

**2019 DAM AND DIKE INSPECTION REPORT  
BOTTOM ASH COMPLEX  
(Facility ID #05307)**

**GERS-19-017**

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

**PREPARED BY:**

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

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

**GERS-19-017 – Revision 0**

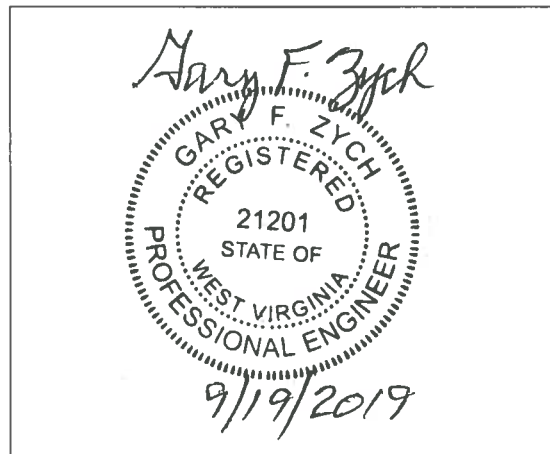
**MOUNTAINEER PLANT  
NEW HAVEN, WV**

**INSPECTION DATE: August 14, 2019**

**PREPARED BY** Brett A. Dreger **DATE** 9/19/2019  
Brett A. Dreger, P.E.

**REVIEWED BY** P. J. Amaya **DATE** 9/13/2019  
Pedro J. Amaya, P.E.

**APPROVED BY** Gary F. Zych **DATE** 9/19/2019  
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).

## TABLE OF CONTENT

1.0	INTRODUCTION: .....	1
2.0	DESCRIPTION OF THE BOTTOM ASH COMPLEX (CCR UNIT):.....	1
3.0	REVIEW OF AVAILABLE INFORMATION .....	3
4.0	INSPECTION [257.83(B)(1)(II)] .....	3
4.1	SUMMARY OF VISUAL OBSERVATIONS: .....	3
4.2	CHANGES IN GEOMETRY SINCE LAST INSPECTION [257.83(b)(2)(i)] .....	5
4.3	CHANGES THAT EFFECT STABILITY OR OPERATIONS [257.83(b)(2)(vii)] .....	5
5.0	BOTTOM ASH POND COMPLEX VISUAL INSPECTION [257.83(B)(I)] .....	5
5.1	CLEARWATER POND (CWP) AND RECLAIM WATER POND (RWP):.....	6
5.2	EAST WASTEWATER POND (EWP) & WEST WASTEWATER POND (WWP)....	6
5.3	EAST BOTTOM ASH POND (EBAP) & WEST BOTTOM ASH POND (WBAP)....	7
5.4	METAL CLEANING TANK, FGD SCRUBBER SLUDGE, AND LEACHATE COLLECTION PONDS .....	9
5.5	OUTFALL MANHOLE .....	9
6.0	ASSESSMENT OF RECENT INSTRUMENTATION DATA [257.83(B)(2)(II)] .....	10
7.0	CONCLUSIONS.....	11
8.0	RECOMMENDATIONS .....	12
8.1	SITE SPECIFIC ACTION ITEM.....	12
8.2	DEFICIENCIES (257.83(b)(2)(vi)).....	13

## APPENDICES

### APPENDIX A:

**Figure 1 – Site Location Map**

**Figure 2 – Bottom Ash Pond Complex**

### APPENDIX B:

**Figure 3 – Photographs Location Map  
& Photographs**

### APPENDIX C:

**Figure 4 – Piezometer Location Map**

**Figure 5 – Mountaineer Bottom Ash Complex Water Levels**

### APPENDIX D:

**Engineer’s Inspection Verification Statement For Mountaineer Bottom Ash Complex  
(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. Brett Dreger, P.E. performed the 2019 inspection of the Mountaineer Bottom Ash Complex. This report has been reviewed by Mr. Pedro Amaya, 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 August 14, 2019. The weather condition was generally good with temperatures ranging from 55° in the morning to 70° F in the afternoon; visibility was good and partly cloudy 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 Waste Containment 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 Waste Containment 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 (i.e., < 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 <b>Minimum</b> depth of impounded water since last annual inspection	9.1 ft (607.1')	11.1 ft (609.1')
Approximate <b>Maximum</b> depth of impounded water since last annual inspection	14.3 ft (612.3')	14.6 ft (612.6')
Approximate <b>Minimum</b> depth of CCR since last annual inspection	Minimal (Out of Service)	14.8 ft (612.8')
Approximate <b>Maximum</b> depth of CCR since last annual inspection	Minimal (Out of Service)	19 ft (617.0')
Approximate <b>Present</b> depth of CCR at the time of the inspection	Minimal (Out of Service)	19 ft (617.0')
Approximate <b>Present</b> depth of impounded water at the time of the inspection	10.6 ft (608.6 ft)	14.2 ft (612.2 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	85 acre-ft	97 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 2018 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 (2018) annual inspection that would affect the stability or operation of the impounding structure.

