Comments on the Potential for the Turkey Run Landfill to Pollute Groundwater and Surface Waters in Violation of GA EPD Solid Waste Management Rules and Landfill Permit

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June 8, 2008

On December 21, 2007, the Georgia Environmental Protection Department (GA EPD) issued a Permit for solid waste handling at the Turkey Run Landfill. As stated in the permit cover letter shown below,
"This permit is conditioned upon the permittee complying with the attached conditions of operation, which are hereby made a part of this permit."

State of Georgia
Department of Natural Resources
ENVIRONMENTAL PROTECTION DIVISION

PERMIT

SOLID WASTE HANDLING

Permit No: **099-019D(MSWL)** Date: **December 21, 2007**

Permittee: **Greenbow, LLC**

Address: **2600 East South Boulevard, Suite 300**
Montgomery, Alabama 36116

In accordance with the provisions of the Georgia Comprehensive Solid Waste Management Act, and the Rules promulgated pursuant thereto, this permit is issued for the following operation:

Meriwether County – Greenbow, LLC Turkey Run Municipal Solid Waste Landfill located approximately 1.5 miles north of the town of Lone Oak on Highway 54 (Latitude 33° 10'40" Longitude 84° 50'50").

This permit is conditioned upon the permittee complying with the attached conditions of operation, which are hereby made a part of this permit.

All statements and supporting data submitted to the Environmental Protection Division of the Georgia Department of Natural Resources have been evaluated, considered and relied upon in the issuance of this permit.

This permit is now in effect; however, under Georgia Law it is subject to appeal for thirty (30) days following issuance, and is subject to modification or revocation on evidence of noncompliance with any of the provisions of the Georgia Comprehensive Solid Waste Management Act, or any of the Rules promulgated pursuant thereto; or with any representation made in the above mentioned application or the statements and supporting data entered therein or attached thereto; or with any condition of this permit.

Carol A. Couch, Ph.D., Director
Environmental Protection Division

Condition 14 in the permit states,

"14. The disposal facility shall be operated in such a manner as to prevent air, water, or land pollution as well as public health hazards or nuisances at all times."

Based on our professional experience and expertise, the proposed Turkey Run Landfill will not meet that requirement.

The siting, design, operation, closure, and anticipated postclosure care (monitoring and maintenance) as proposed are inadequate to prevent pollution of groundwater and surface waters during the time that the wastes in this landfill will be a threat. Some of the key issues that contribute to that conclusion are listed below.

- The wastes in this "dry tomb" type landfill will be a threat to pollute the environment essentially forever.
- The liner system that EPD has approved for this landfill, at best, has a finite period of integrity. Even if properly constructed, it will not be able to collect leachate to prevent groundwater pollution for as long as the wastes in this landfill will be a threat.
- Pollution of groundwater can occur much sooner if construction quality control is inadequate.
- The amount of bufferland on the landfill property is inadequate to dissipate (dilute below hazardous/deleterious levels) the landfill-derived pollutants that will be in the groundwater, before the polluted groundwater reaches offsite property.
- The hydrology underlying this landfill will allow fairly rapid transport of shallow, leachate-polluted groundwater from just under the landfill liner to nearby properties and render those groundwaters hazardous or otherwise unsuitable for use for domestic purposes.
- The approved groundwater monitoring system has a low probability of detecting leachate-polluted groundwater before it trespasses onto adjacent properties.
- The hydrology of the landfill site is such that groundwater polluted by leachate will surface and thereby pollute surface waters with chemicals that are a threat to human health and the environment, affecting individual and public water supplies as well as aquatic life.
- There is a potential for stormwater runoff from the landfill, both during the active life of the landfill and during the postclosure period and beyond, to pollute surface waters with waste-derived chemicals that are a threat to public health and the environment.
- The landfill cover will not prevent rainwater from entering the landfill and generating leachate during the time that the wastes in this landfill will be a threat to generate leachate that can pollute groundwater and surface waters.
- Both the postclosure period and the assured postclosure funding provisions are grossly inadequate for the monitoring and maintenance of the landfill waste containment system and monitoring systems, for the period of time during which the wastes in this landfill will be a threat to release pollutants to the environment.

