

10 October 2018

Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402-2801

**Subject: Unstable Area Demonstration
U.S. Environmental Protection Agency
Final Coal Combustion Residuals Rule (40 CFR §257.64)
Peninsula Site, Phase I Disposal Unit
TVA Kingston Fossil Plant
Harriman, TN**

1. INTRODUCTION

Geosyntec Consultants (Geosyntec) has been retained by the Tennessee Valley Authority (TVA) to prepare the following assessment of the U.S. Environmental Protection Agency's (USEPA's) requirements under the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities (Final CCR Rule) associated with the Unstable Area Demonstration for the Peninsula Disposal Area (referred to herein also as Phase I Disposal Unit and formerly known as the Gypsum Disposal Area) at the Kingston Fossil Plant (KIF), located in Harriman, TN in Roane County. Presented below is the project background, summary of findings, limitations, certification, and references.

2. BACKGROUND

TVA obtained a permit (Permit No. IDL 73-0211) to construct and operate the Peninsula Site Coal Combustion Residuals (CCR) Disposal Facility from the Tennessee Department of Environment and Conservation (TDEC) on 20 December 2007. The CCR disposal facility is divided into Phases I and II disposal units. Initial construction of the Phase I Disposal Unit was completed in 2009, and the Phase II Disposal Unit is scheduled for future construction.

As required by §257.64 of the Final CCR Rule, within 42 months of the published date, an owner or operator of an existing surface impoundment or landfill must complete the unstable area demonstration. According to §257.64, an existing CCR surface impoundment or landfill must not be located in an unstable area unless the owner or operator demonstrates that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit so that the integrity of the structural components of the unit will not be disrupted. The following conditions specifically referenced in the Final CCR Rule must be considered when performing an "unstable area" demonstration:

- On-site or local soil conditions that may result in significant differential settling;
- On-site or local geologic or geomorphologic features; and
- On-site or local human-made features or events (both surface and subsurface).

In support of the above assessment, Geosyntec reviewed multiple historical subsurface explorations and foundation evaluations, as well as the original TVA Hydrogeological Evaluation report for the TVA KIF Peninsula Site [Julian and Boggs, 2005], with a focus on the Phase I Disposal Unit. Information gathered through a 2011 subsurface exploration [Geosyntec, 2011(a)], was used to supplement subsurface exploration data collected by Mactec Engineering and Consulting, Inc. [Mactec, 2005; Mactec 2006; Mactec, 2011]. A complete listing of documents reviewed and utilized as part of this assessment is included in the References section at the end of this letter.

3. SUMMARY OF FINDINGS

3.1 On-site or Local Soil Conditions That May Result in Significant Differential Settling

Initially, the Phase I Disposal Unit was lined with a compacted clay liner. During the construction of the Phase I Disposal Unit, localized construction drop-outs were encountered and addressed through implementing drop-out mitigation measures [Geosyntec, 2008] prior to the disposal unit going operational in 2009. In December 2010, a drop-out occurred and operation of the unit ceased until additional drop-out investigation and mitigation efforts, as well as the liner system re-construction efforts, were completed. For this purpose, a permit modification application was submitted to the TDEC, which was approved on 27 June 2011. This permit modification allowed for the installation of a composite liner system which consisted of a 60-mil high-density polyethylene geomembrane overlaying a compacted clay layer that is at least two-feet thick.

To reduce operational impacts to KIF during the mitigation and re-construction activities, the Phase I Disposal Unit was subdivided into Phase IA and Phase IB units, each approximately 25 acres. Phase IA drop-out mitigation and liner system re-construction efforts commenced in March 2011. The drop-out mitigation efforts included identification and over-excavation of the drop-out susceptible areas to a pre-determined critical depth, removal of any soft or deleterious materials, proof-rolling of the soil below the critical depth (i.e., the bottom of the excavation), backfilling and compaction of the engineered fill material.

After the drop-out mitigation, installation of a composite liner system and a three-layered granular drainage and leachate collection system started in Phase IA, and it was decided to further subdivide Phase IA into two construction sequencing units (i.e., Stage 1 and Stage 2).

Phase IA, Stage 1 and Stage 2 drop-out mitigation and liner system re-construction efforts were completed in October 2011 and December 2011, respectively, and were approved by TDEC to accept waste on 09 November 2011 and 17 February 2012, respectively [Geosyntec, 2011(b); Geosyntec, 2011(c); Geosyntec, 2011(d); Geosyntec, 2011(e); Geosyntec, 2011(f); Geosyntec, 2012].

Phase IB drop-out mitigation and liner system re-construction efforts commenced in September 2013 and were completed in September 2014, using generally the same methodology employed for Phase IA. Phase IB remained inactive pending TDEC's review and approval of the permit modification for the Phase IB and Phase II Disposal Units, which was granted on 29 September 2015. The Phase IB area was approved by TDEC to accept waste on 06 October 2015 [Geosyntec, 2014(a); Geosyntec, 2014(b); Geosyntec, 2014(c)].

