

**Comments on SWANA News,  
“The Long-Term Management and Care of Closed Subtitle D Landfills”  
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Comments by  
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**Introduction**

The May 2011 issue of *MSW Management* carried a Solid Waste of North America (SWANA) News article by Jeremy K. O'Brien, director of the SWANA Applied Research Foundation (ARF) that discussed the SWANA ARF report devoted to “The Long-Term Management and Care of Closed Subtitle D Landfills.” That article is available at <http://digital.mswmanagement.com/publication/?i=67910&p=12&pn=>

That and other SWANA discussions have purported to discuss technical issues associated with protecting the public and the environment from adverse impacts of MSW landfills. However, disinterested and critical technical review reveals that in some instances and important aspects the SWANA reviews have been superficial and misleading, and fall far-short of providing accurate and reliable discussion of the issues. We have provided comments on a number of such aspects of other SWANA articles, including the following:

Lee, G. F., and Jones-Lee, A., “Comments on the O'Brien ARF SWANA Article, ‘The Solid Waste Managers’ Guide to the Bioreactor Landfill—A 2009 Update,’ *MSW Management* 20(3):14,16 May (2010),” Report of G. Fred Lee & Associates, El Macero, CA, Submitted to *MSW Management*, June (2010).  
<http://www.gfredlee.com/Landfills/SWANABioreactorCom.pdf>

Lee, G., F., and Jones-Lee, A., “Comments on O'Brien Editorial, ‘SWANA,’ Summarizing SWANA ARF Disposal Group’s Report on the Potential Problems of Subtitle D Landfills,” Report of G. Fred Lee & Associates El Macero, CA, September (2009). [http://www.gfredlee.com/Landfills/SWANA\\_ARF\\_rpt\\_comments.pdf](http://www.gfredlee.com/Landfills/SWANA_ARF_rpt_comments.pdf)

Lee, G. F., “Comments on the SWANA Summary Report, ‘Recent Studies Indicate Minimal Heavy Metal Releases from MSW Landfills,’ with Responses by Jeremy O'Brien for SWANA, and with Responses by Lee to O'Brien’s Comments,” Report of G. Fred Lee & Associates, El Macero, CA, August (2006). (Published in *MSW Management – Counterpoint*, June 1 (2006) [<http://www.mswmanagement.com/elements-2007/counterpoint-swana-summary.aspx>] and [<http://www.mswmanagement.com/elements-2007/comments-on-obriens-responses-on-water-quality-significance.aspx?ht=>])  
<http://www.gfredlee.com/Landfills/CommSWANASummary.pdf>

In our “flawed technology” review of key environmental quality/public health-protection deficiencies in US EPA Subtitle D MSW landfilling regulations cited below, we provided a detailed discussion, with references to the technical literature, of reasons that minimum Subtitle D landfills can be expected to fail to prevent pollution of groundwaters and other adverse impacts to public health, groundwater resources, and the interests of those in the sphere of influence of landfills for as long as the wastes in the landfill will be a threat.

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 (2010).

<http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf>

In short, as documented in that review, a Subtitle D landfill is intended to serve as a “dry tomb” in which to keep wastes separated from the environment. In concept, if the wastes are kept dry, they will not decompose and will not generate leachate and gas, and hence will not pollute groundwater and the environment. To try to achieve the “dry tomb” conditions, Subtitle D requirements specify covers, liner systems, groundwater and gas monitoring systems, and a modicum of postclosure “care.” However, the passage of time does not diminish the threat of the buried wastes; MSW waste components in a Subtitle D “dry tomb” landfill will be a threat to produce leachate and landfill gas effectively forever as long as the wastes are kept dry. The integrity of covers and liner systems, even if flawless upon installation, will deteriorate over time. The systems are not amenable to routine thorough inspection, maintenance, and repair, especially those systems buried beneath the wastes. As liquid eventually enters the landfilled wastes, leachate will be generated and will breach the liner. The groundwater monitoring programs typically incorporated into Subtitle D landfill designs are intended to detect leachate-pollution of groundwater at a point of compliance some distance down-groundwater gradient from the buried wastes, by means of monitoring wells spaced hundreds or more feet apart. Since leachate will travel in narrow finger-like plumes from areas of liner breach, and since the monitoring wells typically sample water only within a foot or so of the well, the typical monitoring programs have a low likelihood of detecting leachate-pollution of groundwater before widespread pollution has occurred. Finally, the 30-year postclosure period often prescribed is but a small fraction of the time during which the wastes in the landfill will be a threat if kept dry, and during which the cover and liner systems must be maintained in unbreachable condition in order to keep the wastes dry. Landfill owners and regulators have not addressed the issue of ensuring adequate, *ad infinitum* funding for proper maintenance and repair of closed landfills, much less for remediation of polluted groundwater when it inevitably occurs tens or hundreds of years after closure, in order to provide reliable and sure protection of the public and the environment.

