2019 Annual Dam and Dike Inspection Report

Clinch River Ash Pond 1A/1B

Clinch River

Appalachian Power Company

Carbo, Virginia

December 2019

Prepared for: Appalachian Power Company – Clinch River Plant

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AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

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Clinch River Plant

Ash Pond 1A/1B Dam

Annual Engineering Inspection Report

Document Number: GERS-19-049

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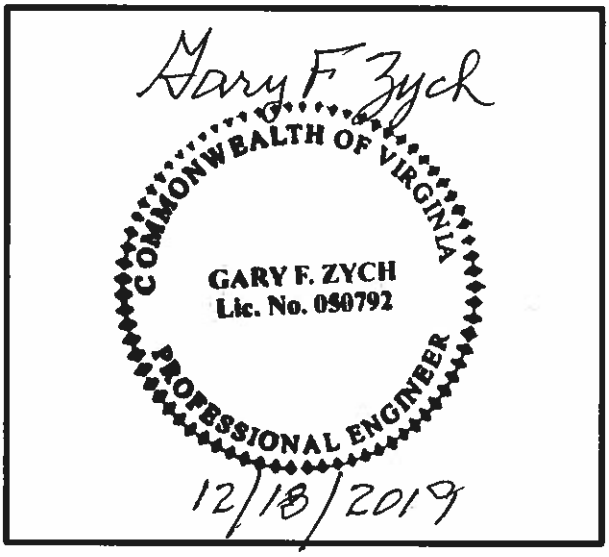

I certify to the best of my knowledge, information and belief the information contained in this report meets the requirements of 40 CFR § 257.83 (b).

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1.0 INTRODUCTION

This report was prepared by AEP- Geotechnical Engineering Services (GES) section, in part, to fulfill requirements of AEP's Dam and Dike Inspection and Maintenance Program, US EPA 40 CFR 257.83(b) for the CCR impoundments and to provide the Clinch River Plant an evaluation of the Ash Pond 1A/1B Dam. Additionally, a periodic inspection is required by the Virginia Department of Conservation and Resources (VDCR) Dam Safety Group.

The inspection was performed by Mr. Gary Zych. Ms. Karen Gilmer of the Clinch River Plant was the plant contact for the inspection. The inspection was performed on November 19/20, 2019. Weather conditions were sunny and the temperature was in the low 30's. There was only a trace of precipitation recorded for the 7 days prior to the inspection.

2.0 DESCRIPTION OF IMPOUNDMENT

The following section provides background information for the Clinch River Plant Ash Pond 1A/ 1B Dam. Figure 1 is the current plan view with old features noted for reference.

Facility Location Description

The Clinch River Plant is located in Russell County, Virginia approximately 2.5 miles southwest of Cleveland, Virginia and approximately 6.5 miles northeast of St. Paul, Virginia. The Ash Pond 1A/1B Dam is located about 0.25 miles north of the Clinch River Plant.

Description of Ash Pond 1A/1B

Ash Pond 1A/1B has been closed in-place and capped. This construction work started in 2016 and the final work was completed in the 2nd quarter of 2018. The pond no longer has any capacity to receive and store CCR materials, sediments or surface water runoff. The dam is still a regulated structure by the Virginia Department of Conservation and Recreation- Dam Safety Program and is classified as High Hazard.

