City Water, Light & Power
Ash Impoundments
Springfield, Sangamon County, Illinois

Structural Stability Assessment for Coal Combustion Residuals Surface Impoundments

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Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

Prepared by:

ANDREWS ENGINEERING INC
3300 Ginger Creek Drive
Springfield, IL 62711
Tel: (217) 787-2334; Fax: (217) 787-9495

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1. INTRODUCTION

City Water, Light and Power (CWLP) Lakeside Ash Pond and Dallman Ash Pond are coal combustion residuals (CCR) surface impoundments. An assessment of the structural stability for the CCR surface impoundments was conducted as required by 40 CFR Part 257.73:

257.73(d) *Periodic structural stability assessments. (1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:*

257.73(f) *(1) Initial assessments. Except as provided by paragraph (f)(2) of this section, the owner or operator of the CCR unit must complete the initial assessments required by paragraphs (a)(2), (d), and (e) of this section no later than October 17, 2016. The owner or operator has completed an initial assessment when the owner or operator has placed the assessment required by paragraphs (a)(2), (d), and (e) of this section in the facility's operating record as required by § 257.105(f)(5), (10), and (12).*

Analysis performed herein for the Initial Structural Stability Assessment of the existing ash ponds at Springfield City Water, Light and Power, Lakeside and Dallman Ash Ponds, Springfield, Illinois, as required per 40 CFR 257.73(d). Information reviewed for this report includes the following documents:

- Coal Ash Impoundment Site Assessment Final Report (May 2011)
- Historical Aerial Photographs (April 1995 – March 2014)
- Engineering Report: Proposed Embankment Modification; CWLP Ash Disposal Area (July 1987).
- Construction Grading Plan for the Dallman Ash Pond (August 1976)

2. CCR UNIT INFORMATION

Both the Lakeside Ash Pond and the Dallman Ash Pond are owned and operated by CWLP. The ponds are operated under National Pollutant Discharge Elimination System (NPDES) Permit Number IL0024767.

The Lakeside Ash Pond is primarily a diked embankment with some incising along the east perimeter and was placed into service prior to 1958. The original Lakeside Ash Pond was been divided into four separate ponds since it was expanded vertically in 1988: three lime softening ponds and the settling pond. The current Lakeside Ash Pond is approximately 27.6 acres and ceased receiving ash in 2009.

The eastern portion of the original Lakeside Ash Pond is incised. The entire ash pond abuts the Lake Springfield dam to the south. The original portion of the ash pond abuts the Unit 1 landfill and the clarification pond to the north. The only portions of the Lakeside Ash Pond with open downstream slopes are the west dike of the original ash pond, and the vertical expansion berms, which were constructed on the east, west and south boundaries of the ash pond.

The second impoundment, the Dallman Ash Pond, which is a diked embankment, was placed into service in approximately 1976 and is approximately 34.5 acres. Fly ash and bottom ash are sluiced to the Dallman Ash Pond with raw lake water.

The entire Dallman Ash Pond is partially incised. Material from the center of the ash pond was excavated and utilized in the construction of the dikes. The Dallman Ash Pond abuts the CWLP landfills to the east and the clarification pond to the south. The only open downstream slopes of the Dallman Ash Pond are on the west and south dikes.

Settled water from both the Dallman Ash Pond and Lakeside Ash Pond flow into opposite sides of a Clarification Pond before being discharged to Sugar Creek at Outfall 004 pursuant to the aforementioned NPDES permit.

3. FOUNDATION

The Sugar Creek historically meandered across the site, generally from the west to east with an overall flow direction to the north. During the construction of the ash ponds, the creek was abandoned and relocated to the west of the site. The old creek bed was filled with different types of soil, ranging from cohesive soils characterized as silty clays, to granular fill characterized as poorly graded silty to clayey sands. Prior to the area development, the upper layer of soil at the site consisted of mainly brown, light brown, and brownish-gray silty clays and clayey silts having soft to stiff consistency. This includes all eolian soils (loess) deposited near the surface, isolated pockets and lenses of fine grained silty to clayey sand at some locations and alluvial silts and silty clays.

According to the construction plan drawings for the Dallman Ash Pond, dikes were constructed on areas of the old creek bed. According to notes on these drawings, the creek bed in these areas was over-excavated by at least 4.0 feet below the existing channel banks and bottom. These excavations were then filled in with cohesive material and compacted to at least 90 percent of optimum density as determined under AASHTO-T99 at optimum moisture.

Although design information is limited for the surface impoundments, a stability analysis was performed by Testing Service Corporation (TSC) in 1994 for the design of the adjacent Unit 2 Landfill. The landfill is located in the northeastern half of the site, which is directly adjacent to the east of the Dallman Ash Pond and north of the Lakeside Ash Pond. This analysis included a review of all of the subsurface studies performed at the site (72 borings in total) as well as five additional borings drilled as part of the stability analysis study. Laboratory testing completed on cohesive soil samples from these five borings included analyses on: moisture content, in-place dry density, unconfined compressive strength, and Atterberg limits. In addition, one sample was selected for triaxial shear testing, and another for direct shear testing.

The TSC analysis for Unit 2 included an evaluation of settlement and bearing capacity for the foundation, and mass stability for the various excavated and constructed slopes of the landfill. Both static and seismic conditions for short- and long-term scenarios were evaluated using the geologic data acquired from the aforementioned study. The safety factors resulting from these

analyses exceeded all requirements for new solid waste landfills in Illinois under 35 Ill. Adm. Code 811.304.

