

Guidance on the Evaluation of Potential Impacts of a Proposed Landfill

G. Fred Lee, PhD, PE, BCEES, F.ASCE and Anne Jones-Lee, PhD
G. Fred Lee & Associates, El Macero, CA
gfredlee33@gmail.com www.gfredlee.com

October 2008 (updated 2015)

The typical approach followed in developing a new municipal solid waste (MSW) landfill for an urban area is to attempt to locate the new landfill in a rural area where there is limited population and limited financial resources to conduct a comprehensive review of reasonably anticipated impacts of the proposed landfill on public health and environmental quality. While it is possible to develop truly protective landfills, federal, state and local landfilling regulations do not require that a landfill be located, designed, operated, closed, and monitored and maintained postclosure as needed to protect those within the potential impact zone of the landfill for as long as the wastes will be a threat to public health and the environment. Typically, the siting and design of proposed landfills are the minimum (or near-minimum) allowed in order that the costs of landfilling be kept as low as possible for those who generate the wastes; that approach, however, transfers the burdens of the impacts of the landfills onto those who live, work, or otherwise use nearby areas. Presented herein is general guidance on evaluating potential impacts of landfills.

Justified NIMBY

While landfill developers and those in urban areas often characterize and dismiss opposition to a proposed landfill in rural communities as reflex “NIMBY” (not in my backyard), a critical review of the current approach for developing new landfills and landfill expansions shows that “NIMBY” is a response by those potentially impacted by the landfill often justified given the current review/permitting process. It is common for urban landfill developers to claim that their proposed landfills will be protective of public health and the environment and that those in rural areas should not oppose the development of the proposed landfill. However, if the landfills are truly protective of those within their spheres of influence, it should be possible to site them within the urban areas in which the wastes are primarily generated.

It has been the authors’ experience that few individuals welcome the siting of a landfill adjacent to their property or areas of activity, especially when they become aware of reasonably anticipated adverse impacts of today’s permitted landfills to the health, groundwater resources, and interests of those within the sphere of influence of the landfill, which can extend for several miles beyond the landfill.

That prescriptive standards and permitting processes do not eliminate or prevent adverse impacts of landfills is well-recognized in the technical community. Further, wastes in MSW landfills remain a threat to groundwater quality for as long as they remain in the landfill. However, because those and other realities are not typically brought to light in landfill siting and permitting, Lee and Jones-Lee developed a discussion of issues and the literature concerning potential impacts of “dry-tomb”-type landfills, and the nature of their component parts and systems as a whole, with respect to their ability to provide protection of public health and

environmental quality for as long as the wastes pose 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 2015). The most recent version of that review is available at <http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf>.

The section of that paper entitled “Justified NIMBY” summarizes potential adverse impacts of MSW and other types of landfills. These impacts are listed in Table 1.

Table 1
Adverse Impacts of “Dry Tomb” Landfills on
Adjacent/Nearby Property Owners/Users

- public health, economic and aesthetic aspects of groundwater and surface water quality
- methane and VOC migration - public health hazards, explosions and toxicity to plants
- illegal roadside dumping and litter near landfill
- truck traffic
- noise
- dust and wind-blown litter
- odors
- vectors, insects, rodents, birds
- condemnation of adjacent property for future land uses
- decrease in property values
- impaired view

From Lee et al. (1994) and Lee and Jones-Lee (2015).

The Lee and Jones-Lee (2015) Flawed Technology review presents information on the characteristics of each of these impacts. It also discusses how to address/reduce justified NIMBY issues by proper landfill siting/location, design, operation, closure and postclosure care for as long as the wastes in the landfill are a threat. While NIMBY issues can be readily addressed, the needed changes in landfill development to provide more reliable protection for as long as the wastes remain a threat are expensive and thus typically not implemented. But the price for inadequate protection of groundwater quality and public health will be paid, but by those within the sphere of influence of the landfill and future generations through adverse impacts on health, loss of groundwater resources, and ultimately responsibility for the “superfund”-like costs for cleanup of landfill-polluted groundwaters. This means that urban and other MSW generators are able to impose landfills on rural communities for a cheaper-than-real price, i.e., without paying the true costs to protect those in the sphere of influence of the landfill for as long as the wastes will be a threat.

