2016 LANDFILL INSPECTION REPORT

GERS-16-004

CARDINAL PLANT
BRILLIANT, OHIO

PREPARED BY
GEOTECHNICAL ENGINEERING
AEP SERVICE CORPORATION
1 RIVERSIDE PLAZA
COLUMBUS, OHIO

Landfill Inspection Report
Fly Ash Reservoir Landfill

GERS-16-004
REVISION 0

CARDINAL PLANT
BRILLIANT, OHIO

INSPECTION DATE **June 02, 2016**

PREPARED BY _____ **DATE** 6/23/2016
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REVIEWED BY _____ **DATE** 6/29/2016
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APPROVED BY _____ **DATE** 6/30/2016
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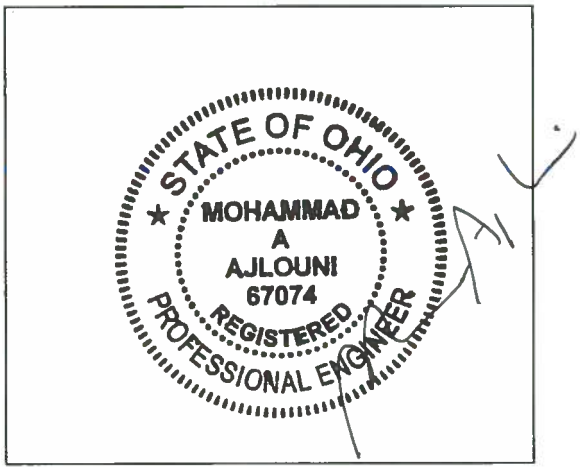
Manager - Geotechnical Engineering



PROFESSIONAL ENGINEER SEAL & SIGNATURE

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1.0 INTRODUCTION

Civil Engineering personnel from the American Electric Power Service Corporation performed the second annual landfill inspection of the Fly Ash Reservoir I, (FAR I) Landfill to satisfy the requirements of 40 CFR Part 257.84(b). FAR I landfill is owned by the Cardinal plant operated by Cardinal Operating Company.

Mr. Mohammad Ajlouni, PE, PhD., a staff from the Geotechnical Engineering Services Section, conducted the FAR I Landfill annual inspection. Mr. Randy Sims, P.E., at the Cardinal Plant, was the project facility contact and accompanied Mr. Mohammad Ajlouni throughout the inspection. The site inspection was performed on June 02, 2016. Weather conditions were good, ranging from clear in the morning to partly cloudy in the afternoon. Temperatures reached a high of approximately 65° F. There was precipitation of 0.27 inch in the preceding 7 days prior to the inspection.

This report has been prepared by Mr. Mohammad Ajlouni, PE, PhD, under the direct supervision of Mr. Gary Zych, PE, AEP's Geotechnical section manager. The report presents: (i) Summary of Visual Observations; (ii) Conclusions; and (iii) Recommendations. Select photographs identifying typical conditions, problem areas, items that need correction or requiring additional monitoring, have been selected from the inspection field photographic file and provided in the Appendix A, to this report. AEP's Civil Engineering Laboratory also conducted the facility annual survey of the FAR I Landfill on December 2, 2015 (Appendix B).

Mr. Mohammad Ajlouni has been the engineer assigned to Cardinal FAR I landfill since the beginning of 2006. Mr. Mohammad Ajlouni was responsible for the design, permitting, construction and also served as the Certifying Engineer for the landfill construction. Mr. Mohammad Ajlouni is familiar with all the components of and the issues facing the landfill construction and operation up to date.

2.0 FACILITY DESCRIPTION

2.1 Permit History

The Cardinal FAR 1 Residual Solid Waste Landfill is located in Jefferson County, Brilliant, Ohio. The landfill is owned by Ohio Power Company, a unit of American Electric Power, and Buckeye Power, Inc. The landfill is operated by Cardinal Operating Company-Cardinal Plant. Cardinal Landfill is being constructed under Permit To Install (PTI) No. 06-07993, issued on May 11, 2007. An alteration to PTI No. 06-07993 was approved by OhioEPA on June 29, 2007 incorporating several revisions to the QA/QC Plan. Alteration no. 2 was approved on September 2, 2008. Alteration no. 2 addressed re-sequencing plans and revisions to preloading plans for Cells 3-6. A Modification to PTI No. 06-07993 was approved by OhioEPA on August 10, 2011 incorporating partial lateral and vertical retraction and expansion of the approved limits of waste line change and the retention of the six existing ground water monitoring wells.

2.2 Landfill Components

The 127 acre landfill consists of two phases and six cells. Phase 1 overlies the bench area between the FAR 1 impoundment and the highwall and consists of Cells 1 and 2 in addition to Cell 3. Phase 2 will be developed over the FAR 1 impoundment (except for Cell 3) and consists of Cells 4 – 6.

Cell 1 is approximately 23 acres in size and consists of two areas, namely, the bench and highwall. The bench area of Cell 1 was constructed and certified in 2007 and 2008. A portion of the highwall area (approximately 60 ft in height) was built and certified.

Cell 3 is approximately 21.5 acres in size and is bounded by the Cell 1/Cell 3 interphase berm to the west, the landfill haul road to the east and north, and the Cell 3/Cell 4 berm on the south. Cell 3 is built over an inactive ash pond that was in the process of being closed by placing 10 ft thick layer of bottom ash and soil cover layer.

Cells 2, 4 through 6 are still in pre-construction conditions. Clay and subsurface drainage layer materials are being stockpiled in these cells to be used in the future construction seasons.