- There is a significant potential for the release of landfill gas over the period that the wastes in the Turkey Run Landfill will be a threat to generate landfill gas; this release will be hazardous and obnoxious to offsite property users and to groundwater quality.
- The EPD minimum prescriptive siting, design, and operation rules do not ensure protection of public health and the environment for those landfills to which they are applied, including the proposed Turkey Run Landfill, and do not assure compliance with Condition 14 of the EPD permit, i.e., that the "*disposal facility shall be operated in such a manner as to prevent air, water, or land pollution as well as public health hazards or nuisances at all times."*
- The February 29 , 2008 affidavit of Jeff Cown, Program Manager II, filed in this matter, reflects a lack of understanding of the severe limitations of the current minimum prescriptive standards set forth in EPD Solid Waste Management Rules in being able "**to prevent air, water, and land pollution as well as public health hazards or nuisances at all times.**" For example, Cown stated on page 4 of his affidavit,

"*9.*

The Georgia Solid Waste Management [MSW] *Rules require several systems for an MSW landfill, which the USEPA Subtitle D landfill regulations and the Georgia Solid Waste Management Rules implementing the criteria in those regulations require, and which the federal regulations and the Georgia Rules recognize to be protective of the environment. The first is the extensive siting criteria and hydrogeologic investigation requirement contained in the Rules and Circular 14. The second is a design requirement that the MSW landfill have a bottom liner system, consisting of a compacted clay sub-base and clay liner, a synthetic geomembrane liner on the bottom and sides of the landfill to prevent liquids from leaving the landfill, and a leachate collection system place on top of the synthetic liner to collect and remove rainwater and liquids contained in the waste, referred to as "leachate," which is collected in the system and treated on or off site, The third system is a groundwater and surface water monitoring system to assure that the landfill is functioning as designed. During the site suitability phase the characteristics and direction of groundwater and surface water flow are characterized through the hydrogeological investigation and hydrogeological site assessment report, and these monitoring systems are designed based on those hydrogeological characteristics. The fourth system is criteria for closure of the landfill using a cover and protective planted soil layers to prevent rainwater from getting into the landfill following closure. The Rules also contain requirements for maintaining minimum buffer distances between property boundaries and waste disposal areas, minimum buffer distances from any residences in the vicinity of the site, and a number of other requirements to insure that an MSW landfill is designed, constructed, and operated in accordance with the Solid Waste Management Rules to be protective of the environment including public and private drinking water sources."*

Owing to the properties and reasonably expected performance of the various landfill containment and monitoring systems of the type approved by EPD for the Turkey Run Landfill, it is recognized that even under the best of conditions these systems cannot be relied upon to prevent releases of waste-derived pollutants from the landfill for as long as the wastes in the landfill will be a threat (essentially forever), or to detect leachate-pollution of groundwater before offsite pollution occurs.

Since the 1970s we have continued to review the literature on these issues; integrating the literature with our personal investigations and expertise, we have published extensively on these issues. Many of our publications are available on our website, www.gfredlee.com at http://www.gfredlee.com/plandfil2.htm. We have developed a comprehensive report that summarizes key literature on these issues:

> Lee, G. F. and Jones-Lee, A., "Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste," Report of G. Fred Lee & Associates, El Macero, CA, December (2004). Updated June (2008).
> http://www.members.aol.com/apple27298/SubtitleDFlawedTechnPap.pdf

That "Flawed Technology" review report contains 135 references to sources of information summarized in that review. Seventy four of the references are to peer-reviewed literature including several authored by us; 40 are our reports which, themselves, provide additional sources of information on specific issues. The "Flawed Technology" review, the table of contents for which is attached, discusses not only the inappropriateness of relying on typical minimum siting and design criteria for Subtitle D landfills but also elements that need to be incorporated into Subtitle D landfills to significantly improve the protection of public health and environmental quality provided for as long as the wastes in the landfill will be a threat. A discussion of many of the deficiencies in EPD's permitting of the Turkey Run Landfill is presented below.

Overall, the permit for the construction and operation of the Turkey Run Landfill should be revoked since that site and the proposed design, operation, closure, and postclosure provisions cannot ensure compliance with the conditions set forth in the conditional permit.

