

**2021 DAM AND DIKE INSPECTION REPORT
BOTTOM ASH COMPLEX
(Facility ID #05307)**

GERS-21-019

**APPALACHIAN POWER COMPANY
MOUNTAINEER PLANT
NEW HAVEN, WEST VIRGINIA**

PREPARED BY:

**AEP SERVICE CORPORATION
CIVIL ENGINEERING DIVISION
GEOTECHNICAL ENGINEERING SECTION
1 RIVERSIDE PLAZA
COLUMBUS, OHIO**

DAM & DIKE INSPECTION REPORT
Mountaineer Bottom Ash Complex
(Facility ID #05307)

GERS-20-031 – Revision 0

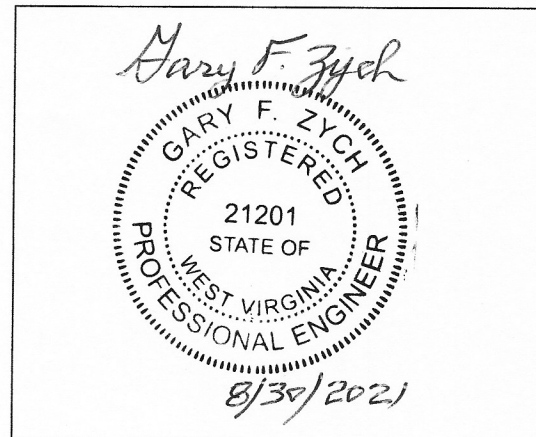
MOUNTAINEER PLANT
NEW HAVEN, WV

INSPECTION DATE: July 21, 2020

PREPARED BY *Brian G Palmer* **DATE** 08/27/2021
Brian G Palmer, P.E.

REVIEWED BY *Shah S. Baig* **DATE** 08-30-2021
Shah S. Baig, P.E.

APPROVED BY *Gary F. Zych* **DATE** 8/30/2021
Gary F. Zych, P.E.
Manager – Geotechnical Engineering Services



PROFESSIONAL ENGINEER
SEAL AND SIGNATURE

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

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(Facility ID #05307)**

1.0 INTRODUCTION:

AEPSC Civil Engineering administers the company's Dam Inspection and Maintenance Program (DIMP). As part of DIMP, staff from the Geotechnical Engineering Section conducts dam and dike inspection annually. This report was prepared, in part, to fulfill the USEPA requirements of 40 CFR 257.83 and the West Virginia Department of Environmental Protection, Division of Water Dam Inspection Section and to provide Appalachian Power Company (APCO) and Mountaineer Plant with an evaluation of the facility. Mr. Brian Palmer, P.E. performed the 2021 inspection of the Mountaineer Bottom Ash Complex. This report has been reviewed by Mr. Shah Baig, P.E. and prepared under the direction of Gary F. Zych P.E. and is a summary of the inspection and assessment of the condition of the Bottom Ash Complex.

Mr. Chris Purdum of the Mountaineer Plant was the facility contact for the inspection and assisted with the inspection. The inspection was performed on July 21, 2021. The weather condition was generally good with temperatures ranging from 71° in the morning to 88° F in the afternoon; visibility was good and sunny throughout the day. Figure 1 illustrates the location of the Bottom Ash Pond Complex.

2.0 DESCRIPTION OF THE BOTTOM ASH COMPLEX (CCR UNIT):

At the Mountaineer Plant, the Bottom Ash Complex (CCR unit) consists of East Bottom Ash Pond (EBAP) and West Bottom Ash Pond (WBAP), East Wastewater Pond (EWP) and West Wastewater Pond (WWP), a Leachate Collection Surge Pond (LCP), a FGD Maintenance Pond, a Reclaim Water Pond (RWP), a Clearwater Pond (CWP) and a small Metal Cleaning Waste Tank Secondary Containment Basin. The EBAP and WBAP are considered a CCR impoundment per 40 CFR 257 and items have been included in this report to fulfill these requirements. The EWP, WWP, RWP, CWP, LCP, FGD Maintenance Pond, and Metal Cleaning Waste Tank Secondary Containment Basin are not CCR impoundments but are included in this report as part of the overall inspection of the facility.

