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August 6, 2000

Winston H. Hickox
Secretary for Environmental Protection
California Environmental Protection Agency
555 Capitol Mall, #525
Sacramento, CA 95814

Dear Winston:

On July 20, I provided you with some background information on my attempts to work toward improving the quality of science and engineering used in developing landfills in California so that they in fact comply with current Title 27 requirements of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill will be a threat. Attached is my August 2 submission to the Central Valley Regional Water Quality Control Board (CVRWQCB) on this issue. Unfortunately, based on the August 4 hearing, I continue to find that this Board's staff is attempting to defend obviously technically invalid approaches that allow the development of landfills that at best will only postpone when groundwater pollution occurs by landfill leachate. Last Friday, the CVRWQCB held a hearing on this matter where again the board staff provided additional unreliable information to the board on the protective nature of a single composite liner. In the limited time provided me, I discussed some aspects of this unreliable information and I am preparing a more detailed written discussion of it that I will distribute when completed.

At the CVRWQCB hearing on Friday, two of the board members recognized the deficiencies in the staff's presentation and the importance of protecting Central Valley groundwater from pollution by landfill leachate for as long as the waste in the landfill present a threat. These two board members were able to convince the other board members that they should adopt a resolution that would request that the State Water Resources Control Board (SWRCB) review the adequacy of a single composite liner in complying with the original Chapter 15, now Title 27, requirements that any landfill constructed in California must be designed, constructed, operated, closed, and receive post-closure care to prevent groundwater pollution by leachate for as long as the waste in the landfill will be a threat.

It has been obvious for over 10 years to those who understand the characteristics of municipal solid waste as well as the characteristics of a minimum Subtitle D liner and the regional board's allowed groundwater monitoring systems, that a minimum Subtitle D liner system obviously cannot comply with Chapter 15, now Title 27, requirements of preventing groundwater pollution by leachate for as long as the waste in the landfill will be a threat. There is no debatable issue about the fact that some of the waste components in a minimum Subtitle D "dry tomb" type landfill will be a threat to cause groundwater pollution effectively forever. The landfill liner systems being used, consisting of

a thin piece of plastic and a couple feet of compacted clay, have a finite limited period of time to prevent leachate from passing through them into the underlying groundwaters compared to the period of time that the waste in the landfill will be a threat This situation means that it is only a matter of time until groundwater pollution occurs at Subtitle D landfills with a minimum single composite liner that are located where there are groundwaters connected to the base of the landfill through a vadose zone.

As discussed in previous correspondence, I have been involved in groundwater quality protection issues in California since the mid 1980s. At that time, I was teaching in the University of Texas system. The SWRCB staff asked me to serve as a consultant to them in the development of Chapter 15. In 1989, when I retired after 30 years of university graduate level teaching and research, and moved back to California, I have been working on landfill matters in this state primarily on behalf of water utilities since that time. I have repeatedly observed that the SWRCB has been unwilling and unable to address the obvious deficiencies in the way in which the Regional Boards were implementing Chapter 15. These issues have been well understood by the state board staff since the late 1980s. However, there are strong political forces within the state that are opposed to developing the needed corrections in now Title 27 so that the regional board will stop approving the development of landfills at geologically unsuitable sites that do not provide for natural groundwater quality protection from pollution by landfill leachate for as long as the waste in the landfill are expected to be a threat.

It is for this reason that I wish to suggest to you that if you and Governor Gray Davis are interested in protecting the groundwaters of the state from pollution by landfill leachate in accord with current regulatory requirements, i.e. for as long as the waste in the landfill will be a threat, then your office and possibly the Governor's office will need to exercise leadership in this matter. This leadership will take a strong political will on the part of the Governor's office to overcome the politics within the state which have been preventing the SWRCB over the past 10 years or so from taking the necessary action to eliminate the significant problems that exist with how Chapter 15, now Title 27, is being implemented in the state.

The fundamental issue that the SWRCB must address is whether Chapter 15, now Title 27, established a water quality protection standard of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill will be a threat. Alternatively, does Chapter 15/Title 27 establish a minimum liner design standard that should be assumed by all Regional Boards to provide the required level of protection of no pollution of groundwaters by landfill leachate for as long as the waste represents a threat at all locations where landfills could be developed in the state. It is common sense that the design of any landfill that complies with Chapter 15/Title 27 requires that the Regional Board conduct a site specific evaluation to determine whether the proposed landfill design will have a high probability of protecting groundwaters from pollution.

As an advisor to the state board in the mid 1980s, I know from discussions with state board staff and members of the SWRCB who were sheparding the development of Chapter 15 in 1984 that it was not the intent of Chapter 15 to develop regulations that at best would only postpone groundwater pollution. I know that former members of the state board staff who helped develop Chapter 15 became highly disillusioned with how the regional boards implemented the regulations where the regional board staff and boards assumed that the minimum liner design guidance would be protective of

groundwater pollution as required by Chapter 15, independent of landfill location and site specific geology. This was never the intent of this regulation.

As discussed in my comments, it has been obvious since 1984 that the minimum liner design standard set forth in Chapter 15 (one foot of clay compacted to 1 x 10^{-7}cm/sec) would only postpone groundwater pollution by a few months. As discussed in my July 5, 2000 comments to the state board that have previously been provided to Governor Davis (a copy is attached), a simple Darcy's Law calculation would show that this is the situation. However, the regional board staff throughout the state who understood this situation ignored it and all the landfills that were constructed between 1984 and 1993 have, in accord with Darcy's Law predictions, been found to be polluting groundwaters. There is no question about the fact that exactly the same situation will occur with minimum Subtitle D single composite lined landfills that have been developed under Chapter 15/Title 27 since 1993. This situation points to the need for the state water board to correct this problem.

As discussed in my correspondence in 1996, I initiated an effort in connection with the CVRWQCB review of the University of California at Davis proposed landfill no. 5. My efforts were unsponsored and were directed toward using this landfill situation as a precedent setting situation for the Central Valley and the state. In 1996, the CVRWQCB indicated that I should take this matter to the state board for review, since it was their responsibility to define how Chapter 15 should be interpreted. In accord with regulatory procedures, I filed a petition on behalf of the public documenting the problem that exists in the interpretation of Chapter 15 implementation in 1996. A copy of this petition has been provided to Governor Davis' office and a copy is attached for you. However, as documented in my July 5, 2000 submission to the CVRWQCB, the state board under the Wilson administration refused to take up this petition in over four years.

This past April, I received a letter (appended to my July 5, 2000 comments) from the state board attorney stating that the 270 day notice period for state board review of petitions had past, (actually over four years had past) and therefore the state board was not going to act on my petition. It is clear that the public is getting a runaround from the CVRWQCB and the SWRCB as to who is responsible for implementing Title 27's requirements of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill represent a threat. The responsibility is clear in Title 27. It is the regional boards who must do the site specific evaluations. However, the politics of the situation are such that the regional boards want the crutch of having the state board dictate to them that the regional boards can and should make the evaluation which could require more than the minimum Subtitle D liner system be used at some proposed landfill sites. This evaluation would require determining whether a single composite liner could be expected to prevent groundwater pollution by landfill leachate at geologically unsuitable sites, i.e. those without natural protection. Since this matter has been well understood, but not resolved over the past 10 years, the regional boards continue to develop landfills at geologically unsuitable sites where there will be inevitable groundwater pollution by landfill leachate. Because of this runaround, it is clear that this matter must be taken to you and the Governor's office for review and action.

It is important to note that my petition, while directed to the University of California at Davis landfill situation, did not represent an attempt by me to block this University from developing another campus landfill. While there are members of the public who do not want to see the University develop

another landfill at the proposed location, my interest in this matter was strictly that of trying to get the L. Vanderhoef Administration to live up to the propaganda that it fosters on the public of being a leader in the environmental protection field. Unfortunately, it has become clear that this administration, while claiming to be a leader in environmental protection, in fact, practices some of the most severe recalcitrant polluter approaches that I have encountered in my over 40 year professional career. It should be logical to everyone that UCD administrations over the years, including the current administration, should get out of campus landfill development, based on the fact that this University now has four campus landfills that are now polluting groundwater and even its own dump tender in a public meeting admitted that the proposed 5th landfill will also pollute groundwater.

I request on behalf of protection of future generation's groundwater resources that you and Governor Davis make it known to the SWRCB and the Regional Boards that under the Davis Administration, the development of landfills must comply with Title 27 requirements of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill represent a threat. Further, the implementation of this regulatory requirement shall be done in such a way as to err on the side of groundwater quality protection rather than as is being done now on the side of saving those who generate the waste in few cents per person per day more than they are paying now for solid waste disposal where minimum Subtitle D landfill liner systems are used at geologically unsuitable sites that do not provide a high probability of protecting groundwater from pollution by landfill leachate for as long as the waste in the landfill will be a threat.

The current approach, while cheaper for those who generate the waste, obviously only passes the cost of the eventual Superfund site cleanup associated with polluted groundwater cleanup on to future generations. While UCD may have saved a few dollars over the years in constructing its campus landfills rather than utilizing the Yolo County Landfill, millions of dollars are being spent by Californians cleaning up the polluted groundwaters at UCD's four campus landfills that are now polluting Davis area groundwaters by landfill leachate. The L. Vanderhoef Administration's economic evaluation of campus landfilling is obviously fundamentally flawed since it does not consider the true long term costs associated with campus landfilling.