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

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.



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

1. Photographs No. 1 and No. 2 illustrate animal burrows located on the east downstream slope of the CWP. In general, the crest and downstream slope of the CWP were in satisfactory condition. The crest of this dike, also used as haul road, is seen in this photograph. The gravel base on the crest and vegetation cover on the slope appeared satisfactory. The existing sulfuric acid tanks are not in use for treatment and will be removed later. The access walkway to the overflow structures appeared safe and in fair condition.
2. Photograph No. 3 illustrates the east dike upstream slope and the effluent flume structure of the CWP. The effluent structure was functioning as design. The lower sections of the upstream slope are protected by stone and the upper sections are covered by vegetation.
3. Photograph No. 4 illustrates the upstream slope of the southern dike. This photograph also depicts the typical condition of the CWP interior slopes. The interior slopes appeared in satisfactory and stable conditions.
4. Typical interior dikes, crest and slopes of the RWP are depicted in Photographs No. 5 and No. 6. 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)**

1. The EWP interior slope condition and effluent flume and concrete weir is shown in Photographs No. 7. This slope appeared to have intermittent grass cover, but some isolated areas were found to be bare.

2. The EWP interior slope conditions and discharge header pipe is depicted in Photograph No. 8. Overall, the dikes and slopes were in satisfactory and stable condition and the vegetation cover was good.
3. The WWP interior slope condition and effluent flume and concrete weir is depicted in Photographs No. 9. This slope appeared to have intermittent grass cover, but some areas were found to be completely bare.
4. The WWP interior slope conditions and discharge header pipe is shown in Photograph No. 10. Overall, the dikes and slopes were in satisfactory and stable condition and the vegetation cover was good.
5. The effluent flume concrete and the steel weir components of the EWP and WWP are illustrated in Photographs No. 7 and No. 9. The flume and weir structure appeared to be in satisfactory and working condition.
6. Overall, 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)**

1. The overall condition of the downstream slope of the east dike is presented in Photographs No. 11 and 12. The condition of the east exterior slope was fair. An extended area of excessive wetness approximately 900 feet long was observed adjacent to the toe of the dike. Standing water was noticed in the tire ruts apparently from previous mowing activities. The slope above this elevation appeared satisfactory.

2. Photograph No. 13 depicts the typical condition of the EBAP interior slopes and overflow and low water outlet structure. The overflow discharge structure, access platform, and side rail appeared to be in satisfactory and working condition. Some erosion was noticed at the outlet end of the pipe that should be repaired.
3. Photograph No. 14 depicts the typical condition of the EBAP interior slopes and discharge header pipe structure. The discharge header pipe appeared to be in satisfactory working condition. There was some erosion noticed at the junction box for the discharger header pipe.
4. Photographs No. 15 and No. 16 show the typical conditions of the EBAP and WBAP crest areas. The crest areas appeared to be in satisfactory and stable condition without any sign of settlement, misalignment, or cracking.
5. The north exterior slopes of the EBAP and WBAP were in satisfactory good and stable condition. Photograph No. 17 shows a wet/soft area along the toe of the WBAP northern downstream slope. 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 repair plan.
6. Photograph No. 18 shows the typical conditions of the WPAB western exterior slopes. The condition of the exterior slope is satisfactory. The lower portions are protected by riprap and the upper portions are properly vegetated.
7. Photograph No. 19 depicts the typical condition of the WBAP interior slopes and overflow and low water outlet structure. The overflow discharge structure, access platform, and side rail appeared to be in satisfactory and working condition.

8. Photograph No. 20 shows the typical condition of the WBAP interior slopes and discharge header pipe structure. The discharge header pipe appeared to be in satisfactory working condition. There was some erosion noticed at the cribbing supporting the access walk way.
9. 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 SCRUBBER SLUDGE, AND LEACHATE COLLECTION PONDS**

1. The metal cleaning tank containment dikes appeared in satisfactory and stable condition. Some standing water was inside the containment area. Two sump pumps are present at the north and south ends of the containment. Both sump pumps appeared to be not functioning at the time of this inspection. No photographs were taken.
2. Overall, the FGD Scrubber Sludge Pond and leachate pond were in satisfactory condition (Photograph No. 21 and No. 22). The overflow discharge structures appeared to be functioning as designed. The interior slope lined with a HDPE liner appeared in satisfactory and stable condition.

