



2017 ANNUAL ENGINEERING INSPECTION REPORT

ENTERGY INDEPENDENCE PLANT CLASS 3N LANDFILL

PERMIT NO. 0200-S3N-R2
AFIN: 32-00042

JANUARY 17, 2018

terracon.com

The Terracon logo is repeated in a dark red rounded rectangle at the bottom right of the page. It features the word "Terracon" in a bold, white, sans-serif font. The letter "T" is stylized with a vertical bar on its left side.

Environmental



Facilities



Geotechnical



Materials

2017 Landfill Inspection Report

Entergy Independence Plant
Class 3N Landfill
Newark, Arkansas

Permit No. 0200-S3N-R2
AFIN: 32-00042

January 2018
Project No. 35177248

Prepared for:
Entergy Independence Plant
555 Point Ferry Road
Newark, AR 72562

Prepared by:
Terracon Consultants, Inc.
25809 Interstate 30 South
Bryant, Arkansas 72022
(501) 847-9292

terracon.com

Terracon

Environmental



Facilities



Geotechnical



Materials

PROFESSIONAL ENGINEER'S CERTIFICATION

This report on the annual engineering inspection of the Entergy Independence Plant Class 3N Landfill and supporting documentation was prepared under the direction and supervision of a qualified, State of Arkansas-registered Professional Engineer. Mr. David McCormick, PE, of Terracon Consultants, Inc. (Terracon), was responsible for the overall preparation of this report. The report has been prepared to fulfill the requirements of §257.84(b). Based on the inspection of the landfill facility and review of available landfill documents the design, construction, operation, and maintenance of the landfill is consistent with recognized and generally accepted good engineering standards.

David C. McCormick, P.E.
Arkansas Professional Engineer No. 9199



1/17/2018

Date



Expires 12.31.19

TABLE OF CONTENTS

PROFESSIONAL ENGINEER’S CERTIFICATION	i
1.0 INTRODUCTION.....	1-1
1.1 Purpose of Report.....	1-1
1.2 Independence Power Plant Information	1-1
1.3 Permit History	1-2
2.0 LANDFILL LAYOUT	2-1
2.1 Existing Conditions of Landfill	2-1
2.2 Changes Made to Landfill Configuration During Reporting Period.....	2-1
3.0 WASTE VOLUME CALCULATIONS	3-1
4.0 ASSESSMENT OF LANDFILL FACILITY	4-1
4.1 General Operations.....	4-1
4.2 Landfill Cover System.....	4-1
4.3 Leachate Collection System	4-1
4.4 Stormwater Control System.....	4-1
4.5 Facility Roads	4-2
4.6 Fugitive Dust Control	4-2

LIST OF APPENDICES

APPENDIX A:	Figures
APPENDIX B:	Photos of Annual Engineering Inspection

LIST OF TABLES

Table 2.1	Construction Summary of Independence Plant Class 3N Landfill
Table 3.1	Summary of Waste Volume Calculations

1.0 INTRODUCTION

1.1 Purpose of Report

The purpose of this report is to document the annual inspection of the Entergy Independence Landfill facility in accordance with 40 CFR §257, *Subpart D - Disposal of Coal Combustion Residuals From Electric Utilities* (the CCR Rule). In particular, the report has been prepared to comply with §257.84(b), which requires an inspection to be conducted by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the landfill is consistent with recognized and generally accepted good engineering standards.

The report includes:

- Information on the current layout of the landfill,
- Waste volume estimates for the amount of waste contained in the landfill and remaining disposal capacity, and
- An assessment of the landfill including structural integrity and overall operations with respect to the CCR Rule and the facility permit requirements.

1.2 Independence Power Plant Information

The Plant is located on approximately 1,850 acres about 2-½ miles southeast of Newark in Independence County, Arkansas as shown on **FIGURE 1** (all figures are included in **APPENDIX A**). The site is characterized by minimal topographic relief and is situated within the White River floodplain.

The Plant has been in operation since 1983 and has historically generated electricity through the combustion of Powder River Basin (PRB) (Wyoming) sub-bituminous coal. The ash, a coal combustion by-product (or residue) (CCR), is generally segregated into two categories, “fly” and “bottom” ash.

