

Need for Revisions of Chapter 15 Governing Municipal Solid Waste Landfilling

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John Caffrey, Chairman
State Water Res Control Board
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Daniel Pennington, Chairman
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Dear Chairmen Caffrey and Pennington, and Board Members:

Periodically over the past half dozen years I have brought to the attention of the Water Resources Control Board and the Integrated Waste Management Board some of Dr. Anne Jones-Lee's (my wife) and my writings on landfilling and solid waste management issues. They have evolved out of my 30 years of university environmental engineering graduate-level teaching and research, plus now nine years of full-time consulting. This past winter I was asked by the organizers of an Air and Waste Management Association national meeting landfill symposium to present a review paper on these issues. This paper was presented last week in San Diego. It has been published in the proceedings of this national conference, which is available on CD-ROM. This paper is also available from our web site (<http://members.aol.com/gfredlee/gfl.htm>). Further, at that site are many other papers and reports that we have developed which provide back-up information to the issues discussed in our review paper.

The organizers of the conference allowed me latitude in complying with the publication requirements of limiting the papers to no more than 15 pages where, as a result, we have been able to present a comprehensive update of our 1992 report on the problems with minimum Subtitle D municipal solid waste landfills protecting groundwaters and the interests of those within the sphere of influence of the landfill from landfill releases during the active life and post-closure care period. In 1992, based on then over 20 years of work on landfills in various parts of the US and especially on landfill liner problems of the type that were just beginning to be used extensively at that time, we pointed out that the minimum Subtitle D landfill was a fundamentally flawed technological approach for managing solid waste that did nothing more than postpone for a few years, compared to the length of time that the wastes in the landfill will be a threat, when groundwater pollution occurs for those landfills sited where there are groundwaters hydraulically connected through a vadose zone to the base of the landfill.

As discussed in the enclosed paper, by the late 1980s, it was already beginning to be understood by those who were familiar with the properties of clay and plastic sheeting liners that the liner materials that are being used in a single composite liner could not be expected to perform in accord with California's Chapter 15 requirements of protecting groundwaters from impaired use for as long as the wastes in the landfill will be a threat. The wastes in a Subtitle D "dry tomb" type landfill will be a threat to pollute groundwaters, effectively forever. The clay liner of a single composite liner can be expected, if it is designed and constructed properly and it maintains its assigned characteristics which would be highly unusual, to prevent leakage through it for only about 25 years. The plastic sheeting layer can fail from day one if it is not properly designed, constructed and the waste placement is not accomplished in such a manner as to prevent puncturing the liner. It has been known since the 1980s when the plastic sheeting liners were first being used that there are significant problems trying to develop a composite liner that will be effective in preventing leakage for a few years, much less an infinite period of time that such liners would have to work to protect groundwater quality. It is well documented now that there is deterioration of the plastic sheeting over time and that significant deterioration in the structure is predicted to begin in about 30 years by the types of tests that are being used now.

A paper at the Air and Waste Management conference by Dr. R. Stessel, Professor of Civil Engineering at Columbia University, entitled "Low-Displacement Testing of Geomembrane Chemical Compatibility Using the CTS" discussed the need to do more appropriate types of testing which would more closely resemble the actual stresses and the chemical attack that will occur in a municipal landfill environment. From his work, which is a combination of stress loading and chemicals that would be expected in a municipal landfill leachate, he has seen much greater deterioration than is being predicted by some others using conventional testing procedures. While no one can predict how long a properly installed flexible membrane liner will function effectively to prevent leachate from passing through it, there is no debatable issue about the fact that the length of time that it will function properly is far shorter than the length of time that the wastes will be a threat. These issues were pointed out in our 1992 review on the "dry tomb" flawed technology approach. The attached paper brings these issues up-to-date, including over 90 references, pointing out that in the last half a dozen years since our initial review was developed there has been nothing that counters the overall conclusion that the "dry tomb" type landfills are fundamentally flawed with respect to protecting public health and the environment. Even the Director of the Solid Waste Association of North America has recently indicated that there is need to stop using "dry tomb" type landfills and start treating municipal solid wastes.

