

2021 Dam and Dike Inspection Report

Bottom Ash Pond

**Northeastern 3&4 Plant
Public Service Company of Oklahoma
Oologah, OK**

October 2021

Prepared for: Public Service Company of Oklahoma – Northeastern Plant

Prepared by: American Electric Power Service Corporation

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Columbus, OH 43215



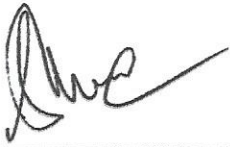
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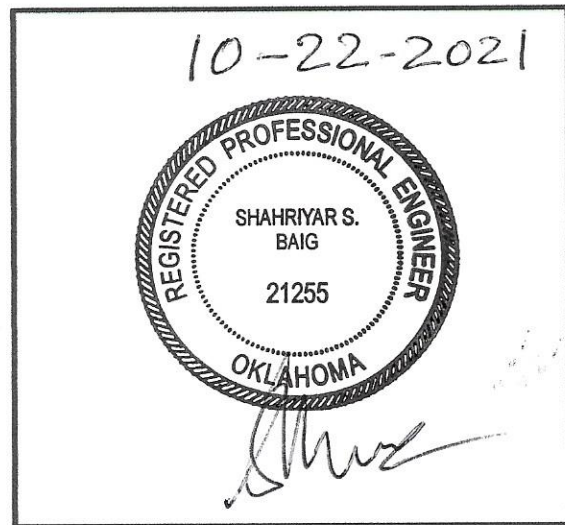
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I certify to the best of my knowledge, information and belief the information contained in this report meets the requirements of OAC § 252:517-13-4.

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2021 Dam and Dike Inspection Report Northeastern 3&4 Plant Bottom Ash Pond Oologah, OK

1.0 INTRODUCTION

This report was prepared by AEP- Geotechnical Engineering Services (GES) section, in part, to fulfill requirements of OAC 252:517-13-4 and to provide the Northeastern Plant an evaluation of the facility.

Shah Baig, P.E. performed the 2021 inspection of the Landfill at the Northeastern Plant. This report is a summary of the inspection and an assessment of the general condition of the facility. Bryan White, plant staff, was also present during the inspection. The inspection was performed on September 23, 2021. Weather conditions were overcast and the temperature was in the low 50's (°F), sunny, light breeze, and clear skies. There was cumulative total of approximately 0.25 inches of rainfall measured over the 7-days prior to the inspection.

2.0 DESCRIPTION OF IMPOUNDMENT

The Public Service Company of Oklahoma (PSO), Northeastern Power Station is located at the junction of U.S. Highway 169 and Oklahoma highway 88, approximately 1 mile south of Oologah, Rogers County, Oklahoma. The Bottom Ash Pond is located southwest side of the power plant, adjacent to the Coalyard. Figure 1 (Site Location Map) illustrates the location of the Bottom Ash Pond with respect to the power plant, landfill, and coalyard.

Figure 2 provides a plan view of the Bottom Ash Pond, the embankment (dike) structure or dam, pertinent dam features, and the dam's appurtenances. The dam is a 4,200-foot long cross-valley fill on an unnamed tributary to Fourmile Creek. The dam is roughly U-shaped and has been divided into north, west, and south embankments for reference in this inspection report.

There is no principal spillway at the bottom ash pond; water is typically recirculated back to the power plant for reuse. The auxiliary spillway at the bottom ash pond is a concrete overflow structure with a design crest elevation of 625.0 feet. Overflow from the spillway discharges to a low area and then flows through culverts under a railroad and off site. Figure 2 shows the spillway and discharge culvert locations.

The dam was designed with a toe drain along the west and south embankments. This drainage system consists of a 1.5-foot-thick sand and gravel drainage blanket layer that extends along the subgrade from the downstream toe toward the centerline of the embankment. The drainage blanket is connected to a gravel and sand bedding layer, 9-inches in thickness, at the toe that runs 12 feet up the slope from the toe and is overlain by a 1-foot layer of riprap. The toe drain was designed to drain seepage from the dam at any point along its length; i.e., there are no seepage collection pipes to discharge seepage at specific locations. Therefore, seepage will tend to collect and discharge at the lowest elevation along the toe. This area is near the western end of the south

embankment at the location of the pre-existing natural streambed, where a pipe was installed under the access road.