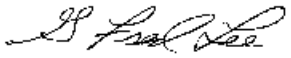
I hope that the Gray Davis Administration will address this issue so as to require that Regional Water Quality Control Boards carry out their regulatory responsibility set forth in Title 27 of conducting in depth site specific evaluations of whether a proposed landfill will have a high probability of protecting groundwater from pollution by landfill leachate for as long as the waste in the landfill are a threat. If there is interest in my being of assistance in working with your office and/or others to obtain a more reliable approach to landfilling of municipal and industrial solid wastes than exists today in connection with implementing Title 27, please contact me. I have a long history of donating my time and resources to this issue dating back to the early 1980s and will continue to do this if I see a strong possibility of correcting the significant problems that exist today in the landfilling of municipal and industrial solid wastes.

If the Gray Davis Administration and your office is unwilling to support this approach, then Governor Davis should make it clear to the public that under his leadership, it is a policy of the state of California to allow eventual groundwater pollution by landfills so that those who generate the waste

can save a few cents per person per day in waste disposal costs at the expense of future generations groundwater quality and financial resources.

Please contact me if you have questions on this matter, and thank you for the assistance you can provide in improving the technical basis for landfilling of municipal and industrial solid waste in the state of California.

Sincerely yours,



G. Fred Lee, PhD, DEE

GFL:kf
Enclosure

cc: Governor G. Davis

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August 2, 2000

Steven Butler, Chairman
Central Valley Regional Water Quality Control Board
3443 Routier Road, Suite A
Sacramento, CA 95827-3003

Dear Chairman Butler and Members of the Board:

Yesterday I received a letter from Gary Carlton, dated 28 July 2000, in which he attempts to defend the Regional Board's position that a single composite liner of the type that the University of California, Davis, proposes to use at its landfill no. 5 complies with Chapter 15/Title 27 requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes represent a threat. As I have documented in previous correspondence, it is obvious from even the most elementary understanding of the properties of municipal solid waste, including the University of California, Davis, campus solid waste, and the components of a single composite liner (compacted clay and a plastic sheeting layer) that a single composite liner cannot protect groundwaters from pollution by landfill leachate for as long as the wastes represent a threat at sites such as the UCD proposed landfill no. 5 site, where the geology does not provide natural protection of the underlying groundwaters from pollution by landfill leachate.

I am contacting you on this matter since Mr. Carlton has introduced new issues into this matter and has failed to reliably report on the discussion I had with Steve Rosenbaum on these issues. With respect to this discussion, last week Mr. Rosenbaum called me to discuss these issues. I discussed them with him, and, based on our discussion, I gained the impression that he understood the problems with a single composite liner complying with Title 27's requirements and that the CVRWQCB was trapped into a technically invalid position regarding this situation. You may recall that several years ago, when I probed this matter, I learned of the Schueller/State Board position that it was the SWRCB's position that a single composite liner would provide the required protection set forth in Chapter 15, now Title 27, of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill represent a threat. However, when I review the Carlton July 28 letter to me on this matter, I find that Carlton is not relying on the Schueller/State Board position, but is again attempting to defend the equivalency of a single composite liner complying with Title 27's requirements for groundwater protection.

Mr. Carlton states, in the fourth paragraph on page one, that,

"In 1993, the single composite liner standard was established for municipal solid waste landfills nationwide by the Federal Resource Conservation and Recovery Act, Subtitle D."

A review of Subtitle D requirements shows that that statement misrepresents the actual situation. The single composite liner is not a standard; it is the minimum liner design allowed under Subtitle D. A review of Subtitle D shows that whatever liner design is used, it must protect groundwaters from pollution by landfill leachate. There is no time limitation on this requirement. As I have pointed out, there are ten states or parts of states that have reviewed this matter and concluded that a single composite liner is not protective of groundwaters. The US EPA (1988a) acknowledged this in 1988 and continues to acknowledge it today. The US EPA relies on a credible groundwater monitoring program to detect leaks at the point of compliance. The UCD landfill, as well as other landfills that have been approved by the CVRWQCB do not have credible groundwater monitoring programs that comply with Subtitle D requirements of reliably detecting leachate-polluted groundwaters when they first reach the point of compliance for groundwater monitoring.

On page two of Mr. Carlton's letter, third paragraph, Mr. Carlton mentions,

"The revised WDRs also contain a more stringent and comprehensive monitoring and reporting program than the existing WDRs."

In the second sentence, mention is made that the revised WDRs require a pan lysimeter to provide leak detection beneath the LCRS collection sumps. Mr. Rosenbaum mentioned these lysimeters in our telephone discussion. At that time I informed him that in the mid-1980s, when I was an advisor to the SWRCB staff on the development of Chapter 15, I was responsible for having Chapter 15 include vadose zone monitoring. Mr. Carlton, however, in his July 28 letter, did not bring to your attention the discussions I had with Mr. Rosenbaum concerning the fact that a pan lysimeter under the LCRS collection sumps is not an adequate or necessarily reliable monitoring approach to detect landfill liner leakage. The pan lysimeter can potentially detect leachate leakage through the liner above the lysimeter. The area of the pan lysimeter, compared to the area of the landfill liner where leakage can occur, is such a small area as to be largely ineffective in detecting leaks through the liner in the vadose zone.

As discussed in my writings on my website (www.gfredlee.com), Keller (1994) has discussed how to develop a reliable vadose zone monitoring system to detect leakage through liners. As he correctly points out, a closely spaced network of vadose zone sampling devices must be used to develop a reliable vadose zone monitoring system. The pan lysimeters referred to by Mr. Carlton do not constitute a credible/reliable monitoring system for the inevitable leachate leakage through the composite liner.

Mr. Carlton attempts to address the unreliability of the groundwater monitoring system for the UCD proposed landfill that I have discussed in previous correspondence with you. He states, *"Additional monitoring wells will be required as new cells are constructed."* In my previous

correspondence, I have suggested that the CVRWQCB should ask its staff responsible for developing WDRs for the UCD proposed landfill if they have made a critical evaluation of the reliability of the monitoring wells spaced along the point of compliance for groundwater monitoring to comply with Subtitle D and Title 27 monitoring requirements. Thus far, the CVRWQCB has been developing monitoring programs based on assumptions that all of the bottom of the landfill will leak leachate uniformly at one time – i.e., leak as though it were an unlined landfill. At many hydrogeologic settings, such an approach is appropriate; however, as discussed by Cherry (1990), the initial leakage of leachate through the plastic sheeting liner will produce finger-like plumes of limited lateral dimensions. These plumes can readily pass between point of compliance monitoring wells spaced hundreds of feet apart, as is proposed for the UCD landfill (see Lee and Jones-Lee, 1998b). Both Subtitle D and Title 27 require protection from leachate-polluted groundwaters when those groundwaters first reach the point of compliance, not at some time later, potentially after offsite pollution of groundwaters has occurred. In order to achieve this requirement, vertical monitoring wells will likely have to be no more than ten feet apart at the point of compliance.

I wish to suggest that the CVRWQCB should ask its staff to evaluate the reliability of the current WDRs allowed groundwater monitoring well spacing along the point of compliance for the UCD landfill. As discussed in my writing, this is a task that can be readily accomplished and should be done in permitting every landfill. Without this type of evaluation, the CVRWQCB staff are not fulfilling their obligation to the public in conducting a credible site-specific review of a proposed landfill's ability to protect public health and the environment for as long as the wastes are a threat.

Mr. Carlton, in the first line on page two states,

> *"Although the time period for observing the operation of landfills with single composite liners is limited, we have no evidence that they are failing to protect groundwater."*

This is the same statement that Mr. Pinkos made in the mid-1990s in a review of the protection provided by a CVRWQCB-permitted landfill that Mr. Rosenbaum attached to his 17 July 2000 letter responding to my detailed comments on the deficiencies in the proposed WDRs for the UCD landfill no. 5. Now that Mr. Carlton, in his 28 July 2000 letter has made this statement, it is clear that neither he nor those on his staff understand the basic properties of landfill liners, municipal solid waste, or are familiar with the substantial literature that exists on this topic. It is clear that this statement reflects the fact that the CVRWQCB staff are not keeping abreast of the substantial 1990s literature in the field pertinent to the ability of a single composite liner to prevent landfill leachate from passing through it for as long as the wastes in the landfill will be a threat.

Presented below is an updated summary of the literature on this issue that I have recently developed in connection with work that I am doing on behalf of Clermont County, OH, Wright County, MN, and the Waikato River Protection Society in New Zealand. In each case, my client is concerned about protecting groundwaters from pollution by landfill leachate that would develop in a single composite-lined landfill. The materials presented have been published in separate papers which have been peer-reviewed by professionals in the field prior to publication (Lee and Jones-Lee, 1998a). It is important to note that the references cited in this section are not necessarily new references. They

have been in the refereed literature for many years and should be known to regulatory agency personnel who have the responsibility of protecting groundwaters from pollution by landfill leachate.