Health Effects of Landfills. MSW landfills release odors, which not only are a nuisance, but also can be adverse to the health of those who live/work near MSW landfills and other hazardous

chemical sites. Lee and Jones-Lee reviewed these issues in their report:

Lee, G. F., and Jones-Lee, A., "Association between Hazardous Chemical Sites and Illness," Report of G. Fred Lee & Associates, El Macero, CA, January (2007). This review is available at <http://www.gfredlee.com/Landfills/HazChemSites-Illness.pdf>.

Other papers and reports on impacts of landfills on public health and environmental quality, and on ways in which their development, operation, closure, and postclosure care can be changed to reduce those impacts, are available on Drs. G. Fred Lee and Anne Jones-Lee's website, www.gfredlee.com, in the Landfills publications section, <http://www.gfredlee.com/plandfil2.html>.

Groundwater Pollution Issues. Today's minimum design Subtitle D (municipal solid waste) landfills with single composite liners and sited in areas hydraulically connected to underlying groundwaters will eventually pollute groundwaters with landfill leachate ("garbage juice"). This is because the eventual and inevitable failure of the single composite liner will allow hazardous and otherwise deleterious chemicals to be released from the MSW landfill; groundwater monitoring systems allowed for MSW landfills are inadequate to reliably detect incipient leakage before off-site groundwater has been polluted and rendered unusable for domestic water supply and other purposes. In addition, if the polluted groundwaters discharge to surface waters, the landfill can also pollute surface waters rendering them unusable for domestic water supply and adversely affecting fish and other aquatic life. Lee and Jones-Lee described elements of a groundwater monitoring program that would improve groundwater quality protection for those who have domestic, farm, and other wells located within several miles of a landfill in their paper,

Lee, G. F., and Jones-Lee, A., "Improving Public Health and Environmental Protection from Inadequately Developed Landfills," [available at <http://www.gfredlee.com/Landfills/ImprovProt-LF.pdf>]

Inadequate Buffer Lands. The active-life (while wastes are still being deposited) releases from landfills that contribute to trespass of odors, hazardous chemicals, dust, noise, view impairment, etc., are largely addressable if the landfill developer is required to acquire adequate buffer lands between areas of waste deposition and adjacent property lines. Often at least one mile, and in some settings two or more miles, of buffer lands are needed to adequately dissipate the odors, etc., so that they are not detectable at adjacent property lines.

Inadequate Postclosure Funding. One of the most significant deficiencies in current landfilling regulations is that the federal (US EPA) and most states' landfilling regulations do not require assured postclosure funding for monitoring, maintenance, and eventual groundwater cleanup from pollution caused by a closed (no longer accepting wastes) "dry tomb"-type landfill for as long as the wastes in the landfill will be a threat to cause groundwater pollution. Wastes in today's landfills that conform to US EPA Subtitle D minimum regulations, will be a threat to cause groundwater pollution effectively forever, yet minimum postclosure funding is typically required for only 30 years. Federal (and typically state) landfilling regulations do not require that those whose wastes are placed in a landfill provide the level of funding (through the fees paid for waste disposal) that will be needed to adequately monitor and maintain the landfill containment structure and the groundwater monitoring systems for as long as the wastes in the landfill will be a threat. Jones-Lee and Lee have developed an overview discussion of these

issues in:

Jones-Lee, A., and Lee, G. F., "Landfill Post-Closure and Post-Post-Closure Care Funding - Overview of Issues," *WasteAdvantage Magazine* 5(12):24-26 December (2014). [available at http://www.gfredlee.com/Landfills/Funding_Issues_WasteAdvantage.pdf].