A railroad track used for coal deliveries to the plant runs along the crest of the west and south dikes.

3.0 REVIEW OF AVAILABLE INFORMATION (252:517-13-4(b)(1)(A))

A review of available information regarding the status and condition of the Bottom Ash Pond has been conducted. This includes files available in the operating record, such as design and construction information, previous periodic structural stability assessments, previous 7-day inspection reports, 30-day data collection reports, and previous annual inspections. Based on the review of the data there were no signs of actual or potential structural weaknesses or adverse conditions.

4.0 INSPECTION (252:517-13-4(b)(1)(B))

4.1 CHANGES IN GEOMETRY SINCE LAST INSPECTION (252:517-13-4(b)(2)(A))

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

4.2 INSTRUMENTATION (252:517-13-4(b)(2)(A))

There are two piezometers and a seepage collection pipe as part of the instrumentation for this facility. The locations of the instrumentations are shown on Figure 2. The maximum and minimum recorded readings of each piezometer since the previous annual inspection is shown in Table 1 below. The readings collected since the last inspection were all within their normal safe operating ranges. MW-01 is located on the crest of the dam and MW-02 is located at the toe of the dam. The water level in the pond ranged from elevation 624.5 – 622.3.

Additionally, the seepage collected at the toe of the south embankment is measured at the culvert. Since the installation of the new culvert in 2016, there has been no measurable flow from the culvert.

Table 1 –Piezometer Water Elevation Data

INSTRUMENTATION DATA			
Bottom Ash Pond			
Instrument	Type	Max/Min Reading since last annual inspection	Date of readings
MW-01	Piezometer	610.07/608.61	7-28-2021 /11-18-2020
MW-02	Piezometer	599.62/598.32	5-26-2021 /9-29-2021

4.3 IMPOUNDMENT CHARACTERISTICS (252:517-13-4(b)(2)(C))

Table 2 is a summary of the minimum, maximum, and present depth and elevation of the impounded water and Coal Combustion Residuals 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. (Most of the bottom ash settles out in a very small area that is periodically excavated and either beneficially used or placed in the on-site landfill. Therefore, the depth range of ash does not vary.

Table 2 – Impoundment Data

IMPOUNDMENT CHARACTERISTICS	
Bottom Ash Pond (Crest Elev: 630.0; lowest 604.0)	
Approximate Minimum depth of impounded water since last annual inspection	18.5 feet (Elev: 622.5 feet)
Approximate Maximum depth of impounded water since last annual inspection	21.0 feet (Elev: 625.0 feet)
Approximate Present depth of impounded water at the time of the inspection	18.5 feet (Elev: 622.5 feet)
Approximate Minimum depth of CCR since last annual inspection	5 feet
Approximate Maximum depth of CCR since last annual inspection	5 feet
Approximate Present depth of CCR at the time of the inspection	5 feet
Storage Capacity of impounding structure at the time of the inspection	183 acre-feet
Approximate volume of impounded water at the time of the inspection	183 acre-feet
Approximate volume of CCR at the time of the inspection	145 acre-feet

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 are 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 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 VISUAL INSPECTION (252:517-13-4(b)(1)(B))

A visual inspection of the Bottom Ash Pond was conducted to identify any signs of distress or malfunction of the impoundment and appurtenant structures. Specific items inspected included all structural elements of the dam such as upstream and downstream slopes, crest, and toe; as well as appurtenances.

Selected inspection photos are included at Appendix A and the location of photographs are included in Figure 3. Additional pictures taken during the inspection can be made available upon request.