In 1988 the US EPA (1988a), as part of promulgating the current Subtitle D municipal landfill regulations, discussed the inability of a single composite liner of the type proposed for the UCD landfill no. 5 to prevent groundwater pollution for as long as the waste in the landfill will be a threat. This *Federal Register* stated,

> *"First, even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvements in MSWLF (municipal solid waste landfill) containment technologies suggest that releases may be delayed by many decades at some landfills."*

The US EPA (1988b) Criteria for Municipal Solid Waste Landfills stated,

> *"Once the unit is closed, the bottom layer of the landfill will deteriorate over time and, consequently, will not prevent leachate transport out of the unit."*

Lee and Jones (1992) and Lee and Jones-Lee (1998a) have presented reviews of the literature on what is known about the properties of flexible membrane liners (FMLs) and clay liners to prevent landfill leachate from passing through them for as long as the wastes in the landfill will be a threat. Table 1 summarizes some of the causes of landfill plastic sheeting and clay liner failure.

Table 1
Causes of Liner Failure

Plastic Sheeting FMLs	Soil/Clay Liners
Holes at Time of Liner Construction	Desiccation Cracks
Holes Developed in Waste Placement	Differential Settling Cracks
Stress-Cracks	Cation Exchange Shrinkage (for Expandable-Layer Clays)
Free-Radical Degradation	Inherent Permeability
Permeable to Low-Molecular-Weight Solvents – Permeation	Interactions between Leachate and the Clays
Inherent Diffusion-Based Permeability	
Finite Effective Lifetime – Will Deteriorate and Ultimately Become Non-Functional in Collecting Leachate and as a Barrier to Prevent Groundwater Pollution	Highly Permeable – Allow Large Amount of Leakage under Design Conditions and Subject to Cracking and Other Failure Mechanisms

Lee and Jones-Lee discuss each of the failure mechanisms presented in Table 1. It can be appropriately concluded that a minimum Subtitle D single composite liner of the type proposed for the UCD landfill no. 5, while possibly providing short-term protection of groundwater quality, is not

reliable for long-term protection and will ultimately fail to prevent leachate from passing through it. Peggs (1998) has discussed the inevitable failure of plastic sheeting layers used in landfill covers and liners. Shackelford (1994) has presented a comprehensive review of the potential for waste and compacted soil interactions that alter the hydraulic conductivity of liners.

Hsuan and Koerner (1995) have reported on the initial phase of long-term (10-year) studies that are underway devoted to examining the rates of deterioration of flexible membrane liners. The focus of the Hsuan and Koerner work is on the breakdown of the polymers in the plastic sheeting liners. They predict that this breakdown will occur due to free radical polymer chain scission in 40 to 120 years. These estimates are indicated by Koerner to consider only some of the mechanisms that could cause breakdown. It is possible that breakdown could begin much earlier. Even if the breakdown of the plastic sheeting polymers took 100 years or so, there is still no question that ultimately the plastic sheeting in the flexible membrane liners will break down, leading to an inability to prevent large amounts of leachate from passing through the liner, causing groundwater pollution in the landfill area.

It should be understood that even liners without holes can leak certain constituents in leachate through diffusion processes. Daniel and Shackelford (1989) discuss the rate of diffusion of chemicals through plastic sheeting and clay liners. They point out that breakthrough due to diffusion for a 60 mil HDPE liner will occur in about two years. For a three-foot-thick clay liner the breakthrough typically takes about 12 years under one foot of head. Workman and Keeble (1989) have presented a nomograph which shows that breakthrough through a three-foot-thick clay liner with a permeability of 10^{-7} cm/sec under one foot of head can occur in about eight years.

These breakthrough times are based on situations where the liner is functioning exactly as designed – i.e., does not have holes in the plastic sheeting or channels in the compacted clay. It is well-known, however, that holes are present and additional holes will develop to a greater extent in the plastic sheeting, and channels, or higher permeability areas, will occur in the compacted clay due to desiccation cracking of the clay liner as the water that was used to pack the liner leaves the liner through unsaturated transport. Therefore, the breakthrough times can be much shorter than these values. Further, Daniel (1990) discussed the fact that compacted clays with a permeability of 10^{-7} cm/sec under one foot of head can leak at the rate of over 120 gallons per acre per day.

An area of continuing concern with respect to plastic sheeting-lined landfills is that dilute aqueous organic solvents can rapidly permeate through an intact (without holes) HDPE liner. This is a chemical transport process in which the low molecular weight organics dissolve into the liner and exit on the downgradient side. Many of these organics can be purchased in local hardware stores. Haxo and Lahey (1988) first discussed this issue. Buss, *et al.* (1995) have reviewed the information on the mechanisms of leakage through synthetic landfill liner materials, such as HDPE. They discuss the importance of permeation of organics through plastic sheeting liners as a landfill liner leakage mechanism that does not require deterioration of the liner properties. Sakti, *et al.* (1991) and Park, *et al.* (1996) have reviewed the available information on this topic and have conducted extensive research on it. They found that an HDPE liner would have to be over three inches thick to prevent permeation of certain organics through it within a period of 25 years.

A critical review of the literature and other information associated with the development of the compacted soil/clay and plastic sheeting layers that are used as landfill containment liners and caps shows that the currently used materials in landfill liner cells have not been found and would not be expected to prevent hazardous and other deleterious constituents present in the wastes from penetrating through the liner and causing groundwater pollution. Clay liners were selected in the 1970s as liners for hazardous chemical waste ponds without consideration of their potential to interact with certain waste constituents or their inherent design permeability (leakage rates). Plastic sheeting liners were selected based on the fact that they were the next cheapest thing to nothing as a liner material. At no time has anyone ever demonstrated that either compacted clay or plastic sheeting, alone or in combination, would be expected to prevent leachate from passing through a landfill liner for as long as the wastes in the landfill will be a threat.

It is evident from a review of the literature that a single composite liner cannot be expected to comply with Title 27 requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. Anyone who states, as Mr. Carlton did,

> *"Although the time period for observing the operation of landfills with single composite liners is limited, we have no evidence that they are failing to protect groundwater."*

is not familiar with the literature. This represents a significant deficiency in the technical competence of the CVRWQCB Waste Discharge to Land Unit.

Mr. Carlton states in the second paragraph on page two of the 28 July 2000 letter to me,

> *"It should be noted that the single composite liner system for WMU-2 should be only one part of the required waste containment system. The WDRs also require that a final cover be installed over WMU-2 at closure. The WDRs require that the final cover shall not be more permeable than the underlying liner system. Once installed, the final cover will minimize the amount of rainwater percolating into the waste and the subsequent generation of leachate. For this reason, the final cover becomes a principal component of the waste containment system."*

What Mr. Carlton does not discuss in his attempt to inform the Board on these issues is that it is well-known from the literature that both the plastic sheeting layer and the compacted clay layer, if one exists, in a minimum Subtitle D landfill cover will deteriorate over time and will allow sufficient moisture (rainfall) to enter the landfill to generate leachate that can lead to groundwater pollution. Montgomery and Parsons (1994) have conducted studies to investigate the cracking of compacted clay layers in landfill covers. They found that cracks up to one-half inch wide, several feet deep developed in two years in a landfill cover. These studies were conducted in Wisconsin. This situation would be expected to be much worse in the drier climate of the Central Valley of California. Further, the mechanisms for deterioration of HDPE as a landfill cover material listed in Table 1 will likely occur at an even higher rate in a landfill cover than they do in the liner. This is due to the greater stresses that are placed on the HDPE cover and the increased potential for free radical chain scission of the HDPE polymer.

As discussed in my writings, since the low permeability layer(s) in a minimum Subtitle D landfill such as that proposed by UCD will be buried below a topsoil layer, it will not be possible through visual inspection of the surface of the landfill to determine when the compacted clay layer has developed cracks, points of deterioration, etc., which will fail to prevent precipitation from entering the landfill. Therefore, contrary to Mr. Carlton's statement, the landfill cover specified in the WDRs for UCD's proposed landfill no. 5 will not prevent moisture from entering the landfill that will generate leachate that will pollute groundwaters for as long as the wastes in the landfill will be a threat.

Mr. Carlton states in his penultimate paragraph,

> *"The revised WDRs are scheduled as an uncontested item for the 4 August 2000 Board meeting. We understand that you will attend the Board meeting for several agenda items and will be available to address any questions the Board may have about the WDRs."*

Based on Mr. Carlton's July 28 letter in which additional unreliable information has been provided to the Board on the validity of the WDRs that the Board staff have proposed for the UCD landfill and my past experience in addressing issues before the Board, in which the Board staff will often, at the last minute, submit new, often superficial, materials that attempt to demonstrate that appropriate comments on technical issues are not reliable, I request that the UCD landfill matter be considered as a "contested" item for the August 4 meeting. This will provide me with the opportunity to discuss any new information that the Board staff attempt to introduce on this matter. It will also provide an opportunity for the Board to ask questions of me concerning the materials that I have submitted on it. I feel it is extremely important that the Board members publicly discuss this issue so that the public is informed about this Board's position on the protection of groundwater quality from pollution by landfill leachate for as long as the wastes in the landfill represent a threat.

If the Board members have questions on these comments, please contact me. Thank you for taking the time to properly review this matter.