#### **5.5 OUTFALL MANHOLE**

Photographs No. 23 and No. 24 show 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 ground appeared to have settled around the manhole. 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 2018). A summary of the pond levels measured during the 2019 inspection and the pool level data from previous three years are summarized below in Table 2b. The historical static water level data (2009-19) 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 (September 2018)	Date of Reading
PZ-09-03	607.9	2-27-2019
PZ-09-04	572.1	10-31-2018 To 8-14-2019
PZ-09-05	561.8	10-31-2018 To 8-14-2019

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

Pond Name	Normal Pool Elevation (feet)	Pond Elevation (feet)			
		10-26-2016	10-17-17	9-27-18	8-14-2019
EBAP	612.0	605.5	604.3	607.1	608.6
WBAP	612.0	612.9	612.8	609.6	612.2
EWP	609.0	605.5	604.3	607.1	606.8
WWP	609.0	609.1	609.1	609.0	609.1
RWP	603.0	603.2	603.4	603.3	603.4
CWP	603.0	603.2	603.2	603.2	603.2

Piezometers PZ-09-04 and PZ-09-05 indicated no significant change in the static water levels from 2009 to present. Piezometer PZ-09-03, which is located at the crest of EBAP indicated significant fluctuation in the water level. In the last three years, the static water levels varied between 578.7-607.9 feet. This fluctuation is consistent with the water level changes in the EBAP. Even though the EBAP is out of service, the plant will periodically send process waters to the EBAP dramatically 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. Some areas that showed less than normal vegetation cover should be improved.
- (iii) The animal activity appears to be less than in previous years and it is manageable. Excessive animal activities were not noticed during this inspection. Few animal holes were observed as noted in this report.
- (iv) Two above ground storage tanks were previously installed at the southeast corner of the Clearwater Pond (CWP). These tanks are currently not in operation and should be removed.
- (v) 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.
- (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 (Photograph No. 17) that was wet and soft and may have some potential drainage issue. Another area is along the east dike (Photograph No. 12) that has soft ground, ponding water, and exhibit significant rutting. There seems to be some seepage contributing to the wetness this area since this area is relatively flat and located

adjacent to the downstream slope. A monitoring plan was discussed with the plant in order to determine a root cause and to develop a remedial plan.

## 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 settlement around the manhole of the outfall pipe should be excavated to the bottom of the settled ground and backfilled with soil, compacted, and regraded.

## 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. The root cause of the potential seepage is under monitoring and currently considered for investigation. A monitoring plan including a survey of the area shall be prepared and implemented by AEPSC Civil Engineering & Geotechnical Services to find the root cause of this issue. Data from existing and additional monitoring instruments shall be

reviewed as part of the monitoring plan. When a root cause is determined, appropriate corrective action shall be implemented.

(ii) Similarly, the wet area observed at the toe of the downstream slope of the WBAP close to the chain link fence should be investigated for poor drainage and water ponding issues. A monitoring plan including a survey of the area shall be prepared and implemented by AEPSC Civil Engineering & Geotechnical Services to find the root cause of this issue.

(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 Brett Dreger at 614-716-2241 (Audinet 200-2241) or Gary Zych at 614-716-2917 (Audinet 200-2917).