2.3 Active Placement Areas

Active Placement areas during the Landfill inspection included the South portion of Cell 3. Photographic documentation of the Active areas inspection is included in Appendix 1. During

the coming year, Cell 3 will be the main placement area in order to create a better access to Cell 1. Afterward, Cell 1 will be filled to the design elevations.

2.4 Closed Areas

Closed areas include small portion of Cell 1(approximately 1 Acre) that was closed in 2009 and Areas outside the landfill footprint but above the historical fly ash pond mainly to the north of cell 3. Photographic documentation is included in Appendix 1 for these closed areas.

2.5 Inactive Areas

As mentioned in Section 2, Cells 2, and 4 through 6 are still in pre-construction conditions. Clay and subsurface drainage layer materials are being stockpiled in these cells to be used in the future construction seasons.

2.6 Leachate Management System

The leachate collection system at FAR I landfill was constructed in 2007. The system includes leachate collection materials, leachate collection pipes, risers, leachate pretreatment structure and the leachate outlet pipe. Fly Ash Reservoir II (FAR II) serves as the leachate collection pond.

2.7 Subsurface Drainage Collection System

The landfill design was augmented with a Subsurface Drainage Layer (SDL) in order to prevent uplift conditions to the landfill liner. The system consists of SDL, transmission pipes and an outfall that also discharges to the FAR II pond.

2.8 Constructed and Available Capacity

The constructed storage capacity of Cell 1 is 2.04 million cubic yards and the constructed storage capacity of cell 3 is 2.95 million cubic yards. The approximate volume of the placed waste at the time of the inspection was 1.52 million cubic yards.

3.0 SUMMARY OF VISUAL OBSERVATIONS

3.1 General

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

Good:	A condition or activity that is generally better or slightly better than what is minimally expected or anticipated from a design or maintenance point of view.
Fair or 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, etc.) where the current maintenance program has neglected to improve the condition. Usually, conditions that have been previously identified in the previous inspections, but have not yet been corrected.
Excessive:	A reference to an observed item (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is below 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.

In addition, a "deficiency" is some evidence that a landfill has developed a problem that could impact the structural integrity of the landfill. 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, such as seepage that is not clear. Seepage that is unable to be measured and/or observe it is considered uncontrolled seepage. [Wet or soft areas are not considered as uncontrolled seepage, but can lead to this type of deficiency. These areas should be monitored frequently.]

2. Displacement:

   Displacement is a large scale movement of the Coal Combustion By Products, structural fill or other earthen material associated with the landfill. 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 storm water ditches/channels, leachate collection 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.

Results of the visual inspection performed on June 02, 2016, are summarized below, with inspection photographs included in Appendices A. The photos location map is shown in Appendix B.

3.2 Findings

Site inspection started at the southeastern corner of cell 3 and going in clockwise direction around the landfill perimeter. Photos were taken to document site conditions and are presented in Appendix A. During the site inspection, mowing operations were completed; all the outer earthen berms and open areas were mowed to less than 6 inches high.

Parts of the landfill's constructed areas that are currently active showed no significant erosional activity. Parts of the landfill's constructed areas that are currently inactive slopes (Cell 1/2 line- see photos 5 and 6) have a temporary cover of cohesive soil showed minor erosion. Parts of the landfill's constructed areas that are currently inactive (other than Cell 1/2 line) have been treated with an approved polymer to prevent or reduce erosion. The vegetation growth along the downstream slopes of the earthen berms was in good conditions (See photos 1, 2, 23 and 23).

The constructed areas (active and inactive) are sloped towards the designed chimney drains (see photos 4 and 21) to minimize surface water quantities going towards the perimeter ditches (see photos 18, 22 and 24). All of the runoff from the active areas is collected via leachate collection system and transmitted via riser/manholes (see photo 26)/transmission pipes (see photo 32) to the FAR II Pond (see photo 33). No ponded water was present during the time of the inspection even with the high precipitation that took place during the week preceding the inspection. Photos 19 and 24 show the recently improved inlets to riser 1 and manhole 2, respectively.

The majority of the Cardinal Plant CCR Landfill is not developed yet and serves as stockpiling/staging area (See photos 3, 27, 28 and 29). All permanently covered areas (North of Cells 1 and 3) were in good condition with good established vegetative cover with no significant signs of erosion (See photos 10, 11, 12, 13 and 29). The vegetative cover was established and regularly mowed with no woody type bushes or trees evident in the landfill areas.

4.0 CONCLUSIONS

Based on our visual inspection, the landfill's earthen berms, open areas, closed areas and inactive areas are considered to be in good condition. The disposal area of the landfill was in good conditions with no signs of erosion or water ponding. The vegetation growth along the downstream slopes of the earthen berms was in good conditions. The closed areas appeared stable and was well maintained. The inlet and outlet of the discharge structures are in fair condition.

5.0 RECOMMENDATIONS- General Maintenance and Monitoring Conditions

5.1 Overall

1. Continue regular mowing of all berms with vegetation control to prevent the growth of excessive woody plants and brushes.

2. Continue regular maintenance of minor erosion rills in timely manner.

3. Continue weekly inspection as required by the CCR mandated roles and submit Inspection Reports to the operating record depository within one week of the end of the field inspection.

5.2 Open Areas

1. Continue current maintenance practices.

5.3 Closed Areas

1. Continue current maintenance practices.

6.0 RECOMMENDATIONS- Remedial Actions/Repairs

6.1 Open Areas

1. No deficiencies were observed during the site inspection that would require remedial action or repairs.

6.2 Closed Areas

1. No deficiencies were observed during the site inspection that would require remedial action or repairs.

APPENDICIES

APPENDIX A

CARDINAL FAR I LANDFILL INSPECTION PHOTOGRAPHS

APPENDIX B

LOCATION PLAN