

2018 Annual Landfill Inspection Report

Cardinal Plant Fly Ash Reservoir I Landfill



Cardinal Operating Company
306 County Rd. 7E
Brilliant, Ohio 43913

Project number: 60583548

January 9, 2019



Prepared for:

Cardinal Operating Company
306 County Road 7E
Brilliant, Ohio 43913

Prepared by:

AECOM
Vik Gautam
T: 216-622-2447
E: Vik.Gautam@aecom.com

AECOM
1300 East 9th Street, Suite 500
Cleveland, OH 44114
aecom.com

Copyright © 2019 by AECOM

All rights reserved. No part of this copyrighted work may be reproduced, distributed, or transmitted in any form or by any means without the prior written permission of AECOM.

Table of Contents

| | | |
|-----------|--|-----------|
| 1. | Introduction..... | 4 |
| 2. | Facility Description | 4 |
| 2.1 | Permit History | 4 |
| 2.2 | Landfill Components | 5 |
| 2.2.1 | Active Placement Areas | 5 |
| 2.2.2 | Closed Areas | 5 |
| 2.2.3 | Inactive Areas | 6 |
| 2.2.4 | Leachate Collection System | 6 |
| 2.2.5 | Subsurface Drainage Collection System..... | 6 |
| 2.3 | Constructed and Available Capacity | 6 |
| 3. | Regulatory Requirements | 6 |
| 4. | Review of Available Information 257.84(b)(1)(i) | 7 |
| 5. | Inspection (257.84(b)(1)(ii)) | 8 |
| 5.1 | Definitions of Visual Observations and Deficiencies | 8 |
| 5.2 | Fly Ash Reservoir I Landfill Inspection Findings..... | 9 |
| 5.2.1 | Changes in Geometry since Last Inspection 257.84(b)(2)(i)..... | 10 |
| 5.2.2 | CCR Landfill Volume 257.84(b)(2)(ii) | 10 |
| 5.2.3 | Changes That Affect Stability or Operation 257.84(b)(2)(iii)..... | 10 |
| 5.2.4 | CCR Landfill Changes 257.84(b)(2)(iv)..... | 11 |
| 6. | Conclusions | 11 |
| 7. | Recommendations – General Maintenance and Monitoring Conditions | 11 |
| 7.1 | Overall | 11 |
| 7.2 | Open Areas..... | 11 |
| 7.3 | Closed Areas | 12 |
| 8. | Recommendations – Remedial Actions/Repairs..... | 12 |
| 8.1 | Open Areas..... | 12 |
| 8.2 | Closed Areas | 12 |

Appendix A : Aerial Survey

Appendix B : Landfill Inspection Photographs

1. Introduction

This report was prepared by AECOM Technical Services, Inc. ("AECOM"), to fulfill requirements of 40 CFR 257.84 and to provide Cardinal Operating Company and Buckeye Power, Inc. with an evaluation of the facility. In accordance with the United States Environmental Protection Agency (USEPA) Final Coal Combustion Residual (CCR) Rule §257.84, annual inspection by a qualified professional engineer is required for each CCR unit. The CCR Rule requires a visual inspection by a licensed civil engineer of each CCR unit to ensure that the design, construction, operation and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. At the request of Buckeye Power, Inc., AECOM completed the annual inspection in accordance with the CCR Rule requirements and prepared the following Cardinal Plant CCR Landfill Annual Inspection report.

The Cardinal Power Plant is located at 306 County Road 7 East, Brilliant, OH, 43913, in Jefferson County. Generating Units 2 and 3 are owned by Buckeye Power, Inc. and operated by Cardinal Operating Company; Unit 1 is owned by American Electric Power. The power plant is managed and operated by Cardinal Operating Company

The annual inspection was previously completed by American Electric Power (AEP) in 2015, 2016, and 2017. The 2018 landfill inspection was completed by AECOM staff Vik Gautam, P.E. and Scott Mesi accompanied by Mr. Randy Sims, P.E., of Cardinal Operating Company. The site inspection was performed on December 17, 2018. During the inspection, temperatures reached a high of 43°F, and the sky was overcast.

This report contains inspection findings, observations, photographs, conclusions, and maintenance recommendations. A field photographic log identifying typical conditions and any items that need correction or requiring additional monitoring is provided in Appendix B.

2. Facility Description

2.1 Permit History

The Cardinal Plant Fly Ash Reservoir I (FAR I) Residual Solid Waste Landfill was constructed over the former Fly Ash Reservoir 1 impoundment under Permit To Install (PTI) No. 06-07993, issued on May 11, 2007 by the Ohio Environmental Protection Agency (Ohio EPA). Its primary purpose is to dispose of flue gas desulfurization (FGD) gypsum material produced as a byproduct of the power plant's stack scrubber system. A minor amount of power plant water treatment sludge is also disposed of at the landfill.

