2019 Annual Dam and Dike Inspection Report

Bottom Ash Pond Complex

John E. Amos Plant

Appalachian Power Co.

Putnam County, West Virginia

May 16, 2019

Prepared for: Appalachian Power Co.
1530 Winfield Rd
Winfield, West Virginia 25213

Prepared by: American Electric Power Service Corporation
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AMERICAN ELECTRIC POWER

BOUNDLESS ENERGY™

GERS-19-008

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John E. Amos Plant
Bottom Ash Pond Complex
Document Number: GERS-19-008
Inspection Date: May 16, 2019

PREPARED BY _____ DATE 6/7/2019
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Senior Civil Engineer

APPROVED BY _____ DATE 6/12/2019
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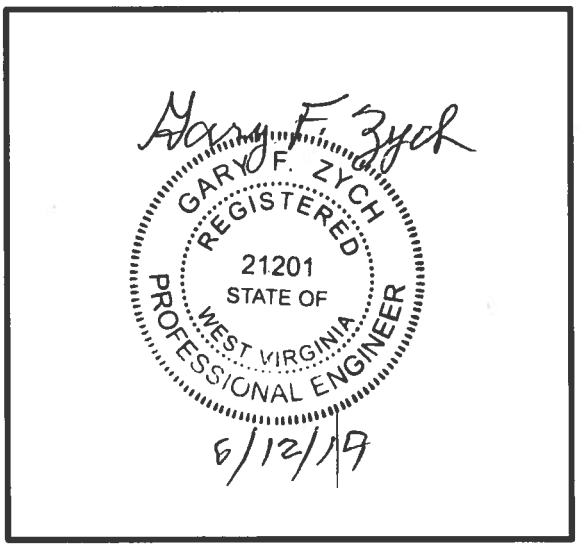


I certify to the best of my knowledge, information and belief the information contained in this report meets the requirements of 40 CFR § 257.83(b).

Table of Contents

1.0 INTRODUCTION

This report was prepared by AEP- Geotechnical Engineering Services (GES) section, in part, to fulfill the US EPA requirements of 40 CFR 257.83 and the West Virginia Dept. of Environmental Protection, Division of Water Dam Inspection Section and to provide Appalachian Power Co. and John E. Amos (JEA) plant personnel with an evaluation of the facility.

The 2019 dam and dike inspection at the JEA bottom ash complex was conducted by Mr. J.T. Massey-Norton on May 16, 2019 with Mr. Gary Lewis and Mr. Rich Fuller who served as the project facility contact. Weather conditions were sunny, with temperatures ranging from the high 70° F to low 80° F. There was no precipitation on the proceeding day of inspection and 1.03 inches of accumulative rainfall during the seven day period prior to the inspection.

2.0 DESCRIPTIONS OF COAL COMBUSTION RESIDUALS (CCR) IMPOUNDMENTS

2.1 DEFINITIONS OF VISUAL OBSERVATIONS AND DEFICIENCIES

This summary of the visual observations uses terms to describe the general appearance or condition of an observed item, activity or structure. The meaning of these terms is as follows:

Good:	A condition or activity that is generally better or slightly better than what is minimally expected or anticipated from a design or maintenance point of view.
Fair or	A condition or activity that generally meets what is minimally Satisfactory: expected or anticipated from a design or maintenance point of view.
Poor:	A condition or activity that is generally below what is minimally expected or anticipated from a design or maintenance point of view.
Minor:	A reference to an observed item (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is below what is normal or desired, but which is not currently causing concern from a structure safety or stability point of view.
Significant:	A reference to an observed item (e.g. erosion, seepage, vegetation, etc.) where the current maintenance program has neglected to improve the condition. Usually, conditions that have been previously identified in the previous inspections, but have not been corrected.
Excessive:	A reference to an observed item (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to properly evaluate the structure or particular area being observed or which may be a concern from a structure safety or stability point of view.

This document also uses the definition of a "deficiency" as referenced in the CCR rule section §257.83(b)(5) Inspection Requirements for CCR Surface Impoundments. This definition has been assembled using the CCR rule Preamble as well as guidance from MSHA, "Qualifications for Impoundment Inspection" CI-31, 2004. These guidance documents further elaborate on the definition of deficiency. Items not defined by deficiency are considered maintenance or items to be monitored.

A "deficiency" is some evidence that a dam has developed a problem that could impact the structural integrity of the dam. There are four general categories of deficiencies. These four categories are described below:

1. Uncontrolled Seepage
    a. Uncontrolled seepage is seepage that is not behaving as the design engineer has intended. An example of uncontrolled seepage is seepage that comes through or around the embankment and is not picked up and safely carried off by a drain. Seepage that is collected by a drain can still be uncontrolled if it is not safely collected and transported, such as seepage that is not clear. Seepage that is unable to be measured and/or observe it is considered uncontrolled seepage. [Wet or soft areas are not considered as uncontrolled seepage, but can lead to this type of deficiency. These areas should monitored my frequently.]
2. Displacement of the Embankment
    a. Displacement of the embankment is large scale movement of part of the dam. Common signs of displacement are cracks, scraps, bulges, depressions, sinkholes and slides.
3. Blockage of Control Features
    a. Blockage of Control Features is the restriction of flow at spillways, decant or pipe spillways, or drains.
4. Erosion
    a. Erosion is the gradual movement of surface material by water, wind or ice. Erosion is considered a deficiency when it is more than a minor routine maintenance item.

