



July 10, 2009

Brian Rakvica  
Nevada Division of Environmental Protection  
2030 E. Flamingo Road, Suite 230  
Las Vegas, NV 89119

Ref: Comparison of CAMU Design Standards to RCRA Subtitle C Requirements

Dear Brian:

Per our recent conversations, please find attached a side-by-side comparison of the design requirements for the BRC CAMU as compared to the RCRA Subtitle C standards. We believe that the CAMU complies with the RCRA Subtitle C standards, given its dry-landfill concept along with the regulatory provisions in Subtitle C.

Please call me at 626 382 0001 if you have any questions.

Sincerely,

Ranajit Sahu  
Project Manager  
Basic Remediation Company

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Dr. Ranajit Sahu, C.E.M. (No. EM-1699, Exp. 10/07/2009)  
BRC Project Manager

7/10/09

Date

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RCRA Subtitle C Requirements	CAMU Design	CAMU Meets Subtitle C?
<b>§ 264.301 Design and operating requirements.</b>		
(a) Any landfill that is not covered by paragraph (c) of this section or §265.301(a) of this chapter must have a liner system for all portions of the landfill (except for existing portions of such landfill). The liner system must have:		See Below
(1) A liner that is designed, constructed, and installed to prevent any migration of wastes out of the landfill to the adjacent subsurface soil or ground water or surface water at anytime during the active life (including the closure period) of the landfill. The liner must be constructed of materials that prevent wastes from passing into the liner during the active life of the facility. The liner must be:	The liner system consists of the following elements, or layers, from top to bottom: a geocomposite drainage layer, a geomembrane, and a geosynthetic clay liner (GCL).	YES
(i) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;	The liner system is constructed of a geocomposite, 60-mil HDPE geomembrane, and geosynthetic clay liner. The materials have been shown to be resistant to the chemicals within the waste material disposed at the site. In addition, design calculations use factors of safety to account for chemical and biological degradation, as well as damage during manufacturing and installation. Geocomposite is to be placed on the geomembrane to protect it from puncture by the overlying operations layer soil. A minimum of 2 feet of operations soil is placed above the geocomposite to further reduce damage from daily operation.	YES
(ii) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and	Consolidation analyses were performed to evaluate the potential effect on the performance of the proposed liner system under increased loads related to the BRC CAMU. Borings and associated laboratory test results were used for locations beneath the Phase II (higher loads due to thicker waste profile). Conservative analyses suggest that consolidation will not adversely impact the performance of the proposed liner or LCRS.	YES
(iii) Installed to cover all surrounding earth likely to be in contact with the waste or leachate; and	Design drawings and subsequent as-built drawings have shown the liner system is designed and has been installed to cover all surrounding earth likely to be in contact with waste and/or leachate.	YES
(2) A leachate collection and removal system immediately above the liner that is designed, constructed, maintained, and operated to collect and remove leachate from the landfill. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (one foot). The leachate collection and removal system must be:	The use of perforated HDPE pipes surrounded by 1 ft of drainage aggregate at the toes of the slopes and down the center of Phases II and IIIA reduce head on the liner system. Analysis performed during design indicated head on the liner system would not be above 12 inches.	YES
(i) Constructed of materials that are:		
(A) Chemically resistant to the waste managed in the landfill and the leachate expected to be generated; and	An HDPE geomembrane and HDPE pipes were used for the construction of the BRC CAMU, which is widely recognized in the industry as a very chemically resistant, durable, long-lasting material	YES
(B) Of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the landfill; and	The materials have sufficient strength and thickness to prevent collapse. The geocomposite has been shown to have a minimum transmissivity of $6.1 \times 10^{-5}$ m <sup>2</sup> /sec at a maximum stress of 18,360 psf and a gradient of 0.10. In addition, based upon calculations for pipe ring deflection, wall buckling, and wall crushing considering an overlying waste height of 93 ft, an HDPE pipe with an SDR of 13.5 satisfies the design criteria; SDR 11 HDPE pipe was used in the LCRS system at the CAMU.	YES
(ii) Designed and operated to function without clogging through the scheduled closure of the landfill.	Geotextile filter is a component of the geocomposite that will reduce physical clogging of the drainage layer from the overlying fine-grained material. Factors of safety were used during design to account for clogging.	YES

