

# **Western Farmers Electric Cooperative**

**Hugo, Oklahoma**

**Combined Coal Combustion Residual  
Surface Impoundments and Landfill  
Annual Inspection Report  
Hugo Plant**

**October 2017**

Prepared by:

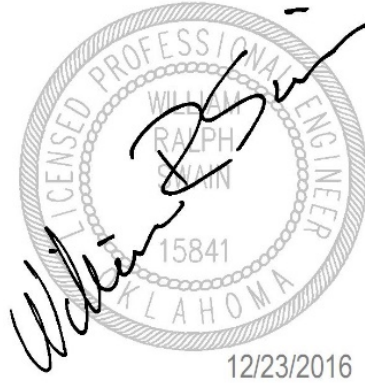


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## ENGINEERING CERTIFICATION

Pursuant to 40 CFR 257.83 and 40 CFR 257.84, and by means of this certification I attest that:

- (i) I am familiar with the requirements of 40 CFR Part 257 (CCR Rule);
- (ii) I, or my agent, have visited and inspected the CCR units at the facility that are the subject of the Annual Inspection Report;
- (iii) The aforementioned inspection(s) and this Annual Inspection Report have been conducted and prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of the CCR Rule; and
- (iv) This Annual Inspection Report meets the requirements of 40 CFR 257.83 and 40 CFR 257.84
- (v) I am a "Qualified Professional Engineer" as defined in 40 CFR 257.53 by the fact that I have the technical knowledge and experience to make specific technical certifications set forth herein.



**CA NO. 7110**  
**Expires 6-30-2018**

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## **Background**

### **Facility Description**

Western Farmers Electric Cooperative (WFEC) engaged Cardinal Engineering (Cardinal) to perform the Annual Inspection of the Coal Combustion Residual (CCR) impoundments and landfill at its Hugo Power Plant (Hugo Plant). The annual inspection is a requirement of the Environmental Protection Agency (EPA) final rule titled Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments in 40 CFR Part 257, Subpart D, published in the Federal Register on April 17, 2015.

The Hugo Plant is located on Highway 70, west of Fort Towson, Oklahoma in Choctaw County. Operation of the plant began in April 1982. The Hugo plant has one unit that burns Wyoming coal with a net output of 450 net mega-watts (MW).

The three types of ash generated from burning the coal are classified as fly ash, economizer ash or bottom ash. At the Hugo Plant, the fly ash is stored in silos or in the CCR landfill (labeled CCR1), economizer ash is managed in CCR1 and the bottom ash is sluiced to one of two impoundments (labeled CCR2 and CCR3).

Cardinal performed the inspection of the impoundments and landfill in accordance with the requirements outlined in 40 CFR 257.83(b) and 40 CFR 257.84(b). The inspection included three (3) site visits during which the Hugo Plant's Operating Records, and available data were collected and reviewed. During each site visit, Cardinal walked the perimeter of CCR1, CCR2 and CCR3 to inspect for signs of distress or malfunction of each unit and appurtenant structures, and to obtain field measurements required to determine the remaining capacity of the landfill and impoundments. The volumes are not based on topographic level accuracy, but were calculated based on field measurements and original drawings of the landfill and impoundments.

### **Fly Ash**

The fly ash landfill is a two-cell unit, labeled CCR1 that has a storage capacity of 1,044,000 cubic yards (cyds). The fly ash is pneumatically conveyed to the fly ash silo then loaded onto a truck and stored in the CCR landfill. Most of the fly ash is removed from the landfill and sold for beneficial use. There is an estimated 551,000 cyds of fly ash in the landfill and a remaining capacity of 493,000 cyds.

### **Bottom Ash**

There are two (2) bottom ash impoundments. The north impoundment is labeled CCR2 and the south impoundment is labeled CCR3. The combined storage capacity of CCR2 and CCR3 is 1,064,000 cyds. Bottom ash from the boiler is sluiced to either CCR2 or CCR3. There is an estimated 231,000 cyds of bottom ash in the impoundments and a remaining capacity of 833,000 cyds.