Approximately 80% of the ash produced is classified as fly ash that is derived from the boiler exhaust gas and collected in electrostatic precipitators. The fly ash is composed of very fine particles similar to glass and has the consistency of a powder. Collected fly ash is blown to silos for short-term storage. A subcategory of the fly ash is known as economizer ash. This material is the coarsest fraction of the fly ash that drops out before the electrostatic precipitators, and represents approximately 2% of the fly ash production.

The bottom ash is composed of angular, glassy particles with a porous surface texture and has the consistency of coarse sand. The bottom ash is sluiced principally to dewatering hoppers for removal of water and for storage.

Historically, approximately 60 to 70% of the two types of ash have been marketed regionally to construction-related industries. The remaining amount of ash has been placed in the onsite Landfill for disposal.

1.3 Permit History

In October 1982, Arkansas Power & Light Company (AP&L) was granted a permit (#200-S) from the Arkansas Department of Environmental Quality (ADEQ) to construct and operate a solid waste disposal facility at the Plant. Entergy Arkansas, Inc. became AP&L's successor in interest in April 1996. The permit was modified in 2002 to update the landfill to comply with Arkansas Pollution Control and Ecology Commission (APCEC) Regulation No. 22 (Solid Waste Management Code) design and operational standards for Class 4 (inert waste) Landfills. The current facility permit (0200-S3N-R2) was issued in December 2014 and includes design and operational modifications to the landfill facility to comply with Regulation No. 22 requirements for Class 3N (Industrial) Landfills.

2.0 LANDFILL LAYOUT

2.1 Existing Conditions of Landfill

The permitted landfill area consists of approximately 335 acres and is located in the northeastern portion of the plant site as shown on **FIGURE 2**. The Landfill is designed to be developed through three phases, which only Phases 1 and 2 are currently permitted for development. The current layout of the Landfill includes a total of 22 disposal cells and has a permitted waste capacity of approximately 13,000,000 cubic yards (cy). Waste Cells 1 through 15 have been constructed and Waste Cells 12, 13, 14, and 15 currently comprise the active disposal area of the Landfill having received CCR materials after October 19, 2015.

Construction of the disposal cells has followed the numerical sequence of the cell numbers with all design, construction, operation and maintenance in compliance with the requirements of APCEC Regulation 22. Cells 1 through 11 were constructed, operated and closed prior to the effective date of the CCR Rule and are not covered by the requirements of the Rule. Cells 12 through 15 are existing landfill CCR units and will be operated in accordance with requirements of the CCR Rule.

Table 2.1 presents a summary of the existing CCR Unit disposal cells that have been constructed at the Independence Landfill.

Table 2.1. Construction Summary of Independence Plant Class 3N Landfill

Cell Number	Year Built	Bottom Liner System	Year Closed	Final Cover System	Status
12	Pre-1996	Original permit	N/A	N/A	Open and active disposal area
13	Pre-1996	Original permit	N/A	N/A	Open and active disposal area
14	2000;2006	Original permit; 2002 permit	N/A	N/A	Open and active disposal area
15	2011	Current permit	N/A	N/A	Open and active disposal area

2.2 Changes Made to Landfill Configuration During Reporting Period

During the reporting period, no changes were made to the landfill configuration. Cells 12 through 15 are open and are actively receiving waste. No new cells were opened, and no existing cells were closed.

3.0 WASTE VOLUME CALCULATIONS

The landfill facility has been surveyed annually since 1996. Each year's survey is compared to the previous year to compute the amount of CCR disposed. The current survey is also compared to the ADEQ permitted top of waste elevations to determine remaining capacity, or airspace. Additionally, the current survey is compared to an estimated "operational" top of waste to determine the remaining operational capacity. The operational top of waste is the maximum disposal elevation that can be achieved within the open cells while maintaining the required 4:1 exterior and 3:1 interior slopes along with a top width sufficient for disposal activities. If additional operational capacity is needed, construction of an adjacent disposal cell will be required.

Disposal rates for the facility are calculated using the average of the disposal rates from the five most recent years. Disposal rates depend upon CCR production at the plant and sales of the ash. These can vary significantly year to year based upon the current economic climate, weather, and how much the plant is operational.

During the reporting period, there were four waste cells (Waste Cells 12 through 15) open at the site. These areas are shown on **FIGURE 2**.