The agency approved an alteration to the PTI on June 29, 2007 that incorporated several revisions to the Quality Assurance/Quality Control (QA/QC) Plan. A second alteration (Alteration No. 2) was approved on September 2, 2008, addressing re-sequencing plans and revisions to the preloading plans for Cells 3, 4, 5 and 6. In addition to Alterations No. 1 and 2, a modification to PTI No. 06-07993 was approved by Ohio

EPA on August 10, 2011. The modification included revising the approved limits of waste by partially expanding as well as retracting the limits of waste in both the vertical and horizontal directions. The PTI modification also included the retention of the six existing ground water monitoring wells at the facility.

2.2 Landfill Components

The 129.45 acre landfill consists of two phases and six cells. Phase 1 consists of Cells 1 and 2 which overlie the bench area between FAR I and a bedrock highwall that is located around a portion of the facility's perimeter on its north and west sides. Cells 1 and 2 are constructed over bedrock near the highwall interfacing with the minespoil berm holding the fly ash of FAR I. Phase 2 consists of Cells 3, 4, 5, and 6. The Phase 2 cells (except Cell 3) are designed to be developed over the former FAR I fly ash impoundment, as shown in Figure 2 in Appendix A. The 2018 survey of Cells 1 and 3 are shown in Figure 1 of Appendix A; Figure 2 represents the 2017 survey data and the general facility layout.

Cell 1 and Cell 3 (the northernmost cells of the landfill) are the only currently active cells at the facility; Cells 2, 4, 5, and 6 are inactive. Cell 1 is approximately 23 acres in size and bound by two features - the highwall to the south and the minespoil berm/bench to the north. 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 21.25 acres in area and is bound by the termination berm and landfill haul road to the north and east, the interphase berm to the west, and the Cell 3/Cell 4 inter-cell berm on the south. Cell 3 is built over an inactive part of the ash pond with a 10 ft. thick layer of bottom ash and a soil cover layer.

At the time of this inspection Cells 2, 4, 5, and 6 are still in pre-construction conditions. Earthen materials are being stockpiled in these cells to be used in future construction.

2.2.1 Active Placement Areas

The active placement areas during this landfill inspection include Cell 1 and the south portion of Cell 3. Photographic documentation of the inspection of the active areas is included in Appendix B in Photograph Nos. 2, 4, 8, 12, and 18 - 25. During the past year, there has not been much CCR waste placement in Cells 1 and 3 due to active sales of the gypsum byproduct material; Cell 3 was the main placement area in order to allow better access to Cell 1. Cell 1 also receives CCR fill although in small quantities. A relatively small quantity of sludge from the Cardinal wastewater treatment plant was placed in Cell 1.

2.2.2 Closed Areas

Closed areas include a small portion of Cell 1 (approximately one acre) that was closed in 2009, and areas outside the landfill footprint, but above FAR I, mainly to the north of Cell 3. Photographic documentation is included in Appendix B for these closed areas as Photograph Nos. 3, 10, 11, 13, and 14.

2.2.3 Inactive Areas

As mentioned in section 2.2, Cells 2, 4, 5, and 6 are in pre-construction conditions. Earthen materials are being stockpiled in these cells to be used in future construction. The stockpile is graded to promote positive drainage and stormwater is discharged into Fly Ash Reservoir II (FAR II). Photographic documentation of the inspection of the inactive areas is included in Appendix B in Photograph No. 27.

2.2.4 Leachate Collection System

The leachate collection system at FAR I Landfill was constructed in 2007. The system includes leachate collection materials, collection pipes, risers, a pretreatment structure and an outlet pipe. The landfill Leachate Collection System is graded to drain to the east side of the landfill, the leachate is then routed into leachate collection manholes which are connected by leachate transmission pipe, becoming progressively larger from 24" diameter in the north to 36" diameter at the south end. The Leachate Collection System discharges to FAR II via the 36" nominal diameter HDPE leachate transmission pipe, as shown in Photograph No. 31 in Appendix B.

2.2.5 Subsurface Drainage Collection System

A subsurface drainage layer (SDL) was incorporated in the landfill design to prevent uplift conditions to the landfill liner. The system consists of a SDL 2-foot thick (minimum), a geotextile placed above the SDL as a separator, 6" diameter perforated HDPE subsurface drainage pipes, 6" diameter solid HDPE transmission pipes, and an outfall that discharges to FAR II, as shown in Photograph No. 29 in Appendix B.

2.3 Constructed and Available Capacity

The constructed storage capacities of Cell 1 and Cell 3 are 2.04 million cubic yards and 2.89 million cubic yards, respectively. The total permitted waste volume of the landfill is 18.95 million cubic yards. The total permitted area of the landfill is approximately 129.45 acres and the currently constructed area of the landfill is approximately 44.28 acres (Cell 1 and Cell 3). There is approximately 15 vertical feet between the as-built limit of waste of Cell 1 and the permitted limited of waste against the highwall. Therefore the as-built area of Cell 1 is less than the permitted area of 23.03 acres. The landfill liner and leachate collection system extend to the highwall.