G. Fred Lee, PhD, DEE

GFL:ds

c: Governor G. Davis
Members, CVRWQCB
Members, SWRCB
Jorge Leon
L. Vanderhoef
Gary Carlton
James Pedri
Loren Harlow
S. Rosenbaum
S. Ritchie, CALFED
Alvin Franks
Jim Parsons
Gil Torres
James Kuykendall
California Groundwater Resources Association
Bill Jennings, DeltaKeepter
Tom To, Yolo County Dept. of Health

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July 21, 2000

The Honorable Gray Davis
Governor of California
State Capitol
Sacramento, CA 95814

Dear Governor Davis:

I am contacting you in connection with my efforts to try to improve the protection of the State of California's groundwater resources from pollution by municipal solid waste landfill leachate. The background to this situation stems from my having grown up in the Central Valley of California, near Delano. After I obtained a Bachelors Degree at San Jose State, I went east to obtain a Masters Degree at the University of North Carolina and a PhD at Harvard University. I taught and conducted research for 30 years in university graduate level environmental engineering/environmental science programs at several major US universities. One of my areas of emphasis was groundwater quality protection.

In the 1980s, I was asked by a member of the State Water Resources Control Board staff to assist in the review and development of what became Chapter 15, governing the landfilling of solid wastes in California. At that time, I held a professorship of civil and environmental engineering in the University of Texas system. In 1989, when I held the position of Distinguished Professor of Civil and Environmental Engineering at the New Jersey Institute of Technology, I was asked by the Metropolitan Water District of Southern California to assist the San Gabriel Basin Watermaster in a review of the potential for the BFI Azusa landfill to cause groundwater pollution in the San Gabriel Basin. In 1989, I testified in a State Board hearing on that matter, pointing out that BFI's groundwater quality data that it had been reporting to the LA Regional Water Quality Control Board showed that the existing landfill was polluting groundwaters with hazardous chemicals. The State Board chose to ignore my testimony and permitted the expansion of that landfill.

Over the next several years, MWD had me testify at several LA Regional Board hearings on this matter, where each time I provided documentation that the data that were submitted by BFI to the LA Regional Board each quarter showed that the landfill was polluting groundwaters with hazardous and other chemicals. The LA Board staff and Board continued to ignore this situation. Finally, the US EPA, examining this same database, concluded that the Azusa landfill was polluting groundwaters and declared this landfill to be part of the San Gabriel Basin national Superfund site because of this pollution.

Chapter 15 requires that when an existing landfill is found to be polluting groundwaters, corrective action be taken. As it turned out with respect to the Azusa landfill, the data in the LA Regional Board's files showed that the Azusa landfill had been polluting groundwaters at least since the mid-1980s. Further, other consultants had pointed this out to the LA Board in the late 1980s. It was in the early 1990s that I found that the approach that was being used by the State Water Resources Control Board and Regional Boards in

California for implementation of Chapter 15 was seriously deficient compared to that needed to implement the regulations as originally intended.

Chapter 15, as adopted in 1984 by the State Water Resources Control Board, was explicit in requiring that landfills developed in California after 1984 must be designed, constructed, operated, closed and provided post-closure care so that they do not cause pollution – impairment of groundwater quality, for as long as the wastes represent a threat. Since the wastes in municipal solid waste landfills of the type that have been developed since 1984 and are being developed today will be a threat to groundwater quality, effectively, forever, this requirement means that the design, construction, operation, closure and post-closure care must be such that there is a very high probability of achieving protection of groundwater quality for as long as the wastes are a threat.

Rather than implementing Chapter 15 as it was originally intended, where the Regional Boards would make site-specific evaluations of the ability of a particular proposed landfill site and design to be protective of groundwaters from pollution by landfill leachate for as long as the wastes are a threat, the Regional Boards adopted, without public review, a behind-the-scenes position that one foot of compacted clay would prevent groundwater pollution by landfill leachate in accord with Chapter 15 requirements. It was obvious to anyone with even the most elementary knowledge of the flow of water/leachate through liners that one foot of compacted clay, in accord with Chapter 15 minimum allowed design at a naturally protective site, would prevent groundwater pollution by leachate for a few months at best. Basically, the minimum design position adopted by the Regional Boards and allowed by the State Board was no better than no liner. This was borne out by the Solid Waste Assessment Tests, where the State Water Resources Control Board staff concluded (Mulder and Haven, 1995[1]) that landfills with liners or without the minimum liner polluted groundwaters equally.

In the early 1990s, the US EPA forced the State of California to update its minimum landfill liner design to that of a single composite liner specified in Subtitle D. It was known then, as it is now, that a single composite liner will only slow down when groundwater pollution occurs. It will not prevent it. These issues are discussed in detail in the attached materials. In the mid-1990s, as part of trying to bring this issue to the surface for public review, I, as an interested, unsponsored concerned individual, indicated to the Central Valley Regional Water Quality Control Board that the then-proposed University of California, Davis, landfill no. 5 should not be permitted with a single composite liner, since landfill no. 4, which was immediately adjacent to it, was already polluting groundwaters with a plume of chloroform over a mile long. This situation should have been convincing evidence to the Central Valley Regional Water Quality Control Board that a single composite liner system, which the US EPA and others indicate will eventually fail, is not a suitable liner for a landfill at that site.

I subsequently learned that the reason the Central Valley Regional Board adopted this approach, even though it was obviously technically invalid, is that a behind-the-scenes position had been developed by the State Water Resources Control Board staff that claimed that a single composite liner was **assumed** to be equivalent in performance to Chapter 15 requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes are a threat. When I learned of this, I amended my petition to the

[1]Mulder, H. and Haven, E., "Solid Waste Assessment Test (SWAT) Program, Report to the Integrated Waste Management Board, Water Resources Control Board Report 96-ICWP, Sacramento, CA, December (1995).

State Board to have this matter reviewed. Finally, four years later, the State Board Office of Counsel notified me that the State Board decided not to review this matter. A copy of their 270-day notice is attached.

My purpose in contacting you is that there is an opportunity to review this matter again, as a result of the University of California, Davis' requesting a revised WDR for this proposed landfill. Attached are my comments to the CVRWQCB on why the revision is inappropriate and asking that this matter be reviewed again. Unfortunately, I find that the CVRWQCB staff are providing the Regional Board with substantial amounts of unreliable information on the protection available from a single composite liner. My additional comments on this situation are attached.

It is clear that the State Board is unwilling to address this issue. Possibly the current Central Valley Regional Water Quality Control Board could address this issue and set a precedent for the State so that all future landfills developed in the State at sites where the groundwaters are vulnerable to pollution by landfill leachate are designed, constructed, operated, closed and provided with post-closure care to insure that groundwater quality protection will be achieved for as long as the wastes are a threat. This is a common-sense approach. It is cheaper than the current approach, in terms of being able to prevent future Superfund sites at all municipal landfill locations where there are useable groundwaters underlying the landfill. I urge that you take leadership in insuring that all future landfills developed in this State have at least a double composite liner, where the lower composite liner is a leak-detection system for the upper liner. This approach is used in ten other states. It should be used in California. I also urge that all existing landfills, whether lined or unlined, be closed with leak-detectable covers so that it is possible to, in fact, stop moisture from entering the landfill for as long as the wastes are a threat. If no moisture enters the landfill, the future groundwater pollution by that landfill will be prevented. Detailed information in support of this position is provided in the attached materials.

If anyone claims that a single composite liner will protect groundwaters from pollution by landfill leachate for as long as the waste in a municipal solid waste landfill will be a threat, please have this matter independently peer-reviewed in a public arena, where the peer reviewers must provide documentation for any position that they support. I can unequivocably state that such a review will show that the single composite liner being protective approach is obviously technically invalid and strongly contrary to future generations' interest.

If you will take action on this matter, the Davis Administration will become recognized as the Administration that finally had sufficient interest in future generations' groundwater resources to begin to protect them from pollution by landfill leachate. If you have questions about these issues, please contact me.

Sincerely yours,

G. Fred Lee, PhD, DEE

GFL:ds
Encl.

cc: Winston H. Hickox, Secretary for Environmental Protection

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July 20, 2000

Steven Butler, Chairman
Central Valley Regional Water Quality Control Board
3443 Routier Road, Suite A
Sacramento, CA 95827-3003

Dear Chairman Butler and Members of the Board:

I wish to respond to Steve Rosenbaum's July 17th letter to me, which was copied to you and others, in which he presents his "Response to Comments, UC Davis Class III Landfill, Yolo County." Mr. Rosenbaum states,

> *"As is stated in the letter, we are not aware of any credible data or literature which argues convincingly that the current single composite liner requirements are unacceptable for climates such as those found in the Central Valley of California."*

Mr. Rosenbaum's response is another of the grossly superficial, technically invalid approaches that the CVRWQCB Waste Discharge to Land Unit is foisting on the public in the name of protecting the groundwater resources of the Central Valley from pollution by landfill leachate for as long as the wastes in the landfill represent a threat. As stated in my correspondence on this matter, this is the requirement of Chapter 15 and Title 27.

In 1996, when I reviewed the University of California, Davis (UCD) proposed landfill replacement, which is the same as the matter under review by your Board, as well as the Placer County Western Regional Sanitary Landfill, I pointed out that a credible review of the properties of municipal solid waste in Central Valley landfills, coupled with a critical review of the properties of a single composite liner of the type that the CVRWQCB is allowing to be used for landfills and landfill expansions that are located at geologically unsuitable sites that lack natural protection of groundwater from pollution by landfill leachate, as demonstrated by a nearby existing landfill already polluting groundwaters, would lead to the conclusion that a single composite liner of the type that UCD proposes to use obviously cannot protect groundwaters, as required by Chapter 15/Title 27, from pollution by landfill leachate for as long as the wastes represent a threat.