WFEC inspect both impoundments each day. The impoundments are designed with a three-foot normal pool level freeboard. This normal pool level freeboard is currently maintained by a 24" diameter constant elevation vertical pipe spillway that discharges into the Process Waste Pond located on the east side of the impoundments. Water level below the three-foot normal pool level freeboard is lowered by operating a set of manual valves.

## **A. SCOPE OF INSPECTION**

The purpose of the annual inspection is to meet the requirements outlined in 40 CFR 257.83(b) and 40 CFR 257.84(b). The regulations require an annual inspection performed by a “Qualified Professional Engineer” as defined in 40 CFR 257.53. The CCR Rule specifies the Annual Inspection Report must address the following items for a CCR impoundment:

- Changes in geometry since the previous annual inspection
- Location and type of existing instrumentation and maximum recorded readings of each instrument since the previous annual inspection
- Approximate minimum, maximum, present depth, and elevation of the impounded water and CCR since the previous annual inspection
- Storage capacity of the surface impoundment at time of inspection
- Approximate volume of the impounded water and CCR at the time of inspection
- Appearance of an actual or potential structural weakness
- Existing conditions that are disrupting or have the potential to disrupt the operation and safety of the impoundment
- Any other changes which may have affected the stability or operation of the impounding structure since the previous annual inspection
- Deficiencies or releases

The CCR Rule specifies the Annual Inspection Report must address the following items for a CCR landfill:

- Changes in geometry since the previous annual inspection
- Approximate volume of CCR at the time of inspection
- Appearance of an actual or potential structural weakness
- Existing conditions that are disrupting or have the potential to disrupt the operation and safety of the impoundment
- Any other changes which may have affected the stability or operation of the landfill since the previous annual inspection
- Deficiencies or releases

## B. Site Inspection

Cardinal made three (3) trips to the Hugo Plant to review documentation and gather all of the necessary field data and measurements for completion of the requirements of this Annual Inspection Report. The *Qualified Professional Engineer* made a visit to the site on October 3, 2017. The second trip on October 18, 2017 consisted of data gathering and initial site reconnaissance. The third trip on October 27, 2017 was for obtaining field measurements and an additional site reconnaissance of both the impoundment and landfill.

Site visits included visual inspections of CCR1, CCR2, and CCR3. Any dike integrity issues, vegetation growth, or other potential detrimental activity was noted during the visual inspections.

The field measurements for the impoundments (CCR2 and CCR3) included the following:

- Verify the elevation of the vertical pipe spillway
- Verify the relation between the level gauges, 3 foot freeboard, and the overflow (vertical pipe spillway)
- Verify the dimensions the impoundment and slopes of the dikes
- Determine the bottom topography of the cells using design and as built drawings

The field measurements for the landfill (CCR1) included the following:

- Verify the dimensions of the impoundment and slope of the dikes.
- Verify the amount of ash in the landfill

During the second site visit on October 18, 2017, Cardinal collected records of operation, operation manuals, and construction drawings, as well as made a cursory inspection of CCR1, CCR2, and CCR3.

All three units, CCR1, CCR2, and CCR3, were visually inspected on October 3, 18, and 27, 2017 by Cardinal staff members. The inspection included walking around all three structures, taking photographs, taking notes and taking level measurements to determine water surface elevation of CCR3. The visual inspection revealed slope sloughing repair activities for the interior east berm of CCR2. CCR2 and CCR3 had slope slough repairs on the outside slope of the east portion of the embankment between the CCR units and the Process Waste Pond. The slough area repaired was estimated to be 50 feet long by 10 feet wide by 3 feet deep at CCR2 and 60 feet long by 10 feet wide by 3 feet deep at CCR3. Other slope sloughing issues observed were minor. The design interior slopes of the dikes are 2H:1V. The steep slopes hinder the maintenance of the CCR's by limiting access to equipment for mowing and repairs.

The CCR2 unit was drained of impounded water for slough repairs. The depth of water contained in CCR3 was measured by using a water level depth gauge board located near the spillway pipe.

On October 3, 2017, Cardinal's Qualified Professional Engineer conducted a site inspection and obtained historical data. Cardinal inspected the integrity of the hydraulic structures that passed through the impoundments and landfill to the extent possible. During the third inspection, Cardinal noted that repair work was in process on a slough on the dividing berm between CCR2 and CCR3, west of the Process Waste Pond.