Digital terrain modeling techniques were used to determine volumes of ash disposed during the current reporting period. Surface models were originally created for the Landfill's surface from aerial photography taken in June 1996 and for the originally permitted proposed final surfaces. The surface models were updated in 1997 through 2015 based on field and/or aerial survey data. For this report, the active areas were surveyed on December 12, 2016. The surface generated from the current survey was compared to the December 17, 2015, survey surface model utilizing AutoCAD Civil 3D software to estimate volume changes that have occurred over the reporting period. Table 3.1 summarizes volume changes for the current reporting period and estimated remaining capacity by waste cell.

Table 3.1 Summary of waste volume calculations.

Cell Number	Status	Area (ac)	ADEQ Permitted Waste Capacity (cy)	2017 Volume Placed (cy)	Total Volume Placed (cy)	Operational Remaining Disposal Capacity (cy)	Operational Remaining Life (years)
Cell 12	Active	5.7	434,800	-1,300	317,800	117,000	1.1
Cell 13	Active	5.7	372,300	-400	291,200	81,100	0.7
Cell 14	Active	15.0	807,400	3,600	776,900	30,500	0.3
Cell 15	Active	18.2	1,258,100	112,400	427,100	691,400	6.2
Totals		44.6	2,872,600	114,300	1,813,000	920,000	8.3

Based upon the digital terrain model, the net volume of material filled in Waste Cells 12 through 15 during the reporting period was calculated to be approximately 114,300 cubic yards (cy). Final permitted contours are shown in **FIGURE 3**. Based upon a 5-year historical annual average disposal rate of approximately 111,300 cy of material, there are about 8.3 years of capacity left in Waste Cells 12 through 15. This time frame is affected by the market for ash material and may be shorter or longer depending on market conditions.

4.0 ASSESSMENT OF LANDFILL FACILITY

This section of the report provides a summary of the inspection of the Entergy Independence Plant Class 3N Landfill facility that was conducted on November 21, 2017. The assessment included observation of the landfill operating company, Headwaters Resources Inc. (HRI) personnel, discussions with Entergy Services Inc. (Entergy) personnel, review of weekly inspections of the facility, review of documents pertaining to the operation and compliance of the landfill, and an onsite inspection of the landfill facility. Photographs of the site inspection are included in **APPENDIX B**.

4.1 General Operations

In general, the final and interim slopes of the active waste cells appeared to be stable. The side-slopes of the landfill are generally at the required 4:1 external and 3:1 interior slope requirements. No tension cracks, seeps, or other features that indicate a potential slope failure were observed during the site inspection. In addition, no active seeps were noted.

The general operations of the landfill facility are being done in a safe manner and the overall maintenance of the facility is in good condition.

4.2 Landfill Cover System

None of the active cells, 12 through 15, are partially closed or have interim cover.

4.3 Leachate Collection System

As required by APCEC Regulation 22, Cell 15 is constructed with a leachate collection system. The system consists of a six-inch diameter high-density polyethylene (HDPE) perforated pipe installed in the center of Waste Cell 15. The pipe drains to a washed gravel-filled sump located on the toe of the eastern slope of the cell. From the sump, leachate is pumped via a dual-contained HDPE pipeline (4" diameter/8" diameter) to the discharge point at the plant's Surge Pond south of the landfill in accordance with the facility's current National Pollutant Discharge Elimination System (NPDES) Permit. Overall, the leachate collection system appeared to be in good working order.

4.4 Stormwater Control System

No issues were found with the Stormwater control system during the inspection. In accordance with the facility's Operation Plan required by the current Class 3N solid waste permit, HRI conducts periodic inspections of the condition of the system and makes appropriate repairs as needed.

Temporary berms are used down gradient of the active area to help minimize the potential for sediment transport from the area. Perimeter ditches and drainage conveyances are used to direct stormwater around the landfill area. Culverts are installed at the southwest corner of the Landfill to allow drainage beneath the perimeter access road.

All stormwater run-on and runoff from the permitted landfill area is ultimately discharged to the Plant's Surge Pond. Water from the Surge Pond is pumped to sedimentation basins that are part of the Plant's wastewater treatment system. After treatment in the sedimentation basins, the water is either used as cooling water in the plant or discharged to the White River. Discharges to the White River are permitted under NPDES Permit No. AR0037451. Treated runoff from the Landfill is a listed source for this NPDES permit.

4.5 Facility Roads

The facility roads were well maintained at the time of the inspection. The disposal access road to the active cells is paved, and it was in excellent condition at the time of the inspection. The perimeter access road has an all-weather surface coarse and was in good condition.