I reiterated this fact in my July 5th letter to you regarding the inappropriateness of the CVRWQCB allowing UCD to construct its proposed landfill no. 5. This landfill is to be located immediately adjacent to landfill no. 4, which is already polluting groundwater with a variety of constituents. There is no issue about the fact that leachate is generated in that landfill in this climate that is polluting groundwaters. Mr. Rosenbaum, in his above-quoted statement, emphasizes the

importance of Central Valley climate in allowing single composite liners to be effective in protecting groundwaters. It should have been obvious to him, and is obvious to others, that the soundness of his argument on Central Valley climate being a protective factor is flawed. UCD landfill no. 4 is polluting groundwaters by landfill leachate. Climate did not protect the groundwaters from this pollution.

Further, if Mr. Rosenbaum had carried out his responsibilities, as required by Title 27, of conducting a proper site-specific evaluation of the proposed landfill's location and design to protect groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat, he would have found that the State Water Resources Control Board Solid Waste Assessment Test (SWAT) results show that climates like that which occurs in the Central Valley, and even drier climates, while generating less leachate than wet climates, still generate leachate that pollutes groundwaters. This is a well-documented fact that Mr. Rosenbaum is ignoring. Therefore, the climate issue raised in his letter is not a valid reason to assume that leachate will not be generated within UCD's proposed landfill no. 5 for as long as the wastes in the landfill will be a threat.

The other component of Mr. Rosenbaum's faulty reasoning – namely, that a single composite liner will be protective – is that this liner will prevent leachate from passing through it for as long as the wastes in the landfill will be a threat. I provided substantial documentation, including quotes from the US EPA in the proposed Subtitle D regulations, as well as information from the literature, which recognizes that a single composite liner can, at best, only postpone when groundwater pollution occurs. It will not prevent it. This is not a debatable fact. As the SWAT results and the Department of Toxic Substances Control special studies on municipal landfills document, Central Valley landfills generate leachate that has a potential to pollute groundwaters. There is no issue about the fact that the single composite liner will deteriorate over time and eventually fail to prevent leachate from passing through it while the wastes in the landfill will still be a threat. A drier climate does not prevent the deterioration of the liner. In fact, it may hasten liner deterioration rates by accelerating free radical attack of the HDPE polymer chains. Mr. Rosenbaum's justification for assuming a single composite liner will comply with Title 27 requirements is fundamentally flawed and strongly contrary to what is known about the properties of the liners and wastes in Central Valley landfills and elsewhere.

Another component of Mr. Rosenbaum's fundamentally flawed reasoning is that,

> *"...we are not aware of any credible data or literature which argues convincingly that the current single composite liner requirements are unacceptable for climates such as those found in the Central Valley of California."*

I assume that Mr. Rosenbaum is aware of the professional ethics issues associated with civil engineers and professional engineers who work for landfill applicants failing to provide for full disclosure of potential harm to the public associated with projects. The Codes of Ethics of the American Society of Civil Engineers and the National Society of Professional Engineers both require full disclosure of potential harm to the public. It is well-known that consultants and others who gain support from landfill applicants cannot discuss the ultimate failure of the system and gain future work from landfill applicants. This is such a well-known problem in the field that a member of the ASCE Professional

Ethics Committee asked me to write a review of this issue. My review was published in summary form in *Civil Engineering* "Forum" as, "Environmental Ethics: The Whole Truth," (October 1995).

What Mr. Rosenbaum is not reporting to you in his July 17th letter is that while there are a number of individuals knowledgeable in the topic area of the eventual failure of minimum Subtitle D liners to prevent leachate from passing through them for as long as the wastes represent a threat, there are few (like myself) who will discuss these issues, since it would mean that they or their firm would lose future work on behalf of landfill applicants. My work in this field is done on behalf of water utilities, municipalities, and others who are concerned about protecting their groundwaters from pollution by landfill leachate. In the case of the UCD landfill, my work is unsponsored. It is being done in the name of trying the get the CVRWQCB to start to permit landfills that will be protective of groundwater resources, as required by current regulations.

Mr. Rosenbaum's statement,

> *"Until there is a significant body of technical information supported by diverse authors that demonstrates that a single composite liner is insufficient to protect groundwater, the Board will likely continue to rely on the design standards promulgated in RCRA Subtitle D and Title 27 of the California Code of Regulations."*

is an example of the "I want dead bodies" approach to landfilling of wastes that convinces me that there is a problem. Mr. Rosenbaum has incorrectly stated the design standards in RCRA Subtitle D and Title 27. A review of these documents, especially Title 27, shows that the single composite liner is the minimum design standard allowed under RCRA. At no place does Subtitle D or Title 27 state that a minimum Subtitle D liner (single composite liner) will prevent groundwater pollution by landfill leachate for as long as the wastes in the landfill will be a threat. Title 27 requires that the Regional Board conduct a site-specific evaluation to assess whether a particular landfill liner design will be adequate for a particular location.

Mr. Rosenbaum included a July 8, 1997, letter by T. Pinkos in his comments. As I have documented over the years, Mr. Pinkos has great difficulty reliably reporting on technical issues. A review of his letter shows that he has made repeated significant errors on these issues. For example, his statement,

> *"These RCRA Subtitle D requirements for composite liners provide a vastly increased degree of groundwater protection when compared to the single clay liner requirements of Chapter 15."*

It is important to ask, in examining the credibility of this statement, if it is an "increased degree of groundwater protection" if the single composite liner only delays when groundwater pollution will occurs. Would it not be better to have the pollution occur in such a way as to be more readily detectable, such as occurred with the clay lined system or unlined landfills, during the time that those who generate the waste that is the cause of the pollution would still have to pay for the groundwater cleanup? The Subtitle D approach only postpones when pollution will occur, and makes it virtually

impossible to detect this pollution with groundwater monitoring wells that sample one foot on each side, spaced hundreds of feet apart at the point of compliance for groundwater monitoring.

There is growing recognition that the US EPA made a significant error in adopting the Subtitle D "dry tomb" regulations. The Agency is conducting a review at this time to explore changing these regulations to at least begin to address their fundamental flaws. Ten other states, including some that have at least as dry a climate as the Central Valley of California, have concluded that they are not going to wait for the Agency to address these problems, but have adopted more protective approaches, involving double composite liners.

Mr. Pinkos' letter states in the third paragraph on page 2,

> *"USEPA found that the single composite liner system is designed to be protective in all locations, including poor locations."*

Since Mr. Rosenbaum provided this 1997 letter to you as being pertinent to the current situation under review by the Board, he should be supportive of its contents. If Mr. Pinkos originally, or Mr. Rosenbaum now, had reviewed and reliably reported on the basis for this statement of a minimum Subtitle D liner being protective at all locations, including poor locations, they would have found that that statement has no relevance to regulating landfills in California.

A review of the US EPA's Subtitle D risk assessment, which serves as the basis for the preamble statement on the protective nature of minimum Subtitle D landfills, shows that the Agency assumes that the landfill liner systems will leak and that people will drink the leachate-polluted groundwater, and that some of those who drink the water will die because of contaminants in the leachate. The Agency concludes that minimum Subtitle D landfills will be "protective," since only a few people will die from pollution of groundwaters by landfill leachate over the next 300 years. The Agency's assumptions led it to conclude that only a few people dying from drinking leachate-polluted groundwater is a low-risk situation. California regulations, however, do not allow people to die from consuming leachate-polluted groundwaters. Chapter 15/Title 27 is explicit in requiring the prevention of groundwater pollution by landfill leachate. This is the standard that the CVRWQCB must uphold in approving UCD's proposed landfill no. 5.

There are several individuals who are familiar with this situation who were formerly associated with the State Board (what is now the Clean Water Program), who were highly involved in landfill matters within the State, who will discuss these issues. These include Gil Torres, the individual responsible for developing Chapter 15; Jim Parsons, who, until recently, was responsible for the State Board's SWAT program; and Alvin Franks, who was one of the administrators of the landfill program for the State Board. All three of these individuals are engineering geologists who are highly familiar with the properties of landfill liners and the situation in the Central Valley of California with respect to climate and leachate generation, who have indicated to me that there is no issue about a single composite liner ultimately failing to prevent leachate from passing through it and polluting groundwaters at a Central Valley landfill. I am confident that, if your Board conducts an independent peer review of these issues, where those responding to the question of "will a single composite liner in a Central Valley landfill comply with Chapter 15/Title 27 requirements of

protecting groundwaters from pollution by landfill leachate for as long as the wastes are a threat" are allowed to remain anonymous, you will find that those knowledgeable in this topic area will agree that Mr. Rosenbaum's response reflects a lack of basic understanding of the properties of the wastes and liners that are being used in Subtitle D landfills.