2.2 BOTTOM ASH POND COMPLEX

The bottom ash pond complex is located in Putnam County, West Virginia immediately northwest of the John E. Amos (JEA) Power Plant between State Route 817 and the Kanawha River (Figure 1). The JEA pond complex is used for sedimentation and storage of bottom ash produced as a waste product in burning pulverized coal at the JEA Power Plant. The bottom ash ponds are comprised of Ponds 1A and 1B within the pond complex (Figure 2).

The Bottom Ash Pond, Reclaim Water Pond and Treatment Pond were generally incised formed by excavation below natural ground surface and therefore do not contain any water retaining dikes. However, a dike was constructed along the north side of the Reclaim Water Pond and Treatment Pond. A small dike was also constructed in the northwest corner of Bottom Ash Pond 1B.

The north dike of the Reclaim Water Pond and Treatment Pond is approximately 800 feet long. The height of the dam is about 29 feet and the design crest width is 10 feet using concrete block face filled with compacted

cohesive soil. The top of the dike is at elevation 588.0 feet with the natural ground surface beneath the dikes is at about elevation 559 feet. Field measurements indicate that dam side slopes are 2.5:H to 1:V (Figure 3).

Both the bottom ash ponds discharge sluice water through 36 inch diameter pipes to the Reclaim Water Pond. A portion of the flow into the Reclaim Water Pond is pumped backed to the JEA Power Plant for reuse. The remaining portion flows through a 36 inch diameter pipe to the Treatment Pond. From the Treatment Pond the water flows through a 24 in x 38 inch elliptical reinforced concrete pipe that transitions to a 36 inch diameter steel pipe. There is a flange connection from the steel pipe to the 36 inch diameter HDPE pipe that conveys the effluent to six diffuser ports submerged along the bottom of the Kanawha River.

An overflow spillway pipe, 36 inch diameter, is located along the Reclaim Pond and Pond 1B also has a 36 in diameter overflow spillway pipe that discharges to Bill's Creek.

3.0 REVIEW OF AVAILABLE INFORMATION (257.83(b)(1)(i))

A review has been conducted of available information regarding the status and condition of the JEA Bottom Ash Pond Complex that includes files available in the operating record such as previous 7 day inspection reports, piezometric measurements and previous annual inspections.

4.0 INSPECTION (257.83(b)(1)(ii))

4.1 BOTTOM ASH POND COMPLEX

4.1.1 CHANGES IN GEOMETRY SINCE LAST INSPECTION (257.83(b)(2)(i))

No modifications have been made to the geometry of the Bottom Ash Pond Complex since the 2018 annual inspection. The geometry of the impoundment has remained unchanged.

4.1.2 INSTRUMENTATION (257.83(b)(2)(ii))

The location and type of instrumentation is shown on Figure 2 and select piezometers are depicted in cross section along the perimeter dike embankment in Figure 3. The maximum recorded readings of each instrument since the previous annual inspection is shown in the table below.

Table 1
INSTRUMENTATION DATA
Bottom Ash Pond Complex

Instrument	Type	Maximum Reading since last annual inspection	Date of reading
PZ-1	Piezometer	571.34	March 5, 2019
PZ-3	Piezometer	569.78	March 5, 2019
PZ-6	Piezometer	567.60	March 5, 2019
PZ-7	Piezometer	568.69	March 29, 2019

Note: Piezometer PZ-7 was inaccessible for the March 5th, 2019 date of measurement due to high river stages for the Kanawha River.

4.1.3 IMPOUNDMENT CHARACTERISTICS (257.83(b)(2)(iii, iv, v))

Below is a summary of the minimum, maximum, and present depth and elevation of the impounded water & CCR since the previous annual inspection; the storage capacity of the impounding structure at the time of the inspection; and the approximate volume of the impounded water and CCR at the time of the inspection.

IMPOUNDMENT CHARACTERISTICS Bottom Ash Pond Complex		
	Bottom Ash Pond 1A	**Bottom Ash Pond 1B**
Water Surface Elevation at time of the inspection	~580 ft.	~580 ft.
Approximate **Minimum, Maximum, and Present** depth/elevation of impounded water since last annual inspection	1 ft./579.1 ft. elev. 22 ft./581.46 ft. elev. 15 ft./580.5 ft. elev.	0 ft./559 ft. elev. 22 ft./580.85 ft. elev. 22 ft./580.5 ft. elev.
Approximate **Minimum Maximum and Present** depth/elevation of CCR since last annual inspection	<2 ft./561 ft. elev. 21 ft./580 ft. elev. Varies (<2-15 ft.)/561 ft. elev. to 574 ft. elev.	<1 ft./560 ft. elev. 21 ft./580 ft. elev. <1 ft./560ft. elev.
Storage Capacity of impounding structure at the time of the inspection	195 AC-Ft	167 AC-Ft
Approximate volume of impounded water at the time of the inspection	145 AC-Ft.	167 AC-Ft
Approximate volume of CCR at the time of the inspection	~50 AC-Ft	<1.0 AC-Ft

** Assumes base of impoundment to be at an elevation of 559 ft. based on design drawings.

4.1.4 VISUAL INSPECTION (257.83(b)(2)(i))

A visual inspection of the Bottom Ash Pond Complex was conducted to identify any signs of distress or malfunction of the impoundment and appurtenant structures. The inspection also included hydraulic structures underlying the base of the dike. Specific items inspected included all structural elements of the dam such as inboard and outboard slopes, crest, and toe; as well as appurtenances such as the outlet structure at the Bottom Ash Pond 1B, Reclaim Pond and the primary decant structure located within the Treatment Pond.

