



Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Colleen M. Castille
Secretary

March 16, 2004

Mr. Brent Brasher
KenGro Corporation
P.O. Box 432
6605 Highway 32 East
Charleston, Mississippi 38921

Re: **KenGro BioSorb**

Dear Mr. Brasher:

The Bureau of Petroleum Storage Systems hereby accepts KenGro BioSorb as an innovative petroleum remediation product. It can be used as an absorbent or as an amendment for in situ and ex situ bioremediation of petroleum-contaminated soil. Two methods cited as examples by KenGro are landfarming and composting.

The Bureau notes that KenGro BioSorb is a natural product, made from kenaf, a plant traditionally cultivated for its fibers, but which also contains nutrients that can assist in bioremediation. The kenaf is processed under controlled conditions that promote the growth of natural-occurring, non-pathogenic microorganisms. These microorganisms do not originate from within the kenaf plant itself but are instead microorganisms from the environment that have attached themselves to its surface. So, by virtue of its inherent properties, and those imparted as a result of processing, the kenaf marketed as KenGro BioSorb can serve as an absorbent, an amendment, a bionutrient, bioaugmentation, or a combination of these functions. The Bureau, having received a sample, would describe KenGro BioSorb's color, size and texture as bearing a semblance to fine, dry grass seed or small, dry wood splinters.

This acceptance is for the use of KenGro BioSorb in the cleanup of petroleum contamination pursuant to Chapter 62-770, Florida Administrative Code (F.A.C.), which is the jurisdiction of this Bureau. Other Bureaus within the Department of Environmental Protection, or other state agencies may recognize this acceptance if it suits their needs and purposes. The Bureau of Petroleum Storage Systems, however, is not responsible for applications beyond its jurisdiction.

It is recommended that a copy of this letter in its entirety, and its accompanying enclosure, be placed in the appendix of site-specific Remedial Action Plans proposing the use of KenGro BioSorb. In this way, a Remedial Action Plan technical reviewer anywhere in the state will be informed that the Bureau has evaluated the acceptability of this product from a regulatory standpoint. It is not a requirement that a particular product or process have an official acceptance letter such as this in order to be proposed in a site-specific Remedial Action Plan, but the plan must contain sufficient information to show that the product or process meets all applicable and appropriate rules and regulations. Enclosure 1 provides some regulatory and other information that may be helpful to users of KenGro BioSorb.

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While the Bureau of Petroleum Storage Systems does not endorse specific or brand name remediation products or processes, it does recognize the need to determine their acceptability from an environmental standpoint with respect to applicable rules and regulations, and the interests of public health, safety and welfare. Vendors must then market the products and processes on their own merits regarding performance, cost and safety in comparison to competing alternatives in the marketplace. In no way, however, shall this regulatory acceptance letter be construed as certification of product performance. Additionally, the Bureau emphasizes that its acceptance of a product or process is a letter of "regulatory acceptance", not a letter of approval.

The Bureau also reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Furthermore, acceptance does not imply that a product or process has been deemed applicable for all cleanup situations, or that it is preferred over other treatment or cleanup techniques in any particular case. A site-specific evaluation of the applicability and cost-effectiveness must be considered for any product or process, whether conventional or innovative, and adequate site-specific design details must be provided in a Remedial Action Plan. You may contact me at (850) 877-1133, extension 29, or at the letterhead address, Mail Station 4590.

Sincerely,

Rick Ruscito, P.E.
Ecology and Environment, Inc.
Bureau of Petroleum Storage Systems
Petroleum Cleanup Section 6

Rebecca S. Lockenbach
FDEP Section Leader
Bureau of Petroleum Storage Systems
Petroleum Cleanup Section 6

c: Tom Conrardy, PCS3, MS 4530, Tallahassee

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ENCLOSURE 1

REGULATORY AND OTHER CONSIDERATIONS FOR KENGRO BIOSORB

1. Availability of regulations: Chapters of the Florida Administrative Code that are cited below can currently be found at web page www.dep.state.fl.us, in a sidebar under the heading "Categories", under "Rules".
2. Composting: KenGro BioSorb, in addition to serving as an absorbent, can be used to bioremediate petroleum and other suitable contaminants either by land farming or by composting. In some ways these processes are similar, but for regulatory purposes the Bureau of Petroleum Storage Systems will generally classify composting as a "biopile" for the treatment of contaminated soil, since the material is placed in piles or windrows that are higher than the 6 to 12-inch layers used for land farming. The Bureau believes that its classification of composting as a biopile is consistent with biopiling, as discussed by the United States Environmental Protection Agency in its publication titled How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites, EPA 510-B-95-007, May 1995, Solid Waste and Emergency Response 5403W. Biopiles are also known as biocells, bioheaps, biomounds, and compost piles.
3. Source Removal: Rule 62-770.300(2), F.A.C., allows the use of land farming as a Source Removal method for petroleum-contaminated soil at a specific site without prior technical approval from the Florida Department of Environmental Protection or its contracted local government programs. Users of KenGro BioSorb for Source Removal via land farming are advised to read the land farming requirements of Rule 62-770.300(2)(b), F.A.C., in detail, but for the sake of convenience they are summarized as follows: (a) a 200-foot minimum distance from any residence, park, or school; (b) ample area to spread soil to a thickness of 12 inches; (c) control of access to the land farm; (d) use of sturdy, weather-resistant materials; (e) an impermeable liner supported by berms; (f) biweekly tilling; (g) a cover; (h) monitoring, including monitoring of additives; (i) a 180-day maximum; and (j) the soil cleanup target levels of Chapter 62-777, F.A.C.