3. Regulatory Requirements

The Annual inspection report is completed to meet CCR regulatory requirements specified in CCR Rule Section 257.84(b)(1). These requirements include at a minimum:

- (i) A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (e.g., the results of inspections by a qualified person, and results of previous annual inspections); and

- (ii) A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit.

In addition to the annual inspections, 7-day inspections per CCR Rule Section 257.84(a)(1) are completed by Cardinal Operating Company and are documented in the facility operating record per § 257.105(g)(5) .

Once the annual inspection has been completed, the CCR Rule Section 257.84(b)(2) requires the qualified professional engineer to prepare a report following each inspection that addresses the following:

- (i) Any changes in geometry of the structure since the previous annual inspection;
- (ii) The approximate volume of CCR contained in the unit at the time of the inspection;
- (iii) Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit; and
- (iv) Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection.

4. Review of Available Information

257.84(b)(1)(i)

Pursuant to CCR Rule Section 257.84(b)(1)(i), prior to completing the visual inspection, AECOM has reviewed available information regarding the status and condition of the landfill, which includes files available in the operating record, such as design and construction information, previous 7 day inspection reports, and previous annual inspections. Design and construction information was referenced prior to and during the inspection to understand these aspects of the landfill.

Cardinal Operating Company personnel complete an inspection of the landfill facility every 7-days. This includes a visual inspection of the landfill components including the active areas, final cover area, culverts, drainage berms/ditches, leachate collection system, leachate pond, leachate pumps, and haul roads. The inspections are completed to comply with the requirements of § 257.84 of the CCR Rule. AECOM reviewed the 7-day inspection reports from June 7, 2017 to December 17, 2018 prior to completing the annual inspection, and no significant deficiencies or maintenance items were identified. There were no recommendations for remedial actions or repairs in the 2017 Annual Inspection Report (inspection completed on May 24, 2017). The 2017 Report reiterated that the current maintenance practices should continue, with emphasis on regular mowing of all berms and vegetation to control the growth of trees or woody vegetation and to continue the maintenance of minor erosion rills in a timely manner.

5. Inspection (257.84(b)(1)(ii))

5.1 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. These terms are defined as follows:

| | |
|---------------------------|--|
| <u>Good:</u> | A condition or activity that is generally better than what is minimally expected or anticipated based on design criteria and maintenance performed at the facility. |
| <u>Fair/Satisfactory:</u> | A condition or activity that generally meets what is minimally expected or anticipated based on design criteria and maintenance performed at the facility. |
| <u>Poor:</u> | A condition or activity that is generally below what is minimally expected or anticipated based on design criteria and maintenance performed at the facility. |
| <u>Minor:</u> | An observed deficiency (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is below what is minimally expected, but does not currently pose a threat to structural stability. |
| <u>Significant:</u> | An observed deficiency (e.g. erosion, seepage, vegetation, etc.) where the current maintenance condition is below what is minimally expected, and could pose a threat to structural stability if not addressed. |
| <u>Excessive:</u> | An observed deficiency (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is below what is minimally expected, and which the ability of the observer to properly evaluate the structure or particular area being observed or which poses a threat to structural stability. |

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. 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:** Displacement of berms, embankments, or waste masses is large scale movement of part of the structure. 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, pipes or pipe outfalls, 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.

Results of the visual inspection performed on December 17, 2018 are summarized below.

5.2 Fly Ash Reservoir I Landfill Inspection Findings

The site inspection began in the closed portion of Cell 3 in the northeast corner then progressed clockwise around the landfill beginning in Cell 3 and finishing in Cell 1. A photographic log of the facility site conditions at the time of the December 17, 2018 inspection is included in Appendix B. The overall site layout in plan view is shown in Appendix A.

As shown in Appendix B, mowing operations were complete as of December 17, 2018, and all areas with protective vegetative cover established such as the closed portion of the landfill and berms did not have vegetation exceeding 6 inches in height. The temporary slopes within the active waste placement areas were well-graded and showed no signs of instability. The active areas of the landfill showed no significant erosion and are well maintained to promote drainage to the chimney drains which discharge to the leachate collection system which conveys the stormwater through transmission pipes and manholes to the Fly Ash Reservoir II. Both active and inactive areas of the landfill slope toward chimney drains to minimize surface water runoff to the perimeter ditches. Minor ponding of rainfall runoff water was noted in the northeastern corner of Cell 3.

The inactive slopes, including the interface between Cell 1 and 2 have a temporary cover soil placed with established vegetation. Inactive areas of the landfill, excluding the interface between Cell 1 and Cell 2, have been treated with a polymer to reduce erosion and minimize fugitive dust. The polymer adequately covered the gypsum in the inactive areas of the landfill where the landfill is not closed, does not receive CCR fill regularly, and does not have temporary cover soil. Vegetative growth along the downstream slopes of the earthen berms was in good condition.