The most recent SWANA ARF report by O’Brien addressing the long-term management and repair of Subtitle D landfills is fundamentally flawed; it does not reliably portray the period of time during which MSW landfills will be a threat to produce landfill leachate that can cause groundwater pollution that is a threat to public health and the environment. Our comments on the deficiencies in the O’Brien report are based on Dr. Lee’s more than four decades of investigating environmental and public health-related impacts of MSW landfills, review of more than 80 landfills, and research on MSW waste decomposition processes and US EPA-sponsored research on landfill liners. We have published extensively on our findings from that work; many

of our papers and reports are available on our website [[www.gfredlee.com](http://www.gfredlee.com)] in the Landfills–Groundwater section [<http://www.gfredlee.com/plandfil2.htm>].

### **Specific Comments**

The SWANA ARF report by O’Brien begins with the following:

*“Perspective of State Regulators*

*Federal RCRA landfill regulations are codified in Part 258 of Title 40 of the Code of Federal Regulations (CFR). These regulations, which are often referred to as “Subtitle D” regulations, were promulgated by the United States Environmental Protection Agency (USEPA) in 1991 and include prescriptive requirements for monitoring and maintaining landfills for a period of 30 years following closure—i.e., the postclosure care (PCC) period. These requirements include the following:*

- *Maintaining the integrity and effectiveness of the final cover system*
- *Maintaining and operating the leachate collection system*
- *Monitoring the groundwater in the vicinity of the site and maintaining the groundwater monitoring system*
- *Maintaining and operating the gas-monitoring system.”*

A distinct, although significantly misleading, implication of that listing – and indeed the entirety of the paper – is that meeting those requirements for a 30-year postclosure period will result in protection of groundwater quality from adverse impacts of MSW landfills. Unfortunately, O’Brien neglected to mention, much less discuss, why providing those elements of postclosure care for 30 years is grossly inadequate for protecting public health, groundwater resources, and the environment in the vicinity of the landfill.

The fact is that the 30-year postclosure assured funding requirement in Subtitle D regulations was incorporated into the initial Resource Conservation Recovery Act (RCRA) regulations developed by Congress in 1976 without critical review of what was known about the period of time during which landfilled wastes would be a threat to pollute the environment. At the time RCRA was developed, a landfill was an unlined “sanitary landfill,” which was typically a hole in the ground into which each day’s waste was placed and covered with a layer of soil. When full, the landfill was “closed” by covering the wastes with a final layer of soil without regard to the permeability of the cover. That landfilling approach allowed rainfall and snow melt to enter the wastes through the cover and generate leachate and landfill gas. It had been well-known since the 1950s (e.g., American Society of Civil Engineers (ASCE) “Sanitary Landfill” manual) that sanitary landfills could cause significant adverse impacts on groundwater quality. Landfills in existence in the 1970s when RCRA was developed typically produced large amounts of landfill gas for 30 years or so. While that finding was apparently the origin of the 30-year postclosure care period specified in RCRA, it was known even then, but evidently ignored in the development of RCRA regulations, that the typical sanitary landfill would cause groundwater pollution for well-beyond 30 years after landfill closure.

In the 1980s, in recognition that moisture was needed in order for landfills to generate leachate and gas, environmental groups convinced Congress that landfills should be required to have covers and liners for the purpose of keeping the wastes dry, collecting leachate (garbage juice), and removing the leachate from the landfill through a leachate collection and removal system. In

principle, wastes kept dry in a “dry tomb” landfill would not generate leachate and landfill gas. The US EPA specified thin plastic sheeting and compacted clay layers as the minimum liner materials in the “new” “dry tomb”-type landfills. That specification was made because those materials were the cheapest materials readily available for lining landfills; it was not based on a reliable finding that those liner materials would be effective in keeping landfilled wastes dry for as long as the wastes remained a threat. The US EPA “dry tomb” landfilling concept also did not consider the fact that the process and pattern of leachate and gas generation in such a landfill would be fundamentally different from that which was experienced in existing “sanitary landfills.”