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<p>(b) The owner or operator will be exempted from the requirements of paragraph (a) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents (see §264.93) into the ground water or surface water at any future time. In deciding whether to grant an exemption, the Regional Administrator will consider:</p>	<p>The BRC CAMU has been designed and is operated differently than a subtitle C landfill as required in paragraph (a). The BRC CAMU is designed with a single composite liner system and is classified as a "dry" landfill meaning the waste should not generate leachate when processed and placed in accordance with the Waste Processing and Placement Plan. Through the approval of the Remedial Action Plan (RAP) Permit, the Regional Administrator found the alternative design and operation of the BRC CAMU to be sufficient for the prevention of hazardous material migration.</p>	<p>YES</p>
<p>(1) The nature and quantity of the wastes;</p>		<p>See Above (b)</p>
<p>(2) The proposed alternate design and operation;</p>		<p>See Above (b)</p>
<p>(3) The hydrogeologic setting of the facility, including the attenuative capacity and thickness of the liners and soils present between the landfill and ground water or surface water; and</p>		<p>See Above (b)</p>
<p>(4) All other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to ground water or surface water.</p>		<p>See Above (b)</p>
<p>(c) The owner or operator of each new landfill unit on which construction commences after January 29, 1992, each lateral expansion of a landfill unit on which construction commences after July 29, 1992, and each replacement of an existing landfill unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system above and between such liners. "Construction commences" is as defined in §260.10 of this chapter under "existing facility".</p>		<p>Not Applicable. See Below (d)</p>
<p>(1)</p>		
<p>(i) The liner system must include:</p>		<p>Not Applicable. See Below (d)</p>
<p>(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life and post-closure care period; and</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 feet (91 cm) of compacted soil material with a hydraulic conductivity of no more than <math>1 \times 10^{-7}</math> cm/sec.</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(ii) The liners must comply with paragraphs (a)(1) (i), (ii), and (iii) of this section.</p>		<p>Not Applicable. See Below (d)</p>
<p>(2) The <i>leachate collection and removal system</i> immediately above the top liner must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and post-closure care period. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (one foot). The leachate collection and removal system must comply with paragraphs (3)(c) (iii) and (iv) of this section.</p>	<p>The use of perforated HDPE pipes surrounded by 1 ft of drainage aggregate at the toes of the slopes and down the center of Phases II and IIIA reduce head on the liner system. Analysis performed during design indicated head on the liner system would not be above 12 inches. Four sumps are designed for the CAMU, one in each Phase I, II, IIIB, and V. Phase IIIA drains to the Phase II sump and Phase IV drains to the Phase IIIB sump. The sumps are equipped with 18-in side slope riser pipes, pumps, and pressure transducers for leachate measurement and removal.</p>	<p>YES</p>

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<p>(3) The <i>leachate collection and removal system</i> between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also <i>leak detection system</i>. This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period. The requirements for a leak detection system in this paragraph are satisfied by installation of a system that is, at a minimum:</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(i) Constructed with a bottom slope of one percent or more;</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(ii) Constructed of granular drainage materials with a hydraulic conductivity of <math>1 \times 10^{-2}</math> cm/sec or more and a thickness of 12 inches (30.5 cm) or more; or constructed of synthetic or geonet drainage materials with a transmissivity of <math>3 \times 10^{-5}</math> m<sup>2</sup>/sec or more;</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(iii) Constructed of materials that are chemically resistant to the waste managed in the landfill and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and equipment used at the landfill;</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(iv) Designed and operated to minimize clogging during the active life and post-closure care period; and</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(v) Constructed with sumps and liquid removal methods (e.g., pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer. Each unit must have its own sump(s). The design of each sump and removal system must provide a method for measuring and recording the volume of liquids present in the sump and of liquids removed.</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(4) The owner or operator shall collect and remove pumpable liquids in the leak detection system sumps to minimize the head on the bottom liner.</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(5) The owner or operator of a leak detection system that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of ground water.</p>	<p>See paragraph d.</p>	<p>Not Applicable. See Below (d)</p>
<p>(d) The Regional Administrator may approve alternative design or operating practices to those specified in paragraph (c) of this section if the owner or operator demonstrates to the Regional Administrator that such design and operating practices, together with location characteristics:</p>		<p>See Below</p>

