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November 2, 1993

John Caffrey, Chair
State Water Resources Control Board
901 P Street
Sacramento, CA 95814

Dear Chairman Caffrey:

Please find enclosed a set of comments that Dr. Jones-Lee and I recently submitted to the LA Regional Water Quality Control Board on the proposed expansion of the Puente Hills Landfill. I am bringing these comments to the attention of the members of the State Water Resources Control Board since this matter could set a very important precedent with respect to the implementation of the landfilling Policy that was adopted by the State Water Resources Control Board on June 17, 1993.

As you may recall, I have been concerned about the approaches being used for the landfilling of municipal solid wastes (MSW) in California since the early 1980's when I was asked by the State Water Resources Control Board staff to review and comment on the then-proposed draft of Subchapter 15. At that time I was teaching and conducting research in the university of Texas system. Since 1989 when I moved back to California, Dr. Jones-Lee and I have been highly involved in issues of landfills and groundwater quality protection in this State as well as in other states and other countries. I was shocked to find in 1989 that regional boards were interpreting Chapter 15's minimum prescriptive liner design standards of one foot of soil compacted to a permeability of no greater than 10^{-6} cm/sec, as being equivalent to Chapter 15's overriding performance standard of protecting groundwater resources in the vicinity of a landfill from use-impairment by landfill-derived constituents for as long as the wastes in the landfill represent a threat.

It has been obvious since Subchapter 15 was first adopted in 1984 that a landfill liner consisting of only one foot of compacted soil with a permeability of 10^{-6} cm/sec would only slow, by a few months, the transport of many of the components of MSW leachate through it. A simple Darcy's Law calculation will show that to be the case for many constituents present in MSW leachate. The manner in which regional boards have implemented Chapter 15, not adequately considering the meeting of the overall groundwater protection **performance standard**, has allowed the construction of landfills in the State since 1984 that only postpone groundwater pollution (use-impairment) by landfill leachate. By approving the tentative WDR's for the Puente Hills Landfill expansion, the LA Regional Water Quality Control Board is releasing the Districts from the overall performance standards set forth in the new landfilling Policy of protecting groundwater resources in the vicinity of the landfill expansion from use-impairment for as long as the wastes represent a threat. By its action, the Regional Board has interpreted the Policy to mean that the performance standard for the components in the US EPA Subtitle D, i.e., a single composite liner, is the performance standard that must be achieved to implement the Policy. This is not what was intended and is not in the best

interest of protecting the groundwaters of California from pollution by landfill leachate.

It is obvious that a single composite liner, coupled with groundwater monitoring of the type set forth in US EPA Subtitle D, and for that matter Chapter 15, as well as the other systems included for the proposed Puente Hills Landfill expansion will not effect the achievement of the overall groundwater protection performance standard set forth in Chapter 15 of protecting groundwaters from use-impairment for as long as the wastes in the landfill will be a threat, which for a "dry tomb" landfill of the type that can be developed under the new landfilling Policy, is effectively forever.

A single composite liner will eventually fail to prevent significant leachate from passing through it. This is well recognized in the field today and is the reason why many years ago some states, including New York and New Jersey, adopted requirements for double composite liners. Pennsylvania adopted requirements for a single composite liner with a leak detection system underlain by an FML. More recently, the states of Michigan and Arizona have adopted requirements for double composite liners for MSW landfills. You may recall that as part of developing the new Policy last June, the State Board staff testified that it was its view that landfills constructed in California should use a double composite liner system in which the lower composite liner would serve as part of a leak detection system for the Subtitle D composite liner. This is the approach that the state of Michigan is adopting. It is also the approach that Dr. Jones-Lee and I recommend for landfills that accept untreated wastes in which there is an attempt to isolate the wastes (create a "dry tomb") from water that can generate leachate. Enclosed is a paper we recently published on this issue:

Lee, G. F. and Jones-Lee, A., "Revisions of State MSW Landfill Regulations: Issues for Consideration for the Protection of Groundwater Quality," Environmental Management Review 29:32-54, Government Institutes Inc., Rockville, MD, Third Quarter (1993).

I know from my discussions with State Board staff in the mid- 1980's that it was not the intent of Subchapter 15 to suggest that meeting the minimum prescriptive design standards was equivalent to meeting the overall groundwater quality protection performance standards of Subchapter 15; that was not the intended manner of implementation of Subchapter 15. However, at that time, because of the relationship between the regional boards and the State Board, there was no possibility for the State Board staff to point out and correct the very significant problems that were occurring in the implementation of Subchapter 15 at the regional board level - in which landfills with only one foot of compacted soil with a maximum design permeability of 1×10^{-6} cm/sec were being constructed. It is my understanding that in order for the State Board to exercise control over regional boards' interpretation of Chapter 15 regulations it was necessary for some entity to appeal a regional board's decision to the State Board for review. As far as I know this situation still exists.