Discussion of the Deficiencies in the "Design and Operation Plan Turkey Run Municipal Solid Waste Landfill for Greenbow LLC – dated December 2007"

In response to the Georgia Department of Environmental Protection (GA EPD)'s approval of the Greenbow LLC's proposed Turkey Run Municipal Solid Waste (MSW) Landfill, a petition was filed by a group of citizens to express concern about the potential impact of this landfill on their domestic water supply. We were asked by the Petitioners to review the Greenbow-proposed Turkey Run Landfill Design and Operation Plan. The GA EPD's approved design and operation of the Turkey Run Landfill are set forth in an affidavit presented by Hodges on February 29, 2008. Our key comments on the deficiencies in the proposed landfill design and operation plan follow.

In this review we have made reference to our publication,

> Lee, G. F. and Jones-Lee, A., "Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste," Report of G. Fred Lee & Associates, El Macero, CA, December (2004). Updated June (2008).
> http://www.members.aol.com/apple27298/SubtitleDFlawedTechnPap.pdf

as the "Flawed Technology" review report, a source of background information on the

issues discussed. In many instances page number(s) are mentioned for the location of particular discussions in that document. (The version of the "Flawed Technology" report for which page citations are provided herein is the June 2008 version. Since we update that review report periodically as new information becomes available, the page references made herein may not correspond to text locations in versions beyond the June 2008 version. However, the Table of Contents of the updates will guide the reader to the location of information on specific topics.)

Regulatory Framework. Georgia regulates the design, operation, and closure of MSW landfills in accord with the minimum requirements set forth in the US EPA Subtitle D regulations. Both Jeff Cown, manager of the GA EPD, and William Hodges, the engineer responsible for developing the Turkey Run Landfill Design and Operation Plan, filed affidavits on February 29, 2008 in support of GA EPD's permitting of this landfill as meeting the Subtitle D landfilling requirements. However, as documented in the "Flawed Technology" review cited above, meeting the siting and minimum design requirements set forth in Subtitle D and the EPD-issued permit for the Turkey Run Landfill does not ensure a high degree of protection of the public health, water resources, or the interests of those within the sphere of influence of a typical Subtitle D landfill, and especially the Turkey Run Landfill. As indicated in the "Concerned Citizens from Meriwether County" petition for review of the proposed landfill, this landfill will not provide protection of their existing, or potentially developed domestic water supplies. The proposed Turkey Run Landfill, with its minimum siting, design, operation, closure and postclosure monitoring and maintenance, and assured available postclosure funding specifications, cannot be relied upon to provide protection of public health, water resources, or environmental quality for as long as the wastes in the landfill will be a threat. It, in fact, has a great potential to eventually lead to significant adverse impacts to public health, water resources, and the environment.

MSW in Dry Tomb Landfill Is a Threat Forever. The proposed Turkey Run Landfill is a "dry tomb"-type landfill. As discussed in the "Flawed Technology" review beginning on page 7, the protection of public health and environmental quality from impact of such landfills is dependent upon keeping the wastes dry and entombed so that leachate is not generated. This dry condition must be maintained *ad infinitum* since the entombed wastes will be a threat to release pollutants in leachate and gas that will migrate offsite and trespass on to adjacent and nearby properties, essentially forever.

The degradation of biodegradable components of municipal solid waste and the leaching of wastes, require moisture. When biological decomposition occurs, landfill gas and leachate are produced; the presence of moisture also allows the leaching (dissolving) of some waste-associated constituents and their transformation products. The biodegradation of landfill components can be postponed for as long as the wastes are kept dry. The duration of postponement depends on the character, integrity, and maintenance of the containment system. The wastes in a dry tomb landfill will be a threat well-beyond the end of the 30-year postclosure care and assured funding period required under US EPA and EPD regulations. Thus, the requirement for 30 years of postclosure care funding is inadequate to properly maintain, monitor, and control gaseous and water

(leachate) releases from the landfill to prevent adverse impacts to public health and the environment for as long as the wastes are a threat, that is, for as long as the wastes are kept dry plus for however long it takes for the biodegradable waste components to decompose and leachable fractions to be leached from the wastes.

New landfills should not be permitted without a clearly defined plan, and assured adequate funding from the landfill developer, to address plausible worst-case releases of pollutants from the landfill for as long as the wastes in the landfill could be a threat to release waste-derived contaminant to the environment. This is especially important for privately developed landfills because of the great uncertainty of the required postclosure funding for as long as the wastes in the landfill will be a threat. This issue is discussed further below.