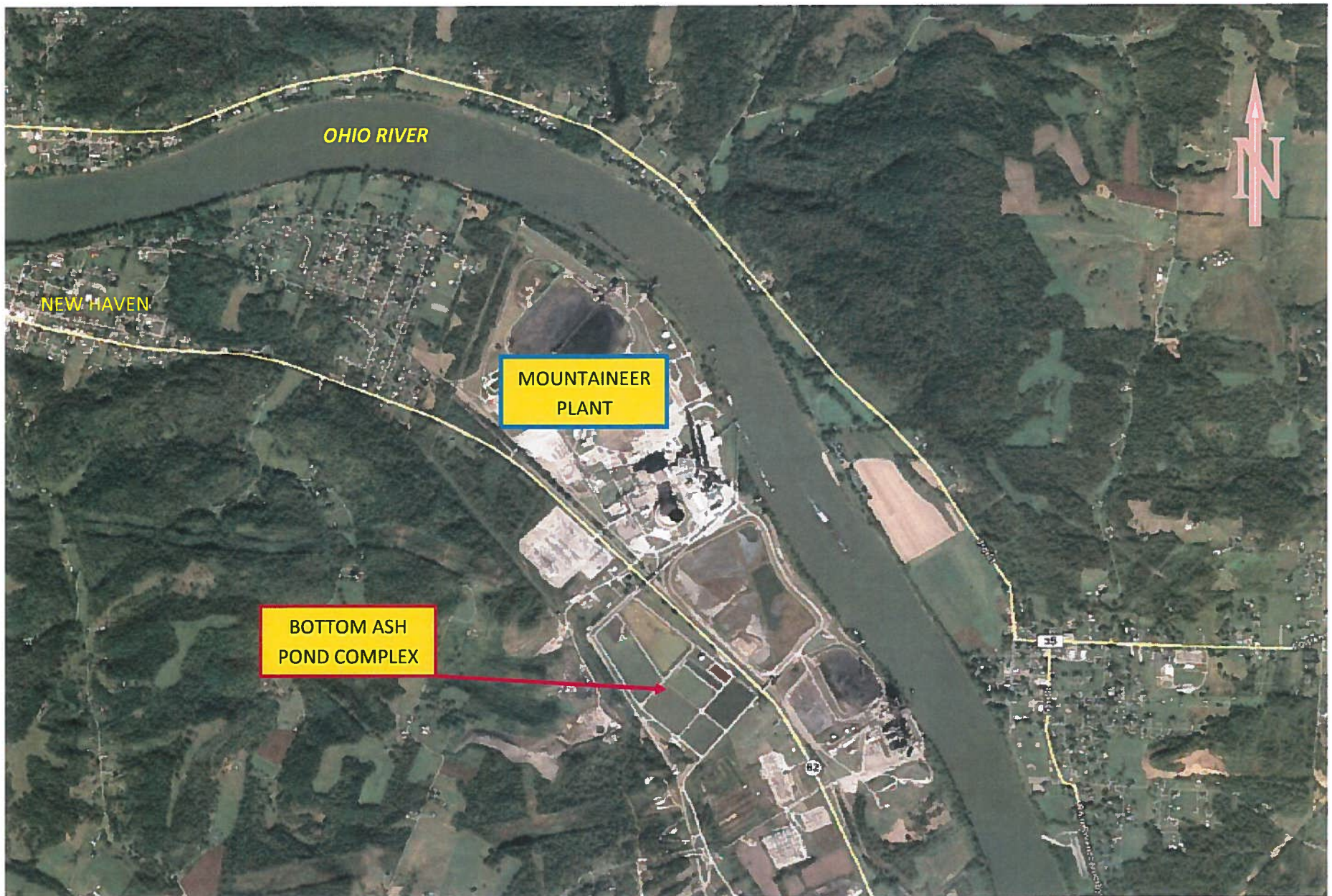


**APPENDIX A:**

**Figure 1 – Site Location Map**

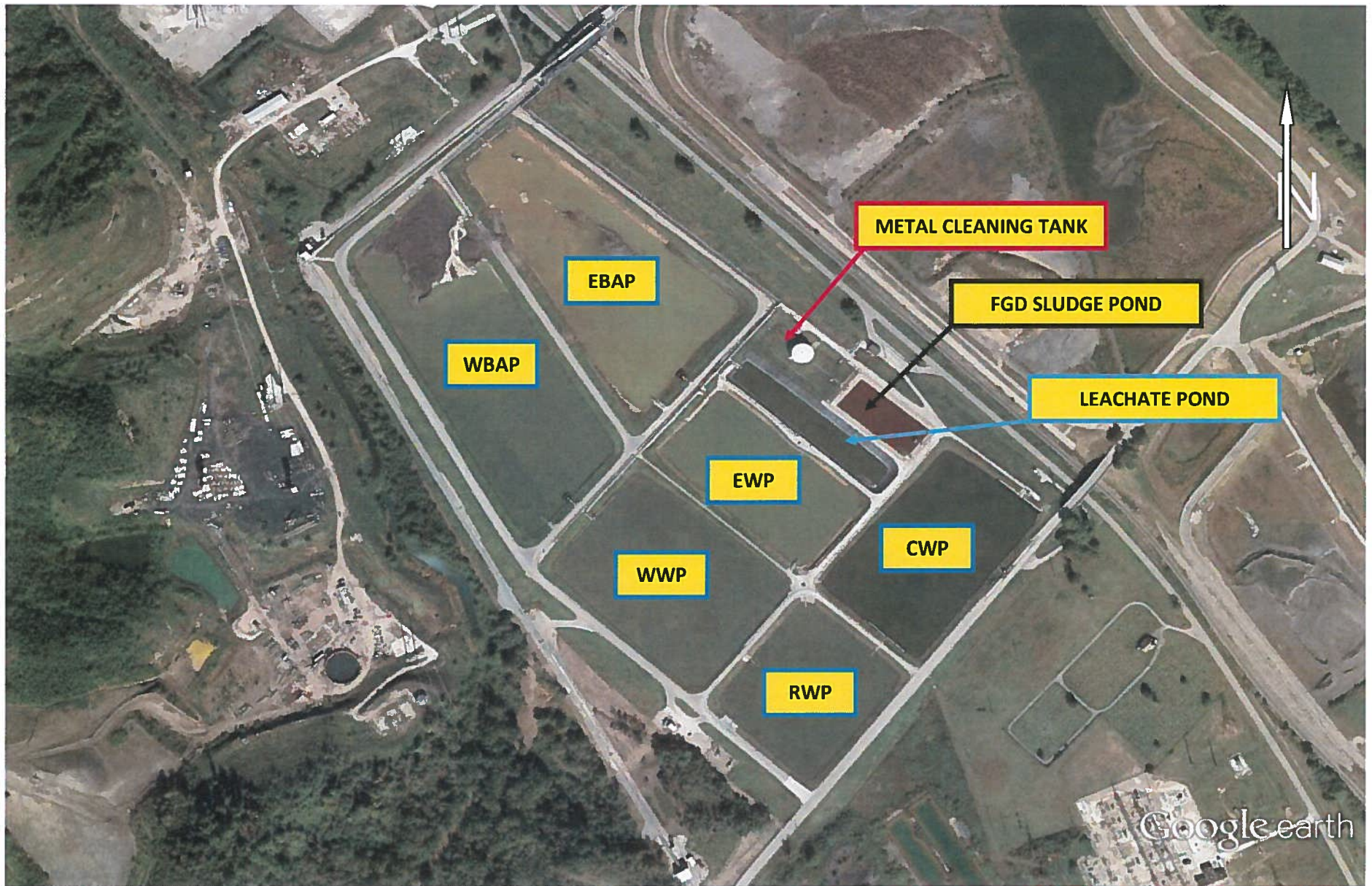
**Figure 2 – Bottom Ash Pond Complex**

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





**FIGURE 2 – BOTTOM ASH POND COMPLEX**  
MOUNTAINEER PLANT, NEW HAVEN, WV

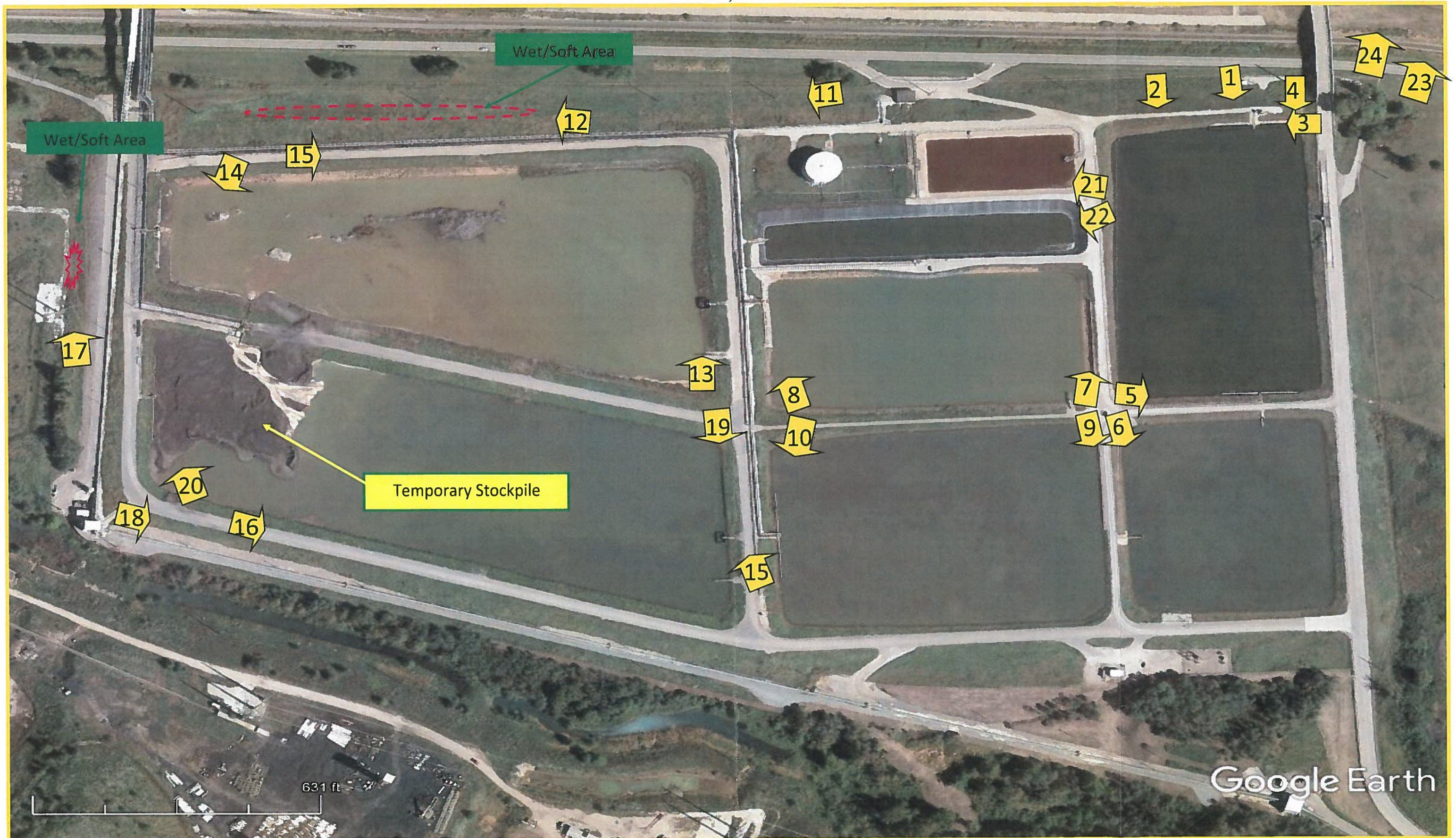


**APPENDIX B:**

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



**FIGURE 3 – PHOTOGRAPH LOCATION MAP**  
**BOTTOM ASH COMPLEX, MOUNTAINEER PLANT**





# AEP GES Dam Inspection

Plant Name:

Inspector:

Unit:

Date:

Photo #:

Description:



Notes:

Location:

Photo #:

Description:



Notes:

Location:

# AEP GES Dam Inspection

Plant Name:

Inspector:

Unit:

Date:

Photo #:

Description:



Notes:

Location:

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Plant Name:

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# AEP GES Dam Inspection

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# AEP GES Dam Inspection

Plant Name:

Inspector:

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Photo #:

Description:



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Location:

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Description:



Notes:

Location:



# AEP GES Dam Inspection

Plant Name:

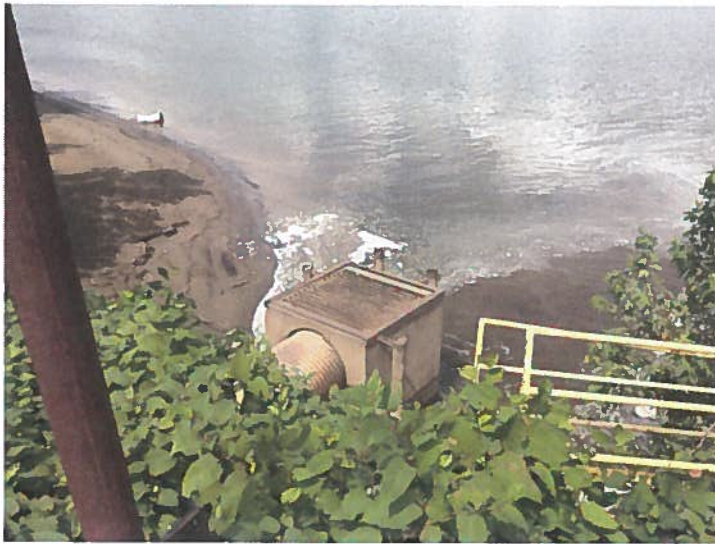
Inspector:

Unit:

Date:

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Location:

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Description:



Notes:

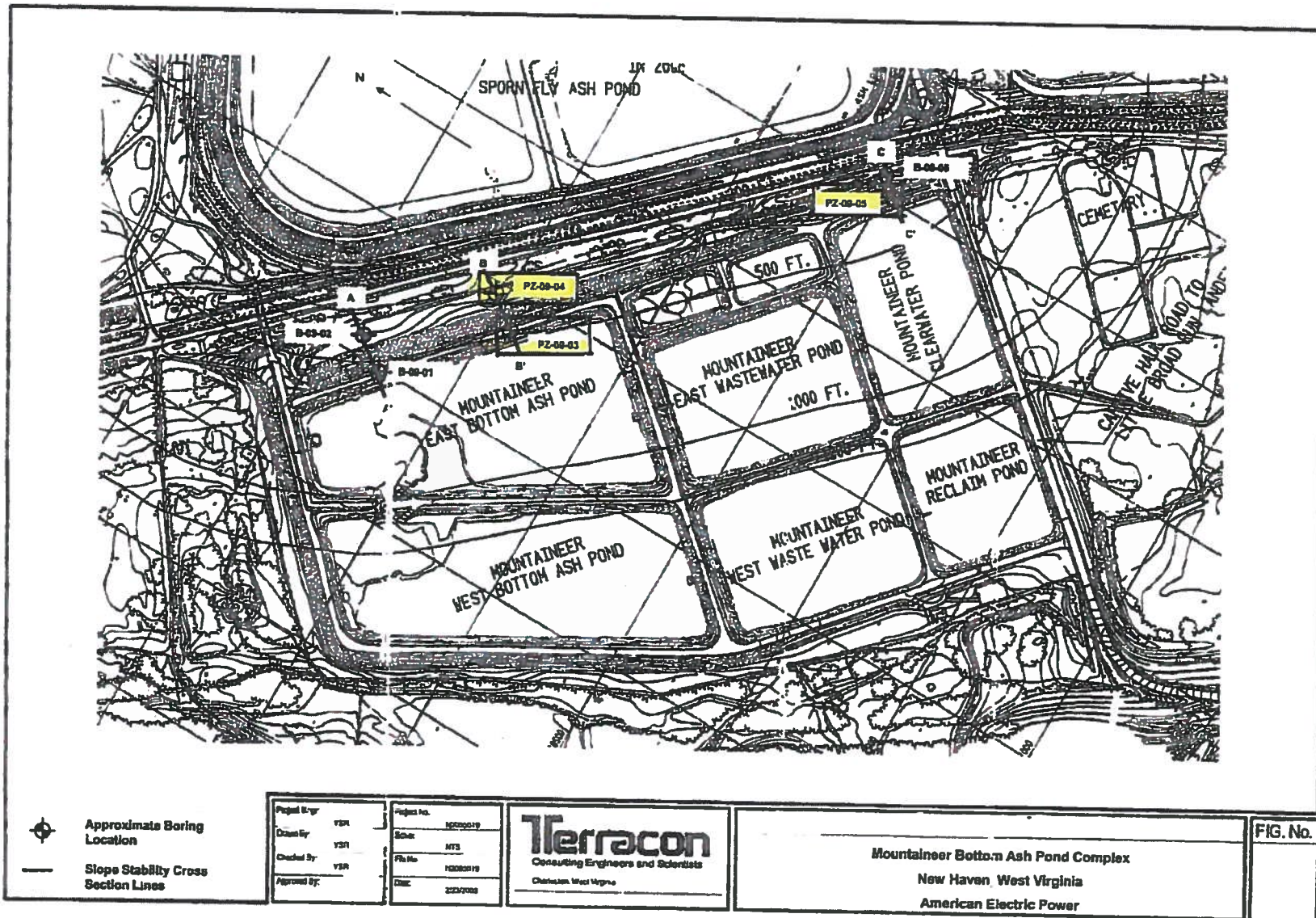
Location:



**APPENDIX C:**

**Figure 4 – Piezometer Location Map**

**Figure 5 – Mountaineer Bottom Ash Complex Water Levels**

**FIGURE 4 – PIEZOMETER LOCATION MAP  
BOTTOM ASH COMPLEX, MOUNTAINEER PLANT**



 Approximate Boring Location  
 Slope Stability Cross Section Lines

Project E-yr	VSR	Project No.	10209019
Drawn by	VSR	Sched.	MFS
Checked by	VSR	File No.	10209019
Approved by:		Date:	2/27/2003