The majority of the Cardinal Plant FAR I Landfill area serves as a stockpiling/staging area (Cells, 2, 4, 5, & 6), and is currently undeveloped. Cells 2, 4, and 5 are being preloaded using earthen materials that will be used in the future cell construction (See Photo No. 27). This is to control/reduce future settlement of the cells when they are constructed. The stockpiles are well graded to promote drainage.

The highwall located to the west of Cell 1 and Cell 2 was in generally good condition. No significant overhangs, rockfall, or other signs of instability were observed. At the time of the inspection it was noted water was dripping off the highwall in a few discrete locations. The source of this water could be surface water run-off from the crest of the highwall or natural seepage from the bedrock. The quantity of water

was minor (the flow rate was not measured but visually appeared to be in the range of 1 to 5 gallons per minute) and the water was clear. No significant erosion or signs of instability were observed at the locations where water was observed, and the water flows to the base of the highwall where it is collected and conveyed by the landfill's perimeter seepage collection system. No signs of ponding water were present at the base of the highwall, suggesting that the seepage collection system is functioning as intended. See Photo No. 28 of the Photographic log in Appendix B.

The permanently covered areas comprising the northern portion of Cells 1 and 3 are in good condition with no signs of soil erosion, animal burrows, or ponding of water, and have well maintained mature vegetative cover.

5.2.1 Changes in Geometry since Last Inspection 257.84(b)(2)(i)

No significant changes have been made to the FAR I landfill facility since the 2017 inspection. The changes that have occurred are limited to the landfill grades as a result of placement of a relatively limited amount of additional CCR and wastewater treatment plant sludge. Additionally, the landfill was maintained during operations by placing dust suppressant, mowing the vegetative cover, and other maintenance requirements as necessary. The landfill has a maximum permitted elevation of approximately 1,180 feet above mean sea level (MSL), and the current maximum landfill elevation is approximately 1,109 feet above MSL.

5.2.2 CCR Landfill Volume 257.84(b)(2)(ii)

The FAR I landfill was not frequently used in the past year, receiving a relatively small amount of CCR and solid waste in 2018. The volume of CCR contained in the landfill increased by approximately 3% in 2018. The gypsum produced at the plant is currently sold for beneficial reuse and therefore is typically not disposed of in the landfill facility.

The total volume of CCR material contained in the Cardinal Plant CCR Landfill was estimated on December 4, 2018 to be 2.18 million cubic yards. The year to date placement in the landfill as of December 4, 2018 includes 64,969 cubic yards of gypsum and 4,670 cubic yards of wastewater treatment plant sludge.

5.2.3 Changes That Affect Stability or Operation 257.84(b)(2)(iii)

No appearances of actual or potential structural weakness of the CCR unit were identified during the 2018 inspection. No existing conditions were identified that were or had the potential to disrupt the operation and safety of the FAR I landfill. No deficiencies or disrupting conditions that would require immediate measures to remedy were identified in the inspection. The inspection findings consisted of maintenance items that were not observed to be signs or potential signs of significant structural weakness.

5.2.4 CCR Landfill Changes 257.84(b)(2)(iv)

It was noted when reviewing the 2018 aerial survey elevations that 1 point of 189 on the south side of Cell 1 where temporary cover is established, was approximately 4 inches above the permitted design elevation at that location. Since the difference is so minor it may be attributed to survey accuracy limitations; the location will be resurveyed by Jack A. Hamilton & Associated Inc. in early 2019 to verify the elevation is correct. If after the area is resurveyed the elevation remains unchanged, the area may need to be re-graded and then reseeded. Cardinal Operating Company staff has been notified and will regrade and reseed this area if necessary.

It was also noted that a stormwater drainage pipe in the southeast corner of Cell 3 is partially obstructed by silt deposits. There are no signs of erosion or instability; however, the Cardinal Operating Company staff has been notified and will remove the silt as soon as practical. See Photo No. 33 of Appendix B.

6. Conclusions

Based on AECOM's visual inspection, the landfill's earthen berms, and open, closed, and inactive areas appear to be in good condition. The active disposal area of the landfill was in good condition with no evidence of significant erosion or water ponding. The vegetative growth along the downstream slopes of the earthen berms was in good condition. The closed areas of the landfill appeared to be stable and well maintained. The discharge structures and pipes were in good condition.

7. Recommendations – General Maintenance and Monitoring Conditions

7.1 Overall

1. Continue to mow all vegetated berms on a regular basis to prevent the growth of excess woody plants and brush.
2. Continue to complete regular maintenance of minor erosion rills and use the polymer as needed for erosion control and fugitive dust control.
3. Continue to complete weekly inspections and submit inspection reports to the operating record as required by 40 CFR 257.83.