While, as discussed in our writings, it is possible to develop substantially more protective landfills, federal and state agencies have not, in general, adopted more protective measures because of the political backlash; providing greater, though not ensured, protection would mean that the garbage “removal” costs for those who generate the wastes in urban areas would double or triple. The real costs of waste disposal are always paid – either by paying for more reliable protective measures and perpetual maintenance, or by paying in lost groundwater resources, and public health and environmental impacts, and for “remediation,” etc. Thus far, the regulators and politicians have chosen the second option; the real costs and impacts are being passed on to the rural populations near locations where landfills are imposed on the residents of an area and to future generations who will suffer the consequences of lost resources and public health impacts. One could argue that if today’s landfills were truly protective, they should appropriately be placed in the urban areas where the majority of the MSW is generated, and by doing so minimize transportation and handling costs.

In proposing its Subtitle D landfill regulations in 1989, the US EPA acknowledged and stated that the liner materials suggested would not prevent groundwater pollution, but would only postpone inevitable pollution. That notwithstanding, as part of litigation settlement with an environmental group, the Agency adopted the minimum design of MSW landfills with a single composite liner. That approach led to the flawed technology of Subtitle D landfilling of MSW that exists today, a landfilling practice that will ultimately lead to massive groundwater pollution. That pollution will render otherwise potable waters unusable for domestic and other purposes and pose a threat to public/animal health and the environment since pollution of offsite wells will be expected to occur prior to the discovery of the landfill leakage. It will also necessitate massive “Superfund”-type programs to provide “remediation” of groundwaters polluted by MSW wastes deposited in minimum design Subtitle D landfills.

As a landfill is closed with a low-permeability cover the generation of leachate can essentially stop. However, over time, the integrity of the cover inevitably deteriorates; as the cover deteriorates, leachate generation will resume (see discussion in our “flawed technology” review). Because leachate generation can be delayed only as long as the wastes are kept dry, thorough and adequate cover maintenance, *ad infinitum*, is critical. In his Figure 2 (shown below), O’Brien illustrated the approach allowed by state regulatory agencies for maintaining the integrity of the landfill cover. Those provisions, however, are inadequate for ensuring that the plastic sheeting layer in the cover does not develop areas of deterioration (cracks) that will allow water that penetrates the top soil and cover soil layer to penetrate into the wastes through the deteriorated plastic sheeting layer. The deterioration of the plastic sheeting layer cannot be detected with the

visual inspection of the cover that is allowed. The only reliable way to determine if the cover of the landfill has maintained its integrity is by monitoring of the leachate collection system; however, by the time the breach of the cover is so detected, leachate will have already been generated. It is for this reason that monitoring of the leachate collection system for leachate generation for as long as the wastes in the landfill can generate leachate when contacted by water, i.e., for as long as the wastes are present, is a necessary component of reliable postclosure care of the landfill. In a “dry tomb” landfill that period of time can be essentially forever since in a true “dry tomb” landfill the MSW does not decompose or release waste components in leachate until moisture is introduced. As noted above and discussed in our “flawed technology” review, failure to maintain the cover of a landfill, for as long as wastes remain buried, so that little or no moisture enters the landfill to generate leachate and landfill gas can lead to groundwater and environmental pollution for very long periods of time – likely on the order of many decades to hundreds of years after leachate begins to be generated.

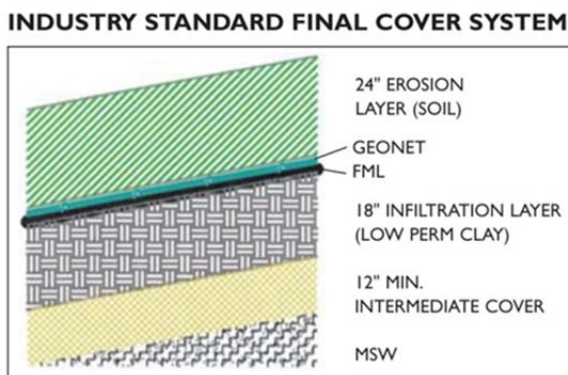


Figure 2. Typical Subtitle D Final Cover System<sup>6</sup>

<sup>6</sup> Source: [http://garrett-moore.com/index.php/projects/solid\\_waste/horry\\_county/](http://garrett-moore.com/index.php/projects/solid_waste/horry_county/)

[Figure from: O’Brien, J., “The Long-Term Management and Care of Closed Subtitle D Landfills,” SWANA News, MSW Management pp. 12-18, May (2011).]