As discussed in the paper, in 1988, the US EPA discussed the inevitable failure of the liner system that they were proposing to use in Subtitle D landfills. They, however, assumed at that time that these failures would be detected through the groundwater monitoring system before they caused off-site groundwater pollution and therefore the pollution that has occurred could be corrected while still on the landfill owner's property. Unfortunately, no one within the US EPA or, for that matter, elsewhere, including the state of California, conducted the simple analyses of what a plume from the initial failure from a flexible membrane lined landfill would look like. In 1990, Dr. John Cherry at the University of Waterloo first pointed out that these plumes will not be fan shaped, but will be finger-like plumes with limited lateral dimensions that could readily pass by the point of compliance of groundwater monitoring and not be detected. I have previously brought to your attention some of our writings on this issue. In connection with a national water quality monitoring conference that will be held in Reno in mid-July of this year, Dr. Jones-Lee and I have published an updated review of the fundamentally flawed nature of

the groundwater monitoring systems that are being used in California and elsewhere for monitoring the leakage from minimum Subtitle D municipal solid waste landfills. Enclosed is a preprint copy of that paper. It will be published in the proceedings of that conference. This paper is also available on our web site.

While these problems are understood by many of the regulatory agency staff, the State Water Board and the regional boards have adopted a "Position" which, at the time of adoption in the early 1990s, was obviously technically wrong in stating that a minimum Subtitle D landfill-associated single composite liner and typical groundwater monitoring system with monitoring wells spaced hundreds of feet apart at the point of compliance can comply with Chapter 15's requirements of detecting groundwater pollution through liner leakage at the earliest possible time. In order to achieve that level of reliability, it would be necessary to have monitoring wells spaced at many landfill sites in California, about 10 feet apart. Some states, such as Michigan, are sufficiently concerned about protecting their groundwater resources so that they have acknowledged the fundamentally flawed nature of vertical monitoring wells at the point of compliance for monitoring liner leakage and have adopted a double composite lined system where the lower composite liner is a leak detection system for the upper liner, i.e. the Subtitle D liner. The State Board staff have acknowledged in testimony before the Board that this approach is far more reliable than what is being done. However, the State Board and regional boards continue to approve landfills in California telling the public that this system will be protective when in fact it is fundamentally flawed, both with respect to the containment system design and the groundwater monitoring system design.

An important component of the Air and Waste Management review paper, which was extensively peer reviewed for acceptance, is the discussion of alternative approaches for managing municipal solid wastes. As discussed, it is possible to fulfill the requirements of Chapter 15 of protecting groundwaters and the interests of those within the sphere of influence of the landfill and thereby eliminate justified NIMBY, at a cost of 10 to 20 cents per person per day more for solid waste disposal than is being paid now for minimum Subtitle D landfilling. These costs are small compared to the costs that will ultimately have to be paid when minimum Subtitle D landfills become Superfund sites in order to stop the groundwater pollution that is occurring. For those diehards who want to continue "dry tomb" landfilling, it is possible to develop "dry tomb" landfills through a combination of a double composite liner and leak detectable cover and a dedicated trust fund of sufficient magnitude derived from disposal fees to generate an ongoing income to close, operate, maintain and eventually remediate groundwater pollution associated with Subtitle D "dry tomb" type landfilling for 10 to 20 cents per person per day. As discussed in the paper, however, an alternative approach is the design and operation of a landfill to treat the wastes through addition of moisture to enhance fermentation and leaching during the time that the liner systems can be expected to function properly. There is growing recognition across the US and in other countries that there is need to adopt a waste treatment approach, rather than the current "dry tomb" type landfilling.

One of the greatest travesties of minimum Subtitle D landfilling is the post-closure care funding. For the US EPA and, for that matter, the state of California, to only require assured funding for 30 years virtually ensures that minimum Subtitle D landfills will become future Superfund sites where large amounts of public funds will have to be spent cleaning up groundwater pollution and properly managing the waste residues because today's regulatory agencies did not use the elementary science and engineering that has been available now for over 10 years as the basis for developing a true adequate post-closure care operations and funding.

While 10 to 20 cents per person per day more to protect those within the sphere of influence of the landfill during the active life releases as well as post-closure period releases is certainly affordable, that translates to about a doubling of the average household garbage bill. Thus far in the almost 40 years that I have been in the environmental field I have seen few regulatory boards and political entities that will take the obvious necessary steps and stop the fundamentally flawed approaches that are being used for managing municipal solid waste. In the US there are now eight states or parts of states that have taken this action to significantly improve municipal solid waste management with respect to environmental and public health protection. Unfortunately, California is not one of them. California should be a leader in groundwater quality protection because of the ultimate need to utilize the groundwaters and groundwater basin as the primary source of supply to meet the ever-growing population demands. It is essential that the regulatory boards, the regional boards and their respective staffs begin an aggressive effort to address the fundamentally flawed nature of minimum Subtitle D landfills to comply with Subtitle D regulations, much less Chapter 15 regulations, for as long as the wastes are a threat.