If, during a Source Removal Task effort pursuant to Section 62-770.300, F.A.C., the thickness of the soil to be treated at a specific site will be greater than 12 inches, then the treatment process, for regulatory purposes, should be considered to resemble more of a composting or biopiling operation than land farming, and it would be more appropriate to conduct the operation as an approved Remedial Action Plan pursuant to Section 62-770.700, F.A.C., as indicated in Rule 62-770.300(2)(c), F.A.C., or as an Alternate Procedure and Requirement pursuant to Section 62-770.890, F.A.C.

4. Permits: When KenGro BioSorb land farming or composting is used for the onsite cleanup of petroleum-contaminated soil in accordance with an approved site-specific Remedial Action Plan pursuant to Section 62-770.700, F.A.C., no soil treatment facility permit is needed. But for the use of KenGro BioSorb for land farming or composting as either a commercial, stationary soil treatment facility, or as a commercial, mobile soil treatment facility, a permit is required pursuant to Chapter 62-713, F.A.C.

5. An appropriate regulation: Even though the Source Removal Task requirements of Rule 62-770.300(2)(b), F.A.C., were written for land farming, some of those same requirements may be appropriate for Remedial Action Task work pursuant to Section 62-770.700, F.A.C., when KenGro BioSorb composting in a biopile is involved. Those who prepare Remedial Action Plans, and technical reviewers of those plans, are encouraged to use judgment in determining which land farming regulatory requirements may also be appropriate for composting. For example, it may be appropriate to keep biopiles or windrows a safe distance from residences, parks and schools; there must still be ample room to perform the operation at the site; and access to the public should be restricted.
6. Design and operating parameters: The design, and engineering controls for a KenGro BioSorb composting project (and land farming too) should be such that groundwater and nearby surface waters will not be adversely affected by petroleum contaminants and nutrient leachates from the biopile, should any leaching occur.

Information about operating conditions for thermophilic composting is readily available in textbooks, and in US EPA publications such as that which is mentioned in paragraph 2 above, EPA 510-B-95-007. The "RAP Checklist", currently available from the Bureau of Petroleum Storage Systems at web page www.dep.state.fl.us/waste/categories/pcp/pages/active.htm, does not contain information specific to composting, but it does contain a list of topics for "Land Farming of Soil". Most of the land farming topics in the checklist are applicable to the closely related topic of composting. Those who prepare Remedial Action Plans, and technical reviewers of those plans, are encouraged to use judgment on a site-specific basis in determining which land farming topics in the RAP Checklist are also appropriate for KenGro BioSorb composting.

The table below is a summary of the major biopile physical conditions listed in EPA publication 510-B-95-007 for the biodegradation of petroleum-contaminated soil. These conditions are not to be construed as absolute. They are, instead, presented for the sake of conveying some general information to readers unfamiliar with the operating conditions for composting. For parameters where information specific to KenGro BioSorb was available, the Bureau has added it to the table, in order to show that KenGro BioSorb composting conditions are within the generally accepted range of conditions considered conducive to composting.

Microbial Population	Greater than 1,000 Colony Forming Units (CFU)/gram
Soil pH	Range 6 - 8 (optimum for KenGro BioSorb: 5.5 - 7.0)
Soil Moisture Content	12% - 30% by weight (KenGro BioSorb: approximately 15%)
Soil Temperature	10 °C - 40 °C (50 °F - 104 °F) during treatment. See note 1. (KenGro BioSorb: 18 °C - 37 °C)
Nutrient Concentrations	Carbon:Nitrogen:Phosphorus (C:N:P) ratio between 100:10:1 and 100:1:0.5 (KenGro BioSorb: 100:10:1)
Soil Texture	Free of clays that could cause clumping and poor aeration.
Total Petroleum Hydrocarbons (TPH)	Less than 50,000 parts per million (ppm).
Heavy Metals	Less than 2,500 ppm, otherwise may be toxic to the microbes.
Oxygen	Essential for aerobic microbial activity. Turn the compost pile periodically to replenish oxygen levels. (KenGro BioSorb: 3.4 kilograms (Kg) of oxygen per Kg of hydrocarbon).