Auxiliary Spillway

1. Photograph No. 1 illustrate the main concrete section of the spillway and Photograph No. 2 illustrate the chute section of the spillway. The concrete control section and discharge chute were in good and functional condition as designed without any obstruction to flow. There were no signs of movement, settlement, or misalignment of the spillway. There were no signs of seepage along the contacts between the concrete training walls and downstream slope of the embankment, or at the end of the concrete chute.
2. The energy dissipater concrete blocks and riprap located at the toe of the spillway were clear of sediment and vegetation and were in good condition (Photograph No. 3).
3. The drainage pipe culverts present slightly downstream of the spillway under the railroad (Photograph No. 4). The pipe culverts appeared clear of obstruction, no standing water, and in good and stable condition.

North Embankment

1. Photograph No. 5 illustrate typical condition of the crest. The crest appeared in good and stable condition with no sign of settlement, misalignment, cracks, rutting, or noticeable sign of distress.
2. The downstream slope of the embankment was well vegetated and controlled. The grass along the downstream slope was recently mowed. There were no signs of sloughing, significant erosion, or slope movement observed (Photograph No. 6).

3. The upstream slope indicated no signs of sloughing or bulges. The riprap protection along the slope was intact in-place and was in good and stable condition. There was no significant grassy vegetation growing within the riprap. (Photograph Nos. 7 and 8).
4. The ash water intake structure was in good structural condition. The metal platform and concrete structure show no signs of deterioration. The intake was clear of debris and appeared to be in good functional condition (Photograph No. 9).
5. Photograph Nos. 10 and 11 illustrate the natural ground that forms the northeast and east portions of the pond. This area exhibited scattered, excessive vegetation, but was fairly accessible and appeared in good stable condition.

South and West Embankment

1. The downstream slope is well vegetated and maintained. There was no observed seepage, wet or damp areas along the slope (Photograph Nos. 12, 13 and 15). The area beyond the toe of the embankment has been well maintained to prevent heavy and/or woody vegetation within the regulatory 30-foot setback. The downstream slope is well vegetated and controlled. No signs of seepage noted along the toe of the west embankment.
2. The seepage collection blanket appears to be functioning as designed. Seepage is directed to the low area below the embankment and is typically discharge through a pipe below an access drive. No seepage or moisture was observed at the outlet of the pipe during the inspection (Photograph No. 16).
3. One rodent hole was observed at the south embankment section on the downstream slope (Photograph No. 14).
4. The upstream slope of the embankment was in good condition. There were no signs of bulges, cracks, sloughing or other deficiencies. There was minor vegetation growing within the riprap in the low area of the slope. The crest and railroad tracks do not show any signs of settlement or misalignment. Reportedly, the tracks are inspected monthly by an outside company to ensure no misalignment or settlement (Photograph Nos. 17 and 18).
5. The outlet end of the pipe culverts located under the railroad is illustrated in Photograph No. 19. The pipe culverts were clear of any obstruction and in good functional condition.

4.6 CHANGES THAT AFFECT STABILITY OR OPERATION (252:517-13-4(b)(2)(G))

Based on field observations there were no changes to the Bottom Ash Pond since the last annual inspection that would affect the stability or operation of the impounding structure.

5.0 SUMMARY OF FINDINGS

5.1 GENERAL OBSERVATIONS

The following general observations were identified during the visual inspection:

- 1) Overall, the facility is in good and functional condition as designed. The impoundment is functioning as intended with no signs of potential structural weakness or conditions, which are disrupting to the safe operation of the impoundment.
- 2) The slopes and crest of the embankment were generally in good and stable condition. The embankments did not exhibit any signs of structural weakness or instability.

5.2 MAINTENANCE ITEMS

The following maintenance items were identified during the visual inspection, see inspection map for locations:

- 1) Repair the observed rodent hole. Mitigate hole by filling with compatible material and compaction. Any additional holes if encountered during routine plant inspection should also be mitigated in similar manner.
- 2) Continue to clear vegetation growing in the riprap.

5.3 ITEMS TO MONITOR

The following items were identified during the visual inspection as items to be monitored.