## **C. Findings**

The following inspection findings are reported according to 40 CFR 257.83 and 40 CFR 257.84 based on field observations, measurements and data provided by WFEC.

### **1.0 Bottom Ash Impoundments CCR2 (north cell) and CCR3 (south cell)**

#### **1.1 Regulation Citation §257.83 (b)(i)**

*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. CCR unit design and construction information required by §§257.73(c)(1) and 257.74(c)(1), previous periodic structural stability assessments required under §§257.73(d) and 257.74(d), the results of inspection by a qualified person and results of previous annual inspections).*

**Findings:** Reviewed available information including previous annual inspection report, structural stability assessment, and 2017 weekly inspection reports. Based on the observed site condition, slopes appear stable. However, construction of two (2) horizontal to one (1) vertical interior slopes may present maintenance difficulties.

#### **1.2 Regulation Citation §257.83(b)(ii)**

*A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit*

**Findings:** CCR2 and CCR3, were visually inspected on October 3 and 18, 2017, with a follow-up inspection on October 27, 2017. The inspection included: walking around both impoundments, taking photographs and taking notes. CCR3 water depth measurement was collected from the water level gauge located at the spillway pipe. CCR2 was drained for slough repairs. Although several areas of minor sloughing were noted during the inspection, there was no indication that these areas would cause a malfunction in the safe operation of the impoundments.

#### **1.3 Regulation Citation §257.83(b)(iii)**

*A visual inspection of any hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operations*

**Findings:** Concrete structures at each end of the pipe passing under the CCR dike are in good condition. The pipe itself was not visible in CCR3 due to complete submergence. However, this pipe is a recent HDPE replacement of the original corrugated metal pipe.

#### **1.4 Regulation Citation §257.83(b)(2)(i)**

*Any changes in geometry of the structure since the previous annual inspection*

**Findings:** No noticeable changes appear to have occurred to CCR2 and CCR3 since construction. Two areas of slough repair have been completed at the east exterior berm between CCR2, CCR3 and Process Waste Pond.

**1.5 Regulation Citation §257.83(b)(2)(ii)**

*The location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection.*

**Findings:** The water level of CCR2 and CCR3 are both measured toward the east end of the impoundments using a vertical staff marked with 0.1 foot increments. At the time of the inspection, CCR2 was drained for slough repairs. CCR3 level was 4.30 feet below the top of the dike. A review of weekly inspection reports provided the maximum recorded reading for CCR2 and CCR3. Since the previous annual inspection, the maximum recorded readings is 3.50 feet below the top of the dike for CCR2 and 4.2 feet below the top of the dike for CCR3.

**1.6 Regulation Citation §257.83(b)(2)(iii)**

*The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection*

**Findings:** Observed water elevation is measured at the outlet structure. The elevation at the time of the inspection CCR3 level was 4.30 feet below the top of the dike. CCR2 impoundment was drained for slough repair. According to the weekly inspection reports, the maximum water elevation was reported at 3.50 feet below the top of the dike for CCR2 and 4.20 feet below the top of the dike for CCR3. Minimum water elevation reported from the weekly inspection reports for both CCR units was 18.0 feet below the top of the dike. Each unit had been drained during this annual inspection period for slough repairs.

**1.7 Regulation Citation §257.83(b)(2)(iv)**

*The storage capacity of the impounding structure at the time of the inspection*

**Findings:** At the time of the inspection (on October 18, 2017), the remaining storage capacity at normal pool level, three feet below the top of dike, for CCR3 was 431,000 cyds. CCR2 was drained for slough repair.

**1.8 Regulation Citation §257.83(b)(2)(v)**

*The approximate volume of the impounded water and CCR at the time of inspection*

**Findings:** At the time of the inspection (on October 18, 2017), the volume of impounded water in CCR3 was estimated at 418,000 cyds (at an elevation of 441.70 ft). Elevation readings are based on the elevation of 446 feet assigned to the top of the discharge structure in construction drawings. Impounded water volume in CCR2 was not calculated due to impoundment was drained for slough repairs at the time of inspection.