Inadequate Landfill Siting. The siting of the proposed Turkey Run Landfill provides inadequate bufferlands on landfill property to allow gaseous and water/leachate releases that will occur from this landfill to dissipate before they trespass onto neighboring property. The 200-foot buffer adopted for the Turkey Run Landfill is insufficient; odors and other volatile chemicals (gases), some of which are highly hazardous, that are released from MSW landfills have been found to migrate for a mile or more from an operating landfill. The US EPA Subtitle D and GA EPD landfilling regulations do not protect the health, welfare, or interests of those living or using properties within a mile or so of the Turkey Run Landfill. Additional information on potential gaseous releases and their impacts is provided in the section "Landfill Gas and Airborne Emission Problems" section of the "Flawed Technology" review, beginning on page 33.

Eventual Groundwater Pollution. The Turkey Run Landfill as proposed will not preclude eventual pollution of groundwater and surface waters with hazardous and otherwise deleterious chemicals that will be adverse to public health, water resources, and interests of nearby people and communities. By adopting the minimum prescriptive design requirements for this landfill, Georgia EPD does not ensure protection of basic public health, water resources, or environmental quality, as a regulatory agency should promote in the interest of the public and the state.

Inadequate Liner Properties. The properties and characteristics of a single composite liner as the primary containment system to collect leachate generated in an MSW landfill, such as is proposed for the Turkey Run Landfill, are reviewed in the "Flawed Technology" review section "Subtitle D Landfill Design Will Not Protect Groundwater for as Long as the Leachate Can Be Generated" beginning on page 9. As discussed therein, it is only a matter of time until such a liner fails to prevent the passage of leachate from the landfill to pollute groundwaters. Such a liner system is not selected because of its inherently protective nature; rather it is the typically least expensive system that evolved from the sequential addition of components – from the unlined landfill, to a clay liner, to an HDPE plastic sheet, to a composite liner – to provide the appearance of better, albeit short-term (compared to the period during which the wastes will be a threat to public health and the environment), containment.

Unreliable Groundwater Monitoring. Another basic flaw of minimum-design Subtitle D landfilling is the inability to reliably monitor for the eventual liner failure and the attendant groundwater pollution before offsite groundwaters are polluted by leachate. Problems with groundwater monitoring at MSW landfills are discussed in the "Flawed Technology" review section "Unreliable Groundwater Monitoring" beginning on page 22. The reliance on vertical monitoring wells, spaced hundreds or more feet apart, at the point of compliance ignores the basic characteristics of landfill liner failure and groundwater flow. The 400-ft distance between monitoring wells specified for the Turkey Run Landfill will certainly allow leachate-polluted groundwater to migrate, undetected, off the landfill property onto public and private property. Such spacing has little chance of detecting incipient groundwater pollution.

On May 14, 2008 the California Department of Toxic Substance Control (DTSC) and the US EPA held a Remediation Technology Symposium (agenda available at http://www.dtsc.ca.gov/HazardousWaste/upload/Remediation_Technology_Symposium_Agenda.pdf). At that symposium M. Einarson made a presentation entitled, "Site Characterization and Monitoring in the New Millennium," which was devoted to problems with conventional groundwater monitoring approaches at hazardous chemical sites (slides available at, http://www.dtsc.ca.gov/hazardouswaste/upload/einarson_remsymp_presentation.pdf). That presentation discusses errors that are typically made by landfill consultants and regulatory agencies in monitoring, and the fallacy of the prevailing and necessary assumption that there will be significant lateral spread of pollution plumes that will be detected by the proposed monitoring well array. Einarson provided additional information beyond that provided in the "Flawed Technology" review regarding the limited lateral spread of typical pollution plumes from landfills, which can lead to plumes' passing the point of compliance for groundwater monitoring without being detected by the monitoring wells.