Note 1: The treatment temperature range shown here is for the destruction of petroleum contaminants. It is not necessarily the range that guarantees the destruction of pathogens, although this should not be a matter of concern when non-pathogenic KenGro BioSorb is used for composting, provided the user does not introduce additional amendments that contain pathogens. Readers interested in learning more about pathogen destruction as it applies to composting are advised to consult textbooks, articles and government publications on the subject. Technical information about the related subject of sewage plant sludge treatment "Processes to Significantly Reduce Pathogens (PSRP)", and "Processes to Further Reduce Pathogens (PFRP)" appears to be directly applicable to concerns about pathogens should there ever be a need to destroy them during composting.

7. In situ applications: As KenGro Corporation has indicated, KenGro BioSorb can be used for in situ treatment of contaminated soil. For such applications, the Bureau believes that site-specific hydrogeologic conditions should be taken into consideration, and design features and engineering controls incorporated as necessary to ensure that leachate, if any, does not adversely affect the underlying groundwater.
8. Use of treated soil: If petroleum-contaminated soil remediated by KenGro BioSorb meets both the Direct Residential Exposure and the Groundwater Leachability Soil Cleanup Target Levels of Chapter 62-777, F.A.C., then it qualifies for an unconditional declaration of No Further Action, for which there are no restrictions on the use of the soil. A regulation that the Bureau believes is worth citing in regard to the disposal of land-farmed soil is Rule 62-770.300(2)(b)10, F.A.C., from the August 5, 1999 issue of Chapter 62-770, F.A.C. Even though this rule is specifically associated with the disposal of land-farmed soil, it may be a useful and appropriate rule to consult when making decisions about the disposal of soil remediated by KenGro BioSorb composting as well.
9. Soil Cleanup Target Levels (SCTL): The soil cleanup target levels for petroleum and other contaminants, for an unconditional declaration of No Further Action, are the Direct Residential Exposure and the Leachability levels of Table II in Chapter 62-777, F.A.C. Both the exposure and the leachability level must be met for the treated soil to qualify for an unconditional declaration of No Further Action. Still, another way of saying the same thing is that the lower of the two levels shall be met. For example, the current direct residential exposure soil cleanup level for benzene is 1.1 milligrams per kilogram (mg/Kg), and its soil cleanup level for leachability based on groundwater cleanup criteria is .007 mg/Kg. Therefore, the lower of the two goals to be met in the case of benzene is the leachability goal of .007 mg/Kg. The point being

made here is that the user of KenGro BioSorb for soil remediation is likely to see variations in the way that wording is used to describe unconditional soil cleanup target levels, and which may at first appear different from each other and confusing. In effect, though, they are equivalent and they are all saying the same thing.

10. Dosage for land farming: KenGro Corporation offers guidance on the dosage of KenGro BioSorb for land farming applications. The application rate is approximately 1% to 3% kenaf on the weight of the soil being treated. The recommended moisture level for the soil is approximately 15%, and the recommended application rate of a 13-13-13 fertilizer is approximately 5 pounds per 100 square feet. The Bureau of Petroleum Storage Systems provides this information for rule-of-thumb purposes only. Users of the product should make adjustments to these dosages and conditions to suit a site's specific needs.
11. Microorganisms: KenGro Corporation has indicated that Mississippi kenaf has been tested for the purpose of identifying the microorganisms that are present. These microorganisms do not originate from within the kenaf plant itself but rather in the environment and then attach themselves to the kenaf's surface. A number of microorganism types were found to be present. They included bacteria of the genus *Bacillus*, and fungi of the genera *Aspergillus*, *Penicillium*, *Rhizopus*, *Nigrospora*, and *Sodaria Qevara*. Not every type of bacterium and fungus was positively identified, but those that were identified appear to be common. The fungi are of the type found in common molds such as bread mold and those found on decaying fruit.
12. Free product absorption: For the use of absorbent pads to recover free petroleum product as a Source Removal Task pursuant to Section 62-770.300, F.A.C., it is not necessary to obtain prior approval from the Florida Department of Environmental Protection or one of its contracted local programs. This is per Rule 62-770.300(1)(b)1, F.A.C., (August 5, 1999). It appears that the intent of this rule should extend to KenGro BioSorb when it is used as a stand-alone absorbent for free product, even though it is in the form of granules rather than pads.
13. Disposal of spent absorbent: When KenGro BioSorb is used by itself as a free product absorbent, the onus shall be on the user to prevent pollution of air, water and soil by properly disposing of the spent absorbent, taking into account the physical and chemical properties of the fluid that was absorbed. A list of Class I, Class II (and Class III, if lined) landfill sites in Florida that may accept spent petroleum-contaminated absorbent for disposal is available at web page www.dep.state.fl.us/waste/categories/pcp/default.htm. Any local requirements that also apply should be observed. The user is responsible for determining whether the absorbed material meets the definition of a hazardous waste, and must manage such waste in accordance with applicable state and local regulations.

Spent KenGro BioSorb may also be disposed by incineration, provided incineration of the kenaf itself or the liquid it has absorbed does not create a hazard, and applicable air emission regulations can be met.