Despite O’Brien’s listing of groundwater monitoring as a protective measure incorporated into Subtitle D landfills, the groundwater monitoring allowed is well-recognized to be one of the most significant deficiencies in the implementation of Subtitle D regulations. While officially, the Subtitle D regulations require groundwater monitoring capable of detecting leachate-polluted groundwater when it first reaches the point of compliance, the monitoring programs allowed by state regulatory agencies and the US EPA for compliance with Subtitle D cannot meet that requirement. Groundwater monitoring programs that are typically accepted specify monitoring wells spaced hundreds of feet apart at the “point of compliance;” each well is capable of sampling water from only a foot or so about it. Such a well array may be effective for detecting incipient pollution from an unlined landfill from which leachate-contaminated groundwater could be expected to emanate as a wide downgradient front. However, it is grossly inadequate for detecting incipient leakage from single-composite-lined landfills that incorporate thin plastic sheeting liners. It has been recognized for many years that the initial leakage of leachate from a Subtitle D single-composite-lined landfill will be through holes, rips, tears, and points of imperfection or deterioration in limited areas of the liner. This means that the initial plume(s) of

leachate from such a landfill will be finger-like plumes of limited lateral dimension. Given that the monitoring wells are spaced hundreds of feet apart, there can readily be many tens of feet or more between monitoring wells through which the finger-like leachate plumes can pass without being detected by the groundwater monitoring system. Thus, unless there is massive failure of the liner system, the early leakage of leachate will not likely be intercepted by the monitoring systems allowed for Subtitle D landfills. As discussed in our “flawed technology” review some states, such as Michigan, will not allow single-composite-lined landfills because the leakage of the composite liner cannot be reliably detected by the monitoring wells.

SWANA ARF, through O’Brien and others, often claim that the minimum design Subtitle D landfill liner systems are effective because there have been no instances of groundwater pollution’s being detected by the groundwater monitoring systems. That is a specious argument for several reasons. First, Subtitle D landfills would be expected to be able to postpone leachate generation for some period of time, as long as construction was adequate and the new systems function properly. It is as maintenance becomes more lax or impossible (e.g., owing to the systems’ being buried and inaccessible) and as systems begin to deteriorate that water begins to enter the landfill to generate leachate and further compromise containment. Thus, even if the groundwater monitoring systems were reliable for detecting incipient pollution from Subtitle D landfills, pollution may still be in abeyance. Second, as discussed above, there is not a reasonable expectation that the groundwater monitoring systems being employed would detect incipient groundwater pollution from lined landfills. The finding of “no pollution” in a monitoring system incapable of detecting that pollution, is meaningless.

O’Brien’s listing of 30 years of landfill gas monitoring as an assurance of protection from Subtitle D landfills is also unreliable and misleading; it disregards how “dry-tomb” landfills generate landfill gas. As noted above, and as discussed in our “flawed technology” review, when MSW was disposed of in unlined “sanitary landfills” that did not have low-permeability covers, and before there was widespread disposal of household and commercial solid wastes in plastic (polyethylene) bags, landfill gas was generated over a period on the order of several decades after waste was deposited; landfill gas was generated as a byproduct of the decomposition of the wastes that were exposed to moisture in the landfill. Today, however, the at least initially low-permeability covers of Subtitle D landfills act to delay the entrance of moisture into the buried wastes and hence delay the decomposition of the organic components of the wastes and attendant gas formation. In fact, landfill gas production may be delayed for many decades to a hundred years or more, as long as the wastes are kept dry. Landfill gas production can be delayed and impeded further because of waste materials that are landfilled in plastic bags; the plastic bags, crushed during landfilling, “hide” wastes from infiltrating water until the plastics are sufficiently decomposed. Because polyethylene plastic bags are highly resistant to decomposition in a MSW landfill, large amounts of MSW remain shielded from moisture and decomposition for long periods of times, beyond the time when other, unprotected, organic wastes have decomposed. If the cover for a Subtitle D landfill maintains its integrity during the 30-year assured postclosure funding period, there will be limited generation of landfill gas by even the wastes that are not hidden in the crushed bags.