The following summarizes the visual inspection of each element:

- The crest of the main perimeter dike was observed to be in good condition. No significant settlement, misalignment, erosion, or seepage could be observed on the crest or the slopes of the main perimeter dike (Photos 1, 2 and 3).
- The riprap revetment on the downstream toe of the main perimeter dike appeared in good shape. (Photo 4).

- The inboard slope of the main perimeter dike exhibited a good vegetative cover. There were no visual signs of misalignment, settlement, sloughing, erosion, or bulging that would indicate any instability within the dike The primary decant skimmer structure was observed to be in an excellent condition (Photo 5).
- No erosion or seepage was noted along the pipe that extends out from exterior slope of the Main Perimeter dike at the Reclaim pond. This pipe was permanently abandoned by welding a steel plate at the discharge end of the pipe (Photo 6).
- The reclaim pond's 36 inch diameter HDPE overflow pipe was observed to be in good condition from the block wall and no erosion was noted along the pipe. (Photo 7).
- The outlet to the 36 inch diameter overflow pipe was free of vegetation and could flow unobstructed to Bills Creek. (Photo 8).
- The 36 inch diameter HDPE overflow pipe (bottom ash pond 1B) was observed to be in good condition No settlement, misalignment or other defects were observed for the two overflow spillways. The inlet and outlet to the overflow pipe were observed to be in satisfactory condition (Photos 9 and 10).
- The primary decant structure (outfall 003) was observed to be in excellent condition and no debris is entrained on trash rack that would impede discharge from the pond. No concrete spalling or other defects were observed at the upstream decant structure or the downstream headwall where the effluent discharges into the Kanawha River. Flow from the pond is discharged through the submerged diffuser ports.
- Bottom ash pond 1B has been excavated and returned to service to receive waste water discharges from the plant. Water elevations for all ponds within the bottom ash pond complex are measured via staff gauges in each pond as part of the plant's weekly inspection.

4.1.5 EVALUATION OF INSTRUMENTATION DATA

The instrumentation for the pond complex consists of staff gauges used to measure the pond water levels and four piezometers installed along the perimeter dike.

The elevations of pond water levels and respective piezometer water levels have remained fairly constant with no adverse trends observed that would impair the structural stability of the perimeter dike. An increase in piezometric levels, however, was recorded on March 5, 2019 for three of the four piezometers and is coincident with high river stages for the Kanawha River (Kanawha River's normal pool stage is 566 ft elev.). The fourth piezometer (PZ-7) also recorded its highest static water level within the same month on March 29th, 2019.

A review of these water level measurements did not exceed levels that would impair the slope stability of the bottom ash pond embankments (GeoEnvironmental Assc., 2015). Piezometer water levels are contained in Attachment C.

4.1.6 CHANGES THAT EFFECT STABILITY OR OPERATION (257.83(b)(2)(vii))

Based on interviews with plant personnel and field observations there were no changes to the dike system of the Bottom Ash Pond Complex since the last annual inspection that would affect the stability or operation of the impounding structure.

5.0 CORRECTIVE MEASURES TAKEN TO REMEDY DEFICIENCY OR RELEASE SINCE LAST INSPECTION

Based on the 7-day inspections, the 30-day instrumentation readings and interviews with plant personnel there have been no deficiencies or releases observed during any inspection since the last annual inspection.

6.0 SUMMARY OF FINDINGS

6.1 DEFICIENCIES & CHANGES WHICH AFFECT STABILITY OR OPERATIONS (257.83(b)(2)(vi, vii))

Based on interviews with plant personnel and field observations there were no significant changes to the Bottom Ash Pond Complex since the last annual inspection that would affect the stability or operation of the impounding structure.

There were no deficiencies or signs of structural weakness or disruptive conditions that were observed at the time of the inspection that would require additional investigation or remedial action.

6.2 ITEMS TO MONITOR

Bottom Ash Pond Complex

1. Static water levels should continue to be measured on its current frequency for piezometers PZ-1, PZ-3, PZ-6 and PZ-7.
2. The pond pool stages should continue to be recorded on a periodic basis.

6.3 MAINTENANCE ITEMS

The following maintenance items were identified during the visual inspection:

Bottom Ash Pond Complex

1. Control of the vegetation cover (i.e. mowing) should be continued on its current regularly scheduled basis.

7.0 CONCLUSION

Overall the facility is in good condition. The impoundment is functioning as intended with no signs of potential structural weakness or other conditions that could potentially disrupt the safe operation of the impoundment. The embankments appear to be well maintained. Continue to perform the maintenance items previously

noted.