4.6 Fugitive Dust Control

In accordance with the facility's CCR Fugitive Dust Control Plan, HRI routinely sprays the working face and haul roads using water trucks to control dust from the fly ash. Fly ash is deposited in the landfill by belly-dumping from the bottom of the tanker trucks in order to minimize the material drop distance. Bottom ash and economizer ash are in a moist condition when transported to the landfill. The landfill access roads have enforced posted speed limit of 25 mph. Within the landfill boundary, a 5 mph speed limit is enforced. During the inspection, minimal fugitive dust was observed.

APPENDIX A
Figures



SITE MAP

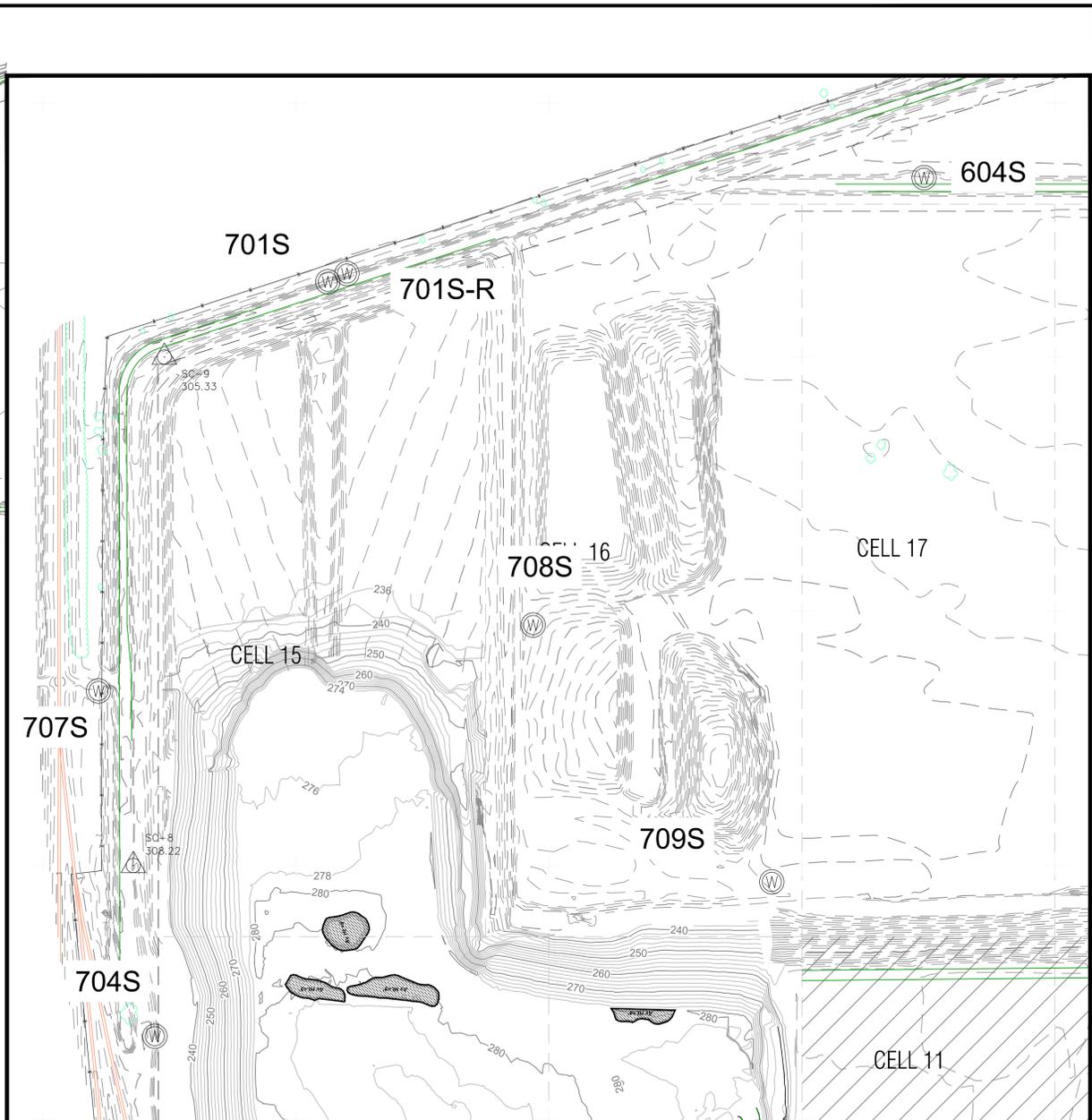
Project Mngr:	TLB
Drawn By:	SRE
Checked By:	DCM
Approved By:	DCM
Project No.	026-001-35177248
Scale:	AS SHOWN
File No.	001
Date:	1/05/2018