State landfill regulatory agencies are allowing landfill developers to use the US EPA LandGEM gas generation model to predict how long landfill gas will be generated in Subtitle D landfills.

However, as discussed in our “flawed technology” review, that model does not reliably account for the pattern in which moisture enters a closed Subtitle D, the limited amount of moisture that enters a closed Subtitle D landfill, or the impact of those characteristics on the rate of landfill gas production. For most Subtitle D landfills the length of time during which sufficient landfill gas is produced to represent explosive and human health hazards to those in the sphere of the landfill will be much longer than that typically predicted for today’s permitted MSW landfills.

Overall, it was misleading and inaccurate for the O’Brien paper to cite the bulleted items discussed above as providing significant assurance of protection for public health, groundwater quality, and the environment from today’s Subtitle D landfills. Subtitle D regulations as being implemented today reflect a flawed technology for reliable management of MSW.

O’Brien stated:

*“The length of the PCC period may be decreased by the state agency that issued the landfill permit if the landfill owner demonstrates that the reduced period is sufficient to protect human health and the environment. Alternatively, the state permitting agency may increase the PCC period if it determines that the lengthened period is necessary to protect human health and the environment. (US Code of Federal Regulations [40 CFR §258.61.]) In the process of developing new postclosure financial assurance regulations, the state of California conducted a survey in 2009 to identify the policies that other states had or were developing with respect to extending or shortening the PCC period.”*

and

*“In July 2010, the state of California adopted new postclosure regulations requiring landfill owners to fund PCC “until the waste no longer poses a threat to human health and the environment.” In addition, landfill owners must include funding for a reasonably expected postclosure remediation action such as the eventual replacement of the final cover.”*

In the early 1980s while holding a position of professor of civil and environmental engineering in the University of Texas system Dr. Lee served as a consultant to the state of California Water Resources Control Board in its development of updated MSW landfill regulations. While O’Brien stated that the state of California adopted new postclosure regulations in July 2010, the fact is that California’s 1985 Chapter 15 MSW landfilling regulation contained the requirement that MSW landfills shall be designed so as to protect groundwater quality for as long as the wastes in the landfill are a threat to pollute groundwater. As discussed in writings cited below, for many years the California Regional Water Quality Control Boards has failed to implement that requirement in the permitting of MSW landfills.

Lee, G. F. and Jones-Lee, A., "Groundwater Quality Protection Issues," Report of G. Fred Lee & Associates, El Macero, CA, February 2007; Presented in part at CA/NV AWWA Fall Conference, Sacramento, CA, October (2007).  
<http://www.gfredlee.com/Groundwater/GWProtectionIssues.pdf>

Lee, G. F., and Jones-Lee, A., “Groundwater Quality Protection Issues,” Presented in part at CA/NV AWWA Fall Conference, Sacramento, CA, PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, October (2007).  
<http://www.gfredlee.com/Groundwater/GWProtectionIssues-sli.pdf>

Finally in the 2000s the California Integrated Waste Management Board (CIWMB) adopted regulations that required better assurance of postclosure funding to more adequately monitor, maintain, and provide for groundwater remediation for as long as the wastes had the potential to generate leachate that could pollute groundwater. That requirement was vigorously opposed by the private landfill companies; a number of unreliable claims have been made by their representative concerning how long the wastes would be a threat and when it would be possible to stop providing postclosure care. The CIWMB staff found that such statements and claims by waste management companies on these issues were not technically valid. These issues are discussed in our “flawed technology” review.

In the section headed, “*Performance-Based Post-Closure Care*,” O’Brien stated:  
*“The Evaluation of Post Closure Care (EPCC) Methodology—developed by GeoSyntec Consultants Inc., with funding from the Environmental Research and Education Foundation (EREF)—presents a scientifically based method for determining the types and timing of monitoring activities that should be conducted during the PCC period.”*

and

*“Documented case studies of landfills at which the EPCC methodology was applied indicate significant reductions may be justifiable with respect to sampling for many of the regulated parameters and that the 30-year postclosure care period may be too long for some Subtitle D landfills. Based on this research, it may behoove landfill owners to consider using the EPCC methodology and to take steps to meet the data and other requirements for its application to their facilities.”*

As discussed in our “flawed technology” review, staff of Geosyntec, a company involved in landfill development, has a long history of providing inadequate and unreliable information on the protective nature of Subtitle D landfills. Their writings on these issues fail to discuss issues discussed in these comments and in our “flawed technology” review concerning the protection actually afforded by Subtitle D landfills prescriptive requirements. This so-called EPCC methodology is likely unreliable for predicting the period of time that Subtitle D landfills will need adequate groundwater monitoring.