Inadequate Landfill Cover. The required prescriptive Subtitle D landfill cover – which is to be no more permeable than the landfill liner system – leads to another aspect of this flawed technology. As discussed beginning on page 16 of the "Flawed Technology" review, the typical approach for closure of Subtitle D landfills, including that prescribed for the Turkey Run Landfill, is to cover the waste with a plastic sheeting layer overlain by a porous soil drainage layer which is topped by a top soil layer that can be vegetated. The key to preventing the entrance of water into the "dry tombed" wastes and consequent generation of leachate and landfill gas, is the integrity of the plastic sheeting layer. While it is possible to construct a Subtitle D landfill cover that will be initially effective in keeping water that falls on the surface of the closed area, out of the landfill, over time the plastic sheeting layer of the cover will deteriorate and fail to prevent water from entering the landfilled wastes. This plastic layer is subject to considerable stresses that can cause it to develop cracks. It is also subject to free-radical attack and consequent deterioration which will allow water to pass through those deteriorated areas into the underlying wastes.

One of the most significant deficiencies in the design of the Turkey Run Landfill is that this plastic sheeting in the cover is not subject to adequate inspection to allow maintenance of its integrity landfill-wide. It is not possible to detect the deterioration of the plastic sheeting layer in the cover by visual inspection of the surface of the landfill since this layer is buried below the top soil and a drainage layer. Since the wastes in a dry tomb landfill will be a threat to generate leachate and landfill gas well-beyond the 30-year postclosure period, essentially forever, it is only a matter of time until the wastes in the landfill generate leachate and landfill gas. As discussed below, this could readily happen after the period of required postclosure funding has expired, when there is no monitoring of the leachate collection system to detect failure of the landfill cover.

Inadequate Postclosure Funding

Among the most significant deficiencies in the US EPA Subtitle D landfilling regulations are the inadequacy and short-sightedness of the requirements placed on the landfill owner for postclosure funding. While the landfill owner should be required to provide adequate postclosure funding for as long as the wastes in the dry tomb landfill will be a threat to pollute the environment with landfill gas and leachate, the Subtitle D regulations do not require funding for as long as the wastes will truly be a threat. The "Flawed Technology" review discussion of this issue begins on page 41. The current regulatory approach, and the approach that GA EPD has adopted for the Turkey Run Landfill, requires minimum postclosure funding for only 30 years after closure of the landfill. This means that while the wastes the Turkey Run Landfill will be a threat to generate leachate and landfill gas essentially forever, there will be no assured funding for landfill monitoring or maintenance, or for remediation of the groundwater pollution that will eventually occur at that landfill, after the 30-year postclosure period has passed. This situation is of particular concern for the Turkey Run Landfill because it is being developed by a private developer, Greenbow LLC; there is no assurance that a private entity will provide funding beyond the stipulated 30-year period as needed to address and correct landfill-related pollution issues.

As quoted above, the GA EPD permit Condition 14 requirement is,

"The disposal facility shall be operated in such a manner as to prevent air, water, or land pollution as well as public health hazards or nuisances at all times."

There is no limit on the period of time during which public health and the environment must be protected from adverse effects of the Turkey Run Landfill. However, there is no requirement for the landfill owner to assure funding to ensure this protection beyond 30 years. Under the current postclosure funding stipulations, if postclosure funding for monitoring and maintenance is to be provided after the 30-year postclosure period, it may have to be provided by the public – Meriwether County or the state of Georgia – or some other source. This makes the GA EPD permit for the Turkey Run Landfill fundamentally flawed.

Other Issues

The "Flawed Technology" review includes discussion of other potential impacts of MSW landfills that are adverse to the interests of those within the sphere of influence of the landfill. The section devoted to "Justified NIMBY" beginning on page 55 summarizes these issues, which include vermin/disease vectors, noise pollution, light pollution, stormwater flooding problems, and decreased values of nearby property. While not considered in the EPD review of the Turkey Run Landfill these issues are real and significant. The failure of EPD to require at least one mile of bufferlands between where wastes will be deposited and adjacent properties means that many of the issues discussed in the "Justified NIMBY" section will be issues that will be faced with this landfill.

Overall Assessment

The siting, design, proposed operation, closure, and postclosure funding aspects of the proposed Turkey Run Landfill are significantly deficiently compared those needed to protect public health, groundwater and surface water quality, and the interests of those in the sphere of influence of the landfill. The EPD permit for the landfill should be revoked.

Information on Drs. Lee and Jones-Lee's expertise and experience in evaluating the potential impact of landfills is available at, http://www.gfredlee.com/landfill.htm.

"Flawed Technology" (June 2008)
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