Terracon
 Consulting Engineers and Scientists

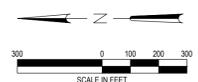
25809 I-30 SOUTH BRYANT, AR 72022
 PH. (501) 847-9292 FAX. (501) 847-9210

SITE MAP 2017 LANDFILL INSPECTION REPORT ENERGY INDEPENDENCE PLANT CLASS 3N LANDFILL NEWARK ARKANSAS

FIG. No.	1
----------	---

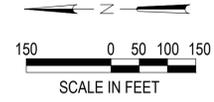


SEE VIEW "A"



NOTES:
 1. TOPOGRAPHIC INFORMATION IS FROM AN AERIAL SURVEY BY AMI ENGINEERING, INC. (MAY 2003) AND A FIELD SURVEY BY HARMON SURVEYING (NOVEMBER 2017).
 2. SURVEY CONTROL POINTS WERE ESTABLISHED IN AUGUST 1997 BY DESIGN, DRAFTING, SURVEYING, AND MAPPING, LLC.

- LEGEND**
- INDEX CONTOUR
 - INTERMEDIATE CONTOUR
 - 🌳 TREES
 - EXISTING ROAD (UNPAVED)
 - EXISTING ROAD (PAVED)
 - EXISTING RAILROAD
 - CELL BOUNDARY
 - LANDFILL PERMIT BOUNDARY
 - PROPOSED TOP OF FINAL COVER
 - PLANT GRID TICK
 - △ SC-# ELEV. SURVEY CONTROL BENCHMARK
 - ▨ CLOSED WASTE DISPOSAL AREA
 - ⊙ 511S MONITORING WELL LOCATION



VIEW "A"