Several years ago, when this matter was under review, I attempted to bring this issue before the Board through a series of questions about the adequacy of the CVRWQCB staff's review of a proposed landfill. At a Board hearing, I asked Bill Marshall if he knew how long the wastes in this landfill would be a threat. His answer was that he did not know. I then asked if he knew how long the single composite liner could be expected to prevent leachate from passing through it that could lead to groundwater pollution. His response was that he did not know. I then asked if the staff had conducted a critical review of the reliability of the proposed monitoring well array to detect leachate-polluted groundwaters at the point of compliance for groundwater monitoring as required by Chapter 15. At that point, staff attorney Betsy Jennings stopped me from asking further questions.

She indicated it was inappropriate of me to ask questions of the staff regarding the adequacy and comprehensiveness of the staff's review of a proposed landfill to comply with then Chapter 15's requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes represent a threat. Ms. Jennings also informed the Board and me that this issue should be reviewed by the State Board – it was not the Regional Board's responsibility. Following that Board meeting, I contacted State Board Chief Council Bill Attwater on the issue of whether members of the public should be allowed to ask questions of the staff to reveal the adequacy of the staff's review of a proposed landfill. Mr. Attwater was explicit in his response to me regarding B. Jennings' acting inappropriately in preventing me from asking these questions. It was clear that her actions had denied the public due process in review of the proposed landfill.

Had the public been allowed due process at the Board's landfill hearing, I would have asked a series of questions which, I am certain, would have revealed that the Board staff had not performed their mandated responsibility of conducting a site-specific evaluation of whether the proposed landfill design would comply with Chapter 15's requirements. Subsequently, I have developed these questions into a report, "Questions that Regulatory Agencies, Staff, Boards and Landfill Applicants and their Consultants Should Answer about a Proposed Subtitle D Landfill or Landfill Expansion." This report is available from my website, www.gfredlee.com, in the Landfill Permitting section. If there is interest, I can provide you with a copy of these questions. These questions are now being used in many locations in the US and in other countries as part of conducting proposed landfill reviews.

Recently, I contacted Jorge Leon, State Board staff attorney, regarding the responsibility of the Central Valley Board, in accord with the requirements of Title 27, to conduct an independent in-depth review of whether a proposed landfill would comply with Chapter 15/Title 27's requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill represent a threat. He was explicit in stating that Title 27 requires that the Regional Boards conduct these reviews. This is yet another example of B. Jennings inappropriate handling of this matter, where she indicated at a previous hearing that I should take this matter to the State Board, since it was their responsibility, and not the Regional Board's.

As you know, I tried to take this matter to the State Board. I prepared detailed documentation as to why a single composite liner at a Central Valley landfill, where an adjacent landfill was already polluting groundwater, would obviously not prevent groundwater pollution for as long as the wastes represent a threat. The State Board did not act on my petition for four years, and finally, this spring, notified me that the 270-day notice period had passed, and therefore, the Board was not going to act on the petition. It is clear that the public has been getting a runaround between the CVRWQCB review issues and those of the State Board. The State Board, based on the information provided to me by Mr. Leon, indicated that it is the Regional Board's responsibility to conduct these reviews. Yet when I tried to have the review conducted by the CVRWQCB, the Board and I were informed that I should take the matter to the State Board. Meanwhile, Regional Boards continue to approve the construction of landfills that obviously cannot comply with Chapter 15/Title 27 requirements.

Mr. Rosenbaum's final statement,

> *"The proposed revised WDRs are currently on the agenda for the 4 August 2000 Board meeting as an uncontested item."*

is unbelievable. I have taken the time to prepare detailed comments on this issue. He proposes to ignore these comments and not have the Board discuss them. Clearly, these issues should be discussed by the Board so that the public knows whether this Board is going to act on their behalf in protecting groundwaters of the Central Valley as required by current regulations, or is going to perpetuate an obviously flawed approach for landfilling of wastes.

I am confident that if the Board asks Mr. Rosenbaum to address the questions that I have raised covering the protective nature of the UCD proposed landfill in the presence of knowledgeable individuals on the topic, where they can ask followup questions on the validity of his responses and familiarity with the literature, the Board will conclude that Mr. Rosenbaum and others on the staff who support the position stated in his July 17th letter have failed to perform their mandated responsibility of conducting a proper review of UCD's proposed landfill no.5 to comply with Chapter 15/Title 27's requirements of protecting groundwaters from pollution by landfill leachate for as long s the wastes in the landfill will be a threat.

It will be important in conducting this review for the Board members to decide what is more important to the State of California – and especially the Central Valley Region: cheaper-than-real-cost garbage disposal, where the true costs are passed on to future generations, loss of groundwater resources, threats to their health and welfare and the Superfund-like costs for groundwater cleanup, or, erring on the side of protection of groundwater resources and requiring that at least a double composite liner where the lower composite liner is a leak-detection system for the upper liner should be required at all Central Valley landfills and landfill expansions where the site does not provide a well-demonstrated high degree of natural protection. I would hope that this Board would decide that protection of groundwater quality for use by future generations is more important than saving the public that generates waste today from 10 to 15 cents per day in increased garbage disposal fees.

If the Board members have questions on these comments, please contact me. Thank you for taking the time to properly review this matter.

G. Fred Lee, PhD, DEE

GFL:ds
Encl.

cc: Governor G. Davis
Members, CVRWQCB
Members, SWRCB
Jorge Leon
L. Vanderhoef
Gary Carlton
James Pedri
Loren Harlow
S. Rosenbaum
S. Ritchie, CALFED
Alvin Franks
Jim Parsons
Gil Torres
James Kuykendall
California Groundwater Resources Association
Bill Jennings, DeltaKeepter
Tom To, Yolo County Dept. of Health

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July 5, 2000

Steven Butler, Chairman
Central Valley Regional Water Quality Control Board
3443 Routier Road, Suite A
Sacramento, CA 95827-3003

Dear Chairman Butler and Members of the Board:

Please find attached my comments on the Tentative Revised Waste Discharge Requirements for University of California, Davis, UC Davis Class III Landfill, Yolo County (UCD landfill no. 5).

As you may recall, in 1996 I provided detailed comments to the CVRWQCB on why the staff's proposed WDRs for closing UCD landfill no. 4 and the development of UCD landfill no. 5 should not be approved by the Board. The primary thrust of my comments was that the proposed approach for closure of landfill no. 4 would not prevent further groundwater pollution by this landfill. Also, the proposed design and monitoring of landfill no. 5 would not prevent groundwater pollution by this landfill.

When the CVRWQCB approved the staff's WDRs, as an individual interested in groundwater quality protection, on September 9, 1996, I filed an appeal to the State Water Resources Control Board of these WDRs requesting that the State Board review this matter. Subsequently, I learned that the CVRWQCB staff and Board actions in support of what were obviously deficient WDRs in complying with Chapter 15's requirements, were based on an SWRCB "Position," announced to the public for the first time on March 19, 1997, by H. Schueller of the Clean Water Programs, that minimum Subtitle D and Chapter 15 prescriptive landfill liner and cover requirements met the performance standards required by Chapter 15 of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill are a threat. Since this position (policy) was adopted without public review, I asked the State Board in a supplement, dated March 27, 1997, to my petition to conduct a public review of this position.

I provided detailed discussions of why the WDRs and this position were well known to be significantly deficient in complying with Chapter 15 (now, Title 27) requirements for protection of groundwaters from pollution by landfill leachate. A copy of the original petition and the supplement are appended to these comments.

On April 17, 2000, the SWRCB Office of Counsel, notified me that the 270-day period in which the State Board must review petitions had lapsed and the Board, by lack of action, denied the petition. A copy of the April 17 notice is appended to these comments.

On June 2, 2000, I received a Notice of Tentative Revised WDRs for the UCD campus landfill. This notice requested comments concerning the tentative order for revised WDRs. Attached are my comments.

I find that the revised draft WDRs for UCD's proposed landfill no. 5 are still obviously significantly deficient in complying with Chapter 15/Title 27 requirements of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill will be a threat. A single composite liner of the type that UCD proposes to use will fail to prevent leachate from passing through it during the time that the waste in the landfill will be a threat. Changing the two feet of compacted clay in this composite liner to a geocomposite clay liner (GCL) will not change this situation. In fact, as discussed in the enclosed comments, the GCL could readily shorten the time in which groundwater pollution will occur.

I am submitting these comments as part of an ongoing effort to try to get the State and Regional Boards in California to begin to develop municipal solid waste and industrial solid waste landfills that will have a high degree of certainty of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill will be a threat. I have no personal interest in the UCD landfill other than that of a taxpayer whose children will experience the loss of groundwater resources and will have to pay for the cleanup of the polluted groundwaters that will arise out of the construction of landfill no. 5 as proposed in the June 2, 2000, draft WDRs.

As discussed herein, a small additional initial investment in a double composite liner, rather than the single composite liner now proposed, will save future generations many tens of millions of dollars in not having to cleanup the polluted groundwaters arising from the ultimate failure of the single composite liner. It should be noted that there are ten states in the US that would not allow UCD's proposed landfill no. 5 design because of the ultimate failure of the single composite liner to prevent large amounts of leachate from passing through it while the wastes in the landfill are still a threat.

An important aspect of this situation is that requiring a double composite liner as part of the development of landfill no. 5, where the lower composite liner is a leak detection system for the upper liner, will not impose a significant financial burden on UCD. The UCD L. Vanderhoef administration, and specifically, L. Vanderhoef, should adopt this approach on their own initiative as part of providing leadership in the state in environmental protection. However, thus far, L. Vanderhoef and his administration have approached issues of this type as a recalcitrant polluter, doing the least possible to just get by current CVRWQCB staff and Board approaches for interpretation of current regulations.