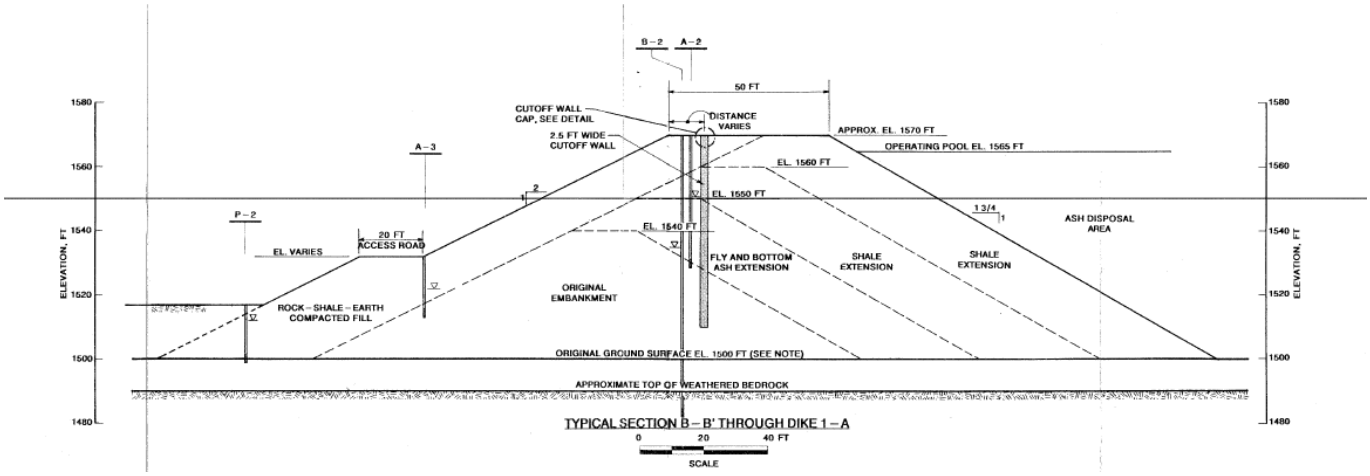
The following section discusses the embankment configuration, construction and operational history, and surface water control associated with the Ash Pond 1A/1B Dam.

Embankment Configuration

The Ash Pond 1A/1B embankment has a maximum height of approximately 70 feet with a length of roughly 3,150 feet. The embankment is constructed of soil (silty clay with shale/sandstone fragments); fly ash, bottom ash, and shale/rock fill on with a downstream slope of 2.0 H: 1 V (2.0 feet horizontal, 1 foot vertical) and an upstream slope of 1.75 H: 1V. The final configuration of the dam was the result of

3 upstream raisings. The width of the crest is roughly 35 feet wide, and portions of the embankment have a 20-foot wide bench on the downstream slope which carries an access road leading up to the crest. There is a splitter dike separating Pond 1A and 1B. A 2.5-foot wide, 65-foot deep, 2,150-foot long cement-bentonite-fly ash slurry wall was designed and constructed in 1990. The slurry wall penetrated the various materials used for the upstream raising and was keyed into the original embankment, except at the ends of the dam where it was keyed 1 to 2 feet into the shallow, fractured, bedrock. A 1,500 foot long section of Dump's Creek was re-routed during the original construction of the Ash Pond 1A/1B Dam.

The majority of the downstream slope has an inverted filter that was constructed in 2006-2009. A toe drain system with a single stage drainage media runs along the downstream toe. The toe drain system was retrofitted to drain into a seepage pump station near the center of the dam. The seepage is pumped and drains by gravity into the reclaim pond, near the southern end of the Ash Pond 1A/1B Dam.



Typical cross section taken from AEP Drawing SK-CL-62290A.

Construction and Operational History

An abbreviated bullet point list of the construction and operational history of Ash Pond 1A/1B is included below:

- Original embankment construction completed in 1964. Designed by Casagrande Consultants.
- A splitter dike creating Ash Pond 1A and Ash Pond 1B built – Unknown year
- Upstream raising number 1 – Crest Elevation 1550 – Unknown year
- Upstream raising number 2 – Crest Elevation 1560 – Unknown year
- Upstream raising number 3- Crest Elevation 1570 – 1971
- Upstream raising number 4 – Crest Elevation 1580 – 1976 (planned but never constructed)
- First application of an inverted filter blanket-1984
- Toe drain construction-1988

- Slurry trench construction completed-1990
- Northern end of the toe drain system repaired-1991
- Inverted filter blanket installed on the downstream – 2006 through 2009.
- Diversion channel constructed -2015
- Principal spillway abandoned and fully grouted due to increased infiltration/seepage at joints 2016
- Temporary emergency spillway constructed at the very left end of the dam.