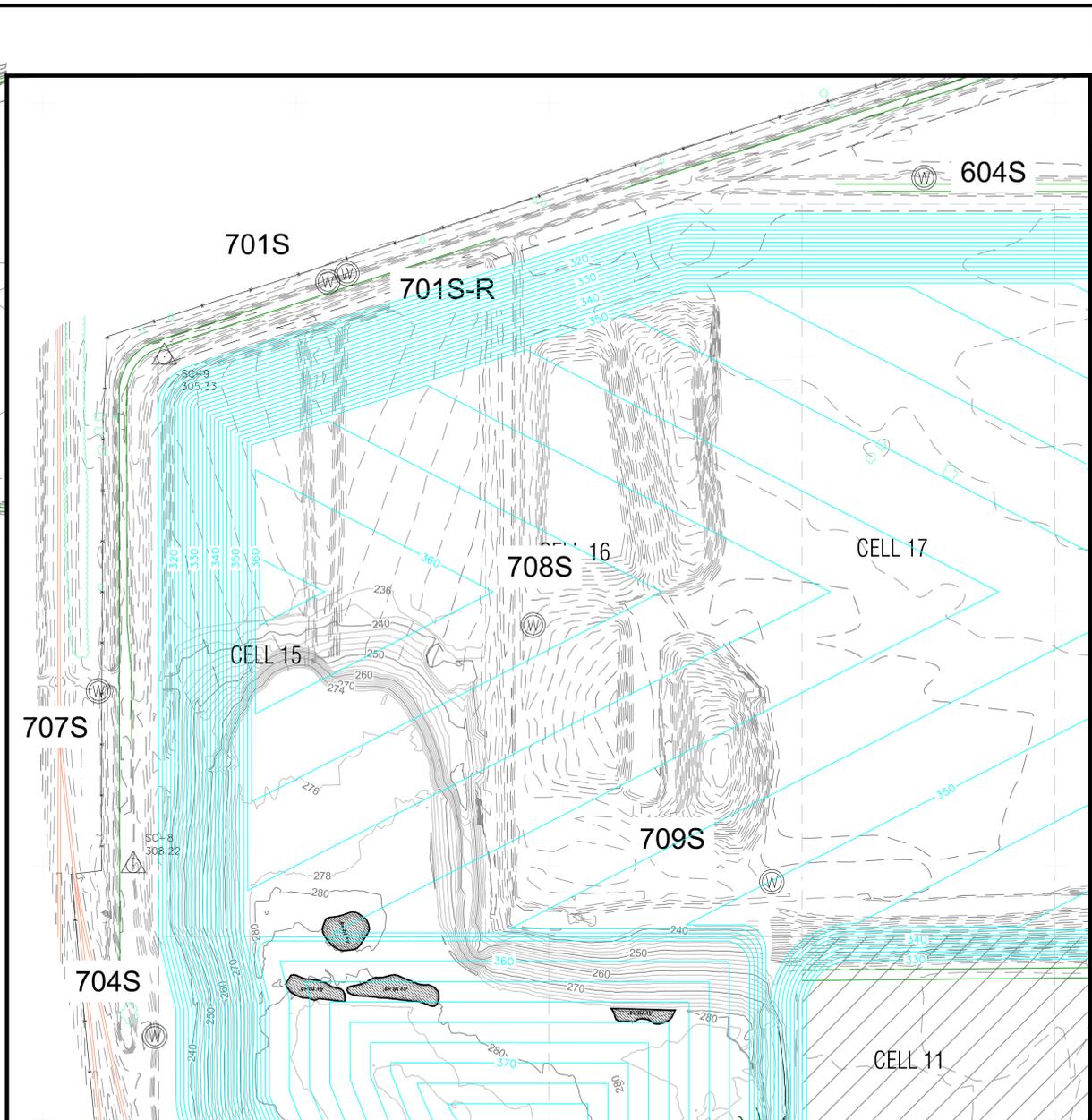
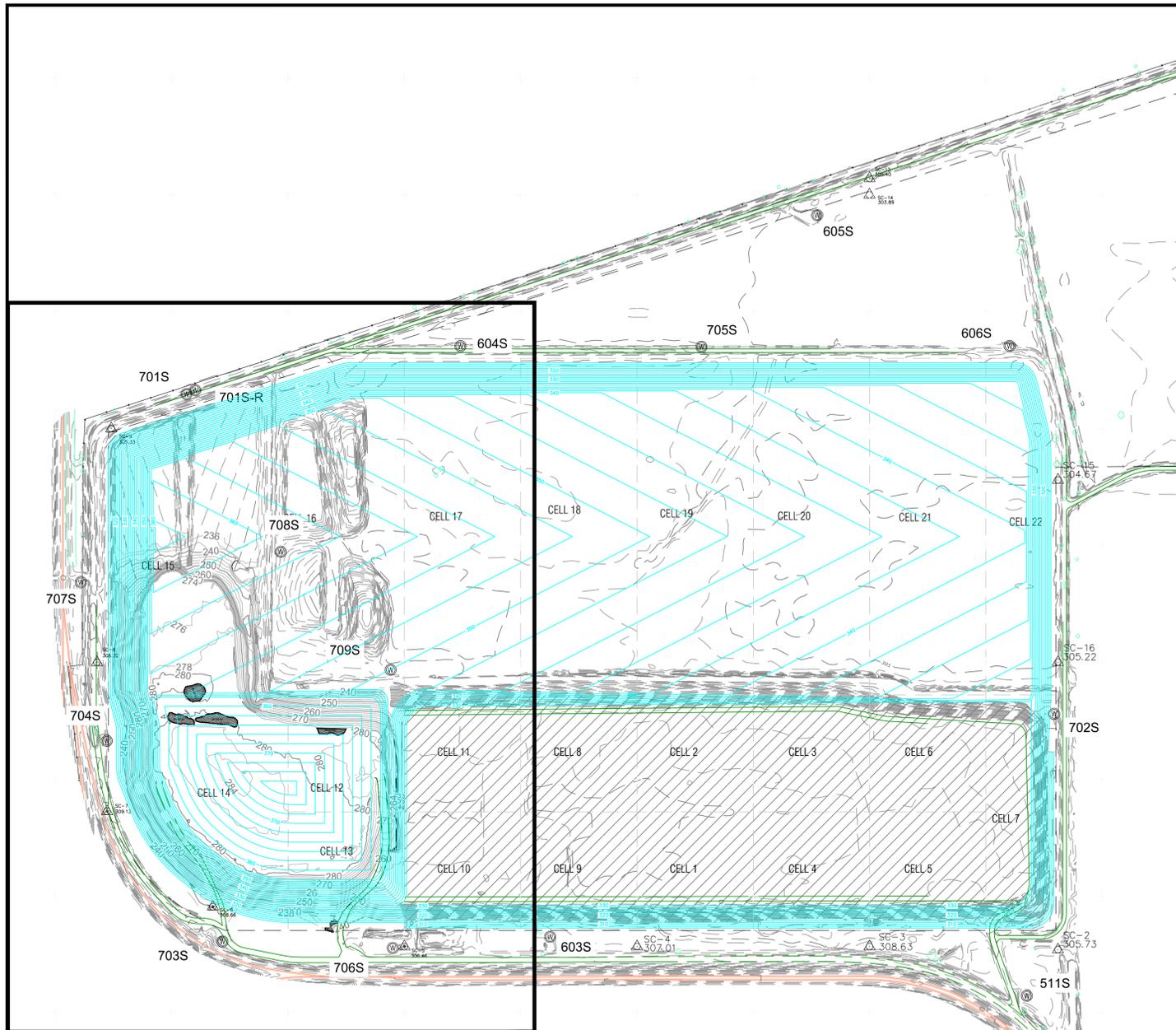
REV	DATE	BY	DESCRIPTION