Some areas, such as California, have explicit regulations that require postclosure funding for monitoring and maintenance for as long as the wastes in the landfill will be a threat (CIWMB, (2004). However, such requirements have demonstrated themselves to be largely ineffective. While that requirement has been in the California regulations since the 1970s, for example, there are no funding mechanisms in place to ensure that those whose wastes are placed in the landfill adequately fund the postclosure monitoring and maintenance of the landfill for as long as the wastes are a threat beyond the minimum 30 years. Basically, providing this funding is, by default, passed on to future generations; there is no assurance that adequate funds will be available when needed. Drs. G. Fred Lee and Anne Jones-Lee discussed the importance of ensuring that adequate postclosure funding be developed by those who generate the wastes that are placed in a landfill for as long as those wastes represent a threat, in their comments:

Lee, G. F., and Jones-Lee, A., "Comments on the CIWMB Staff Efforts to Gain Assured Postclosure Funding for Landfills for as Long as the Wastes in the Landfill Are a Threat to Public Health and the Environment," Comments Submitted to California Integrated Waste Management Board by G. Fred Lee & Associates, El Macero, CA, January (2007) [available at <http://www.gfredlee.com/Landfills/CIWMBPostCloseFund.pdf>].

They pointed out that this is especially important for privately developed landfills, for which the ability and reality of a private company's providing postclosure funding, effectively forever, is appropriately of concern. The potential for a landfill owner to declare bankruptcy or otherwise "walk away" from the landfill while it still poses a threat and shirk its responsibility for postclosure monitoring and maintenance of the landfill for as long as the wastes are a threat, is a very real concern. While public-agency-developed landfills may not face that problem, there are legitimate concerns about whether the public agencies responsible for the landfill will, in fact, support postclosure care of a landfill that was developed and closed many years ago. It is clear that the long-term public health/welfare and environmental consequences of failing to provide adequate postclosure monitoring and maintenance will not likely be faced by those in the urban areas who contributed wastes to the landfill; they will, however, be irrefutably faced by those who own or use land and groundwater resources within the sphere of influence of the landfill and may be expected to have less influence among regulators. This adds to the justification for NIMBY positions by those who want to protect groundwater resources from the impacts of a landfill in rural areas.

Obtaining Reliable Information on Impacts of Landfills

Rural communities and individuals that are concerned about potential impacts of a proposed landfill are at a significant disadvantage in participating in the landfill review process of board deliberations, permitting hearings, etc. Typically, landfill developers are well-financed and able to hire attorneys and consultants who discuss the landfill from the developer's perspective but fail to adequately discuss potential adverse impacts of the landfill on those within the sphere of influence of the landfill. Lee and Jones-Lee discussed the fact that consultants that normally work for landfill developers are advocates for the projects; in that capacity they cannot be

expected to provide disinterested, transparent, reliable information on the adequacy of a proposed landfill's siting, design, operation, closure, and postclosure care, especially if they desire to be awarded future work from landfill developers in:

Lee, G. F., and Jones-Lee, A., "Practical Environmental Ethics: Is There an Obligation to Tell the Whole Truth?" Published in condensed form, "Environmental Ethics: The Whole Truth," *Civil Engineering*, Forum, 65:6 (1995), <http://www.gfredlee.com/Landfills/ethics.pdf> and

Lee, G. F., and Jones-Lee, "Selection of an Independent Consultant to Review the Potential Impacts of a Proposed Landfill," Report of G. Fred Lee & Associates, El Macero, CA, December (2006) [available at <http://www.gfredlee.com/Landfills/SelectIndepConsult.pdf>].

Governmental agencies typically do not have the resources to critically evaluate all aspects of proposed landfills, and may well be facing dilemmas in simply finding a mechanism or location for waste disposal. Therefore, those who stand to be impacted by a landfill must find qualified attorneys, hydrogeologists, and other technical consultants to provide independent technical review and advocacy on behalf of public health protection, and must also find a means of funding such advisors. Examples of work Lee and Jones-Lee have done in this regard can be found at <http://www.gfredlee.com/plandfil2.html#examples>.