8.0 REFERENCES

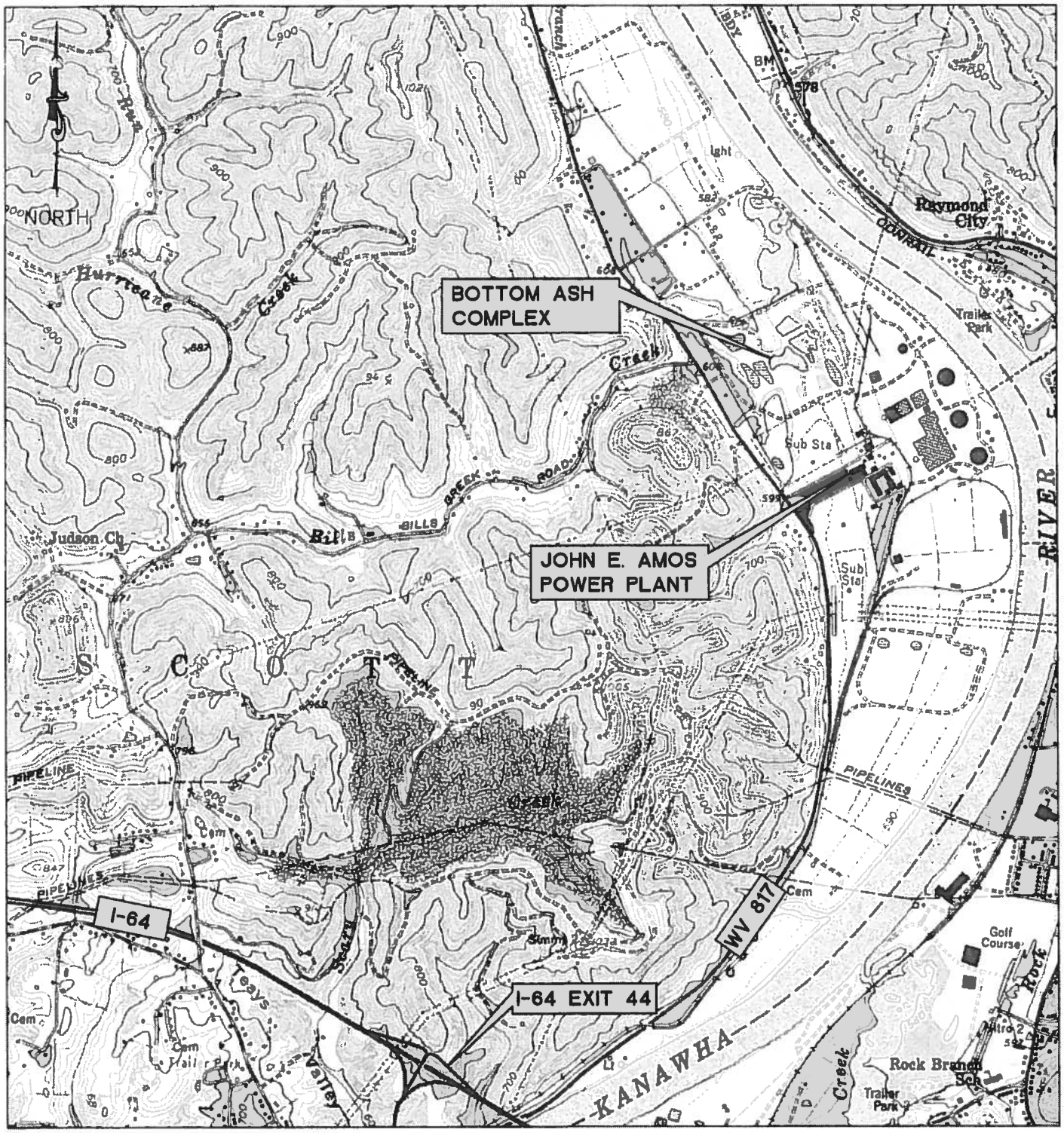
Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, 40 C.F.R §257 & §261 17 April 2015.

GeoEnvironmental Assc. Inc., 2015, CCR Rules Certification Report John Amos Plant- Bottom Ash Complex, Putnam County, West Virginia, Prepared for AEP Service Corp., Geotechnical Engineering Group, 1 River Side Plaza, Columbus Ohio 43215-2373

"Qualifications for Impoundment Inspection CI-31", U.S. Department of Labor, Mine Safety and Health Administration (MSHA), 2004.

ATTACHMENT A

Figures



SAINT ALBANS, WV
7.5 MINUTE SERIES
UPDATED 1976

SCALE 1" = 2000'

0 2000' 4000'