The pond embankments are generally small in height (< 50 ft.) and have design slopes of 3 Horizontal to 1 Vertical (3H to 1V) for both the interior and exterior slopes. The Bottom Ash Ponds normal pool elevation are at 612 feet, the Waste Water Ponds normal pool elevations are at 609 feet, and the Reclaim and Clear Water Ponds normal pool elevations are at 603 feet. The East Bottom Ash and the East Wastewater Ponds were out of service at the time of this inspection, but could be used in alternate sequences with the West Bottom Ash and the West Wastewater Ponds during routine maintenance, repair, ash removal or other operating activity. Figure 2 included in Appendix A illustrate various ponds arrangement at the Bottom Ash Complex.

Table 1 is a summary of the minimum, maximum, and present depth and elevation of the impounded water and Coal Combustion Residuals (CCR) since the previous annual inspection; the approximate volume of the impounded water and CCR at the time of the inspection.

Table 1 – Impoundment Data.

Parameter	EBAP	WBAP
	Depth (Elevation)	
Approximate Minimum depth of impounded water since last annual inspection	5 ft (603.0')	13.7 ft (611.7)
Approximate Maximum depth of impounded water since last annual inspection	6.7 ft (604.7')	14.5 ft (612.5')
Approximate Minimum depth of CCR since last annual inspection	Minimal (Out of Service)	10.0 ft (608.0')
Approximate Maximum depth of CCR since last annual inspection	Minimal (Out of Service)	~27.0 ft (625.0')
Approximate Present depth of CCR at the time of the inspection	Minimal (Out of Service)	~27.0 ft (625.0')
Approximate Present depth of impounded water at the time of the inspection	5 ft (603.0 ft)	14.5 ft (612.5 ft)

Storage Capacity of impounding structure at the time of the inspection	165 acre-ft	137 acre-ft
Approximate volume of impounded water at the time of the inspection	46 acre-ft	~105 acre-ft
Approximate volume of CCR at the time of the inspection	Minimal (Out of Service)	~40 acre-ft

Dike: crest = 620 ft, bottom = 598 ft.

3.0 REVIEW OF AVAILABLE INFORMATION

In addition to the visual inspection, a review of available information regarding the status and condition of the Bottom Ash Pond Complex was completed. This review included files available in the operating record, such as design and construction information, previous periodic structural stability assessments, previous 7-day inspection reports, previous 30-day instrumentation data, and previous annual inspections reports. Based on the findings of the current inspection and review of the available data, it is concluded, there were no signs of actual or potential structural weakness or adverse conditions and that the facility is functioning as intended in the design.

4.0 INSPECTION [257.83(B)(1)(II)]

4.1 SUMMARY OF VISUAL OBSERVATIONS:

The 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 are described 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/Satisfactory: A condition or activity that generally meets what is minimally 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, cracks, concrete surface etc.) where the current maintenance program has neglected to improve the condition. Usually conditions that have been identified in previous inspections, but have not been corrected.
- Excessive: A reference to an observed item (e.g., erosion, seepage, vegetation, cracks, concrete surface etc.) where the current maintenance condition is below or worse than what is normal or desired, and which may affect the ability of the observer to properly evaluate the structure or particular area, or which may be a concern from the structure safety or stability point of view.

In addition, a “deficiency” is some evidence that a CCR unit has developed a problem that could impact the structural integrity of the CCR unit. There are four general categories of deficiencies. These four categories are described below:

1. Uncontrolled Seepage

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 (dike/dam) and is not collected and safely carried off by a drain. Seepage that is collected by a drain can still be uncontrolled if it is not safely transported, such as seepage that is not clear. Seepage that is unable to be measured and/or observed is considered uncontrolled seepage.

[Note: Wet or soft areas are not considered as uncontrolled seepage, but can lead to this type of deficiency. These areas should be monitored frequently]

2. Displacement:

Displacement is a large-scale movement of the CCR unit, structural fill or other earthen material associated with the embankment (dike/dam). Common signs of displacement are cracks, scarps, bulges, depressions, sinkholes and slides.