**1.9 Regulation Citation §257.83(b)(2)(vi) (part 1)**

*Any appearances of an actual structural weakness of the CCR unit*



**Findings:** The visual inspection revealed two (2) areas of minor slope sloughing on south interior berm of CCR3. Both slough observed are considered minor. As identified previously, CCR2 and CCR3 had slope slough repairs on the outside slope of the east portion of the embankment between CCR2, CCR3 and the Process Waste Pond. No other structural weaknesses were identified.

**1.10 Regulation Citation §257.83(b)(2)(vi) (part 2)**

*Any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit*

**Findings:** The dikes of both CCR2 and CCR3 were designed and constructed at two (2) horizontal to one (1) vertical slope. These slopes require monitoring and repair of sloughing as needed. No other conditions are disrupting or have the potential to disrupt the operation and safety of the CCR units.

**1.11 Regulation Citation §257.83(b)(2)(vii)**

*Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.*

**Findings:** Exterior slough repairs to the east berm between CCR2, CCR3 and the Process Waste Pond has been improved by repairing the berm using recompacted berm fill and geogrid material. The repair included extending the slope from a 2.0H:1.0V slope to a 3.3H:1.0V slope.

**2.0 Fly Ash Landfill CCR1**

**2.1 Regulation Citation §257.84(b)(i)**

*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. results of inspections by a qualified person, and results of previous annual inspection)*

**Findings:** Reviewed available information and 2017 weekly inspection reports. There were no indications of distress or malfunctions from the weekly inspection report review.

**2.2 Regulation Citation §257.84(b)(ii)**

*A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit*

**Findings:** CCR1 was visually inspected on October 18, 2017, with a follow-up inspection on October 27, 2017. The inspection included walking around the structure, taking photographs, taking notes, and measuring the approximate distance below the top of the dike of the landfilled fly ash. No signs of distress or malfunction were identified.

**2.3 Regulation Citation §257.84(b)(2)(i)**

*Any changes in geometry of the structure since the previous annual inspection*

**Findings:** No noticeable changes appear to have occurred to CCR1 since the previous annual inspection report.

**2.4 Regulation Citation §257.84(b)(2)(ii)**

*The approximate volume of CCR contained in the unit at the time of inspection*

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**Findings:** The approximate volume of fly ash contained in CCR1 at the time of inspection on October 27, 2017 was 551,000 cyds.

**2.5 Regulation Citation §257.84(b)(2)(iii) (part 1)**

*Any appearances of an actual structural weakness of the CCR unit*

**Findings:** The visual inspection revealed minor slope sloughing problems on CCR1. No actual structural weaknesses were identified.

**2.6 Regulation Citation §257.84(b)(2)(iii)(part 2)**

*Any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit*

**Findings:** The dikes of CCR1 were designed and constructed at two (2) horizontal to one (1) vertical slope. These slopes require monitoring and repair of sloughing. No conditions were identified that are disrupting or have the potential to disrupt the operation and safety of the CCR unit.

**2.7 Regulation Citation §257.84(b)(2)(iv)**

*Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection*

**Findings:** There were no changes identified that would affect the stability or operation of CCR1 since the previous annual inspection report.

**D. Conclusion**

Overall, this annual inspection under the CCR Rule did not reveal any deficiencies or releases in either CCR1, CCR2, or CCR3. Under the Hugo Plant's standard practice, slope sloughs and other maintenance issues are noted on the weekly inspection reports and logged into the Hugo Plant's mechanical maintenance system. Specifically, slope sloughs are assigned maintenance work orders by priority based on location and severity of the slough. Severity of a slope slough is objective and based on the amount of displaced material.

Various operational changes have occurred since the commissioning of CCR1, CCR2, and CCR3 that differ from the original design of the systems. The original operation of the CCR2 and CCR3 specified the use of stop logs to manage the water level within the impoundments, which allowed the decanting of water. The current operational practice does not use the stop logs; instead, the non-emergency gates remain open. This practice does not allow for decanting, but it does provide a balance between personal safety and the original intent of the stop logs.

Cardinal finds that at the time of this annual inspection of the Hugo Plant, CCR1, CCR2, and CCR3 are designed, constructed, operated, and maintained consistent with recognized and generally accepted good engineering standards.