3.2 On-site or Local Geologic or Geomorphologic Features

Based on the 2005 hydrogeologic evaluation of the disposal unit, topographic depressions or dolines were exhibited at the Peninsula Site. These features did not possess open throats or avenues for reception of incipient recharge. Rather, the dolines were mantled by soil thicknesses ranging from about 35 to 75 feet (ft). Visual and laboratory classifications of these soils indicated that they are of residual origin except in the area of the site pond where alluvial deposition has occurred. The hydrogeologic evaluation indicated that no voids were detected immediately above bedrock that would indicate migration of soil into the deeper bedrock system. There were no natural karst features (i.e., sinkholes, sinking streams, and springs) directly formed into the subsurface. Coring of the bedrock at the site exhibited slight to highly fractured conditions. Most cavities and joints were also observed to be completely or partially filled with clays and sand. Some topographic depressions coincided with bedrock depressions, but no active karst features were observed during the hydrogeological study at these locations [Julian and Boggs, 2005; Geosyntec, 2014(a)].

3.3 On-site or Local Human-made Features or Events (both Surface and Subsurface)

The only human-made feature was a former farm pond located in the center of the site. This feature was filled in during the 2009 construction of the Phase I Disposal Unit in accordance with the obtained permits and it is not expected to affect the integrity of the facility [Julian and Boggs, 2005; Geosyntec, 2014(a)].

4. CONCLUSION

Based upon a review of the documents listed in the attached References and analysis of existing conditions, Geosyntec has assessed that the current structural components of the Phase I Disposal Unit of the Peninsula Site at the TVA Kingston Fossil Plant meet the unstable areas requirements

of the Final CCR Rule §257.64. Any identified unstable areas have been remediated with accepted engineering practices such that the integrity of the unit will not be disrupted.

5. CERTIFICATION

I, Mehmet Iscimen, P.E., being a Registered Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this report is true and correct as of the date of my signature below, has been prepared in accordance with the accepted practice of engineering, and that the Phase I Disposal Area at KIF meets the requirements of the unstable areas location restrictions specified in § 257.64 of the Final CCR Rule.



SIGNATURE: _____

DATE: 10 October 2018

PRINTED NAME: Mehmet Iscimen, P.E.
ADDRESS: Geosyntec Consultants, Inc.
One Central Plaza
835 Georgia Avenue, Suite 500
Chattanooga, TN 37402-2218
TELEPHONE: 423.385.2310

6. REFERENCES

- Geosyntec 2008. "Summary of Construction Drop-out Mitigation Measures, Kingston Fossil Plant, Gypsum Disposal Site (IDL 73-0211)," October 2008.
- Geosyntec 2011(a). "Field Investigation Report, FGD Disposal Facility Drop-Out, Kingston Fossil Plant," February 2011.
- Geosyntec 2011(b). "Drop-Out Mitigation and Liner System Construction Phase IA, Stage 1 Earthwork CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Gypsum Disposal Area, Roane County, Tennessee," September 2011.
- Geosyntec 2011(c). "Drop-Out Mitigation and Liner System Construction Phase IA, Stage 1 Geosynthetics CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Gypsum Disposal Area, Roane County, Tennessee," October 2011.
- Geosyntec 2011(d). "Drop-Out Mitigation and Liner System Construction Phase IA, Stage 1 Granular Drainage System CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Gypsum Disposal Area, Roane County, Tennessee," October 2011.
- Geosyntec 2011(e). "Drop-Out Mitigation and Liner System Construction Phase IA, Stage 2 Earthwork CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Gypsum Disposal Area, Roane County, Tennessee," October 2011.
- Geosyntec 2011(f). "Drop-Out Mitigation and Liner System Construction Phase IA, Stage 2 Geosynthetics CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Gypsum Disposal Area, Roane County, Tennessee," November 2011.
- Geosyntec 2012. "Drop-Out Mitigation and Liner System Construction Phase IA, Stage 2 Granular Drainage System CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Gypsum Disposal Area, Roane County, Tennessee," January 2012.
- Geosyntec 2014(a). "Operations Manual, Coal Combustion Residuals Disposal Facility, Permit Modification Peninsula Site, Kingston Fossil Plant, Roane County, Tennessee," June 2014.
- Geosyntec 2014(b). "Phase IB Drop-Out Mitigation and Liner System Construction Earthwork CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Roane County, Tennessee," October 2014.

- Geosyntec 2014(c). “Phase IB Drop-Out Mitigation and Liner System Construction Geosynthetics and Granular Drainage System CQA Certification Report, Kingston Fossil Plant, Peninsula Site, Roane County, Tennessee,” November 2014.
- Julian, Hank E. and Boggs, Mark J. 2005. Kingston Fossil Plant Peninsula Site – Hydrogeologic Evaluation of Coal-Combustion Byproduct Disposal Facility, October 2005.
- Mactec 2005. “Report of Geotechnical Exploration, Proposed Gypsum Disposal Area, Kingston Fossil Plant, Kingston, Tennessee,” October 2005.
- Mactec 2006. “Report of Additional Geotechnical Exploration, Proposed Gypsum Disposal Area, Kingston Fossil Plant, Kingston, Tennessee,” February 2006.
- Mactec 2011. “Report of Geotechnical Exploration, Gypsum Pond, Kingston Fossil Plant, Kingston, Tennessee,” February 2011.