3. Blockage of Water Control Appurtenances:

Blockage of Water Control Appurtenances is the restriction of water flow at spillways, storm water ditches/channels, leachate collection systems and ground water interceptor drains.

4. Erosion:

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.

4.2 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 last (2020) annual inspection. The geometry of the impoundment has remained essentially unchanged.

4.3 CHANGES THAT EFFECT STABILITY OR OPERATIONS [257.83(b)(2)(vii)]

Based on interviews with plant personnel and field observations there were no changes to the CCR unit (Bottom Ash Complex) since the last (2020) annual inspection that would affect the stability or operation of the impounding structure.

5.0 BOTTOM ASH POND COMPLEX VISUAL INSPECTION [257.83(B)(I)]

The Bottom Ash Pond Complex is comprised of diked embankments to the north, east, and west sides of the complex. The south side of the complex is incised and also consists of a haul road providing access to this area. There are six main ponds (EBAP, WBAP, EWP, WWP, RWP, and CWP) within the complex. The Bottom Ash Ponds and Wastewater Ponds were designed in tandem, but one pond each is in service at a given time. At present, the WBAP and WWP are used most of the time without a need to switch to the other ponds. In addition, a metal cleaning tank pond, a FGD pond, and a leachate pond were added to the east of the EWWP. Figure 3 (Photograph Location Map) and photographs are included in Appendix B.

The Bottom Ash Pond Complex extends in a general northwest to southeasterly direction.

5.1 CLEARWATER POND (CWP) AND RECLAIM WATER POND (RWP):

In general, the crest and exterior slope of the CWP and RWP (East Dike) were in satisfactory condition. The crest of the south dike is used as haul road. The gravel base on the crest and vegetation cover on the slope appeared satisfactory. The existing sulfuric acid tanks remain on the crest of the East Dike at the outfall of the CWP but are not in service. The access walkway to the overflow structures appeared safe and in fair condition. An inactive animal burrow on the exterior of the East Dike was noted for repair.

The effluent structure was functioning as design. The lower sections of the interior slope are protected by stone and the upper sections are covered by vegetation.

The interior slopes appeared in satisfactory and stable conditions.

The stone material around the discharge culvert was in satisfactory condition. Overall, the interior dikes, crest and slopes of the CWP and RWP appeared to be in satisfactory condition with no signs of rutting, misalignment, or cracking.

5.2 EAST WASTEWATER POND (EWP) & WEST WASTEWATER POND (WWP)

The exterior slope and crest of the WWP (West dike) appeared to be in satisfactory condition. The interior slope, the effluent flume, and concrete weir appeared in satisfactory condition.

The EWP interior slope condition and effluent flume and concrete weir appeared to be in satisfactory and working condition.

In general, the main junction box was in satisfactory condition and appeared to be in functioning condition.

Overall, the exterior dike (west dike) and the interior dikes appeared in satisfactory and stable condition and the crest areas appeared in satisfactory and stable condition without any sign of settlement, misalignment, and significant rutting.

5.3 EAST BOTTOM ASH POND (EBAP) & WEST BOTTOM ASH POND (WBAP)

The overall condition of the exterior slope of the EBAP (East Dike) was fair. An extended area of excessive wetness approximately 900 feet long was observed adjacent to the toe of the East Dike. The slope above the toe area appeared satisfactory. An inactive animal burrow was observed.

The crest area of the EBAP appeared to be in satisfactory condition with no signs of rutting, cracks, or misalignment. There is a minor erosion occurring under the pipe cribbing support on the eastern edge of the EBAP crest area.

The EBAP interior slopes and overflow and low water outlet structure appeared to be in satisfactory condition. The overflow discharge structure, access platform, and side rail appeared to be in satisfactory and working condition.

The north exterior slope of the EBAP and WBAP (North Dike) were in satisfactory and stable condition. A wet/soft area along the toe of the WBAP northern downstream slope was observed. This area is present from the toe of the slope to the existing chain-link fence. It appears that this condition is due to poor drainage and needs to be investigated to properly develop a drainage control plan.