Surface Water Control

The water surface level was previously controlled by a principal spillway riser/discharge pipe structure near the northern end of Ash Pond 1B. As part of the closure project, the riser structure was demolished and removed, and the 36-inch-diameter concrete discharge pipe was abandoned in place and fully grouted.

Currently, storm water runoff is diverted around the Ash Pond 1A/1B area by means of two diversion channels. The Pond 1A diversion channel consists of grouted riprap channel and a concrete chute/ stilling basin.

The Pond 1B Upper and Lower diversion channels are lined with riprap for erosion protection and sections also have gabion mattresses lining system.

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

A review of available information regarding the status and condition of the Ash Pond 1A/1B Dam was conducted. This included files available, such as design and construction information, 7-day inspection reports, 30-day data collection reports, previous dam safety inspection reports and pond closure plans. Based on the review of the data there were no signs of actual or potential structural weakness or adverse conditions.

4.0 INSPECTION

4.1 CHANGES IN GEOMETRY OF IMPOUNDING STRUCTURE (257.83(b)(2)(i))

The pond closure project has been completed as per the approved drawings by Virginia DCR Dam Safety and Virginia DEQ. The pond area has been regraded and capped with a 30-mil PVC liner and 24-inches soil cover. The facility is no longer active and has no storage capacity to impound surface water runoff.

4.2 ASSESSMENT OF RECENT INSTRUMENTATION DATA (257.83(b)(2)(ii))

Instrumentation at the dam consists of seepage collection system and piezometers. The locations of each instrument are shown on the Instrumentation Location Plan in Appendix B.

In general, the pond closure project appears to have the reduced seepage quantities as measured by the V-notch weirs and the seepage collection system. The maximum value record by each V-notch weir since the last inspection is listed in the table below. The weirs can be impacted by surface water runoff and the maximum flows listed below are not representative of normal seepage during dry weather. (Note that Weir 6 has been dry for several years).

V-Notch Weir Id	Maximum Reading (Seepage in Gallons per Minute)	Date of Reading
3	2.42	9/5/2019
4	2.42	7/11/2019
5	6.49	7/11/2019
6	Dry	
5a	2.42	6/13/2019

A review of the seepage sump data indicates a drastic reduction in overall toe seepage since the closure project starting the capping. The seepage sump values are averaging less than 50 gpm. The seepage rate during this inspection was calculated to be 15 gpm.

In general, the piezometer data indicates no significant changes in the phreatic surface in the embankments. As a result of the pond closure project, several of the piezometers have been abandoned. The table below identifies the piezometers that remain and includes the maximum value/date recorded since the last inspection. Piezometers which are representative of specific cross sections through the dam have been plotted and shown in Appendix B. Piezometers that are shaded in the table below are located along the toe of the dike.

Piezometer	max elev	Date
A-2 R [1547]	1546.46	2/21/2019
A-3 [1524]	1519.22	2/21/2019
P-5 [1514]	1511.41	2/21/2019
P-6 [1516]	1509.79	12/27/2018
P-0901S [1548]	1531.31	Multiple dates
P-0902 [1516]	1511.07	2/21/2019
P-0904 [1550]	1542.56	2/21/2019
P-0906 [1514]	1510.25	2/21/2019
P-0908S [1547]	1546.88	2/21/2019
P-0909 [1508]	1514.51	2/21/2019
MW-0913S [1514]	1508.82	2/21/2019
MW-0914 [1550]	1528.39	2/21/2019

4.3 CHARACTERISTICS OF IMPOUNDED MATERIAL (257.83(b)(2)(iii, iv,v))

As part of the Ash Pond 1 Closure Project, all free water within the pond area has been removed. Ash Pond 1A/1B is no longer receiving CCR materials.