The April 17, 2000, SWRCB Notice letter, where the State Board has refused to review the obviously significant deficient "Position" on the equivalency of a single composite liner and the typically approved associated groundwater monitoring system to Title 27's requirements for groundwater quality protection, means that the State Board is relying on the Regional Boards to require additional measures to protect the groundwater resources within the Boards' jurisdiction from pollution by landfill leachate. The importance of groundwater resources to the future within the Central Valley mandates that the CVRWQCB not continue to accept the obviously flawed equivalency

between a single composite liner and Title 27's requirements for protecting groundwater quality from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. It is my understanding that the CVRWQCB has the right/obligation to establish WDRs for proposed landfills, as well as landfill closures, that will comply with Title 27 requirements. The CVRWQCB is not restricted from independent assessment of the ability of a proposed liner system and groundwater monitoring system to protect groundwater resources from pollution by landfill leachate. In fact, it is obligated to conduct this review.

I urge, in the name of protection of future generations' groundwater resources within California, that the CVRWQCB work with UCD and the public in developing WDRs for UCD's proposed landfill no. 5 and the closure of landfill no. 4 to provide for true groundwater quality protection for as long as the wastes in the landfills will be a threat.

If there are questions on these comments or the attached materials, please contact me.

G. Fred Lee, PhD, DEE

GFL:ds
Encl.

cc: Governor G. Davis
Members, CVRWQCB
Members, SWRCB
S. Rosenbaum
S. Ritchie, CALFED
Bill Jennings, DeltaKeeper
Gary Carlton
James Pedri
Loren Harlow
James Kuykendall
California Groundwater Resources Association
Tom To, Yolo County Dept. of Health
Alvin Franks
Jim Parsons
Gil Torres
L. Vanderhoef

Comments on Tentative Revised Waste Discharge Requirements for the University of California Davis (UCD) Class III Landfill, Yolo County, Dated June 2, 2000

Submitted by
G. Fred Lee, PhD, DEE
G. Fred Lee & Associates
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July 5, 2000

Presented herein are my comments on the Tentative Revised Waste Discharge Requirements for the proposed UCD Class III landfill (UCD landfill no. 5).

In 1994, I provided detailed comments to the Central Valley Regional Water Quality Control Board (CVRWQCB) on the fundamentally flawed nature of the University of California, Davis' (UCD's) proposed landfill no. 5. I pointed out in those comments that that landfill as proposed would, at best, only postpone when groundwater pollution occurs. UCD, by adopting a minimum US EPA Subtitle D landfill design (also minimum Chapter 15, now Title 27, landfill liner design) would create yet another landfill that would be polluting groundwaters of the area.

UCD has been practicing landfilling of campus waste for many years. It has developed four landfills on the UCD campus, all of which are now polluting groundwaters, and two of which have created chloroform plumes that extend over a mile from the landfill. It has been the UCD administration's approach for landfilling of campus waste that the University would practice the minimum design, operation, closure and post-closure care needed to just get by the CVRWQCB's then-current approach for regulating the landfilling of municipal solid waste. This cheaper-than-real-cost garbage disposal has led to severe groundwater pollution, which is now costing the taxpayers of California many tens of millions of dollars in polluted groundwater clean-up.

While the current UCD administration claims that past administrations were not at fault for adopting this approach since the approach was approved by the Regional Board, the facts are that it has been known since the 1950s that the construction of a landfill of the type that UCD has constructed, which will superficially meet minimum regulatory requirements then (and, for that matter, now) in a geological setting such as that which exists at UCD, will lead to groundwater pollution. Research done at the University of California, Berkeley, demonstrated in the 1950s that this situation would likely occur. This research served as background information to the American Society of Civil Engineers (ASCE)1959 Sanitary Landfill manual. That manual discussed the need to carefully site landfills to avoid groundwater pollution. The UCD's administrations, including the L. Vanderhoef administration, have chosen to ignore good engineering practice and environmental and groundwater quality protection in order to achieve cheaper-than-real-cost garbage disposal at the expense of future generations' groundwater resources and quality.

In 1994, when I found that the CVRWQCB adopted waste discharge requirements which were obviously fundamentally flawed in complying with then Chapter 15's requirements of protecting groundwaters from pollution by landfill leachate for as long as the waste in the landfill would be a threat, I appealed, without support, the Regional Board's actions to the State Board. A copy of this appeal is appended to these comments. The State Board accepted receipt of the appeal, but chose to not act on it until recently, when I was informed on April 17, 2000 that the 270-day period within which the Board must act, had passed (actually, it was about 4 years) and the Board has chosen not to act on this appeal. As I understand the situation, this now enables me to take action to have this matter reviewed by the courts.

My original review and appeal, as well as this action have all been unsponsored. They are being conducted in the name of trying to establish a more technically valid approach for protecting groundwater quality from pollution by municipal and industrial landfill leachate than has been occurring in California.

In discussing this matter with the Regional Board staff, I learned that the staff understood the fundamental deficiencies in the proposed design of the UCD landfill in providing groundwater quality protection from pollution by landfill leachate for as long as the wastes represent a threat. I subsequently learned that the reason the Regional Board staff supported this approach, even though they knew that it would not comply with Chapter 15 requirements of protecting groundwater from pollution for as long as the wastes are a threat, was that H Schueller then head of the Clean Water Program had issued a policy statement that stated that it was the State Board's position that constructing a minimum US EPA Subtitle D landfill with a single composite liner and monitoring wells spaced hundreds or more feet apart along the downgradient edge of the landfill would be considered as complying with Chapter 15's requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes are a threat. The wastes in municipal landfills, including the UCD landfill, will be a threat, effectively, forever; therefore, the minimum US EPA Subtitle D liner, consisting of a thin plastic sheeting and a couple of feet of clay, must protect groundwaters from pollution by landfill leachate forever. Obviously, this cannot be done.

When I learned of this behind-the-scenes policy that had been adopted, without public review, by the SWRCB, I amended my petition to include review of that policy. A copy of my amended petition is appended to these comments.

The proposed UCD landfill no. 5 is to be located near UCD landfill no.4. Landfill no. 4 has already polluted groundwaters for over a mile downgradient from the landfill by a chloroform plume associated with UCD's mismanagement of its campus chloroform wastes, which were dumped into pits at that landfill. A similar plume exists at UCD landfill no.2, at the UCD LEHR national superfund site.

Another fundamentally flawed aspect of UCD's proposed landfill no. 5 is the grossly inadequate groundwater monitoring system that is proposed to be used, compared to that needed to comply with either US EPA Subtitle D or Chapter 15 (now Title 27) requirements. These issues are discussed in the attached materials. Without question, ultimately, the single composite liner that UCD proposes to use for its

proposed landfill no. 5 will ultimately develop finger plumes of leachate that will pass between the monitoring wells that UCD proposes to use at the point of compliance for groundwater monitoring. This will mean that off-site groundwater pollution will occur from the proposed landfill no. 5, which will require remediation of the polluted groundwaters.

With respect to the specific proposal to substitute a geocomposite clay liner (GLC) for the two feet of compacted clay , it should be understood that neither the two feet of clay nor the GLC will prevent pollution of groundwaters. In fact, the GLC will likely allow more rapid pollution. Because of its very thin character, there are structural stability problems with the GLC that can lead to failure that would not occur with the two feet of clay. Further, diffusion through the GLC can occur at a much higher rate than through the two feet of clay. While the GLC is claimed to have a lower advective permeability, this claim is misleading because the rate of transport of pollutants through the GLC will be controlled by diffusion, not advection. Also the GLC has a much smaller capacity for ion exchange shrink/swell and therefore will be more subject to cracking as calcium substitutes for sodium in the clay.

Recommended Approach

In the fall of 1999 the US EPA issued a request for comments on the changes that should be made in Subtitle D landfill regulations. In January 2000 Dr. Anne Jones-Lee and I submitted the attached comments on changes that should be made in Subtitle D regulations. I recommend that the CVRWQCB rescind the current WDRs for the UCD proposed landfill and substitute the recommendations that Dr. Jones-Lee and I submitted to the US EPA on the changes in Subtitle D regulations. These changes should be required for the proposed UCD landfill no.5. The most important of the changes in UCD landfill no. 5 design include a double composite liner with the lower composite liner serving as leak detection for the upper composite liner.

This approach is now required by 10 states in the US; it is recognized as the approach that should be used for minimum design for Subtitle D (Title 27) landfills located where the geological strata do not provide for natural protection of the groundwater resources. This approach also greatly reduces the unreliability of the groundwater monitoring systems that are based on vertical monitoring wells spaced hundreds of feet apart at the point of compliance. This approach can be readily implemented and should be required of UCD and, for that matter, all landfills located within the Central Valley. While the initial cost of this approach is about twice that of a single composite liner, which typically represents an increase in cost of about a few cents per person per day for those who deposit waste in the landfill, it will save the taxpayers of California millions of dollars in groundwater clean-up.

Another change that should be made in the WDR's is concerned with the closure of UCD landfill no. 4. UCD landfill no. 4 should be closed with a leak detectable cover that will be operated and maintained forever. This approach will shut off the moisture supply that is leading to further leachate generation and groundwater pollution.