In his “Biostabilization in the PCC Period” section O’Brien discussed some issues pertinent to introducing moisture or leachate into a MSW landfill to reduce the duration of postclosure care. He stated:

*“Federal PCC regulations—as well as most state PCC regulations—discourage landfill owners from considering biostabilization by not providing regulatory flexibility to allow the installation of interim final covers. Furthermore, other than Wisconsin, states have not adopted policies that encourage the biostabilization of landfilled waste before the end of the PCC period. In light of its environmental benefits and higher costs, state regulators should provide clear regulatory policies and should consider could providing economic and other incentives to landfill owners to biostabilize landfilled waste during the PCC period.”*



Beginning in the 1980s we became involved in evaluating potential benefits and problems with introducing leachate into MSW landfills. At that time we had a contract with the US Army Construction Engineering Laboratory to review these issues with respect to the potential efficacy of leachate recycle in landfills on military bases. As discussed in our report on that work, leachate recycle – what is now being called “biostabilization” by O’Brien – has the potential to reduce the period during which MSW is a threat to generate landfill gas and generate leachate that can cause groundwater pollution. However, the introduction of leachate back into a landfill has the potential to increase the magnitude of groundwater pollution through increased hydraulic loading of the landfill.

Since the development of our report on this issue we have closely followed the development of this approach and have published several papers on how leachate recycle can be practiced without increasing groundwater pollution. These issues are discussed in our “flawed technology” review. Basically, leachate recycle should not be conducted without a double-composite-lined landfills designed so that failure of the uppermost composite liner can be detected in the leak detection system between the two composite liners. The MSW should be shredded prior to placement to enhance the contact between the waste materials and the added moisture. Also, after landfill gas generation has essentially ceased, clean water should be added to thoroughly wash the leachable potential pollutants from the residual wastes.

In May 2010 O’Brien ARF published “The Solid Waste Managers’ Guide to the Bioreactor Landfill—A 2009 Update,’ MSW Management 20(3):14,16 May (2010)” that discussed some aspects of leachate recycle then called bioreactor landfills. However, that “guide” did not adequately address well-known potential problems with practicing leachate recycle in conventionally designed/developed Subtitle D landfills. We discussed these concerns in our comments on that guide:

Lee, G. F., and Jones-Lee, A., “Comments on the O’Brien ARF SWANA Article, ‘The Solid Waste Managers’ Guide to the Bioreactor Landfill—A 2009 Update,’ MSW Management 20(3):14,16 May (2010),” Report of G. Fred Lee & Associates, El Macero, CA, Submitted to MSW Management, June (2010).  
<http://www.gfredlee.com/Landfills/SWANABioreactorCom.pdf>

Based on a comprehensive review of these issues, and contrary to O’Brien’s statement quoted above, states should be very cautious about promoting so-called bioreactor/biostabilized landfills in minimum-design Subtitle D landfills having single-composite liners and inadequate groundwater monitoring well arrays to detect leachate polluted groundwater when it first reaches the point of compliance for monitoring.

O’Brien’s paper included a discussion of “Need for Final Cover System Replacement” in which he made reference to findings of a 2007 National Research Council study (Committee to Assess the Performance of Engineered Barriers, National Research Council. 2007. *Assessment of the Performance of Engineered Waste Containment Barriers*. (ISBN: 0-309-10810-1). Washington, DC: National Academic Press). As discussed in our “flawed technology” review, that report contains important information on the ultimate failure of landfill liner systems. It also contains a number of technical deficiencies that reflect a lack of familiarity with technical aspects of some of the topics discussed.