IMPOUNDMENT CHARACTERISTICS Pond 1A/1B	
Approximate **Minimum** depth of impounded water since last annual inspection	0 feet
Approximate **Maximum** depth of impounded water since last annual inspection	0 feet
Approximate **Present** depth of impounded water at the time of the inspection	0 feet
Approximate **Minimum** depth of CCR since last annual inspection	40 ft. (El. 1540)
Approximate **Maximum** depth of CCR since last annual inspection	70 ft. (El. 1570)
Approximate **Present** depth of CCR at the time of the inspection	Varies between 40 & 70 feet. [1]
Storage Capacity of impounding structure at the time of the inspection	500 ac-ft. at Top of Dam El. 1540 (notch at North End) [2]
Approximate volume of impounded water at the time of the inspection	0 ac-ft.
Approximate volume of CCR at the time of the inspection	500 ac-ft.

1. The depth of CCR material in the impoundment varies as a result of intentional contouring of the ash surface to promote surface runoff as part of the pond closure project.

2. The values in the table above assume that the 1570 contour encompasses a plan view area of 22.5 acres and the interior surfaces of the pond slope at a uniform rate of 2H: 1V.

4.4 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/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 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 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 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 problem has developed that could impact the structural integrity of the structure. 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 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. Seepage that is not clear and is turbid would also be considered as uncontrolled. Seepage that is unable to be measured and/or observe it 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 more frequently.

2. Displacement of the Embankment

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

Blockage of Control Features is the restriction of flow at spillways, decant or pipe spillways, or 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.

4.5 SUMMARY OF VISUAL OBSERVATIONS

Results of the visual inspection are summarized below. References to left and right are made as if one is standing on the crest of the dam and facing downstream.

1. In general, there were no signs of slope instabilities, uncontrolled seepage, or erosion of the downstream slopes of the dam. The slopes are covered with a combination of riprap and vegetation. Vegetation is adequate and was recently mowed before the inspection. The condition of the riprap appeared sound and there was no displacement of the riprap. [photos 1-4]

2. The slope of the most southern dike is all grassed and in good condition. There were no observed signs of instabilities, erosion or seepage [photo 5].

3. The Pond 1A diversion ditch along the right abutment was in good condition. The riprap lining was observed to be in good condition. The concrete downchute for the diversion ditch was also in good condition. [photos 6-7]. The spring observed last year flowing into the ditch had very little discharge this year.

4. The seepage weirs at the reclaim pond were all discharging to some extent. All of the flow was clear. Weir 5 appeared to have the largest flowrate based on the field measurements.

5. There is the wet/moist area near the concrete vault at the toe of the south dike. This vault is related to waterlines from the local water district [photo 8].

6. The right abutment area is cleared of brush within 25 feet of the dam embankment, except for a short section near the toe. [photo 9]

7. The seepage collection sump was operational at the time of the inspection. The majority of the seepage was flowing in from the left segment of the system. All of the flow appeared clear. There is significant precipitate at the ends of both inlet pipes.

8. The surface area of the impoundment has been capped and covered. The vegetative growth is good over the entire surface. [photos 10-13]

9. Surface drainage appears adequate but there is still evidence of poor drainage at the inlet of the south swale into the east diversion ditch [photo 14]

10. No erosion along any of the surface water drainage swales and ditches was observed.

11. There was no observed flow at Weir 4 at the time of this inspection.

12. Pond 1B diversion ditch system and collection basin appeared to be in good condition. No debris was observed in the collection basin [photos 15-16].

13. Three open tube piezometers were being installed in the impoundment area of Pond 1A. These will be replacing the three vibrating wire piezometers that were installed as part of the closure project. The vibrating wire piezometers did not operate properly.

14. The interior slopes of the reclaim pond appeared stable and there was no displacement of the riprap cover or erosion of the grassed slopes [photo 17].

5.0 SUMMARY OF FINDINGS

The dam forming the Pond 1A/1B is in satisfactory condition and there were no visual signs of weakness or instability observed during the inspection.
The following are general maintenance items and monitoring requirements that are recommended as a result of the inspection.