The interior slopes and discharge header pipe structures of for both the EBAP and WBAP on the interior of the North Dike appeared to be in satisfactory condition. There was some erosion noticed at the junction box for the discharger header pipe of the EBAP. There continues to be some soil erosion at the supports for the access walk way at the WBAP.

The WBAP western exterior slopes (West Dike) appeared to be in satisfactory condition. The lower portions are protected by riprap and the upper portions are properly vegetated. In general, the crest conditions are in satisfactory condition with no signs of rutting, cracks or misalignment.

The general condition of the WBAP interior slopes, overflow discharge structure, access platform, and side rail appeared to be in satisfactory working condition.

The north section of the WBAP is used for the temporary stockpile of bottom ash. This area also contains the ash sluice pipe for the discharge of bottom ash in this section of the pond. This area appeared to be well maintained and properly controlled for the handling of the bottom ash.

5.4 METAL CLEANING TANK, FGD MAINTENANCE, AND LEACHATE COLLECTION PONDS

The exterior of the East Dike along the FGD Maintenance Pond and the metal cleaning tank containment area generally appeared in satisfactory condition. An inactive animal burrow was noted in the embankment below the FGD Maintenance Pond.

Overall, the FGD Maintenance Pond and leachate pond were in satisfactory condition. The overflow discharge structures appeared to be functioning as designed. The interior slope lined with a HDPE liner appeared in satisfactory and stable condition.

The metal cleaning tank containment dikes appeared in satisfactory and stable condition.

5.5 OUTFALL MANHOLE

The outfall 001 and the transfer basin connected to the outfall pipe at the riverbank. The transfer basin is located just before the outfall pipe to the river. The water flow appeared to be uninterrupted at the time of inspection.

6.0 ASSESSMENT OF RECENT INSTRUMENTATION DATA [257.83(B)(2)(II)]

Three piezometers were installed in February 2009. PZ-09-03 was installed at the crest of the EBAP. PZ-09-04 was installed at the toe, directly down the slope from PZ-09-03. PZ-09-05 was installed at the crest of the CWP. The location of all three piezometer are illustrated in Figure 4 (Piezometer Location Map) included in Appendix C. The following Table 2a illustrates the maximum reading recorded of the piezometers since the last annual inspection (October 2020). A summary of the pond levels measured during the 2021 inspection and the pool level data from previous three years are summarized below in Table 2b. The historical static water level data (2019-2021) of the Bottom Ash Complex is compiled and presented in Figure 5 at Appendix C.

Table 2a – CCR Ponds Maximum Recorded Reading.

Piezometer	Maximum Reading Since Last Annual Inspection (October 2020)	Date of Reading
PZ-09-03	601.6	4-21-2021
PZ-09-04	572.4	3-24-2021
PZ-09-05	562.8	12/30-2021

Table 2b – Static Water Levels of the Bottom Ash Pond Complex.

Pond Name	Normal Pool Elevation (feet)	Pond Elevation (feet)			
		9-27-18	8-14-2019	10-13-2020	7-21-2021
EBAP	612.0	607.1	608.6	602.6	603.0
WBAP	612.0	609.6	612.2	609.0	612.5
EWP	609.0	607.1	606.8	598.3	599.8
WWP	609.0	609.0	609.1	609.1	609.1
RWP	603.0	603.3	603.4	603.4	603.4
CWP	603.0	603.2	603.2	603.2	603.2

Piezometers PZ-09-04 and PZ-09-05 indicate no changes in the static water levels from 2018 to present. This is probably due to the piezometers being installed above the static water table in the area. Based on well installation logs, piezometers PZ-09-04 and PZ-09-05 were installed and developed as dry wells. Even after initial well development,

the water injected into the wells dissipated and the piezometer have remained dry. Piezometer PZ-09-03, which is located at the crest of EBAP has indicated fluctuations in the water level over the years. This fluctuation is consistent with the water level changes in the EBAP and is a reflection of the phreatic surface in the embankment materials. Even though the EBAP is out of service, the plant will periodically send process waters to the EBAP affecting the water levels.