- 1) None

5.4 DEFICIENCIES (252:517-13-4(b)(5))

There were no signs of structural weakness or disruptive conditions that were observed at the time of the inspection that would require additional investigation or remedial action. There were no deficiencies noted during this inspection or during any of the periodic 7-day inspections or 30-day data collection since the last annual inspection. A deficiency is defined as either 1) uncontrolled seepage, 2) displacement of the embankment, 3) blockage of control features, or 4) erosion, more than minor maintenance. If any of these conditions occur before the next annual inspection contact AEP Geotechnical Engineering immediately

In general, routine inspections, monitoring and maintenance by plant personnel should continue. If you have any questions with regard to this report, please contact Shah Baig, P.E. at (Ph: 614-716-2241, email: sbaig@aep.com) or Gary Zych, P.E. (Ph: 614-716-2917, email: gfzych@aep.com).

LIST OF FIGURES

Figure 1 – Site Location Map
Bottom Ash Pond
Northeastern Plant, Oologah, OK

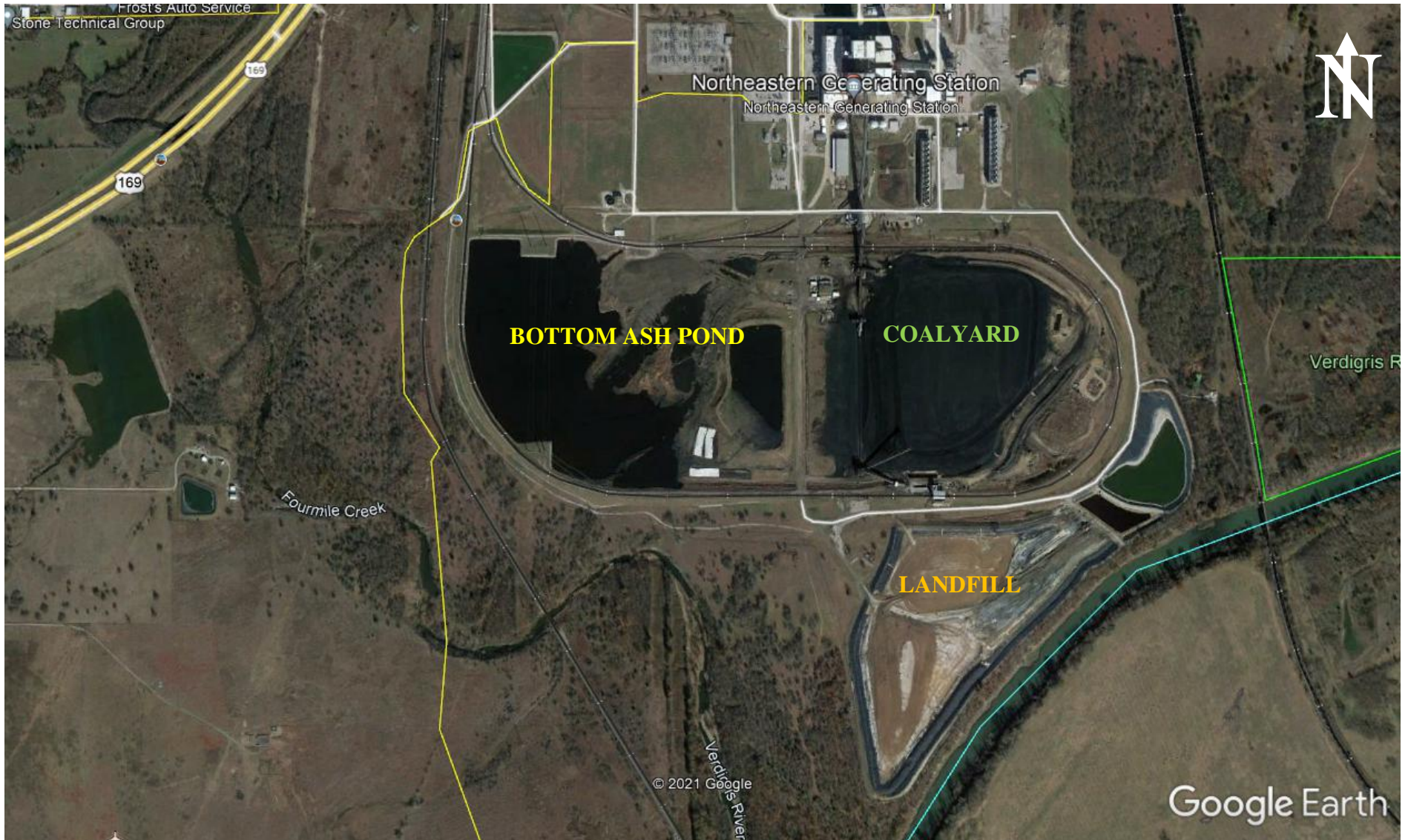
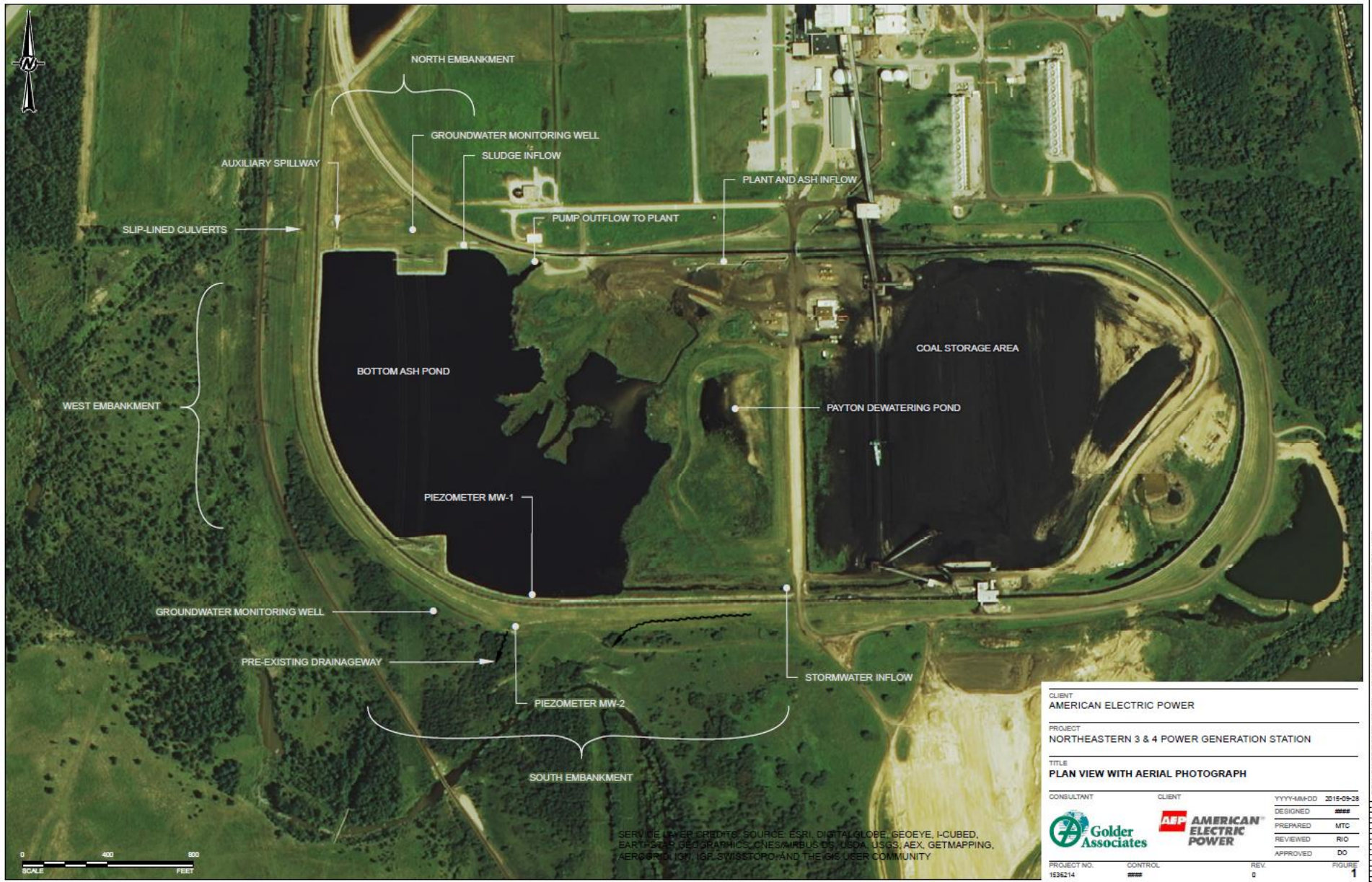