5.1 MAINTENANCE ITEMS

Assistance or guidance with the implementation of these items can be provided by AEPSC Civil Engineering & Geotechnical Services:

1. Remove any mineralization and/or obstructions from the seepage weirs as noted during periodic inspections.

2. Maintain the vegetation within the regulatory 25-feet zone beyond the toe and abutments as required by VDCR Dam Safety.

5.2 MONITORING ITEMS

1. Continue to monitor the seepage weirs and sump as part of the normal periodic inspection.

2. Continue to monitor the piezometers in the dam and impoundment area.

5.3 DEFICINCIES (257.83(b)(2)(vi))

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

However, the precipitant build-up at the outlets of the toe drains in the seepage collection sump is a deficiency since it could limit the effectiveness of the toe drain system. This material should be removed. AEP Geotechnical Engineering Section will work with the plant to determine a plan of action for removal of the material in the sump.

CONCLUSIONS

Based on the visual inspection, the overall condition of the Ash Pond 1A/1B is satisfactory and appears to be operating as designed. Inspection and monitoring activities being performed by the Plant and AEPSC Civil Engineering & Geotechnical Services should continue. There is no evidence of distress that would indicate the possibility of immediate sliding, slope instability, settlement, misalignment or cracking of the ash pond embankments.

Of concern is the effectiveness of the toe drain to continue to work properly if the precipitant build-up is not removed from the outlets of the pipes entering into the seepage collection sump.

If you have any questions with regard to this report, please do not hesitate to contact Gary Zych at (614) 716-2917 (Audinet-200-2917).