EXISTING CONDITIONS
 2017 LANDFILL INSPECTION REPORT
ENERGY INDEPENDENCE PLANT
 CLASS 3N LANDFILL
 NEWARK ARKANSAS

Terracon
 Consulting Engineers and Scientists
 BRYANT, AR 72022
 25869 I-30 SOUTH
 PH: (501) 847-9292 FAX: (501) 847-9210

FIGURE 2

DESIGNED BY:	TLB
DRAWN BY:	SRE
APPROV BY:	DCM
SCALE:	SEE BARS
DATE:	1/05/2018
JOB NO.:	026-001-3517724
ACAD NO.:	002
SHEET NO.:	2 OF 3



SEE VIEW "A"

LEGEND

- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- 🌳 TREES
- EXISTING ROAD (UNPAVED)
- EXISTING ROAD (PAVED)
- EXISTING RAILROAD
- CELL BOUNDARY
- LANDFILL PERMIT BOUNDARY
- PROPOSED TOP OF FINAL COVER
- PLANT GRID TICK
- △ SC-# ELEV. SURVEY CONTROL BENCHMARK
- ▨ CLOSED WASTE DISPOSAL AREA
- ⊙ 511S MONITORING WELL LOCATION

- NOTES:**
1. TOPOGRAPHIC INFORMATION IS FROM AN AERIAL SURVEY BY AMI ENGINEERING, INC. (MAY 2003) AND A FIELD SURVEY BY HARMON SURVEYING (NOVEMBER 2017).
 2. SURVEY CONTROL POINTS WERE ESTABLISHED IN AUGUST 1997 BY DESIGN, DRAFTING, SURVEYING, AND MAPPING, LLC.

REV	DATE	BY	DESCRIPTION

NEWARK

FINAL PERMIT CONTOURS
 2017 LANDFILL INSPECTION REPORT
ENERGY INDEPENDENCE PLANT
 CLASS 3N LANDFILL
 ARKANSAS

Terracon
 Consulting Engineers and Scientists
 BRYANT, AR 72022
 25869 I-30 SOUTH
 PH: (501) 847-9292
 FAX: (501) 847-9210

FIGURE 3

DESIGNED BY:	TLS
DRAWN BY:	SRE
APPROV. BY:	DCM
SCALE:	SEE BARS
DATE:	1/05/2018
JOB NO.:	026-001-3517724
ACAD NO.:	002
SHEET NO.:	3 OF 3

APPENDIX B
Photos of Annual Engineering Inspection



1. Cell 15 sump area looking to the west.



2. Cell 15 east dike looking to the west. The ash is kept away from the north dike to assist with leachate management.



3. Cell 15 North berm facing southeast.



4. Cell 15 north dike looking southwest. This slope drains into the storm water runoff pond.



5. Cell 14 looking to the east.



6. West side of Phase 1 looking north.



7. South side of Phase 1 looking east.



8. Southeast corner of Phase 1 looking north.