Amanda Graphics, LLC
Engineering Consulting & CAD Support

2020 Annual Landfill Inspection Report

Cardinal Plant

2020 CCR Landfill Inspection Report

CARDINAL OPERATING COMPANY

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

January 10, 2021

, PE

1/10/2021

Prepared for:

Cardinal Plant
306 County Road 7E
Brilliant, Ohio 43913

Prepared by:

Amanda Graphics, LLC
John T. Massey-Norton
T: 614-898-5305

Francis S. Brezny
T: 614-570-2973

Amanda Graphics, LLC
2554 Red Rock Blvd.
Grove City, OH 43123

Table of Contents

1. Introduction

This report was prepared by Amanda Graphics, LLC, to fulfill requirements of 40 CFR 257.84 and to provide Cardinal Operating Company and Buckeye Power, Inc. with an evaluation of the Fly Ash Reservoir I Landfill Facility (the Landfill), located at the Cardinal Power Plant. 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.; Unit 1 is owned by American Electric Power. The power plant is managed and operated by Cardinal Operating Company.

At the request of Buckeye Power, Inc., Amanda Graphics, LLC completed the annual inspection in accordance with the CCR Rule requirements and prepared the following Cardinal Plant CCR Landfill Annual Inspection report.

The annual inspection was previously completed by AECOM in 2018 and 2019. The 2020 annual inspection was completely by Amanda Graphics, LLC staff, J.T. Massey-Norton (Sn. Geologist), accompanied by Amanda Padamadan under the supervision of Francis S. Brezny (PE). The site inspection was performed on September 24th, 2020. Weather conditions were good, ranging from cloudy to partly sunny as the day progressed with temperatures reaching into the mid 70°F.

This report contains inspection findings, observations, photographs, conclusions, and maintenance recommendations. An aerial survey was performed by Jack A. Hamilton & Assoc., Inc. on October 23, 2020 (Appendix A.) 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 solids from the wastewater treatment plant (WWTP) are 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.

In 2020, The Cardinal Operating Company obtained two additional permit alterations. On October 27th, 2020, the Ohio EPA approved an alteration to receive an additional residual solid waste stream, dry fly ash. The landfill is expected to start receiving dry fly ash in 2021. On December 24th, 2020, the Ohio EPA also approved a permit alteration to install pretreatment settling tanks to manage the landfill leachate once the FAR II impoundment initiate closure.

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 mine spoil 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 2019 survey of Cells 1 and 3 is shown in Figure 1 of Appendix A; Figure 2 represents 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 mine spoil 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 a part of the former 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. During the past year, there has been very little CCR waste placement in Cells 1 and 3 due to sales of the gypsum byproduct material, and portions of Cell 3 have seen an increase in landfill capacity in the past year as gypsum has been reclaimed from the landfill for beneficial utilization. Cell 1 also receives CCR fill although in small quantities. A relatively small quantity of sludge from the Cardinal wastewater treatment plant has been placed within Cell 1 and Cell 3.

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.

2.2.3 Inactive Areas

As mentioned in section 2.2, Cells 2, 4, 5, and 6 are in pre-construction conditions. Earthen and granular drainage materials are being stockpiled in these cells to be used in future construction. The stockpiles are graded to promote positive drainage and stormwater is discharged into Fly Ash Reservoir II (FAR II).

2.2.4 Leachate Collection System

The leachate collection system (LCS) at FAR I Landfill was constructed in 2007. The LCS is constructed of granular drainage materials embedded with collection pipes connected to risers extending through the CCR fill. The landfill's LCS is graded to drain to the east side of the landfill where the leachate is then routed into collection manholes which are connected by a transmission pipe, becoming progressively larger from 24” diameter in the north to 36” diameter at the south end. The transmission pipe discharges to a V-notched weir prior to flowing into the FAR 2 pond. On the date of the inspection, the leachate effluent was observed to be flowing freely (approximately 23 gpm), without obstruction and was visually clear.

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 2-foot thick (minimum) layer of free-draining material (the SDL), 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.

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 47 ft vertical feet between the as-built limit of waste to the permitted limited design grades for both cells. Therefore, the as-built volume is less than the permitted volume.