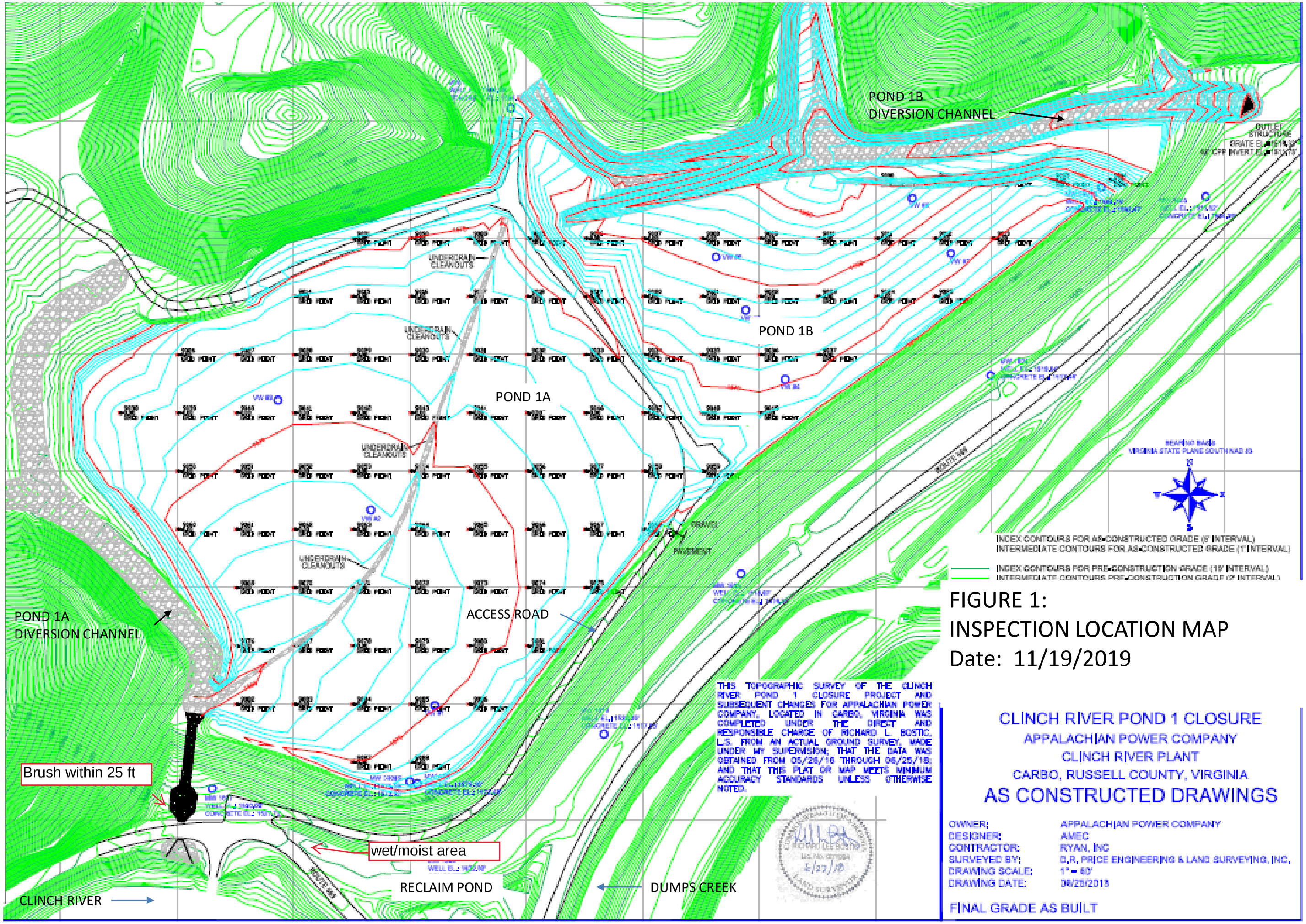


FIGURE 1:
INSPECTION LOCATION MAP
Date: 11/19/2019

APPENDIX A: INSPECTION PHOTOGRAPHS

Photo #1 – exterior slopes of Ponds 1A and 1B

Photo #2 – exterior slopes near transition of 1A and 1B

Photo #3 –exterior slope of Pond 1A

Photo #4 – grass cover on slopes of Pond 1B, above riprap

Photo #5 – exterior slope of south dike

Photo #6 – Pond 1A diversion ditch

Photo #7 – concrete chute for Pond 1A diversion ditch

Photo #8 – seepage leading towards weir #5

Photo #9 – right abutment, 25-ft clear zone

Photo #10 – cap surface of Pond 1A

Photo #11 – cap surface of Pond 1B

Photo #12 – cap surface of Pond 1A

Photo #13 – cap surface of Pond 1A

Photo #14 – drainage swale into Pond 1A diversion channel

Photo #15 – Pond 1B diversion ditch

Photo #16 – collection basin at toe of Pond 1B diversion ditch

Photo #17 – reclaim pond interior slopes

APPENDIX B:

INSTRUMENTATION LOCATION PLAN
PIEZOMETER PLOTS

Clinch River Power Plant - Ash Pond 1A & 1B
Drawn By; Dan Murphy
Date: 7/26/2018

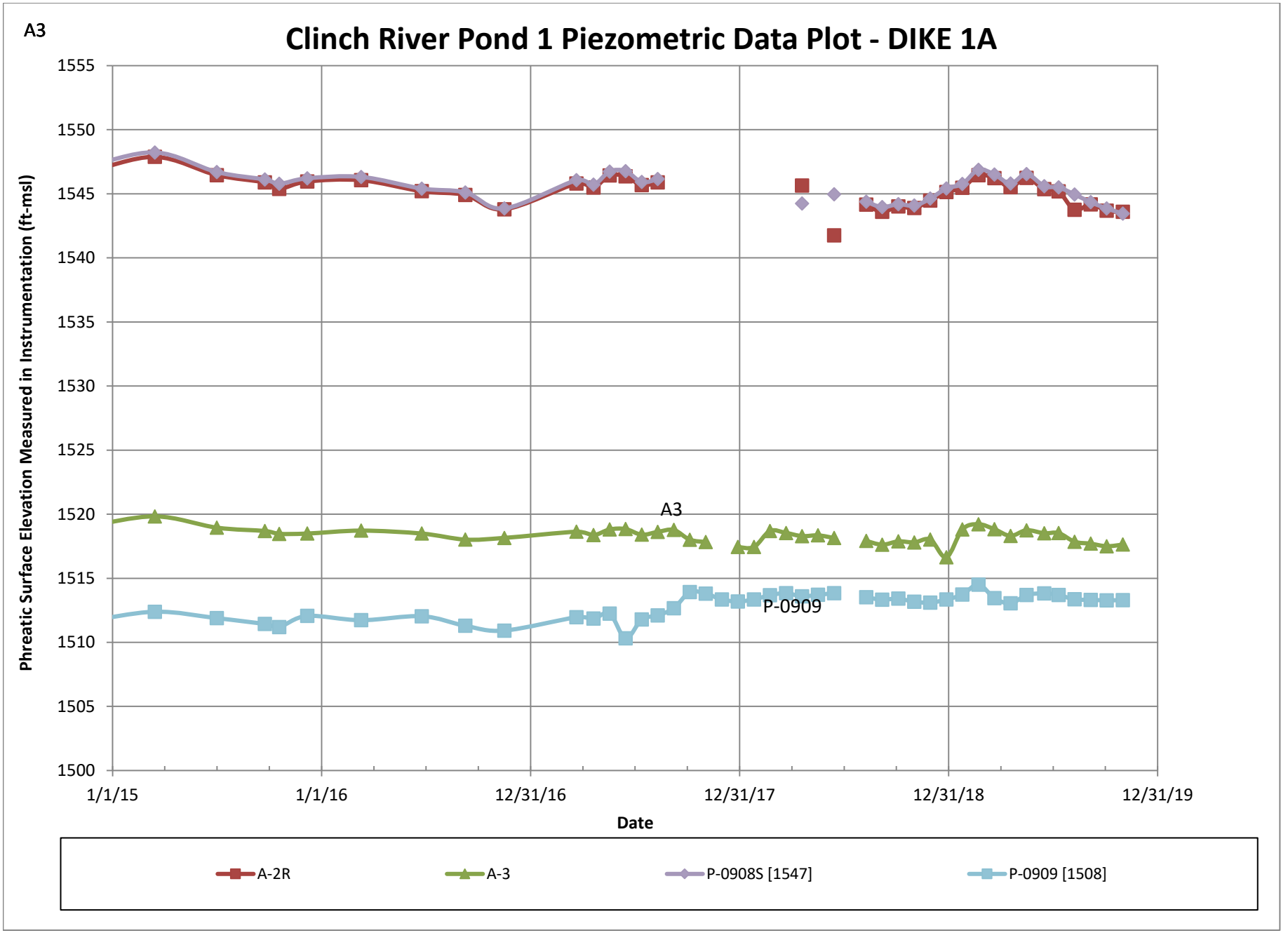
N

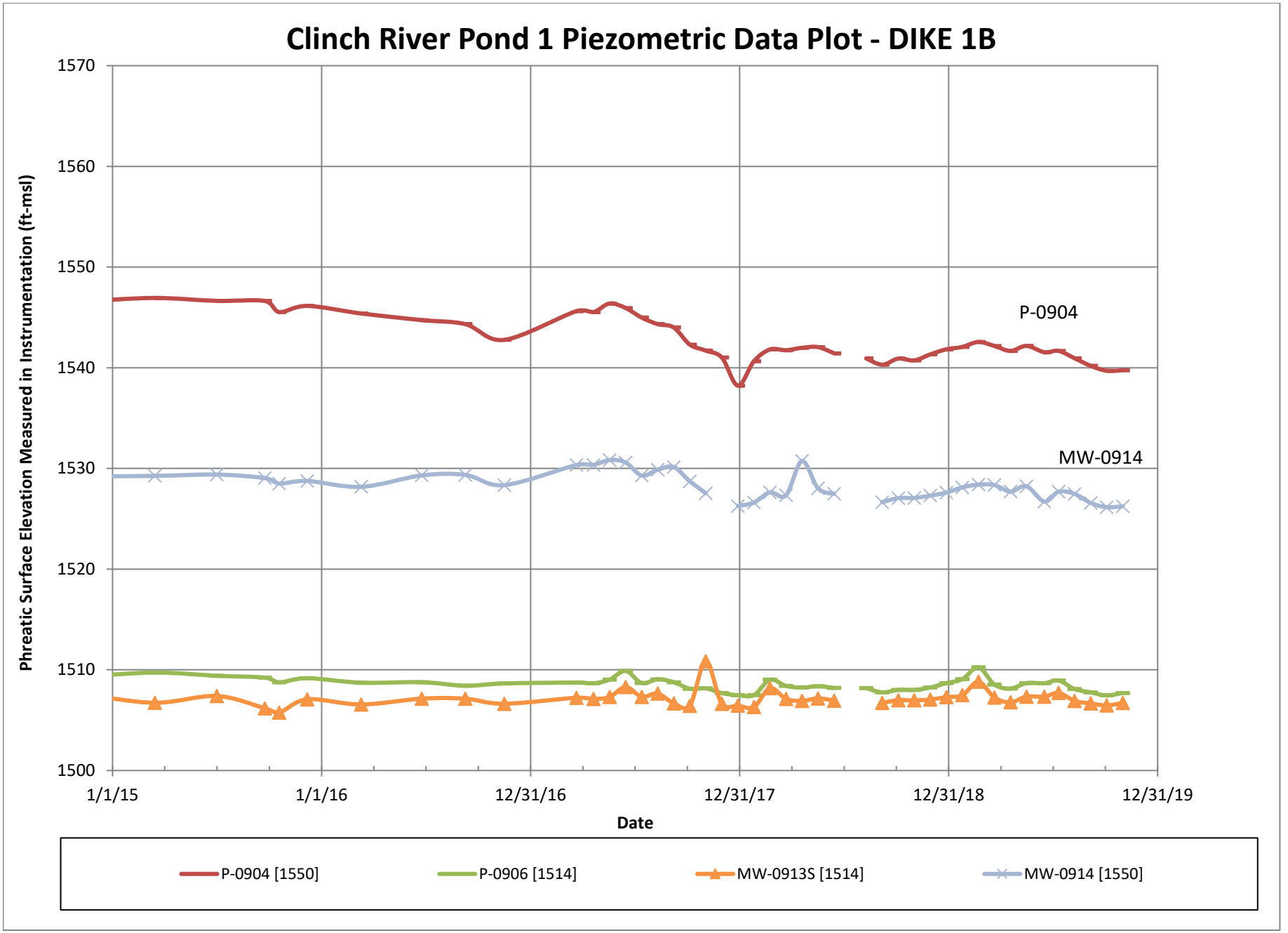
0 180 360 Feet

POND 1 INSTRUMENTATION LOCATION PLAN

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

A3


Clinch River Pond 1 Piezometric Data Plot - DIKE 1A
Phreatic Surface Elevation Measured in Instrumentation (ft-msl)
1555
1550
1545
1540
1535
1530
1525
1520
1515
1510
1505
1500
1/1/15
1/1/16
12/31/16
12/31/17
12/31/18
12/31/19
Date
A3
P-0909
A-2R
A-3
P-0908S [1547]
P-0909 [1508]


Clinch River Pond 1 Piezometric Data Plot - DIKE 1B
Phreatic Surface Elevation Measured in Instrumentation (ft-msl)
1570
1560
1550
1540
1530
1520
1510
1500
1/1/15
1/1/16
12/31/16
12/31/17
12/31/18
12/31/19
Date
P-0904
MW-0914
P-0904 [1550]
P-0906 [1514]
MW-0913S [1514]
MW-0914 [1550]