7.2 Open Areas

1. Remove the sediment deposited near the stormwater pipe in the southeast corner of Cell 3 as shown in Photo No. 33 of Appendix B.

2. Continue to monitor water dripping off the highwall and the highwall seepage collection system. Monitor the water for signs of turbidity or increases in flow rate and monitor the condition of the highwall at the locations where the water is observed for signs of instability, weathering, or erosion.
3. Continue to monitor the leachate collection system and spring drain collection system for unobstructed flow.
4. Consider re-grading the intermediate bench at the southwest corner of Cell 1 where the gypsum slope meets the temporary cover and vegetation (see Photo No. 6). There are no signs of stormwater erosion, however it may be prudent to increase the height of the berm at the crest of the lower slope with temporary cover to reduce runoff water velocities and redirect stormwater during large storm events.
5. Continue all current maintenance and fill placement practices.

7.3 Closed Areas

1. Continue current maintenance practices including but not limited to continuing to maintain the vegetative cover height at 6 inches or less and continue the 7-day inspections of the area.

8. Recommendations – Remedial Actions/Repairs

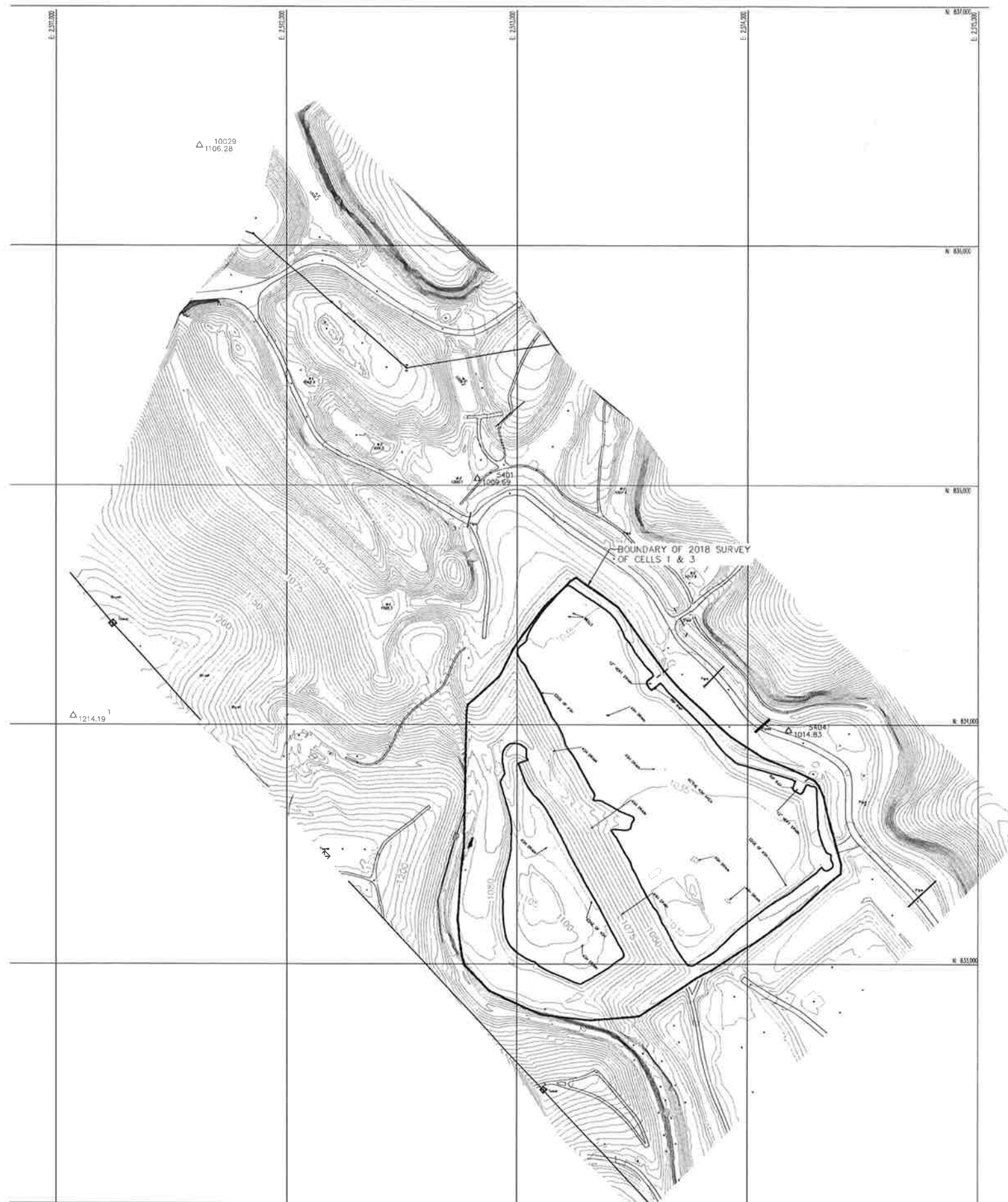
8.1 Open Areas

1. There were no deficiencies, signs of structural weakness, or signs of disruptive conditions observed at the time of the inspection that would require additional investigation or remedial action.