JOHN E. AMOS PLANT
BOTTOM ASH COMPLEX

LOCATION MAP

PUTNAM COUNTY

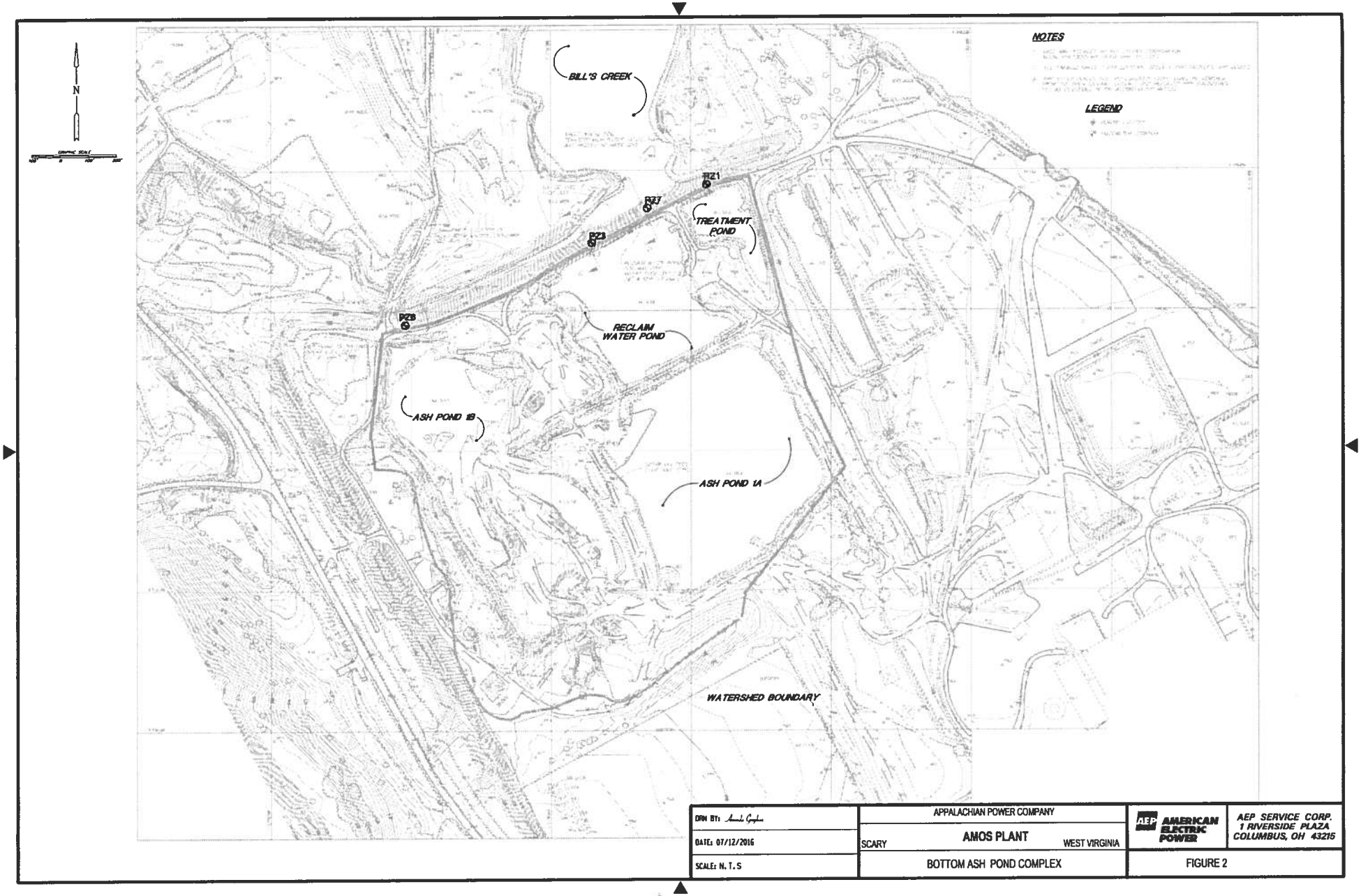
REV NO.	
DATE	
DESC.	

gai consultants
CHARLESTON OFFICE
300 SUMMERS STREET,
SUITE 1100
CHARLESTON, WV 25301
304-926-8100

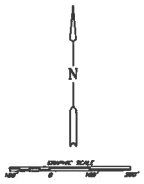
DATE	SCALE
7/8/13	1"=2000'

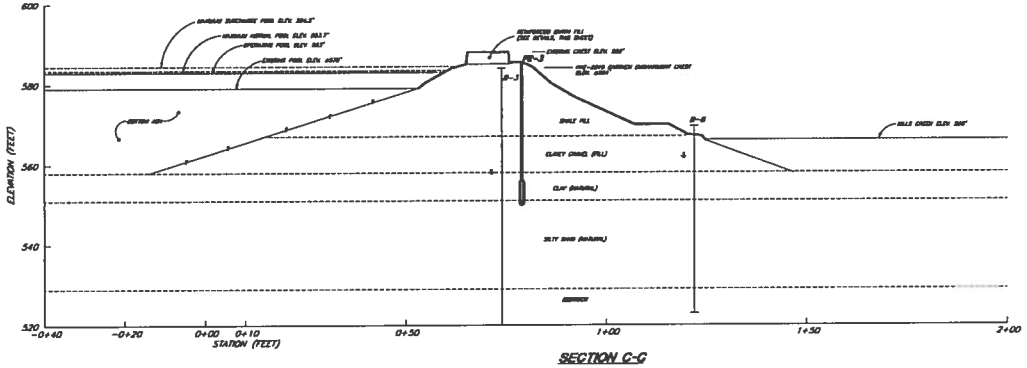
FIGURE NUMBER

1

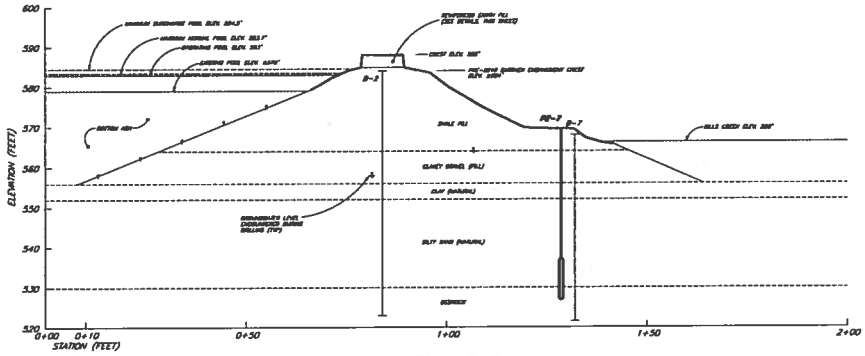


DRN BY:	APPALACHIAN POWER COMPANY	AMERICAN ELECTRIC POWER	AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215
DATE: 07/12/2016	SCARY AMOS PLANT WEST VIRGINIA		
SCALE: N. T. S	BOTTOM ASH POND COMPLEX	FIGURE 2	