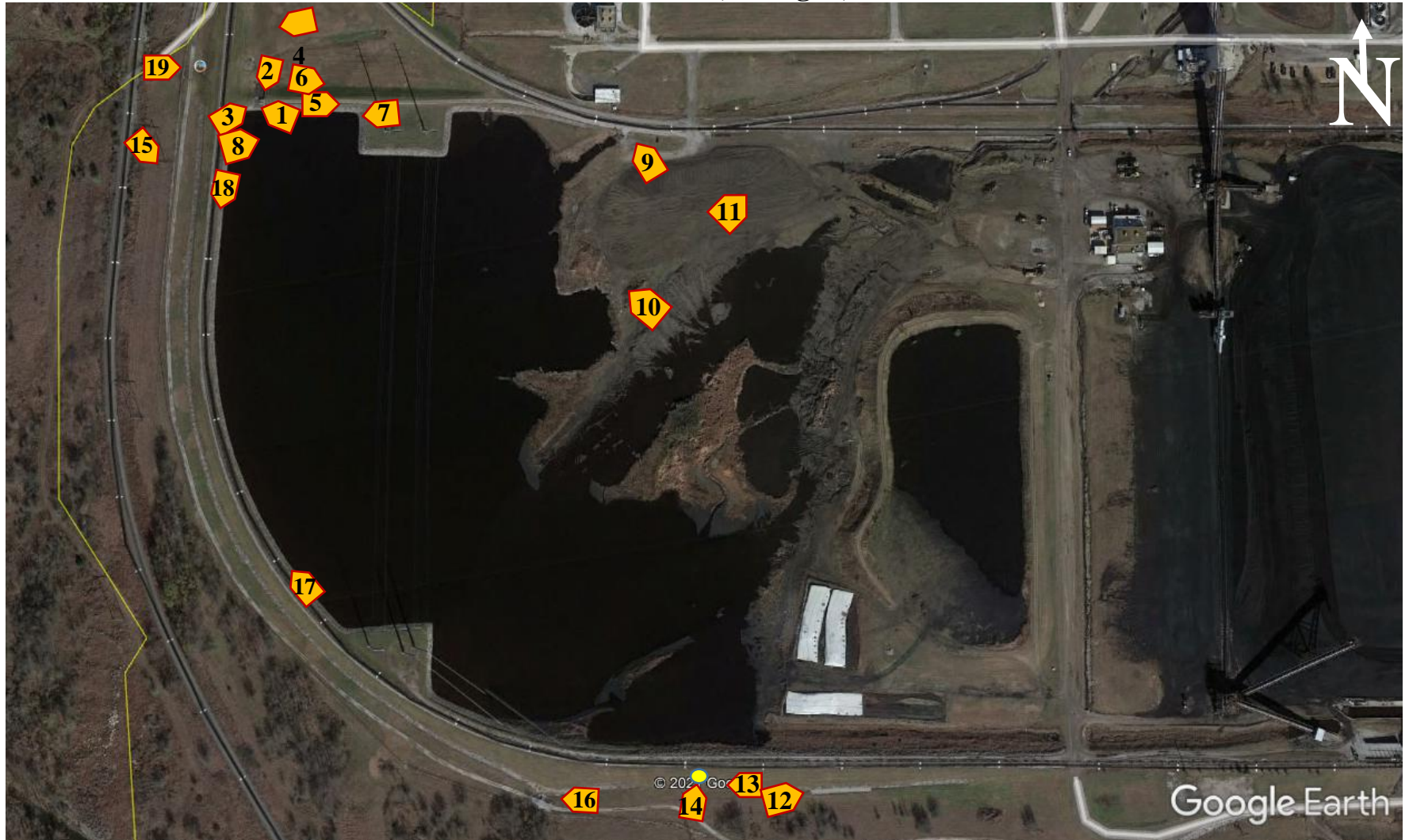
Figure 2 – Facility Map
Bottom Ash Pond
Northeastern Plant, Oologah, OK



