

*Prepared for:*

**FORT ARMISTEAD ROAD – LOT 15 LANDFILL, LLC**  
3601 Fort Armistead Road  
Baltimore, Maryland 21226

## **UNSTABLE AREAS EVALUATION**

**Per Requirements of 40 CFR §257.64**

### **Fort Armistead Road - Lot 15 Industrial Landfill Baltimore, Maryland**

*Prepared by:*



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**Unstable Areas Evaluation**

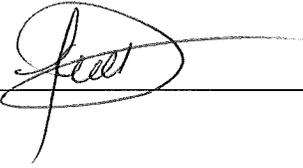
**Coal Combustion Residual (CCR) Unit:** Fort Armistead Road - Lot 15 Industrial Landfill

**Certification:**

I, R. David Espinoza, a registered professional engineer in the state of Maryland certify that this Unstable Areas Evaluation fulfils the minimum requirements of 40 CFR §257.64. This certification is based on my review of design and operational information and/or data made available by Raven Power about the CCR Unit.

Printed Name: R. David Espinoza

PE License Number: 22181 State: Maryland

Signature: 

Date: 14 October 2016

Seal:



## 1. INTRODUCTION AND TERMS OF REFERENCE

Geosyntec Consultants (Geosyntec) has prepared this document for Fort Armistead Road – Lot 15 Landfill, LLC (a wholly owned subsidiary of Raven Power) for the Fort Armistead Road - Lot 15 Industrial Landfill (Lot 15 or the Site), located in Baltimore City, Maryland, to address the unstable areas evaluation requirements in the Federal Coal Combustion Residuals (CCR) Rule specified in Title 40 of the Code of Federal Regulations (CFR), Section (§) 257.64. As detailed in 40 CFR §257.64, it must be demonstrated no later than 17 October 2018 that the CCR unit is not located in an unstable area, or if located in an unstable area that the Site’s structural components have been designed to ensure the integrity of the CCR unit will not be disrupted. The unstable area evaluation for the Site is presented below.

## 2. CCR RULE REQUIREMENTS FOR UNSTABLE AREAS - §257.64

CCR units are restricted from being located in unstable areas, defined as an area susceptible to forces capable of producing mass movements that could impair the integrity of some or all of the structural components responsible for preventing releases of CCR from the CCR unit. Title 40 §257.64 requires an evaluation of the presence of natural or human-induced events or forces capable of impairing the integrity of the CCR unit’s containment features. To comply with this requirement, the units must be evaluated for the presence of natural unstable features (i.e., landslides, avalanches, debris slides and flows, block sliding, rock fall, and karst terrain) and identify the following features that could result in instability: thick layers of soil that are soft and compressible, layers conducive to downslope movement, local topography influencing downslope movement, and anthropogenic activities influencing instability.

## 3. UNSTABLE AREAS EVALUATION

Because the Lot 15 Landfill was designed to comply with 40 CFR §258.15 (Unstable Areas), which regulates the design of municipal solid waste landfill units, the facility meets the requirements outlined in §257.64. The demonstration provided presents how Lot 15 Landfill meets the requirements outlined in §257.64.

- **Adequate Subsurface Investigation.** Owners of CCR units must conduct a geotechnical investigation when determining whether an area is unstable. Per the CCR Rule preamble page 21367, the assessment should consider (1) differential settlement potential of on-site or local soils; (2) on-site or local geologic and geomorphologic features and; (3) on-site or local human-made features or events. Lot 15 Landfill performed an adequate geotechnical investigation during MDE permitting that was used to establish that the facility was not located in an unstable area. Documents to that effect were included in Section 5 of the Phase II Report<sup>1</sup> (Site Investigation and Monitoring) as

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<sup>1</sup> This refers to the Site report entitled “Phase II Report: Site Geologic Study” hereafter referred to as Phase II Report. The report was prepared by Geosyntec (2011) and submitted to the Maryland Department of Environment.

well as Attachment 6 of the Phase II Report (Field Exploration and Laboratory Testing) that includes a detailed description of the subsurface investigation performed at the site.

- **Adequate Stability Analysis Performed.** The standard for adequacy of stability analysis for unstable area assessment is described in the CCR Rule preamble, page 21368. Owners of CCR units must perform a stability evaluation to determine (1) the adequacy of the subsurface exploration program; (2) the liquefaction potential of the embankment, slopes and foundation soils; (3) the expected behavior of the embankment slopes and foundation soils when they are subjected to seismic activity; (4) the potential for seepage induced failure and; (5) the potential for differential settlement. Lot 15 Landfill meets these requirements for adequacy of the subsurface exploration program (see Section 5 of the Phase II Report). Also, because the site is not located in a seismic impact zone and subsurface is mostly compacted over-consolidated clay, there is neither liquefaction risk nor seismic induced failure risk. Because the subsurface is mostly compacted clay, there is no risk of seepage induced failure at the site. Similarly, the foundation soils have been analyzed for differential settlement or the impact of differential settlement on the integrity of the structural components responsible for preventing releases from the CCR units. Documents used to demonstrate compliance were included in the MDE permitting Phase II Report, in particular Section 3 (Siting Criteria). Also, detailed stability analysis is included in Appendix F of Phase III Report<sup>2</sup> (Slope Stability Analysis).
- **Presence of Natural Unstable Features.** The rule requires that natural unstable features be identified including areas of landslide, avalanche, debris slides and flows, block sliding, rock fall and karst terrain. Based on Geosyntec’s review of the available literature and its intimate knowledge of the site, there no significant natural feature that could result in instability. Documents used to demonstrate compliance were included in Appendix F of the Phase III Report (Slope Stability Analysis).
- **Presence of Features Identified per Preamble page 21367.** Owners of CCR units must conduct a geotechnical investigation to identify: (1) the presence of any potential thick layers of soils that are soft and compressible causing significant post-construction differential settlement; (2) on-site or local soils that are conducive to downslope movement of soil, rock and debris under the influence of gravity and; (3) local topography or surface and subsurface features that could induce downslope movement; and (4) any anthropogenic activities (including past waste placement, especially in the case of overfills) which may cause excessive settlement or bearing capacity failure of foundation soils. The Lot 15 Landfill performed a detailed geotechnical investigation program during MDE permitting to identify these four types of features. Subsequent cell construction resulted in open excavation that confirmed the idealized profile.

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<sup>2</sup> This refers to the Site report entitled “Application for and Industrial Landfill Permit: Phase III Report” hereafter referred to as Phase III Report. The report was prepared by Geosyntec (2012) and submitted to the Maryland Department of Environment.

Documents used to demonstrate compliance were included in Attachment 6 of the Phase II Report (Field Exploration and Laboratory Testing).

- **Engineering Measures Employed to Mitigate Unstable Conditions.** Owners of CCR units must mitigate weak ground strength if the unit is located in karst areas. Based on the review of site completed as part of the MDE permitting Phase II Report, the Lot 15 Landfill site is not located in a karst region and data already exists to support this conclusion.

In summary, based on multiple subsurface explorations that have been performed at the site, conclusions of previous geologic studies of the site, and an analysis of the landfill structure, no unstable areas were identified at Lot 15.