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, Amanda Graphics, LLC 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. This information was referenced prior to and during the inspection (if needed).

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. Amanda Graphics, LLC was provided access to and has reviewed the 7-day inspection reports from January 1, 2020 to December 9, 2020. These reports have noted no significant deficiencies or maintenance items.

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:

Good:	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.
Fair/Satisfactory:	A condition or activity that generally meets what is minimally expected or anticipated based on design criteria and maintenance performed at the facility.
Poor:	A condition or activity that is generally below what is minimally expected or anticipated based on design criteria and maintenance performed at the facility.
Minor:	An observed deficiency (e.g. erosion, seepage, vegetation, etc.) where the current maintenance conditional is below what is minimally expected, but does not currently pose a threat to structural stability.
Significant:	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.
Excessive:	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 September 24, 2020 are summarized below.

5.2 Fly Ash Reservoir I Landfill Inspection Findings

The overall site layout in plan view is shown in Appendix A. The site inspection began in the southwest corner of the landfill's Cell 1 area progressing along the highwall. The inspection then observed the condition of the active fill areas of both cells progressing to the closed and capped portions/perimeter berms of the landfill. As previously noted, Cells 4, 6, 5, and 2 have not been constructed but have been used to stockpile fill materials for future construction activities. A photographic log of the facility site conditions at the time of the September 24, 2020 inspection is included in Appendix B.

Areas where no activity was taking place were observed to be in excellent condition and were protected using a polymeric dust suppressant which had been sprayed on the surface (Photo 1). No fugitive dust was observed on the date of the inspection at any location. The temporary slopes within the active waste placement areas were also observed to be in excellent condition exhibiting uniform slopes, no erosion, slumping or other signs of instability or displacement.

The bedrock highwall located along the western perimeter of Cell 1 appeared to be stable with no significant rock overhangs, rockfall or other signs of instability. The bedrock highwall is composed of alternating sequences of thin to thick bedded limestone interbedded with shale and siltstone reaching a height of 60 ft. No ponded water or uncontrolled seepage flows were observed at the base of the highwall, suggesting that the seepage collection system is functioning as intended. (Photo 2).

The active fill areas within Cell 3 were observed to be well maintained and in excellent condition. A majority of the gypsum in Cell 3 footprint has been actively reclaimed for beneficial utilization. The excavated area did not have any significant ponded water or erosion within the cell and appeared to be well graded to promote drainage to the LCS's risers (also referred to as chimney drains). The riser structures (exposed on account of the excavation activities) were surrounded and protected by a layer of CCR to prevent impact from heavy equipment (Photo 3).

All areas with protective vegetative cover established such as the closed portion of the landfill and berms had a healthy grass stand of vegetation that was mowed and well maintained. The northern closed area was in excellent condition. No erosion or animal burrows were observed, and the slopes were uniform (i.e. no slumping or bulging) and appeared to be well drained. No standing water was observed or soft/wet areas on the surface. (Photos 4 and 5).

The pedestal for settlement profiler No.1 is depicted in Photo 6 showing typical conditions. Photo 7 depicts settlement profiler No.2 which also shows good conditions along with the LCS manhole showing excellent conditions (i.e. no cracking, spalling or exposed rebar). Photo 8 shows the excellent conditions of the manhole interior. The landfill's leachate was observed to be freely flowing into the manhole.

The access road into Cell 3 is in good condition and crosses the perimeter ditch that collects non-contact storm water. A HDPE 16 " culvert was observed to be in fair condition and is partially blocked by the accumulation of sediment (Photo 9).

The interim berm between Cell 3 and the landfill's undeveloped cells was observed to be in good condition with the slope terminating at a crest which forms a temporary ditch along the perimeter of the cell to convey contact storm water to the LCS (Photo 10). The interim slope is constructed with a temporary cover soil in which an established vegetation was observed to be in good condition, free of displacement or other signs of instability.

The exposed gypsum slope depicted in Photo 10 also shows excellent conditions and has been treated with a dust suppression polymer that also protects the slope from erosion. The dark colored fill depicted in Photo 10 is the wastewater treatment plant solids being placed in Cell 3.

Photo 11 shows typical conditions of various stockpiles located within the undeveloped cells of the landfill. This is to control/reduce future settlement of the cells when they are constructed. The stockpiles are well graded to promote drainage.