SECTION C-C



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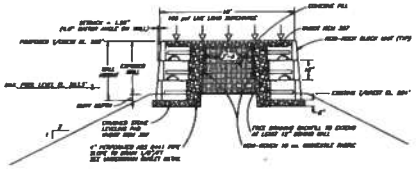


DETAIL - REINFORCED EARTH FILL TYPICAL SECTION

NOT TO SCALE

PIEZOMETER SCREEN

NOTES: 1. SEE SHEET 1 OF 2 FOR SECTION LOCATIONS.
2. EXISTING GROUND SURFACE FROM SURVEY DATA DATED 6/8/13 PROVIDED BY AEP.

DRN BY: Amanda Gephart	APPALACHIAN POWER COMPANY	AEP AMERICAN ELECTRIC POWER	AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215
DATE: 07/12/2016	SCARY AMOS PLANT WEST VIRGINIA		
SCALE: N. T. S	EMBANKMENT SECTIONS & DETAILS	FIGURE 3	

ATTACHMENT B

Photos

Photo 1 – Typical view of block wall and inboard slope showing good conditions.

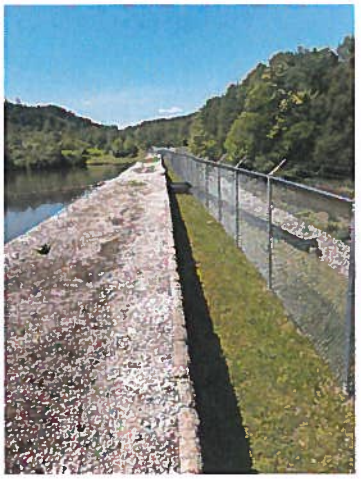


Photo 2 – Typical view of the block wall and exterior earthen embankment. Vegetative cover is well maintained and no misalignment or erosion was observed.

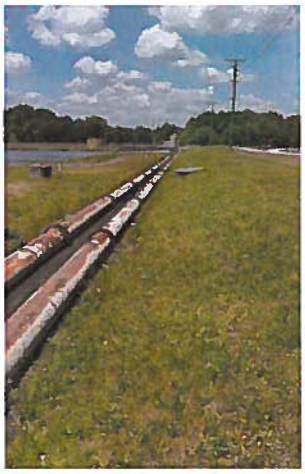


Photo 3 – Typical view of the crest and slopes of Bottom Ash Pond 1A showing good conditions.

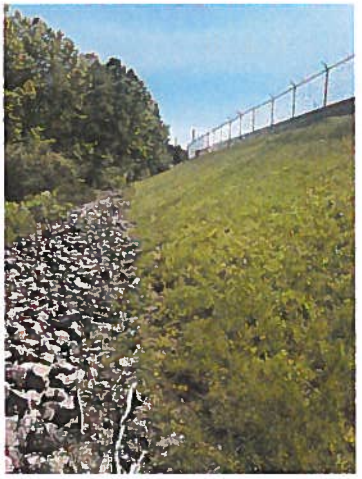


Photo 4 –Typical view of exterior embankment showing good conditions of the slope and rip rap.

Photo 5 – Typical view of the inboard slope (reclaim pond) and skimmer structure showing good conditions and a well maintained vegetative cover.

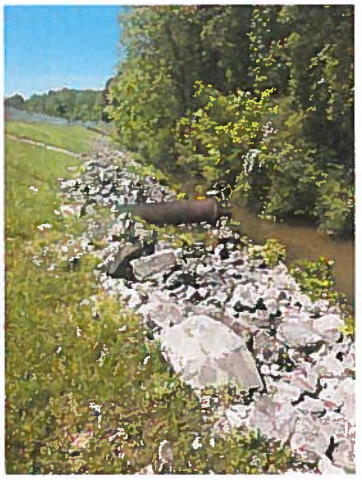


Photo 6 – Typical view of a former discharge pipe. No seepage was observed around the pipe.

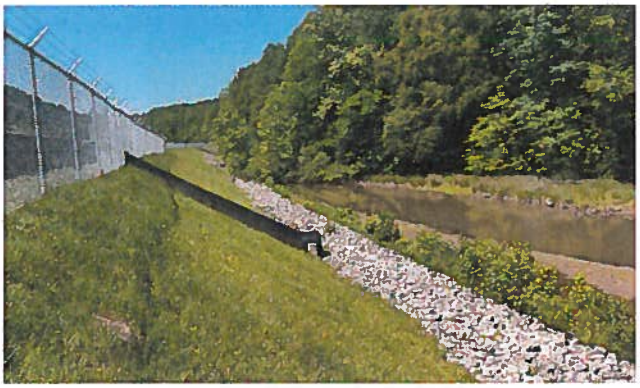


Photo 7 – Typical view of the reclaim' s pond 36 inch diameter HDPE overflow pipe showing good conditions with no obstructions to flow and no visible erosion.