A prime example of inappropriate solid waste management practices is the approach that is being conducted at the University of California, Davis. Because of initially cheaper costs than taking the wastes to Yolo County Landfill, the University of California, Davis administrations, including the current Vanderhoef administration, have been developing their own on-campus landfills. At this time, there are four campus landfills at UCD, all of which are polluting groundwater. Three of these are part of a national Superfund site where the ultimate costs for managing the Superfund site is estimated now to be on the order of \$50 million. It has been well known since the 1950s through American Society of Civil Engineering landfill guidance manuals that disposal of municipal solid waste following the approach that has been used at UCD which is the minimum required by the regulatory agencies throughout the period, would eventually pollute groundwaters in a Davis area setting. Yet the past and current administrations continue to build landfills which only postpone groundwater pollution. Even the UCD landfill staff admit that the fifth proposed landfill, which has been approved by the Central Valley Regional Water Quality Control Board as conforming to the State Board staff's "Position," will also pollute groundwater.

Unfortunately, this type of situation is allowed in California under the State Board staff's "Position," announced a year ago by Mr. Schueller, that a minimum Subtitle D landfill complies with Chapter 15 requirements of protecting groundwater from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. This "Position" was adopted without public review, and represents inappropriate rule-making by the State Board. It should be immediately rescinded where the State and Regional Boards must conduct an in depth critical review of the suitability of a proposed landfill design, including its groundwater monitoring system, for a particular location to comply with Subtitle D and Chapter 15 requirements for groundwater quality protection for as long as the wastes are a threat.

It is my experience that many members of the regulatory agency staffs readily admit privately that they know that the landfilling approach being used today is fundamentally flawed. However, no one is openly discussing these issues. It is time that this issue be publicly discussed at the State Board level in order to start to implement Chapter 15 as it was intended at the time of adoption in 1984. In order to stop municipalities and universities like the UCD L. Vanderhoef administration from managing municipal solid wastes by doing the least possible just to get by in order to save a few dollars now at the expense of future generations' health, welfare, and groundwater resources, it is necessary for the boards at the

regional board and State Board levels to abandon the ill-conceived State Board staff's "Position" of the equivalency of minimum Subtitle D complying with Chapter 15 requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat and begin to aggressively work toward developing solid waste management approaches that will, in fact, have a high reliability in protecting groundwaters from pollution by landfill leachate.

In my previous discussion of landfilling issues of about a year ago where I was working with the California Recycling Resources Association, I pointed out that the cheaper-than-real-cost initial disposal fees that are being allowed today are highly contrary to effective recycling, reuse and reduction of municipal solid wastes. The 3R's cannot effectively compete against the \$20/ton to \$50/ton disposal fees. These cheaper-than-real-cost disposal fees are an artifact of not properly addressing the true long-term costs. It is essential that the true cost of solid waste management in "dry tomb" type landfills be borne by those who generate the wastes through increased disposal fees. Under these conditions, the 3R's would be readily competitive and practiced.

If you, members of your staffs or others you encounter claim that in some way the material discussed in the attached papers is technically invalid, I request that the points of dispute be independently, interactively peer reviewed by experts where the issues in dispute can be discussed before the Boards in which each proponent of a particular position would have an opportunity to present materials they believe support their position and those who hold counter views would be able to interact in discussing these views and present materials that they feel support their position. This peer review should take place over several sessions with adequate time between to allow for full development of the issues. The peer review should not be of the superficial peer review that is being undertaken now by the State and Regional Boards which does not allow for proper peer review of issues, but in some cases is being manipulated in accord with preconceived positions on issues.

Thank you for taking time to review these matters. If there is any way that I can be of help to change the fundamentally flawed approach being used for municipal solid waste management in California, please contact me.

Sincerely yours,

Fred

G. Fred Lee, PhD, DEE

Copy to: W. Pettit
R. Chandler

Reference as: "Lee, G.F., 'Need for Revisions of Chapter 15 Governing Municipal Solid Waste Landfilling', letter to J. Caffrey, State Water Resources Control Board, and D. Pennington, CA Integrated Waste Management Board, Sacramento, CA, July (1998)."