The junction structures for the leachate collection system and spring drain/SDL were observed to be in good condition and were freely flowing on the date of the inspection.

The landfill's LCS terminal point for the transmission pipe was observed to be in excellent condition which was discharging the leachate effluent freely and was observed to be visually clear prior to flowing into the FAR II pond (Photo 12).

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 2019 inspection. The changes that have occurred result from a limited placement of wastewater treatment plant solids (14,300 cy.) 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 1109 feet above MSL.

As stated previously, areas of Cell 3 were actively excavated in 2020, and experienced a lowering of the top of waste elevation. This lowering was up to a maximum of about 17 ft.

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

The FAR I landfill was not frequently used in the past year and received small amounts of additional CCR or other solid waste in 2020. The plant is pursuing a successful beneficial utilization of gypsum and therefore gypsum is not typically disposed of in the landfill facility.

The total volume of waste material contained in the Cardinal Plant CCR Landfill has decreased to 1.9 million cubic yards resulting from the continued reclamation of gypsum from the landfill. The estimated net volume of gypsum excavated and reclaimed for beneficial utilization from the landfill for 2020 is approximately 143,000 tons (approximately 113,000 CY).

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 2020 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.

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. The discrepancy was pointed out to Cardinal Operating Company, which took action to regrade and lower the grade in the area. A resurvey performed in early 2019, which verified that the grade had been lowered.

The current survey indicates that all areas of active placement within Cells 1 and 3 have surface elevation that lies below the permitted top of waste grade.

6. Conclusions

The landfill's earthen berms, and open, closed, and inactive areas appear to be in excellent 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 excellent condition. The closed areas of the landfill appeared to be stable and well maintained. The discharge structures and pipes were in excellent 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.

7.2 Open Areas

1. Continue to monitor the leachate collection system and spring drain collection system for unobstructed flow. Clean out the ditch to the FAR 2 pond to facilitate unobstructed flow from the SDL.
2. 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

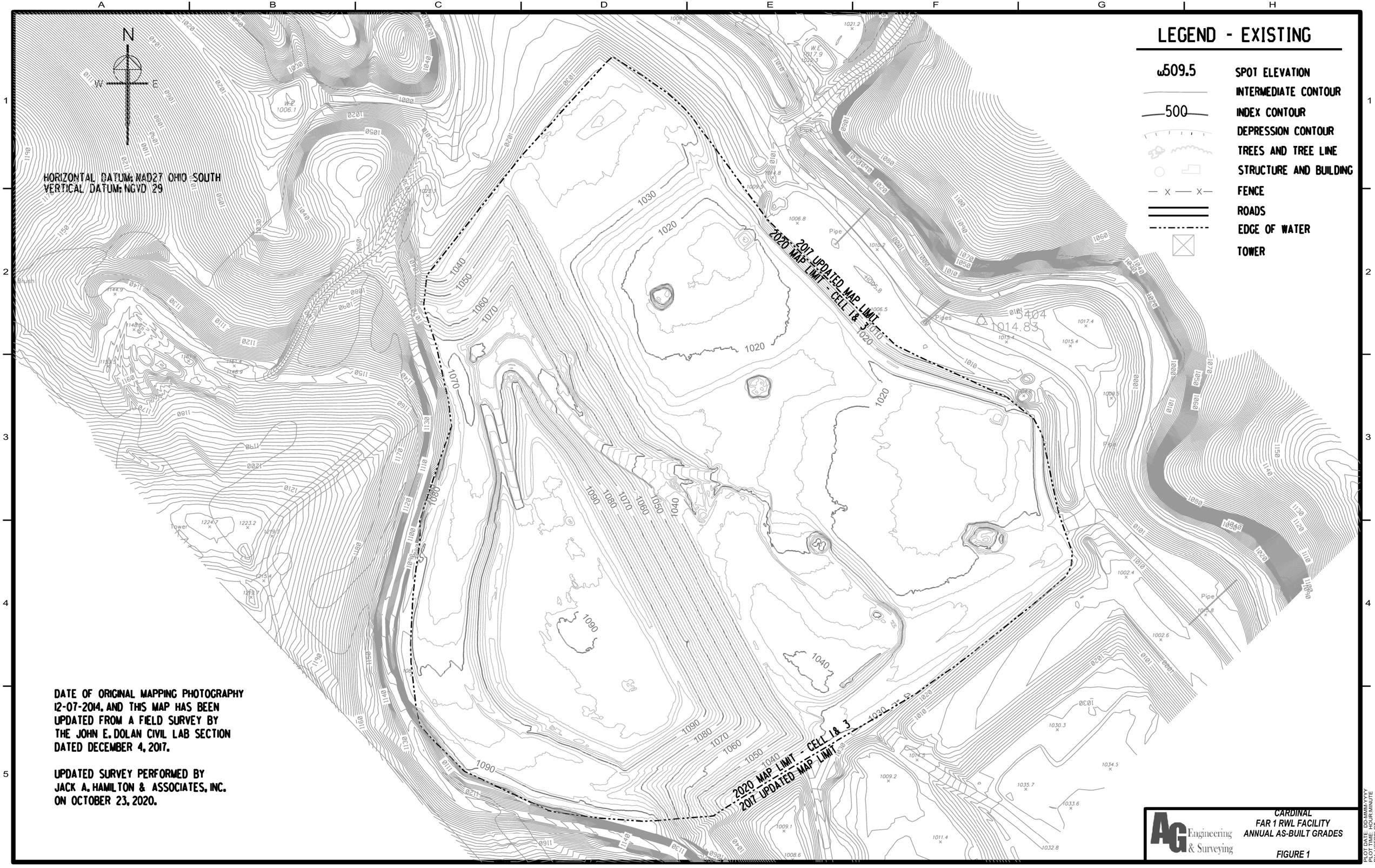
1. There were no deficiencies, signs of structural weakness, or signs of disruptive conditions observed at the time of the inspection that would require additional investigation or remedial action.