You may recall that at the June 17, 1993 meeting of the Board at which the new landfilling Policy was adopted, I specifically asked the staff and the Board whether the overall performance standard of Chapter 15 took precedence over any prescriptive minimum design standards for liners or other system components. Both the staff and members of the Board explicitly stated that the

performance standard requiring the protection of groundwater quality from use-impairment for as long as the wastes in the landfill represent a threat must be achieved, and that the design and performance of the components of the containment and other systems must be conducted in such a manner so as to achieve this overall performance standard.

It is my understanding that the proposed Puente Hills Landfill expansion is one of the first, if not the first, landfill being reviewed under the new landfilling Policy. The groundwater quality protection issues that have arisen in Puente Hills Landfill situation, however, are not atypical of those that will continue to arise in the consideration of WDR's for other canyon landfills in the State. In the past four years we have reviewed the potential for a number of canyon landfills of the Puente Hills type, but much smaller in size, to pollute groundwaters in their vicinities. We have found, as we did for the Puente Hills Landfill, that the natural geologic characteristics of canyon settings tend to make them unsuitable for landfills. To try to site a landfill in such a geologically unsuitable setting requires the engineering of a containment and monitoring system to prevent groundwater pollution by landfill leachate. Thus far the containment systems that have been proposed - of landfill liners, leachate collection and removal system, etc. - at best only postpone, in some cases for only a very short period of time, the transport of leachate out of the landfill to the underlying groundwaters in the vicinity of the landfill. For each of the landfills that we have reviewed, the groundwaters under the landfill that will be polluted by landfill leachate are hydraulically connected to groundwaters in alluvial basins that are or could at some time in the future be used for domestic water supply purposes.

The LA Regional Board and the Sanitation Districts are attempting to use what they call "groundwater barriers" (slurry walls) across the mouths of the canyons to intercept leachate-polluted groundwaters before they reach the alluvial basins through the fractured rock groundwater system underlying the Puente Hills Landfill site. However, it is well-recognized in the technical literature that slurry walls of the type being developed are not effective in preventing leachate-contaminated groundwater from passing through or around the wall and migrating offsite to the alluvial basin groundwaters. As expected, such slurry walls have failed at the Puente Hills Landfill as well as at other locations within the LA Basin to prevent leachate-contaminated groundwaters from passing downgradient of them. The proposed slurry walls for the Puente Hills Landfill expansion will also fail to protect the groundwater resources of the San Gabriel Valley.

Another significant characteristic of canyon landfills of the Puente Hills type that makes them particularly unsuitable for landfills of the type being developed is the underlying fractured rock geology. It is, again, well-recognized that it is impossible to reliably monitor such a system to detect incipient groundwater pollution by landfill leachate before widespread pollution has occurred. It is also well-recognized in the field today that a Subtitle D single composite liner and the associated liner leakage assessment based on groundwater monitoring, including slurry wall groundwater barriers, is a flawed technology that cannot be relied upon to achieve the landfilling Policy performance standard of the protection of the groundwater resources in the vicinity of the landfill as well as those hydraulically connected to it from use-impairment for as long as the wastes deposited in the landfill are a threat.

This Board has a unique opportunity and indeed a significant obligation to implement

Chapter 15 as it was originally intended, to protect the groundwaters of the State from pollution by landfill leachate. I know from my contact with the State Board staff in the early 1980's, that they had a sincere interest in developing regulations that would protect the groundwaters of California from pollution by landfill leachate. It is unfortunate that by the manner of their implementation at the regional board level, these regulations were among the weakest in the country for providing protection of groundwater quality from landfill-derived contaminants. This situation can now be corrected by this State Board. With ever-increasing populations and decreasing surface water resources due to reallocation that can be used for domestic and other purposes, it is essential that the State Board adopt and implement landfilling regulations that will clearly achieve the performance goals set forth in the new landfilling Policy, of protecting the groundwater resources from use-impairment for as long as the wastes represent a threat. The past implementation approach of only postponing when pollution occurs can no longer be allowed. The future generations of Californians are entitled to groundwater resources that have not been polluted beyond the current extent by municipal and industrial landfill leachate.

I strongly urge that this Board take whatever steps it can to see that the new landfilling Policy is in fact implemented as indicated on June 17, 1993 to require that any new landfill or lateral expansion of a landfill that is permitted be done in such a manner so as to provide, under plausible worst-case scenarios, a very high probability of protection of the groundwater resources in the vicinity of the landfill as well as those hydraulically connected to it from pollution by landfill leachate for as long as the wastes present in a landfill are a threat.

If you, other members of the Board, members of the staff or others have any questions on this matter please contact me. If there is any way we can be of assistance, please let us know. Thank you for taking time to consider this matter.

Sincerely yours,

G. Fred Lee, PhD, DEE

cc: Members of the WRCB
W. Pettit

GFL:ml
Enclosure