The geologic characteristics at the site were determined via subsurface boring programs related to permitting and monitoring of the landfill units as well as the drilling conducted for the monitoring program currently implemented for the ash impoundments. The geologic characteristics were determined to be consistent throughout the site as described in the initial paragraph to this Section. The structural characteristics of the soils also apply to the entire site, which includes the ash ponds.

4. SLOPE PROTECTION

4.1 Lakeside Ash Pond

Both the upstream and downstream slopes of the Lakeside Ash Pond are vegetated to protect the slopes against surface erosion. During the 2016 Annual Inspection, no significant signs of erosion were observed on any of the slopes and no observations of significant erosion was noted during any of the weekly inspections prior to the Annual Inspection.

4.2 Dallman Ash Pond

The downstream slope of the Dallman Ash Pond is vegetated to protect against surface erosion. Riprap was placed on the bottom portion of the downstream slope. Ruts and gullies on the downstream slopes, when observed, are immediately filled with soil and monitored during the weekly inspections. During the 2016 Annual Inspection, no significant signs of erosion were observed on any the upstream slopes and no observations of significant erosion on the upstream slopes was noted during any of the weekly inspections prior to the Annual Inspection.

5. DIKE COMPACTION

5.1 Documentation

5.1.1 Lakeside Ash Pond

No as-built construction documentation is available for the Lakeside Ash Pond. No construction plans are available for the original construction of the Lakeside Ash Pond. Construction plans for the vertical expansion (Engineering Report: Proposed Embankment Modification; CWLP Ash Disposal Area, July 1987) do call for the expansion berms to be constructed by placing cohesive material in thin lifts of 6 to 8 inches and compacted.

5.1.2 Dallman Ash Pond

No as-built construction documentation is available for the Dallman Ash Pond. Notes in the construction plan drawings do call for dike materials to be compacted to “at least 90% of the minimum density at optimum moisture as determined by AASHTO-T99.”

5.2 Slope Stability Analyses

A slope stability analyses was performed as part of the Initial Safety Factor Assessment performed by Andrews Engineering, Inc. (AEI) for both the Lakeside Ash Pond and Dallman Ash Pond using available geotechnical data for the site. The analyses indicate that Lakeside and Dallman Ash Ponds provide factors of safety equal to or greater than minimum values as required by 40 CFR 257.73(e).

6. VEGETATED SLOPE HEIGHT

6.1 Lakeside Ash Pond

No as-built construction documentation is available for the Lakeside Ash Pond. No construction plans are available for the original construction of the Lakeside Ash Pond. Construction plans for the vertical expansion (Engineering Report: Proposed Embankment Modification; CWLP Ash Disposal Area, July 1987) do not specify a thickness for the vegetated slope layer.

6.2 Dallman Ash Pond

No as-built construction documentation is available for the Dallman Ash Pond. Notes in the construction plan drawings do call for a 6-inch layer of seeded topsoil be placed on the top of all upstream and downstream slopes.

7. SPILLWAYS

Neither ash pond has constructed or natural spillways.

8. HYDRAULIC STRUCTURES

8.1 Lakeside Ash Pond

During the vertical expansion, an outlet structure was constructed through the northern berm of the Lakeside Ash Pond, which drains into the adjacent clarification pond. The outlet is constructed with a 24-inch diameter reinforced concrete pipe (RCP). The length of the pipe is approximately 60 feet. The pipe was bedded in compacted cohesive material and an anti-seep collar at approximately halfway through the berm. The outlet appears to be structurally sound, with no observed signs of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris.

8.2 Dallman Ash Pond

An outlet structure was constructed through the southern dike of the Dallman Ash Pond, which drains into the adjacent clarification pond. The outlet is constructed with a 24-inch diameter high density polyethylene (HDPE) pipe. The length of the pipe is approximately 120 feet. No other details are available on the installation of the outlet. The outlet appears to be structurally sound, with no observed signs of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris.

9. ADJACENT BODIES OF WATER

Both Lakeside Ash Pond and Dallman Ash Pond are adjacent to the Clarification Pond to the south and the north, respectively. In addition, the Sugar Creek is adjacent to both ash ponds to the west. The Initial Safety Factor Assessment was performed by AEI, which determined the safety factors for the Dallman Ash Pond and Lakeside Ash pond for both long- and short-term scenarios. These analyses were performed with the assumptions that the Clarification Pond was drained, and also that the Sugar Creek had nearly zero flow at approximately 520 feet.

10. OBSERVATIONS

As reported in the 2016 Annual Inspection, signs of erosion have been periodically observed on the north and west outer berms of the Dallman Ash Pond in the forms of ruts and gullies that typically range from 6- to 24-inches deep. The erosion appears to be caused by stormwater flow collecting at points along the top of the berm before flowing down the outer slope in concentrated streams. Ruts and gullies are immediately filled with soil and monitored in the observed locations.

Indications of seepage have been observed on outer berms of the Lakeside Ash Pond, between the top of the original pond berms and the vertical expansion berms. These range from staining or dampness to areas with noticeable drainage. Signs of seepage have been observed along the west berm, as well as isolated portions on the east and west portions of the north berm of the Lakeside Ash Pond.

No other visual indications of actual or potential structural weaknesses of the surface impoundments have been observed. Based on the review of historical aerial photographs completed during the 2016 Annual Inspection, there were no observed indications of mass movement on any of the constructed berms for the surface impoundments.

11. STATEMENT

This Structural Stability Assessment for Coal Combustion Residuals Surface Impoundments was completed for CWLP by Andrews Engineering, Inc. in accordance with the requirements under 40 CFR Part 257.81.

Paul M. Van Metre, P.E.

10-14-2016
Date