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 - EXISTING

- ω509.5 — SPOT ELEVATION
- INTERMEDIATE CONTOUR
- 500 — INDEX CONTOUR
- DEPRESSION CONTOUR
- TREES AND TREE LINE
- STRUCTURE AND BUILDING
- FENCE
- ROADS
- EDGE OF WATER
- TOWER

DATE OF ORIGINAL MAPPING PHOTOGRAPHY 12-07-2014, AND THIS MAP HAS BEEN UPDATED FROM A FIELD SURVEY BY THE JOHN E. DOLAN CIVIL LAB SECTION DATED DECEMBER 4, 2017.

UPDATED SURVEY PERFORMED BY JACK A. HAMILTON & ASSOCIATES, INC. ON OCTOBER 23, 2020.

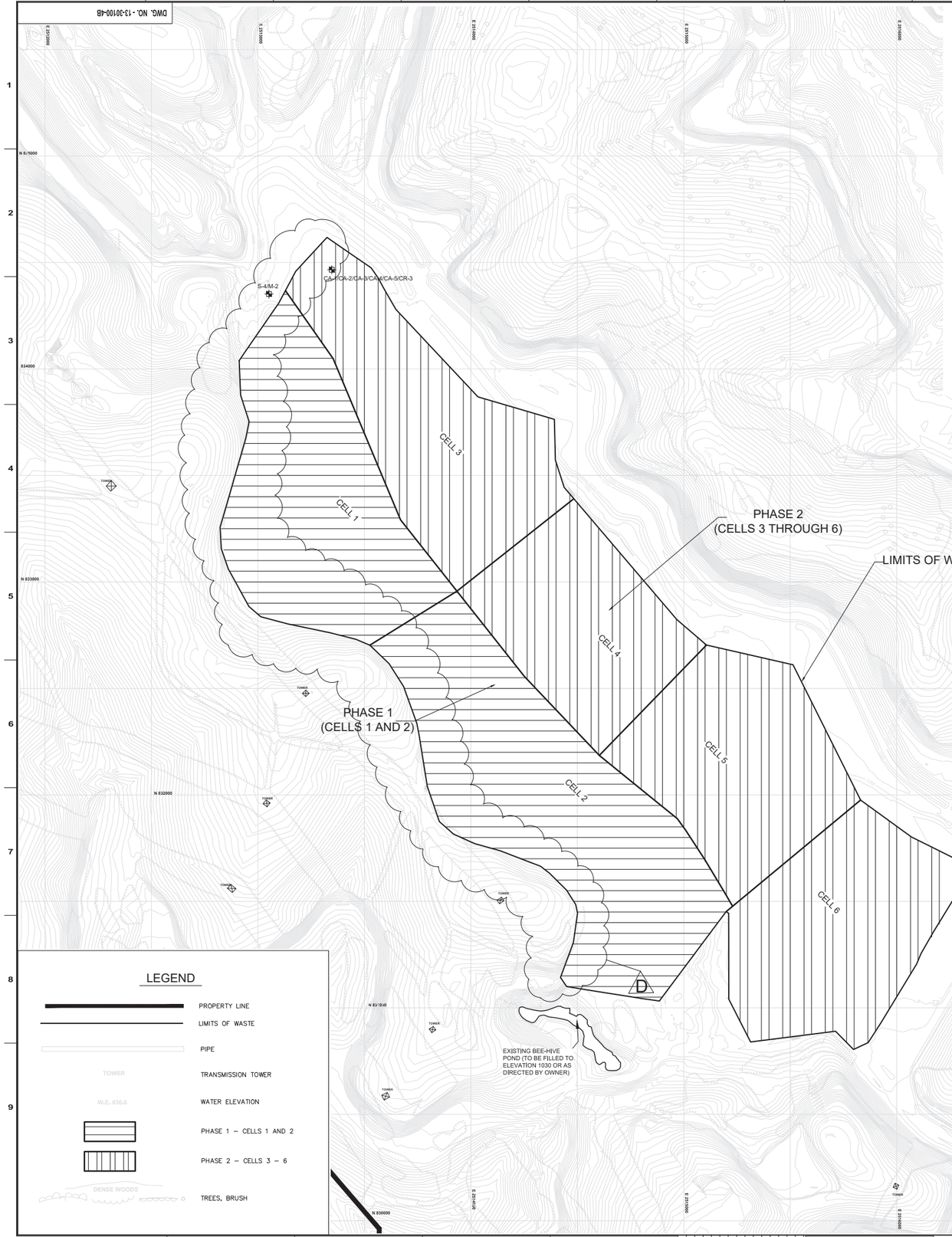
AG Engineering & Surveying

CARDINAL
FAR 1 RWL FACILITY
ANNUAL AS-BUILT GRADES

FIGURE 1

PLOT DATE: DD-MMM-YYYY
PLOT TIME: HOUR:MINUTE
BY: USERPLOT
CROSS REFS:

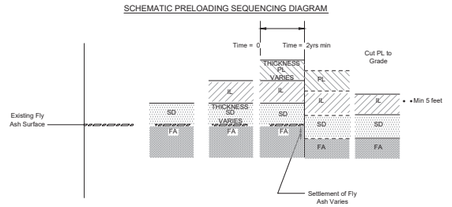
DWG. NO. - 13-30100-4B



LEGEND

- PROPERTY LINE
- LIMITS OF WASTE
- PIPE
- TOWER — TRANSMISSION TOWER
- W.E. 836.6 — WATER ELEVATION
- PHASE 1 – CELLS 1 AND 2
- PHASE 2 – CELLS 3 – 6
- DENSE WOODS — TREES, BRUSH

SCHEMATIC PRELOADING SEQUENCING DIAGRAM



SCHEMATIC LEGEND

- FA (FLY ASH)
- SD (SUBSURFACE DRAINAGE / CONTOURING FILL LAYER)
- PL (PRELOAD LAYER)
- IL (ISOLATION LAYER)

CELL #	AREA (ACRE)	WASTE VOLUME (CY)
1	23.03	2,042,000
2	31.65	3,049,000
3	21.25	2,894,000
4	15.68	4,083,000
5	18.66	4,602,000
6	19.18	2,273,000
TOTAL	129.45	18,943,000

VOLUMES GIVEN ABOVE REPRESENT VOLUMES DETERMINED FROM THE SERIES 6 CONSTRUCTION STAGING AND OPERATION DRAWINGS.