O'Brien also stated,

*“Finally, it would be beneficial to be able to periodically test the integrity of the final cover geomembrane following the closure of the landfill. For all of these reasons, landfill managers should consider the option of installing a leak detecting and monitoring method for the final cover system when closing Subtitle D landfills.”*

As discussed in our writings, we fully agree that leak detection systems are needed for landfill cover, and discuss several approaches for such a system. As discussed above the presence of leachate in the leachate collection system of a closed landfill is a clear indication that the landfill cover is not preventing water from entering the landfill.

In his “Long-Term Oversight” section, O'Brien stated:

*“One of the primary issues regarding longterm care of a closed Subtitle D landfill is whether or not regulatory oversight is needed during this phase of the landfill lifecycle. In this regard, the state of California concluded that state regulatory oversight is needed due to the lack of experience and expertise of local government planning boards and/or building departments and the need to ensure that financial assurance is provided for long-term care activities.*

*“Alternatively, the ITRC has concluded that long-term care requirements can be included in the site deed; and therefore, regulatory oversight by the state can be ended. To support their position, they reference redeveloped brownfield sites, which have addressed long-term care issues in this manner. State governments may decide to continue their roles in providing regulatory oversight for closed Subtitle D landfill sites following the 30-year PCC period. In this regard, the USEPA and state regulators may want to consider the creation of a new regulatory phase called “long-term care” to distinguish it from Subtitle D PCC. State regulatory agencies could issue a certificate that the closed Subtitle D landfill has successfully met its Subtitle D PCC requirements and has entered the long-term care phase for the site.”*

Over the past several decades we have been involved in the review of investigations of, and proposed remediation for, areas in which hazardous chemicals are present in the soil and groundwater – so-called “brownfield” sites. Various governmental and regulatory agencies, commercial and industrial groups, as well as public interest groups have asked us to review the adequacy of site investigations/remediations relative to potential public health and environmental quality issues that could be faced by future users of the areas once redeveloped. We have frequently found that in the zeal to redevelop blighted areas inadequate consideration is given to long-term potential public health and environmental problems that can occur from known residual hazardous chemicals left at the site in containment structures as well from currently unrecognized and unregulated chemicals that could be found at the site. Such chemicals can be a threat to public health and the environment effectively forever. While “deed restrictions” are often considered to be an obvious and easy remedy, a municipal clerk in a city/county building department that is in charge of reviewing a deed restriction on activities is not in the best position to make sound judgments on long-term public health and environmental quality threats and concerns posed by such situations. In the paper cited below we have discussed some of the significant public health and environmental quality protection problems associated with the redevelopment of brownfield sites that contain residual hazardous chemicals and landfill areas.

Lee, G. F., and Jones-Lee, A., “Issues in Providing Long Term Public Health and Environmental Protection from Redeveloped Brownfield Properties,” Report of G. Fred Lee & Associates, El Macero, CA, Nov. 1 (2010).  
<http://www.gfredlee.com/HazChemSites/Brownfield-Issues.pdf>

That guidance discusses the kinds of issues that need to be addressed in review of brownfield sites as well as closed landfill long-term hazards. To provide adequate public health and environmental protection will necessitate the involvement of highly trained personnel to provide continuing oversight and adequate ongoing monitoring.

The approach promoted by the ITRC [Interstate Technology and Regulatory Council] would relieve a private landfill developer of responsibility for providing long-term postclosure care for as long as the wastes in the landfill are a threat appears. This appears to be an attempt by private landfill companies to make their profits from developing landfills but pass the expenses for providing long-term maintenance and the inevitable remediation on to the public, as they advocate to relieve themselves of the costs associated with true, requisite postclosure care for as long as needed to protect public health and the environment. As discussed in our “flawed technology” review, landfills developers should be required to set aside sufficient funds from landfill operations during the landfill’s active life to ensure adequate funding for perpetual postclosure care. Based on our experience we would strongly oppose the ITRC approach for providing long-term care of closed landfills.

O’Brien stated in his “Conclusion,”

*“The findings of relevant research reviewed by the SWANA Applied Research Foundation have been presented in this article to shed light on some of the key issues associated with the long-term maintenance and monitoring of closed Subtitle D landfills. It is hoped that this effort will foster discussions between regulatory agencies, the landfill industry and environmental and community organizations that will lead to the establishment of environmentally protective and economically sound policies and management strategies to provide for the long-term care of these facilities.”*

While we agree that these issues need to be discussed we urge that the addressing of these issues incorporate a more balanced comprehensive discussion than that presented by O’Brien.