Photo 8– Typical view of 36 inch diameter overflow pipe showing good conditions with no obstructions to flow and no visible erosion along the pipe.

Photo 9 – Typical view showing good conditions of the inlet for the bottom ash pond 1B overflow pipe. The concrete headwall was in excellent condition and no separation of the pipe to the headwall was observed.

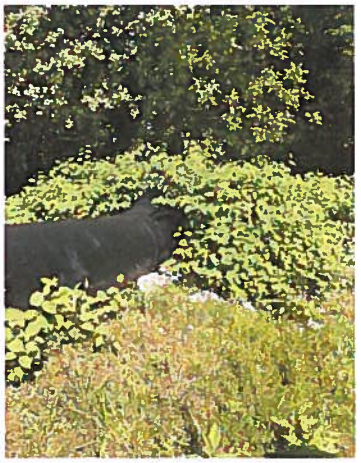


Photo 10- Atypical view of the overflow pipe showing encroachment of vegetative growth at the outlet of the pipe. This area is scheduled to be cut and the vegetation is to be removed.

Photo 11 – Mr. Gary Lewis (foreground) and Mr. Rich Fuller (background) participated in the inspection.

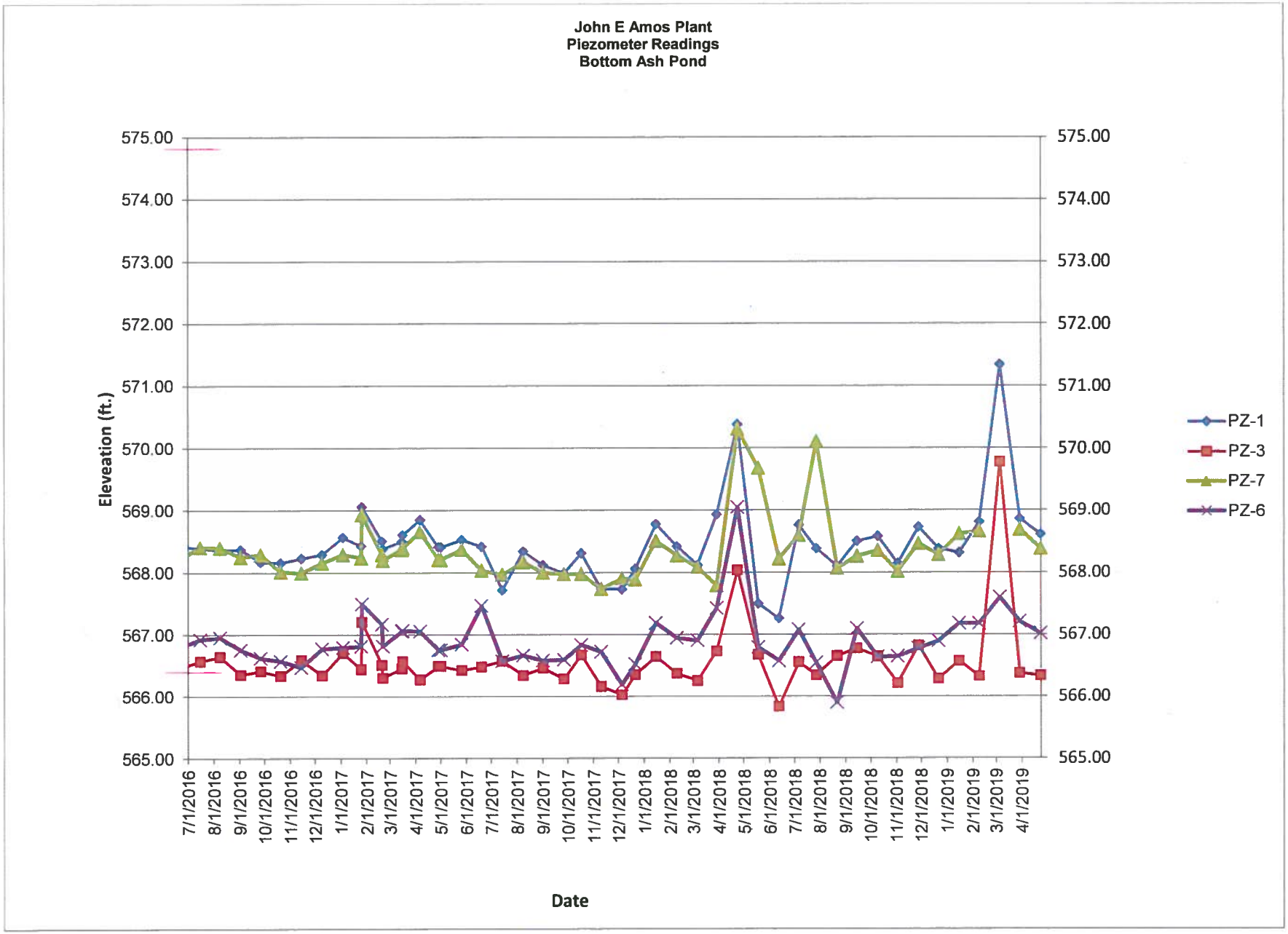
ATTACHMENT C

Instrumentation Data

Amos Bottom Ash Pond Piezometer Measurements

	PZ-1		PZ-3		PZ-6		PZ-7	
Top of Riser El.	585.81		586.78		587.6		571.51	
Date	Depth (ft.)	Elev. (ft.)	Depth (ft.)	Elev. (ft.)	Depth (ft.)	Elev. (ft.)	Depth (ft.)	Elev. (ft.)
7/15/2016	17.42	568.39	20.20	566.58	20.67	566.93	3.10	568.41
8/8/2016	17.45	568.36	20.13	566.65	20.64	566.96	3.11	568.40
9/2/2016	17.44	568.37	20.42	566.36	20.84	566.76	3.26	568.25
9/26/2016	17.64	568.17	20.36	566.42	20.97	566.63	3.22	568.29
10/20/2016	17.65	568.16	20.44	566.34	21.02	566.58	3.49	568.02
11/14/2016	17.58	568.23	20.18	566.60	21.12	566.48	3.51	568.00
12/9/2016	17.52	568.29	20.43	566.35	20.82	566.78	3.35	568.16
1/3/2017	17.24	568.57	20.07	566.71	20.80	566.80	3.22	568.29
1/25/2017	17.38	568.43	20.33	566.45	20.78	566.82	3.27	568.24
2/19/2017	17.30	568.51	20.26	566.52	20.43	567.17	3.22	568.29
2/20/2017	17.43	568.38	20.47	566.31	20.78	566.82	3.31	568.20
3/15/2017	17.31	568.50	20.32	566.46	20.54	567.06	3.14	568.37
3/16/2017	17.20	568.61	20.20	566.58	20.53	567.07	3.11	568.40
4/6/2017	16.96	568.85	20.50	566.28	20.54	567.06	2.85	568.66
4/28/2017	17.40	568.41	20.28	566.50	20.84	566.76	3.30	568.21
5/1/2017	17.40	568.41	20.28	566.50	20.84	566.76	3.30	568.21
5/26/2017	17.28	568.53	20.35	566.43	20.75	566.85	3.14	568.37
6/19/2017	17.39	568.42	20.29	566.49	20.13	567.47	3.47	568.04