7.0 CONCLUSIONS

Based on the visual inspection, the overall condition of the Bottom Ash Complex is satisfactory. Specific conclusions related to this inspection are as follows.

- (i) The Bottom Ash Complex appears to be operating as designed and shows no signs of distress, slope instability, dike misalignment or significant settlement.
- (ii) Overall, vegetation control and management for the facility is considered satisfactory.
- (iii) The animal activity appears to be the same as in previous years and it is manageable as routine maintenance items. Excessive animal activities were not noticed during this inspection. Few animal holes were observed as noted in this report.
- (iv) Some erosion around the overflow header structure of the EBAP was noticed. Part of the discharge pipe was out of alignment or damaged. Although access may be an issue, this condition should be remediated as part of maintaining the facility.
- (v) Some minor erosion has occurred under the pipe cribbing on the EBAP crest area. There are some pipes that lie directly on the crest surface (next to the pipe cribbing) that may have caused concentrated water flow from rain events. The erosion does not appear to have any effect on the driving surface of the crest area, but should be repaired in a timely fashion.

- (vi) There were two areas at the toe of the downstream slopes of the EBAP and WBAP that exhibited wetness. One area is along the north dike that was wet and soft and may have some potential drainage issue. Another area is along the east dike that has soft ground, ponding water, and exhibit significant rutting. These areas have been surveyed and show that the areas are relatively flat and do not drain well. It is also likely that some seepage may be related to the wet area. With plans for the pond closure and repurposing project under way at Mountaineer plant, it is believed that these seepage and wet areas will be addressed with the modifications to the bottom ash ponds.

8.0 RECOMMENDATIONS

Following are general maintenance items and monitoring requirements that are recommended as a result of the inspection. Assistance or guidance with the implementation of these items can be provided by AEPSC Civil Engineering & Geotechnical Services:

- (i) A few animal holes were encountered during this inspection. These holes shall be mitigated by filling them in with compactible backfill and compact the final lift to finish at the existing grades.
- (ii) Water level measuring staff gauges should be installed at the overflow discharge structure or pipe locations. The staff gauges should have elevation marked and labelled in the mean sea level (msl). The length of the staff gauges shall be such that will provide full depth measurements in case of high pool level during significant flood events.
- (iii) The erosion around the pipe cribbing on the EBAP crest area should be filled in and graded to prevent concentrated flows of runoff developing during rain events.

8.1 SITE SPECIFIC ACTION ITEM

(i) Potential seepage along the east dike downstream slope of the EBAP is most likely to be contributing to the wet area between the toe of the dike and the fence. These areas have been surveyed and show that the areas are relatively flat and do not drain well. With plans for the CCR/ELG project under way at Mountaineer plant, it is believed that these seepage and wet areas will be addressed with the modifications to the bottom ash ponds.

(ii) Similarly, potential seepage along the north dike downstream slope of the WBAP is most likely to be contributing to the wet area between the toe of the dike and the chain fence. These areas have been surveyed and show that the areas are relatively flat and do not drain well. With plans for the CCR/ELG project under way at Mountaineer plant, it is believed that these seepage and wet areas will be addressed with the modifications to the bottom ash ponds.

(iii) Piezometer PZ-09-03 shall be flushed and continue to be used in monitoring and the data be reviewed for further corrective action.

8.2 DEFICIENCIES (257.83(b)(2)(vi))

There were no deficiencies or signs of structural weakness or disruptive conditions. There were no deficiencies noted during any of the quarterly inspections. If any of these conditions occur before the next annual inspection contact AEP-Geotechnical Engineering immediately.

Based on the inspection and review of relevant documents, AEPSC – Civil Engineering believes that the Bottom Ash Complex has a generally satisfactory appearance and is in satisfactory functional condition. Inspections, monitoring and general maintenance by plant personnel should continue. If you have any questions with regard to this report, please do not hesitate to contact Brian Palmer at 614-716-3218 (Audinet 200-3218) or Gary Zych at 614-716-2917 (Audinet 200-2917).