PHASE 1 CONSTRUCTION

1. IMPROVE EXISTING ACCESS ROADS AND CONSTRUCT LAY DOWN AREAS, STAGING AREAS, AND EROSION CONTROL STRUCTURES.
2. EXCAVATE EXISTING MINE SPOIL FROM PHASE 1 AREA. (SEE SHEET 4C FOR GRADING PLAN)
3. PROCESS MINE SPOIL FOR PLACEMENT AS ISOLATION LAYER MATERIAL FOR PHASE 1, PHASE 2, AND AS REPLACED SUBGRADE MATERIAL.
4. STOCKPILE PROCESSED MATERIAL IN PHASE 1 AREA OR ANOTHER DESIGNATED AREA.
5. PLACE PRELOAD IN PHASE 2 CELLS.
6. PLACE SUBGRADE MATERIAL ABOVE EXCAVATED AREA (SEE SHEET 4D FOR GRADING PLAN).
7. CONSTRUCT PHASE 1 SUBSURFACE DRAINAGE LAYER ABOVE SUBGRADE (MINIMUM 2 FEET THICK) (SEE SHEET 4E).
8. PLACE GEOTEXTILE ABOVE SUBSURFACE DRAINAGE LAYER AS SEPARTOR.
9. CONSTRUCT CONTOURING FILL LAYER (SEE SHEET 4F).
10. CONSTRUCT PHASE 1 ISOLATION LAYER (MINIMUM 5 FEET THICK) (SEE SHEET 4G).
11. CONSTRUCT PHASE 1 RECOMPACTED SOIL LINER ABOVE ISOLATION LAYER (MINIMUM 1.5 FEET THICK) (SEE SHEET 4I).
12. PLACE GEOMEMBRANE ABOVE RECOMPACTED SOIL LINER (PVC LINER).
13. PLACE GEOTEXTILE AS CUSHION ABOVE GEOMEMBRANE.
14. CONSTRUCT TEMPORARY LEACHATE PIPING ACROSS FAR 1 BENEATH BOTTOM OF PHASE 2 ISOLATION LAYER (SEE SHEETS 6A AND 7B).
15. CONSTRUCT LEACHATE MANAGEMENT SYSTEM COLLECTION MANHOLES, TRANSMISSION PIPING AND SAMPLING STRUCTURE.
16. CONSTRUCT PHASE 1 LEACHATE MANAGEMENT LAYER (MINIMUM 1 FOOT THICK)) AND PLACE GEOTEXTILE AS SEPARATOR AND FILTER ABOVE AND BELOW LAYER (SEE SHEET 4J).
17. PLACE PROTECTIVE COVER (MINIMUM 3 FEET THICK) ABOVE LEACHATE COLLECTION LAYER.
18. CONSTRUCT INTERPHASE BERM AND TEMPORAY LINER SYSTEM TERMINATION BETWEEN PHASE 1 AND PHASE 2.
19. BEGIN PHASE 1 WASTE PLACEMENT OPERATIONS (SEE SHEET 4K).
20. AS WASTE REACHES FINAL GRADES, BEGIN FINAL COVER PLACEMENT IN ACCORDANCE WITH FINAL COVER CONSTRUCTION STAGING AND OPERATION STAGES. (SEE SHEET 6B AND 6C).