CLIENT		AMERICAN ELECTRIC POWER	
PROJECT		NORTHEASTERN 3 & 4 POWER GENERATION STATION	
TITLE		PLAN VIEW WITH AERIAL PHOTOGRAPH	
CONSULTANT	CLIENT	YYYY-MM-DD	2016-09-28
		DESIGNED	###
	AMERICAN ELECTRIC POWER	PREPARED	MTC
		REVIEWED	PIO
		APPROVED	DO
PROJECT NO.	CONTROL	REV	FIGURE
1636214	###	0	1

IF THIS SHEET IS USED IN A PROJECT, THE USER SHALL BE RESPONSIBLE FOR OBTAINING THE NECESSARY PERMITS AND RIGHTS FROM THE APPROPRIATE AGENCIES.

Figure 3 – Inspection Photograph Location Map
Bottom Ash Pond
Northeastern Plant, Oologah, OK



APPENDIX A

<p>Photograph No. 1 Auxiliary spillway of the ash pond.</p>	 A photograph showing a concrete spillway structure with a metal railing. In the background, a long train of brown freight cars is visible on a grassy field under a clear blue sky.
<p>Photograph No. 2 Auxiliary Spillway chute of the ash pond.</p>	 A photograph of a concrete spillway chute situated on a grassy embankment. A white pickup truck is parked on the grass to the left, and a metal walkway is visible at the top of the chute.
<p>Photograph No. 3 Auxiliary spillway energy dissipater.</p>	 A close-up photograph of an energy dissipater structure. It features a concrete curb on the left, a series of concrete blocks in a channel, and a pile of white gravel to the left of the channel.

Photograph No. 4
Drainage pipe culverts
under the railroad.








Photograph No. 5
Typical condition of the
crest of the northwest
dike section (looking
east).






Photograph No. 6
Typical condition of the
downstream slope of
the northwest dike.



<p>Photograph No. 7 Typical condition of the upstream slope of the northwest dike (looking west).</p>	 A photograph showing the upstream slope of a dike. The dike is constructed from large, grey, angular rocks. To the left of the dike is a body of water. To the right is a grassy area with a white pickup truck parked on a dirt path. In the background, a long train of yellow and black freight cars is visible, along with a power line tower under a clear blue sky.
<p>Photograph No. 8 Typical condition of the upstream slope of the northwest dike (looking west).</p>	 A photograph showing the upstream slope of a dike from a different angle. The dike is made of grey rocks. To the left is a body of water. To the right is a grassy area with a dirt path. In the background, a long train of yellow and black freight cars is visible, along with a power line tower under a clear blue sky.
<p>Photograph No. 9 Ash water intake structure.</p>	 A photograph showing the ash water intake structure. The structure is made of concrete and metal. It is located in a body of water. There is a red life preserver on the structure. The background shows a grassy area and a fence.

<p>Photograph No. 10 Natural ground at the northeast area of the pond.</p>	
<p>Photograph No. 11 Another view of the natural ground area (looking north).</p>	
<p>Photograph No. 12 Typical condition of the downstream slope</p>	

<p>Photograph No. 13 Downstream slope.</p>	
<p>Photograph No. 14 Animal borrow.</p>	
<p>Photograph No. 15 Riprap at the toe of the downstream slope.</p>	

Photograph No. 16
Drainage collection pipe
culvert.



Photograph No. 17
Upstream slope (looking
north).



Photograph No. 18
Upstream slope (looking
south).



Photograph No. 19
Pipe culverts under the
railroad outlet end.