Suggested Approach

We have found that individuals/groups that face evaluating the impacts of a proposed landfill or expansion and the reliability of a landfill proponents' documentation in support of the landfill's development first need to organize those concerned about the landfill's impacts. Next, the group needs to define the reasons for their concerns. In making such an evaluation, it may be helpful for the members of the group to read the Lee and Jones-Lee "Flawed Technology" review cited above as well as several of the example reports on Drs. Lee and Jones-Lee's website.

The group should then work with their local elected officials and the press to inform them of their concerns about potential impacts of the proposed landfill. Next the group should assess the technical and financial resources available to them to evaluate the potential impacts of the proposed landfill. Some citizens' groups opposed to particular landfills have been able to identify a local attorney who will assist the group at no or limited cost. The group needs to acquire the assistance of a local hydrogeologist who is familiar with the hydrogeology of the proposed landfill area. The hydrogeologist should review the accuracy and adequacy of the hydrogeology information in the application.

The group would also need to acquire the assistance of a landfill expert who can review the landfill's proposed location, design, etc., and prepare a preliminary report on the potential impacts of the landfill. If possible (depending on availability of funding), the landfill consultant should visit the area and discuss the situation with members of the group. Based on the review of the landfill proposal and the site visit, a course of action should be developed by the group to address their concerns about the potential impacts of the proposed landfill. If possible the consultant should personally present a summary of his/her findings at a landfill review board hearing. If insufficient funds are available from the group to support such a presentation, then their landfill consultant's report should be submitted to the review board with a conference call between the review board and the consultant to discuss aspects of the report.

All of these activities should be conducted in close coordination with the group's attorney, and all work should be conducted so that it can be used in review or appeal of a board/regulatory agency's decision to proceed with the development of a landfill that does not adequately protect the health, groundwater resources, welfare, and interests of those potentially impacted by the landfill. Since review boards' and regulatory agencies' review of a proposed landfill may be limited to whether the landfill meets the current (often inadequate) minimum regulatory requirements, it may be necessary to have the development of the landfill reviewed by the courts, through litigation.

Citations

CIWMB (California Integrated Waste Management (now CalRecycle), "Post Closure Maintenance Beyond the Initial 30 Years and Financial Assurance Demonstrations," California Integrated Waste Management Board P&E Committee Workshop, December 6 (2004). Available at <https://www.google.com/url?q=http://www.calrecycle.ca.gov/Archive/IWMBMtgDocs/mtgdocs/2004/12/00017505.ppt&sa=U&ei=ddfPVJ2fK6eumAWIoYHICQ&ved=0CAYQFjAB&client=internal-uds-cse&usg=AFQjCNFcPBnpg1G05kFPnUzhCmPo0tD53g>

Lee, G. F., Jones-Lee, A., and Martin, F., "Landfill NIMBY and Systems Engineering: A Paradigm for Urban Planning," In: Systems Engineering: A Competitive Edge in a Changing World, Proc. National Council on Systems Engineering Fourth Annual International Symposium, pp. 991-998, August (1994). PowerPoint slides from this presentation available at <http://www.gfredlee.com/Landfills/NIMBY-NCO2.pdf>

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 2015). The most recent version of that review is available at <http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf>.

Acquiring the Assistance of Drs. Lee and Jones-Lee

Drs. Lee and Jones-Lee make many of their reports and professional papers available on their website, www.gfredlee.com, at no cost, to assist those concerned about evaluating the potential impacts of landfills. They will answer telephone questions about their publications. They can also serve as paid consultants to states, counties, municipalities, environmental groups, citizen's groups, industry, commercial establishments, and individuals to review potential impacts of specific landfill situations, prepare reports, and testify in landfill review board hearings, regulatory agency permitting hearings, trials, etc. Information on their qualifications to serve as consultants is available at <http://www.gfredlee.com/exp/landfill.html>, <http://www.gfredlee.com/exp/areawork.htm> and http://www.gfredlee.com/exp/lfbio_exp.htm.

Please contact Dr. G. Fred Lee at gfredlee33@gmail.com or by phone at (530) 753-9630 for information on obtaining the services of Drs. G. Fred Lee and Anne Jones-Lee in evaluating the impacts of a proposed or existing landfill.