L	0	0	0	0	0	0	0	0	0
1D	Radium 226 and 228 Combined	pCi/L	8.3	5.3	4.6	4.3	6.4	3.2	5.5	6.0	4.5
2D	Fluoride	mg/L	2.5	1.8	2.4	2.4	2.4	2.8	2.4	2.8	2.8
2D	Beryllium	mg/L	0	0.00079	0.00043	0.00085	0.00091	0.00081	0.00090	0.0014	0.00080
2D	Lithium	mg/L	0.56	0.56	0.53	0.56	0.55	0.56	0.55	4.8	0.53
2D	Antimony	mg/L	0.0011	0.0016	0.0014	0.00089	0.00069	0.00068	0.00061	0.00066	0.00052
2D	Arsenic	mg/L	0.051	0.049	0.043	0.050	0.049	0.053	0.049	0.053	0.042
2D	Barium	mg/L	0.012	0.013	0.012	0.011	0.011	0.011	0.010	0.011	0.011
2D	Cadmium	mg/L	0	0	0	0	0	0	0	0	0
2D	Chromium	mg/L	0.00068	0.00090	0	0.0011	0	0.00046	0	0	0
2D	Cobalt	mg/L	0	0.00057	0.00033	0.00031	0.00026	0.00027	0.00027	0.00029	0.00023
2D	Lead	mg/L	0	0.00050	0.00026	0.00023	0	0	0	0	0
2D	Molybdenum	mg/L	0.0025	0.0027	0.0028	0.0026	0.0025	0.0026	0.0025	0.0028	0.0025
2D	Selenium	mg/L	0	0.00018	0.000085	0.00012	0.00014	0	0	0	0.00025
2D	Thallium	mg/L	0.00046	0.00083	0.00057	0.00054	0.00048	0.00050	0.00050	0.00051	0.00041
2D	Mercury	mg/L	0	0	0	0	0	0	0	0.00023	0
2D	Radium 226 and 228 Combined	pCi/L	8.2	8.5	7.1	8.5	9.2	2.7	9.3	6.4	9.4
3D	Fluoride	mg/L	2.7	2.1	2.9	2.8	2.9	3.1	2.9	3.0	3.1
3D	Beryllium	mg/L	0	0.00035	0.00051	0.00042	0.00021	0.00024	0.00042	0.00071	0.00056
3D	Lithium	mg/L	0.53	0.54	0.51	0.54	0.53	0.56	0.54	0.48	0.54
3D	Antimony	mg/L	0.0013	0.0013	0.0022	0.0020	0.00049	0.00040	0.0012	0.00048	0.00056
3D	Arsenic	mg/L	0.0089	0.024	0.028	0.052	0.016	0.016	0.033	0.013	0.015
3D	Barium	mg/L	0.013	0.011	0.018	0.012	0.011	0.011	0.011	0.011	0.011
3D	Cadmium	mg/L	0	0	0.000052	0	0	0	0	0	0
3D	Chromium	mg/L	0.0048	0.0014	0.0038	0.0010	0.0012	0	0.00058	0	0.00048
3D	Cobalt	mg/L	0.0033	0.0019	0.0047	0.0019	0.0016	0.0015	0.0017	0.0016	0.0015
3D	Lead	mg/L	0	0.00041	0.0014	0.00030	0	0	0	0	0
3D	Molybdenum	mg/L	0.0021	0.0023	0.0030	0.0025	0.0022	0.0023	0.0024	0.0024	0.0023
3D	Selenium	mg/L	0	0.000092	0.00067	0.00024	0.00016	0	0.00012	0	0.00022
3D	Thallium	mg/L	0.0017	0.0016	0.0021	0.0013	0.0010	0.00095	0.0010	0.0010	0.011
3D	Mercury	mg/L	0	0	0	0	0	0	0	0	0
3D	Radium 226 and 228 Combined	pCi/L	3.6	4.1	2.5	3.3	3.5	8.6	3.5	2.4	2.9



FIGURE

GROUNDWATER MONITORING WELL LOCATIONS AND GROUNDWATER CONTOUR MAP









 Groundwater water level contours from Montgomery & Associates, Groundwater Elevation, Figure 3.
 Groundwater elevations shown at each well reflects data obtained from the July 2017 sampling event.

MONITORING WELL LOCATIONS AND GROUNDWATER CONTOUR MAP

Springerville Generating Station Tucson Electric Power Company Springerville, Arizona



APPENDIX A

MONITORING WELL CONSTRUCTION SUMMARY



Springerville Generating Station

Ash Landfill Facility

CCR Monitoring Wells Construction Summary

Well Name	Upgradient or Downgradient	Approx. Distance from CCR Landfill Boundary (FT)	Completion Date	Total Drilled Depth (FT)	Screened Interval (FT)	Casing Material	Pump Placement Depth (FT)	Pump Installation Date	Groundwater Level (FT)	Date Measured
CCR-1U	Upgradient	150	3/1/2016	860	792-842	PVC	826.4	6/22/2016	803.95	6/22/2016
CCR-2U	Upgradient	92	4/28/2016	1067	740-840	PVC	790.8	6/22/2016	768.44	6/22/2016
CCR-1D	Downgradient	1000	3/12/2016	904	820-900	PVC	846.3	6/22/2016	830.00	6/22/2016
CCR-2D	Downgradient	195	4/7/2016	1000	860-960	PVC	910	6/21/2016	894.55	6/21/2016
CCR-3D	Downgradient	190	4/9/2016	963	810-910	PVC	839.7	6/21/2016	827.78	6/21/2016

Note: All depths in feet (FT) are below ground surface.