7/14/2017	18.09	567.72	20.20	566.58	21.02	566.58	3.54	567.97
8/8/2017	17.47	568.34	20.43	566.35	20.93	566.67	3.34	568.17
9/1/2017	17.69	568.12	20.31	566.47	21.01	566.59	3.51	568.00
9/26/2017	17.82	567.99	20.49	566.29	21.00	566.60	3.53	567.98
11/10/2017	18.07	567.74	20.61	566.17	20.87	566.73	3.77	567.74
12/5/2017	18.08	567.73	20.75	566.03	21.40	566.20	3.60	567.91
12/21/2017	17.75	568.06	20.42	566.36	21.07	566.53	3.62	567.89
1/15/2018	17.03	568.78	20.13	566.65	20.41	567.19	3.00	568.51
2/9/2018	17.39	568.42	20.40	566.38	20.65	566.95	3.24	568.27
3/6/2018	17.69	568.12	20.52	566.26	20.69	566.91	3.42	568.09
3/29/2018	16.88	568.93	20.04	566.74	20.17	567.43	3.72	567.79
5/18/2018	18.31	567.50	20.10	566.68	20.80	566.80	1.83	569.68
6/12/2018	18.55	567.26	20.94	565.84	21.02	566.58	3.29	568.22
7/6/2018	17.05	568.76	20.22	566.56	20.52	567.08	2.91	568.60
7/27/2018	17.43	568.38	20.43	566.35	21.05	566.55	1.40	570.11
8/21/2018	17.71	568.10	20.12	566.66	21.70	565.90	3.44	568.07
9/14/2018	17.31	568.50	20.00	566.78	20.50	567.10	3.25	568.26
10/9/2018	17.23	568.58	20.13	566.65	20.96	566.64	3.16	568.35
11/2/2018	17.67	568.14	20.56	566.22	20.95	566.65	3.49	568.02
11/27/2018	17.08	568.73	19.95	566.83	20.82	566.78	3.05	568.46
12/21/2018	17.43	568.38	20.49	566.29	20.70	566.90	3.23	568.28
1/15/2019	17.50	568.31	20.20	566.58	20.42	567.18	2.89	568.62
2/8/2019	17.00	568.81	20.45	566.33	20.42	567.18	2.85	568.66
3/5/2019	14.47	571.34	17.00	569.78	20.00	567.60		
3/29/2019	16.95	568.86	20.40	566.38	20.39	567.21	2.82	568.69
4/23/2019	17.20	568.61	20.44	566.34	20.58	567.02	3.13	568.38

Values in Red are the highest denoted water levels since previous inspection


John E Amos Plant
Piezometer Readings
Bottom Ash Pond
Eleveation (ft.)
575.00
574.00
573.00
572.00
571.00
570.00
569.00
568.00
567.00
566.00
565.00
7/1/2016
8/1/2016
9/1/2016
10/1/2016
11/1/2016
12/1/2016
1/1/2017
2/1/2017
3/1/2017
4/1/2017
5/1/2017
6/1/2017
7/1/2017
8/1/2017
9/1/2017
10/1/2017
11/1/2017
12/1/2017
1/1/2018
2/1/2018
3/1/2018
4/1/2018
5/1/2018
6/1/2018
7/1/2018
8/1/2018
9/1/2018
10/1/2018
11/1/2018
12/1/2018
1/1/2019
2/1/2019
3/1/2019
4/1/2019
Date
PZ-1
PZ-3
PZ-7
PZ-6