8.2 Closed Areas

1. There were no deficiencies, signs of structural weakness, or signs of disruptive conditions observed at the time of the inspection that would require additional investigation or remedial action.

Appendix A : Aerial Survey



- LEGEND**
- 980 — EXISTING SURFACE CONTOUR (INDEX)
 - — — EXISTING SURFACE CONTOUR (INTERMEDIATE)
 - 997.0 X EXISTING SURFACE SPOT ELEVATION
 - WELL
 - SILT FENCE
 - EDGE OF LINER
 - EDGE OF ASH
 - MAPPING UPDATE PERIMETER
 - CULVERT
 - TRANSMISSION TOWER
 - HORIZONTAL AND VERTICAL CONTROL
 - TREE LINE
 - 740 MAJOR CONTOUR
 - MINOR CONTOUR
 - X SPOT ELEVATION
 - 739.6 SPOT TEXT
 - WATER LINE
 - RIP RAP



- MAPPING NOTES**
- AERIAL SURVEY FOR CELLS 1 AND 3 COMPLETED BY JACK A. HAMILTON AND ASSOCIATES ON OCTOBER 24, 2018.
 - DRAWING IS IN US SURVEY FEET.
 - DATE OF ORIGINAL MAPPING PHOTOGRAPHY: 12-07-2014.
 - CONTOURS INSIDE TREE LINES SHOULD BE CONSIDERED AS GROUND OBSCURED.
 - THIS MAP UPDATED FROM A FIELD SURVEY BY THE JOHN E. DOLAN CIVIL LAB SECTION DATED DECEMBER 4, 2017.

AECOM
 277 West Nationwide Boulevard
 Columbus, OH 43215
 614-464-4500 (phone)
 614-464-0588 (fax)

BUCKEYE POWER
 6677 Busch Boulevard
 Columbus, OH 43229
 614-846-5757 (phone)

**CARDINAL PLANT
 BRILLIANT, OH**
**CARDINAL FAR I RESIDUAL
 WASTE LANDFILL FACILITY
 ANNUAL AS-BUILT GRADES**

**ISSUED FOR
 CERTIFICATION**

ISSUED FOR BIDDING _____ DATE BY _____
 ISSUED FOR CONSTRUCTION _____ DATE BY _____

| REVISIONS | | |
|-----------|-------------|------|
| NO. | DESCRIPTION | DATE |
| △ | | |
| △ | | |
| △ | | |
| △ | | |
| △ | | |

AECOM PROJECT NO: 60583548
 DRAWN BY:
 DESIGNED BY:
 CHECKED BY:
 DATE CREATED:
 PLOT DATE: 1/4/2019
 SCALE:
 ACAD VER: 2017

SHEET TITLE

FIGURE 1

**FAR I LANDFILL
INSPECTION AND PHOTO LOCATION
CARDINAL PLANT**
Inspection Date: MAY 24, 2017

GENERAL NOTES

- CELL LIMITS ARE SHOWN WITH - - - - -
- CELL 1 & CELL 3 ARE THE CURRENT ACTIVE CELLS
- COUNTOUR INTERVALS SHOWN ARE TWO FEET.
- DATE OF ORIGINAL MAPPING PHOTOGRAPHY 12-97-2014, AND THIS MAP HAS BEEN UPDATED FROM A FIELD SURVEY BY THE JOHN E. DOLAN CIVIL LAB SECTION DATED NOVEMBER 16, 2016.

LEGEND - EXISTING

- 599.5 SPOT ELEVATION
- INTERMEDIATE CONTOUR
- INDEX CONTOUR
- DEPRESSION CONTOUR
- TREES AND TREE LINE
- STRUCTURE AND BUILDING
- FENCE
- ROADS
- EDGE OF WATER
- TOWER

REFERENCE DRAWINGS

13-30100-09 SURVEY CONTROL POINT GRID

I HEREBY CERTIFY THIS DRAWING TO BE A CORRECT REPRESENTATION OF AN AERIAL AND FIELD SURVEY OF THE CARDINAL FAR I RESIDUAL WASTE LANDFILL.

Mohammad A. A. Loumi
MOHAMMAD A. A. LOUMI, P.E.



| DATE | NO. | DESCRIPTION | APPROVED |
|---------|-----|---|--------------------|
| 3/27/17 | 1 | ISSUED TO SHOW AS-BUILT CONDITION FOR 2016. | <i>[Signature]</i> |

THIS DRAWING IS CLASSIFIED AS

AEP PUBLIC

REFERENCE AEP'S CORPORATE INFORMATION SECURITY POLICY
THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP. OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST.