APPENDIX A:

Figure 1 – Site Location Map

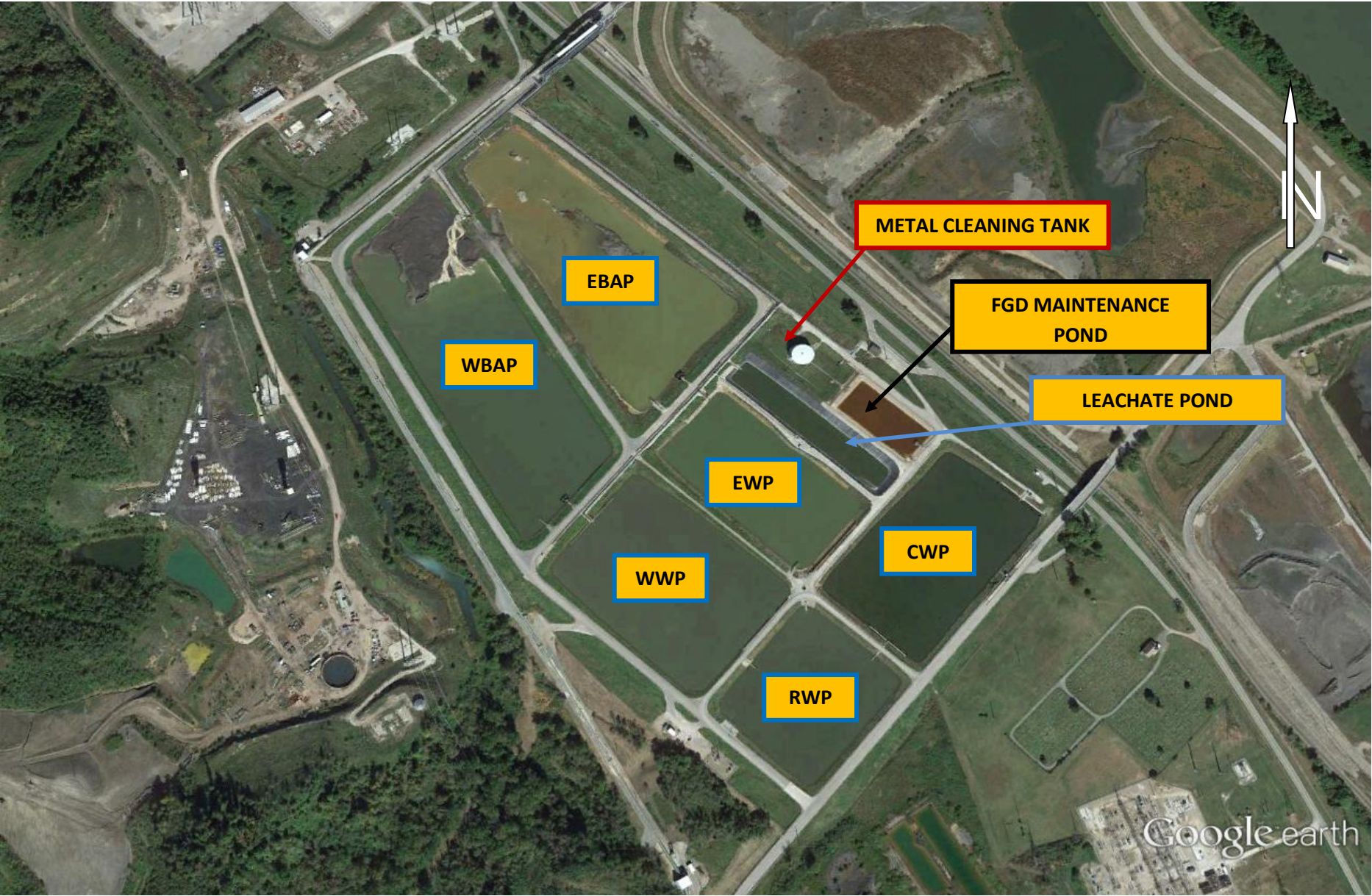
Figure 2 – Bottom Ash Pond Complex

FIGURE 1 – SITE LOCATION MAP
MOUNTAINEER PLANT, NEW HAVEN, WV



FIGURE 2 – BOTTOM ASH POND COMPLEX

MOUNTAINEER PLANT, NEW HAVEN, WV




APPENDIX B:

**Figure 3 – Photograph Location Map
& Photograph Pages**



LEGEND:

-  PHOTO LOCATION
-  PHOTO DIRECTION

DRAWING NUMBER:		FIGURE 3	
		POWER COMPANY	
		MOUNTAINEER PLANT	
		PHOTO FIGURE	
PLANT	PHOTO DATE:	6/14/16	
 AMERICAN ELECTRIC POWER	AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215		

17-01-00-01
 17-01-00-01
 17-01-00-01
 17-01-00-01

AEP GES Dam Inspection

Plant Name:

Inspector:

Unit:

Date:

Photo #:

Notes:



Photo #:

Notes:



AEP GES Dam Inspection

Plant Name:

Inspector:

Unit:

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AEP GES Dam Inspection

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Unit:

Date:

Photo #:

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Photo #:

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AEP GES Dam Inspection

Plant Name: Mountaineer

Inspector: B Palmer

Unit: Bottom Ash Pond

Date: July 21, 2021

Photo #: 29

Notes: General condition of interior slope of North Dike in East BAP looking west. Discharge structure visible.



N38 58.407 W81 56.283

Photo #: 30

Notes: General condition of interior slope and crest of the North Dike at West BAP



N38 58.365 W81 56.356

AEP GES Dam Inspection

Plant Name:

Inspector:

Unit:

Date:

Photo #:

Notes:



Photo #:

Notes:



AEP GES Dam Inspection

Plant Name:

Inspector:

Unit:

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AEP GES Dam Inspection

Plant Name:

Inspector:

Unit:

Date:

Photo #:

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Photo #:

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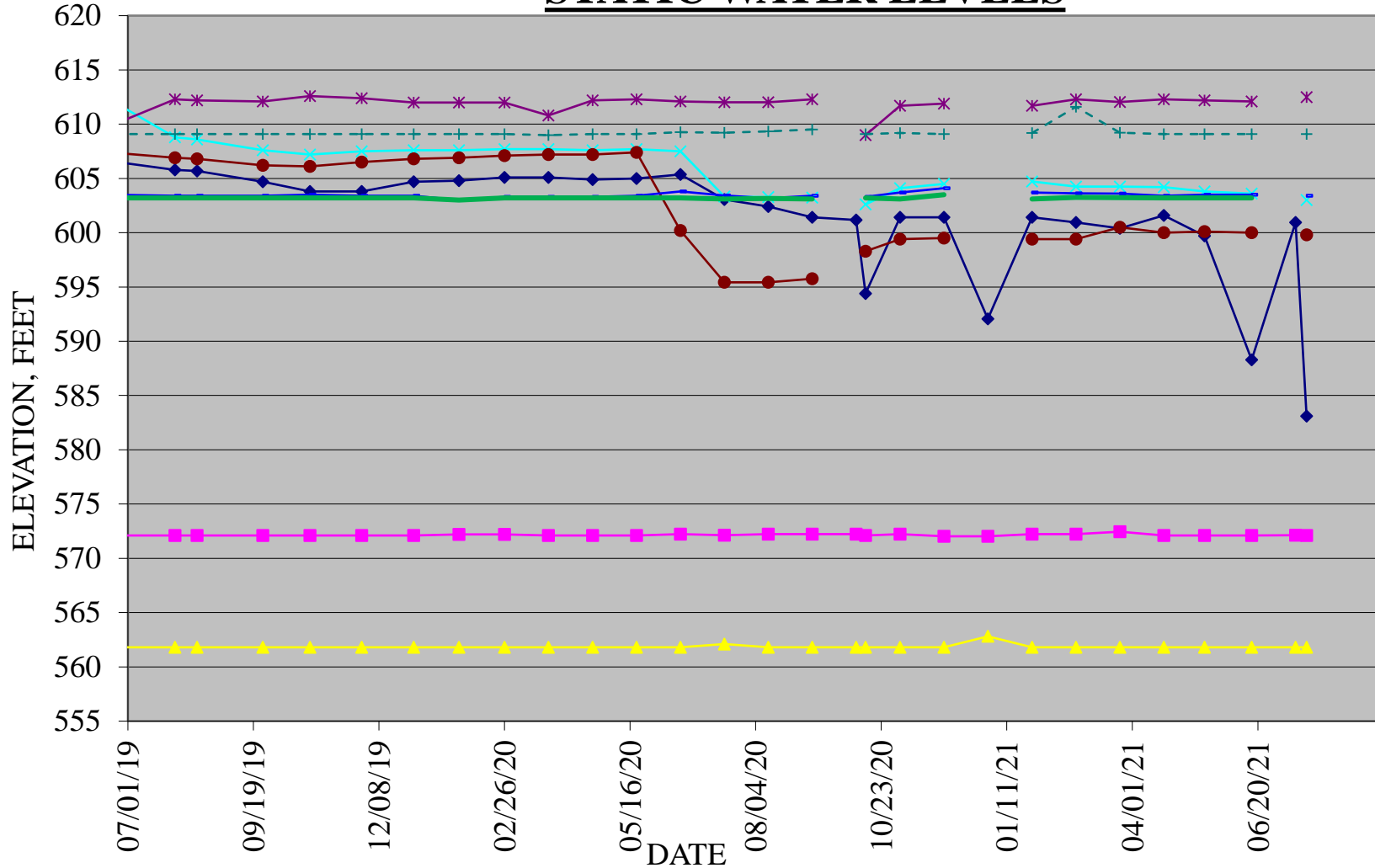