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(1) Will prevent the migration of any hazardous constituent into the ground water or surface water at least as effectively as the liners and leachate collection and removal systems specified in paragraph (c) of this section; and	The BRC CAMU has been designed and is operated differently than a subtitle C landfill as required in paragraph (c). The BRC CAMU is designed with a single composite liner system and is classified as a "dry" landfill meaning the waste should not generate leachate when processed and placed in accordance with the Waste Processing and Placement Plan. Through the approval of the Remedial Action Plan (RAP) Permit, the Regional Administrator found the alternative design and operation of the BRC CAMU to be sufficient for the prevention of hazardous material migration.	YES
(2) Will allow detection of leaks of hazardous constituents through the top liner at least as effectively.	The BRC CAMU has been designed and is operated differently than a subtitle C landfill as required in paragraph (c). The BRC CAMU is designed with a single composite liner system and is classified as a "dry" landfill meaning the waste should not generate leachate when processed and placed in accordance with the Waste Processing and Placement Plan. Through the approval of the Remedial Action Plan (RAP) Permit, the Regional Administrator found the alternative design and operation of the BRC CAMU to be sufficient for the prevention of hazardous material migration.	YES
(e) The double liner requirement set forth in paragraph (c) of this section may be waived by the Regional Administrator for any monofill, if:	Not Applicable - not a monofill	Not Applicable.
(1) The monofill contains only hazardous wastes from foundry furnace emission controls or metal casting molding sand, and such wastes do not contain constituents which would render the wastes hazardous for reasons other than the Toxicity Characteristic in §261.24 of this chapter, with EPA Hazardous Waste Numbers D004 through D017; and		Not Applicable
(2)		Not Applicable
(i)		Not Applicable
(A) The monofill has at least one liner for which there is no evidence that such liner is leaking;	Liquid has not been detected in the Phase II or Phase IIIB vadose zone monitoring sumps. Liquid was detected in the vadose zone monitoring sump in Phase I after a significant rain event in February. Based on the evaluation presented in the Leachate and Vadose Zone Sump Evaluation Report, it is assumed there is no defect and/or leakage in the Phase I liner system.	Not Applicable
(B) The monofill is located more than one-quarter mile from an underground source of drinking water (as that term is defined in §144.3 of this chapter); and	The groundwater beneath the site is impacted from off-site operations. Groundwater is not considered a source of drinking water	Not Applicable
(C) The monofill is in compliance with generally applicable ground-water monitoring requirements for facilities with permits under RCRA 3005(c); or		Not Applicable
(ii) The owner or operator demonstrates that the monofill is located, designed and operated so as to assure that there will be no migration of any hazardous constituent into ground water or surface water at any future time.	The single composite liner system will not prevent migration alone as efficiently as the double composite liner system. The CAMU is a single composite liner system; however, the waste placement and operation of the CAMU reduces the generation. The waste placement and processing plan has provided guidance for conditions of waste for placement such that the waste will not generate leachate. Precipitation falling on the waste does not infiltrate due to the low permeability of the waste and enters the LCRS through the exposed side slopes of the cells. As a result, once waste is above grade, additional leachate generation is not anticipated and the potential for hazardous constituent migration to groundwater is reduced.	Not Applicable
(f) The owner or operator of any replacement landfill unit is exempt from paragraph (c) of this section if:	The BRC CAMU has been designed and is operated differently than a subtitle C landfill as required in paragraph (c). The BRC CAMU is designed with a single composite liner system and is classified as a "dry" landfill meaning the waste should not generate leachate when processed and placed in accordance with the Waste Processing and Placement Plan. Through the approval of the Remedial Action Plan (RAP) Permit, the Regional Administrator found the alternative design and operation of the BRC CAMU to be sufficient for the prevention of hazardous material migration.	Not Applicable

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(1) The existing unit was constructed in compliance with the design standards of section 3004(o)(1)(A)(i) and (o)(5) of the Resource Conservation and Recovery Act; and		Not Applicable
(2) There is no reason to believe that the liner is not functioning as designed.		Not Applicable
(g) The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 25-year storm.	The surface water controls and on-site stormwater basins are sized for the 25 year, 24-hour storm event.	YES
(h) The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm.		
(i) Collection and holding facilities (e.g., tanks or basins) associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.		
(j) If the landfill contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the landfill to control wind dispersal.	Slit trench waste is the only waste anticipated to be subject to wind dispersal; therefore technical Specifications Section 02205.2.01.F requires: G. Daily Cover – Eastside Area materials shall be used to cover slit trench material daily. A minimum of 6-inches of soil material shall be used to cover exposed slit trench waste.	YES
(k) The Regional Administrator will specify in the permit all design and operating practices that are necessary to ensure that the requirements of this section are satisfied.		Not Applicable
(l) Any permit under RCRA 3005(c) which is issued for a landfill located within the State of Alabama shall require the installation of two or more liners and a leachate collection system above and between such liners, notwithstanding any other provision of RCRA.	CAMU not located in Alabama	Not Applicable