PHASE 2 CONSTRUCTION

1. CONSTRUCT PHASE 2 SUBSURFACE DRAINAGE LAYER ABOVE EXISTING FAR 1 COVER (MINIMUM 2 FEET THICK) (SEE SHEET 4E).
2. PLACE GEOTEXTILE ABOVE SUBSURFACE DRAINAGE LAYER AS SEPARATOR.
3. CONSTRUCT CONTOURING FILL LAYER (SEE SHEET 4F).
4. CONSTRUCT PHASE 2 ISOLATION LAYER (MINIMUM 5 FEET THICK) (SEE SHEET 4G).
5. PLACE TEMPORY GEOTEXTILE LOCATOR AND CONSTRUCT MINESPOIL PRELOAD IN PHASE 2 CELLS (SEE SHEET 4H).
6. REMOVE PRELOAD AND GEOTEXTILE LOCATOR. REESTABLISH BASE GRADE AND FILL AND RECOMPACT SURFACE TO ISOLATION LAYER MINIMUM REQUIREMENTS (SEE SCHEMATIC PRELOADING PLACING DIAGRAM ON THE LEFT).
7. CONSTRUCT PHASE 2 RECOMPACTED SOIL LINER (MINIMUM 1.5 FEET THICK) ABOVE RECOMPACTED ISOLATION LAYER (SEE SHEET 4I).
8. PLACE GEOMEMBRANE ABOVE RECOMPACTED SOIL LINER (PVC LINER).
9. PLACE GEOTEXTILE AS CUSHION ABOVE GEOMEMBRANE.
10. CONSTRUCT PHASE 2 LEACHATE MANAGEMENT LAYER (MINIMUM 1 FOOT THICK) AND PLACE GEOTEXTILE AS SEPARATOR AND FILTER ABOVE. ABANDON OR REMOVE PREVIOUS TEMPORARY LEACHATE PIPING AFTER CONNECTION OF PHASE 2 PERMANENT PIPING.
11. PLACE PROTECTIVE COVER (MINIMUM 3 FEET THICK) ABOVE LEACHATE COLLECTION LAYER. REMOVE PORTION OF INTER PHASE BERM ABOVE PROTECTIVE COVER.
12. BEGIN PHASE 2 WASTE PLACEMENT OPERATIONS (SEE SHEET 4K).
13. AS WASTE REACHES FINAL GRADES, BEGIN FINAL COVER PLACEMENT IN ACCORDANCE WITH FINAL COVER CONSTRUCTION STAGING AND OPERATION STAGES. (SEE SHEET 6D THRIUGH 6G AND 4M FOR FINAL GRADES).

DATE	NO.	DESCRIPTION	APPD.
	D	PTI MODIFICATION NO. 1	
NOV 17 2009	C	REVISED - NOD 2 RESPONSE	DGB
MAY 25 2006	B	REVISED - NOD 1 RESPONSE	DGB
OCT 24 2005	A	ISSUED FOR PERMIT	DGB

REVISIONS

CARDINAL OPERATING COMPANY

CARDINAL PLANT

BRILLIANT OHIO

TITLE:

CARDINAL FAR 1
RESIDUAL WASTE LANDFILL
GENERAL DEVELOPMENT

DWG. NO. 13-30100-4B-D

SCALE:	CIVIL ENGINEERING DIVISION
DR:	
CH:	
ENGR.	
PROJ. ENGR.	
DATE:	

APPROVED BY

SIGNATURE

DATE

AEP AMERICAN ELECTRIC POWER — 1 RIVERSIDE PLAZA COLUMBUS, OH 43215

O.E.P.A. DRAWING NO. 4B

DRAWING 4B OF 39

FIGURE 2

IGS1092

SYSTEM DATE- SYSTEM TIME- 15th FLICED

Appendix B

Landfill Inspection Photographs

Photo 1

Cell 1 FGD Gypsum slope showing excellent conditions (i.e. no erosion, slumping or bulges).

Photo 2

Cell 1 highwall slope showing stable conditions.

Photo 3

Cell 3 FGD Gypsum landfill showing the active fill area.

Photo 4

Cell 3 FGD Gypsum landfill showing the closed and permanent cover cap area.

Photo 5

Cell 3 FGD Gypsum landfill showing a well established vegetative cover over the closed and permanent cover cap area.

Photo 6

Settlement pedestal for the Landfill's No. 1 settlement profiler.

Photo 7

Settlement pedestal for the Landfill's No. 2 settlement profiler with the leachate collection system manhole.

Photo 8

Interior view of manhole showing leachate flowing freely into the manhole.

Photo 9

Minor sediment build up in 16 in the HDPE culvert at the access road leading into the landfill.

Photo 10

Interim berm for Cells 1 and 3 showing excellent vegetative cover on lower portions of the slope. The upper portion of the slope showing exposed FGD Gypsum is also in excellent condition and has been treated with a dust suppressant polymer. The dark colored fill is calcium chloride waste that is also generated from the plant's SO_2 scrubbing operation.

Photo 11

Typical view of stockpile fill materials that will be used in future expansions of the landfill.

Photo 12

Typical view of leachate discharge from the leachate transmission pipe flowing freely and was observed to be visually clear.