**Terracon**  
 Consulting Engineers and Scientists  
 Charleston, West Virginia

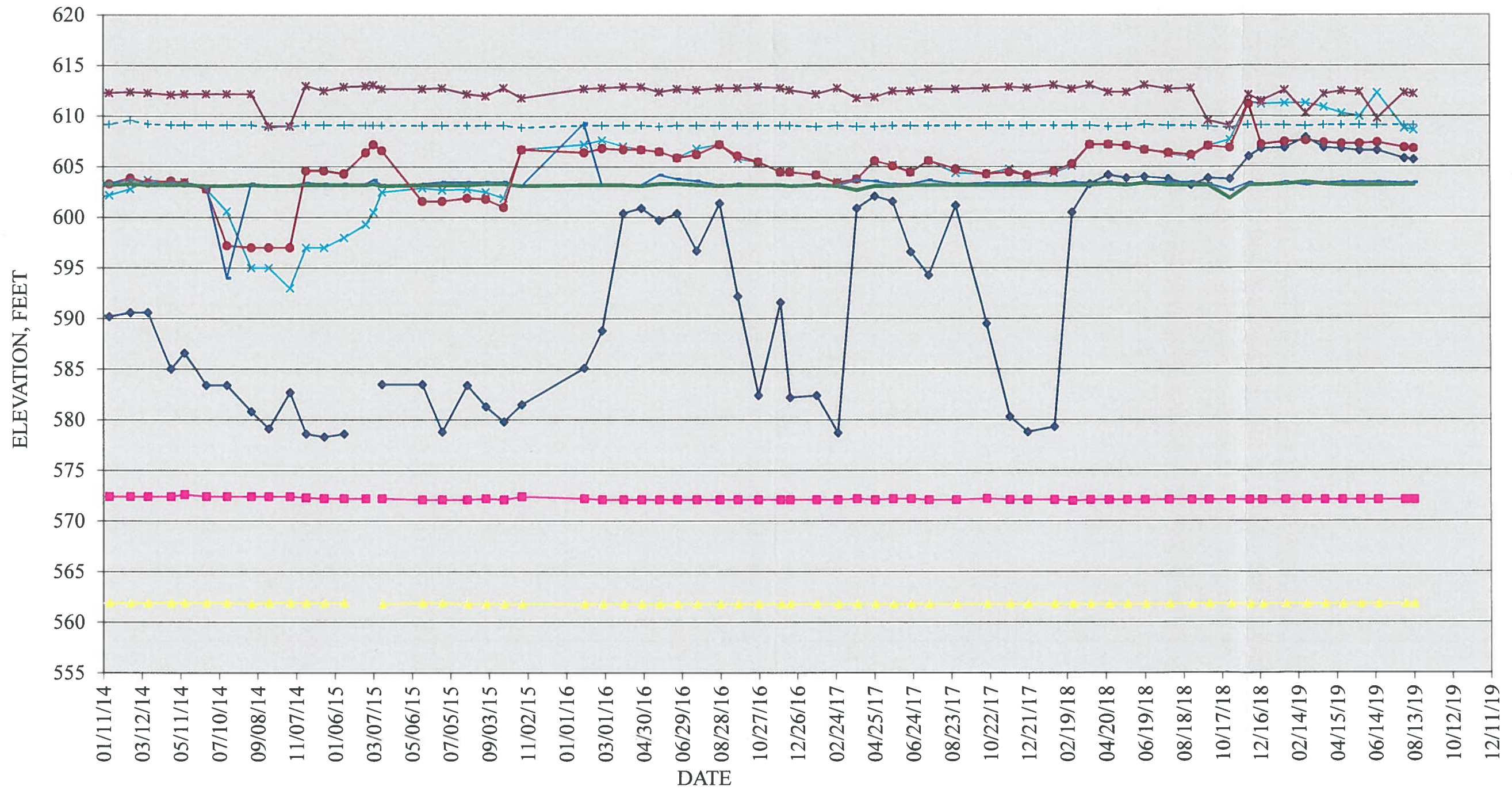
Mountaineer Bottom Ash Pond Complex  
 New Haven, West Virginia  
 American Electric Power

FIG. No.

AEPMT-P-000145



**FIGURE 5 - MOUNTAINEER BOTTOM ASH COMPLEX STATIC WATER LEVELS**



**APPENDIX D:**

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

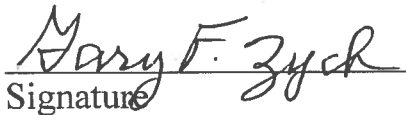
## ENGINEER'S INSPECTION VERIFICATION STATEMENT

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

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I hereby verify that I supervised the visual inspection of the Mountaineer Bottom Ash Complex (ID# 05307) and its appurtenances on August 14, 2019. 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<sup>(1)</sup>;
- 4) any conditions that will not allow proper functioning of the dam during normal or maximum reservoir water level conditions.



Signature

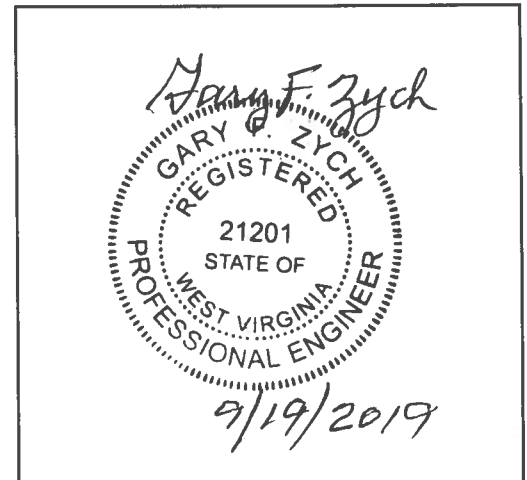
Gary F. Zych, P.E.

Manager

Geotechnical Engineering Services

American Electric Power Service Corporation

9/19/2019  
Date



SEAL

<sup>(1)</sup> As defined in Section 2.47 of the Dam Safety Rules