APPENDIX C:

Figure 4 – Piezometer Location Map

Figure 5 – Mountaineer Bottom Ash Complex Water Levels

FIGURE 5 - MOUNTAINEER BOTTOM ASH COMPLEX
STATIC WATER LEVELS



APPENDIX D:

**ENGINEER'S INSPECTION VERIFICATION STATEMENT FOR
MOUNTAINEER BOTTOM ASH COMPLEX ID #05307**

ENGINEER'S INSPECTION VERIFICATION STATEMENT

For Compliance with Dam Safety Rules §47-34-15.4.c

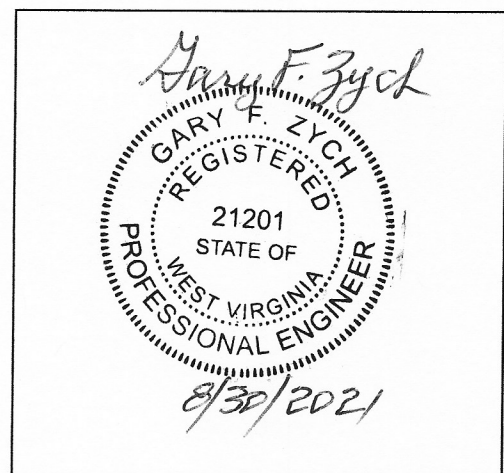
I hereby verify that I supervised the visual inspection of the Mountaineer Bottom Ash Complex (ID# 05307) and its appurtenances on July 21, 2021.

The attached signed and sealed inspection report documents:

- 1) the current conditions as observed;
- 2) any maintenance items necessary to prolong safe functioning of the dam;
- 3) any conditions observed during the inspection which indicate that the dam has a serious problem⁽¹⁾;
- 4) any conditions that will not allow proper functioning of the dam during normal or maximum reservoir water level conditions.

Gary F. Zych
Signature
Gary F. Zych, P.E.
Manager
Geotechnical Engineering Services
American Electric Power Service Corporation

8/30/2021
Date



SEAL

⁽¹⁾ As defined in Section 2.47 of the Dam Safety Rules