CARDINAL OPERATING COMPANY
CARDINAL PLANT
BRILLIANT OHIO
GEOTECHNICAL
CARDINAL FAR I RESIDUAL WASTE LANDFILL FACILITY ANNUAL AS-BUILT GRADES

| | | |
|------------------|--------------------------------------|--|
| UNIT: 13 | DRAWING NUMBER: 30100-08 | REV: 1 |
| SCALE: 1" = 20' | CIVIL ENGINEERING | |
| DATE: SEE REV. 0 | APPROVED BY: <i>Thomas R. Zelina</i> | |
| | | AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215 |

FIGURE 2

Appendix B : Landfill Inspection Photographs

Facility Name:
Cardinal FAR 1 Landfill

Site Location:
306 County Road 7 East, Brilliant, OH, 43913

Project No.
60583548

| | | |
|--|--------------------------|---|
| Photo No. 1 | Date: 12/17/18 |  |
| Direction Photo Taken: West | | |
| Description: Cell 3 southeast corner. Overview of general conditions. | | |

| | | |
|---|--------------------------|--|
| Photo No. 2 | Date: 12/17/18 |  |
| Direction Photo Taken: West | | |
| Description: Active portion of Cell 1. Overview of general conditions. | | |

| | | |
|--|---|---------------------------------|
| Facility Name: Cardinal FAR 1 Landfill | Site Location: 306 County Road 7 East, Brilliant, OH, 43913 | Project No.: 60583548 |
|--|---|---------------------------------|

| | | |
|--|--------------------------|---|
| Photo No. 3 | Date: 12/17/18 |  |
| Direction Photo Taken: North | | |
| Description: View of closed areas of the landfill, standing out the approximate Cell 1/3 interface looking towards Cell 3. | | |

| | | |
|---|--------------------------|--|
| Photo No. 4 | Date: 12/17/18 |  |
| Direction Photo Taken: Southeast | | |
| Description: Active placement area in Cell 3. | | |

Facility Name:
Cardinal FAR 1 Landfill

Site Location:
306 County Road 7 East, Brilliant, OH, 43913

Project No.
60583548

| | |
|---|--------------------------|
| Photo No. 5 | Date: 12/17/18 |
| Direction Photo Taken: South | |
| Description: Overview of active placement area. | |



| | |
|--|--------------------------|
| Photo No. 6 | Date: 12/17/18 |
| Direction Photo Taken: East | |
| Description: Cell 1 southwest corner line. Cell 1&2 waste outer slopes and temporary cover. | |



Facility Name:
Cardinal FAR 1 Landfill**Site Location:**
306 County Road 7 East, Brilliant, OH, 43913**Project No.**
60583548**Photo No.**
7**Date:**
12/17/18**Direction Photo Taken:**

South

Description:

Cell 1 west line stabilized highwall conditions.

**Photo No.**
8**Date:**
12/17/18**Direction Photo Taken:**

East

Description:

Cell 1 west line waste internal slope conditions.



Facility Name:
Cardinal FAR 1 Landfill

Site Location:
306 County Road 7 East, Brilliant, OH, 43913

Project No.:
60583548

| | | |
|--|--------------------------|---|
| Photo No. 9 | Date: 12/17/18 |  |
| Direction Photo Taken: West | | |
| Description: Cell 1 west stabilized highwall conditions. | | |

| | | |
|--|--------------------------|--|
| Photo No. 10 | Date: 12/17/18 |  |
| Direction Photo Taken: East | | |
| Description: Cell 1 northwest line. Closed area conditions, waste outer slope conditions. | | |

Facility Name:
Cardinal FAR 1 Landfill**Site Location:**
306 County Road 7 East, Brilliant, OH, 43913**Project No.:**
60583548

| | | |
|--|--------------------------|---|
| Photo No. 11 | Date: 12/17/18 |  |
| Direction Photo Taken: West | | |
| Description: Cell 1&3 line north crest closed area conditions. | | |

| | | |
|--|--------------------------|--|
| Photo No. 12 | Date: 12/17/18 |  |
| Direction Photo Taken: N/A | | |
| Description: Cell 1 chimney drain (typical). | | |

| | | |
|--|---|---------------------------------|
| Facility Name: Cardinal FAR 1 Landfill | Site Location: 306 County Road 7 East, Brilliant, OH, 43913 | Project No.: 60583548 |
|--|---|---------------------------------|

| | | |
|--|--------------------------|---|
| Photo No. 13 | Date: 12/17/18 |  |
| Direction Photo Taken: East | | |
| Description: Closed area conditions. | | |

| | | |
|---|--------------------------|--|
| Photo No. 14 | Date: 12/17/18 |  |
| Direction Photo Taken: Northeast | | |
| Description: Cell 3 north closed area conditions. | | |

Facility Name:
Cardinal FAR 1 Landfill**Site Location:**
306 County Road 7 East, Brilliant, OH, 43913**Project No.**
60583548

| | | |
|--|---|---------------------------------|
| Facility Name: Cardinal FAR 1 Landfill | Site Location: 306 County Road 7 East, Brilliant, OH, 43913 | Project No.: 60583548 |
|--|---|---------------------------------|

| | | |
|--|--------------------------|---|
| Photo No. 17 | Date: 12/17/18 |  |
| Direction Photo Taken: South | | |
| Description: Cell 3 berm crest conditions. | | |

| | | |
|---|--------------------------|--|
| Photo No. 18 | Date: 12/17/18 |  |
| Direction Photo Taken: Southeast | | |
| Description: Cell 3 active area placement conditions. | | |

Facility Name:
Cardinal FAR 1 Landfill

Site Location:
306 County Road 7 East, Brilliant, OH, 43913

Project No.
60583548

| | |
|--|--------------------------|
| Photo No. 19 | Date: 12/17/18 |
| Direction Photo Taken: Southeast | |
| Description: Cell 3 center of north swale active area placement conditions with recently improved inlet. | |



| | |
|--|--------------------------|
| Photo No. 20 | Date: 12/17/18 |
| Direction Photo Taken: West | |
| Description: Cell 3 active area placement conditions | |



Facility Name:
Cardinal FAR 1 Landfill

Site Location:
306 County Road 7 East, Brilliant, OH, 43913

Project No.
60583548

| | | |
|---|--------------------------|---|
| Photo No. 21 | Date: 12/17/18 |  |
| Direction Photo Taken: West | | |
| Description: Cell 3 south active area placement conditions. | | |

| | | |
|---|--------------------------|--|
| Photo No. 22 | Date: 12/17/18 |  |
| Direction Photo Taken: South | | |
| Description: Cell 3 outer slopes of active area placement conditions. | | |

Facility Name:
Cardinal FAR 1 Landfill

Site Location:
306 County Road 7 East, Brilliant, OH, 43913

Project No.
60583548

| | | |
|--|--------------------------|---|
| Photo No. 23 | Date: 12/17/18 |  |
| Direction Photo Taken: South | | |
| Description: Cell 3 north/south dividing line and outer slope of external berm conditions. | | |

| | | |
|---|--------------------------|--|
| Photo No. 24 | Date: 12/17/18 |  |
| Direction Photo Taken: Southeast | | |
| Description: Cell 3 south swale line and outer slopes of active area placement conditions with recently improved inlet. | | |

Facility Name:
Cardinal FAR 1 Landfill

Site Location:
306 County Road 7 East, Brilliant, OH, 43913

Project No.
60583548



Facility Name:
Cardinal FAR 1 Landfill**Site Location:**
306 County Road 7 East, Brilliant, OH, 43913**Project No.**
60583548

| | | |
|---|--------------------------|---|
| Photo No. 27 | Date: 12/17/18 |  |
| Direction Photo Taken: South | | |
| Description: Future Cell 3&4 west line preload. | | |

| | | |
|---|--------------------------|--|
| Photo No. 28 | Date: 12/17/18 |  |
| Direction Photo Taken: West | | |
| Description: Dripping water noted on highwall adjacent to Cell 1. | | |

Facility Name:
Cardinal FAR 1 Landfill**Site Location:**
306 County Road 7 East, Brilliant, OH, 43913**Project No.**
60583548**Photo No.****29****Date:**

12/4/18

Direction Photo Taken:

East

Description:

Subsurface Drainage Layer outfall in Cell 6.

**Photo No.****30****Date:**

12/4/18

Direction Photo Taken:

East

Description:

Leachate Pretreatment Structure.



Facility Name:
Cardinal FAR 1 Landfill**Site Location:**
306 County Road 7 East, Brilliant, OH, 43913**Project No.:**
60583548**Photo No.:**
31**Date:**
12/4/18**Direction Photo Taken:**

West

Description:

Cell 5 leachate outfall to FAR II Pond.

**Photo No.:**
32**Date:**
12/4/18**Direction Photo Taken:**

West

Description:

View of FAR II Pond from Cell 5.



Facility Name:
Cardinal FAR 1 Landfill**Site Location:**
306 County Road 7 East, Brilliant, OH, 43913**Project No.:**
60583548**Photo No.:**
33**Date:**
12/17/18**Direction Photo Taken:**

West

Description:

Surface water drainage pipe at the southeast corner of Cell 3 shows signs of silt deposit.

Plant staff notified and will remove silt as part of regular maintenance.

**Photo No.:**
34**Date:**
12/17/18**Direction Photo Taken:**

N/A

Description:

Highwall seepage collection piping at the toe of highwall. Noted minor sparse vegetative cover at the north end.