Adoption of these recommended approaches will enable UCD to close landfill no. 4 to stop further pollution of groundwater. It will also allow UCD to develop landfill 5 so that it will be more protective of groundwater quality.

While the past CVRWQCB and the current SWRCB have not been willing to take the action needed to develop landfills in California that are protective of groundwater resources from pollution by landfill leachate for as long as the wastes are a threat as required by Title 27, the current CVRWQCB should take the lead for the state and require that landfills developed in the Central Valley will in fact protect groundwater resources for as long as the wastes are a threat.

If there are questions on these comments please contact me. Thank you for taking time to review this matter.

G. Fred Lee, Ph.D, DEE

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January 30, 2000

via email
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Criteria For Municipal Solid Waste Landfills (Section 610 Review)
Submitted to Docket Number F-1999-MLFN-FFFFF

RCRA Docket Information Center
Office of Solid Waste (5305G)
US EPA (EPA HQ)
401 M St, SW
Washington DC202460

Dr. Anne Jones-Lee and I wish to provide comments pertinent to the Agency's current review of the continued need for Subtitle D regulations. We focus our comments on the adequacy of Subtitle D regulations as they have been implemented at the state and local levels to provide protection of public health, groundwater resources and the environment from Subtitle D landfilled wastes for as long as the wastes in a Subtitle D landfill remain a threat. This is a topic that we have been concerned with since Subtitle D was first proposed in 1988. We have published extensively on the fundamentally flawed approach that the US EPA adopted in 1991 with the promulgation of Subtitle D regulations. These comments summarize many of the issues addressed in our publications.

The basis for our concern and comments stems from my more than 30 years of work on the impact .of landfilled municipal solid wastes (MSW) on public health, groundwater resources and the environment. For 20 of these years I was involved in graduate level teaching and research at several major US universities on various aspects of water quality and solid and hazardous waste management. The research included evaluation of the ability of landfill liners of the type used in Subtitle D landfills to prevent MSW leachate from polluting groundwaters for as long as the wastes are a threat. A summary of my professional expertise and experience pertinent to these comments is appended.

Subtitle D Landfill Containment and Monitoring Systems Are a Flawed Technological Approach for Protection of Groundwater Quality

In 1997 we were invited to present a review paper on the problems of Subtitle D landfills at an Air and Waste Management Association (AWMA) conference session devoted to landfilling of MSW. That paper was presented at the national meeting in June 1997 and published in the conference proceedings. A copy of that paper is appended to these comments. Also, in July 1998 we presented a review paper at the US EPA national Water Quality Monitoring conference devoted to the problems of reliably monitoring liner leakage of leachate from MSW Subtitle D landfills before widespread offside pollution of groundwater occurs.

These papers summarize the current state of knowledge on the ability of minimum Subtitle D MSW landfills to protect groundwater from pollution by landfill leachate for as long as the waste are a threat. A summary of the key deficiencies in the current Subtitle D regulations is presented below. Also we present recommendations on changes that should be made in Subtitle D regulations.

- MSW in a Subtitle D landfill will be a threat to public health, groundwater resources and the environment effectively forever. THE US EPA SHOULD REVISE SUBTITLE D REGULATIONS TO CLEARLY RECOGNIZE THE *AD INFINITUM* THREAT OF MSW IN A SUBTITLE D LANDFILL AND, AS DISCUSSED HEREIN, RELIABLY PREPARE TO MANAGE THIS THREAT TO PUBLIC HEALTH, GROUNDWATER QUALITY AND THE ENVIRONMENT FOR AS LONG AS THE LANDFILLED WASTES ARE A THREAT..

- A single composite liner will not protect groundwater quality from pollution by landfill leachate. SUBTITLE D SHOULD BE REVISED SO THAT ALL MSW LANDFILLS SITED AT LOCATIONS WHERE THERE ARE GROUNDWATERS HYDRAULICALLY CONNECTED TO THE BASE OF THE LANDFILL THAT COULD AT ANY TIME IN THE FUTURE BE USED FOR DOMESTIC WATER SUPPLY WILL BE PROTECTED FROM LANDFILL LEACHATE FOR AS LONG AS THE WASTES ARE A THREAT..

- Minimum Subtitle D landfill leachate leakage through the liner cannot be reliably monitored by the approach allowed in implementing Subtitle D regulations involving vertical monitoring wells located hundreds of feet apart at the point of compliance for groundwater monitoring. The current typical Subtitle D landfill groundwater monitoring system is cosmetic and is unreliable as a means of providing offsite groundwater quality protection. SUBTITLE D SHOULD BE REVISED TO REQUIRE THAT A DOUBLE COMPOSITE LINER SYSTEM IS USED. THE LOWER COMPOSITE LINER IN THE DOUBLE COMPOSITE LINED MSW LANDFILL IS TO BE USED AS A LEAK DETECTION SYSTEM FOR THE EVENTUAL FAILURE OF THE UPPER SUBTITLE D COMPOSITE LINER TO PREVENT LEACHATE FROM PASSING THROUGH THE LINER THAT COULD POLLUTE GROUNDWATER.

- The current Subtitle D regulations do not require the long term funding that will be needed to provide the monitoring, maintenance and eventual remediation of leachate polluted groundwater over the period of time that the wastes in the landfill will be a threat. SUBTITLE D SHOULD BE

REVISED SO THAT THE SUBTITLE D LANDFILL OWNER IS REQUIRED TO DEVELOP A DEDICATED TRUST FUND OF SUFFICIENT MAGNITUDE TO ADDRESS ALL PLAUSIBLE WORST CASE LANDFILL CONTAINMENT SYSTEM FAILURE SCENARIOS FOR AS LONG AS THE WASTES IN THE LANDFILL WILL BE A THREAT. FOR PLANNING PURPOSES THIS PERIOD SHOULD BE CONSIDERED TO BE INFINITE. THIS TRUST FUND CAN BE GENERATED FROM DISPOSAL FEES.

- Current Subtitle D landfill covers will not prevent moisture from entering the landfill wastes that generates leachate that will cause groundwater pollution during the time that the wastes will be a threat. The eventual failure of the plastic sheeting layer in the cover cannot be detected by the current landfill cover inspection approach. SUBTITLE D SHOULD BE REVISED SO THAT A LEAK DETECTABLE COVER IS INSTALLED AND RELIABLY OPERATED FOR AS LONG AS THE WASTES IN THE LANDFILL ARE THREAT. THIS WILL REQUIRE THAT ASSURED FUNDING BE DEVELOPED DURING THE ACTIVE LIFE OF THE LANDFILL.

- Subtitle D regulations fail to reliably protect public health, safety and the environment from the adverse impacts of landfill gas generated in a Subtitle D landfill for as long as the wastes are a threat to generate gas emissions. SUBTITLE D SHOULD BE REVISED TO RECOGNIZE THAT SUBTITLE D LANDFILLS WILL HAVE THE POTENTIAL TO GENERATE AND RELEASE TO THE ENVIRONMENT LANDFILL GAS AND OTHER VOLATILE CONSTITUENTS FOR MUCH LONGER THAN THE CURRENT 30 YEAR MINIMUM ASSURED FUNDED POSTCLOSURE CARE PERIOD. THE REVISED REGULATIONS SHOULD PROVIDE FOR MANAGEMENT OF ALL GAS RELEASES FOR AS THE LANDFILL IS A THREAT TO RELEASE GASES/VOLATILE CONSTITUENTS TO THE ENVIRONMENT.

- Contrary to US EPA's statement in the 1991 Subtitle D regulation, this regulation fails to address the justified NIMBY opposition to Subtitle D landfills developed without adequate buffer lands to dissipate the emissions of waste derived components and other impacts of MSW landfills to the those who live and/or use properties within the sphere of influence of the landfill. This area of influence often extends for several miles from the landfill. SUBTITLE D REGULATIONS SHOULD BE REVISED SO THAT THE HEALTH, ENVIRONMENT, WATER AND AIR RESOURCES AND THE INTERESTS OF THOSE WHO ARE POTENTIALLY IMPACTED BY THE LANDFILL ARE FULLY PROTECTED FOR AS LONG AS THE WASTES IN THE LANDFILL ARE A THREAT.
-

Adoption of this recommended approach for revising Subtitle D will be a major step toward beginning to manage MSW in a technically valid cost effective manner to protect groundwater, public health and the environment. This approach will put an end to the highly unreliable information the current US EPA administration has been providing the US public about the "safety" of minimum Subtitle D landfills. With

high quality construction of the liner and cover systems, this safety applies for a short period of time compared to the time that the wastes in the landfill will be a threat. While this recommended approach will initially cost the MSW generators (public residential, commercial and industrial) more to manage the MSW, the true long term costs of managing landfilled MSW will be less since the "superfund" costs associated with the remediation of the leachate polluted groundwater will be less likely to occur.

Another important impact of adopting these recommended revisions of Subtitle D is that they will cause the true cost of MSW landfilling to become more comparable to practicing the 3Rs. At this time MSW reuse, reduction and recycling (3Rs) is experiencing problems in obtaining public support due to the higher costs compared to the costs of minimum Subtitle D landfill tipping fees. Currently the Agency claims to promote MSW reduction, reuse and recycling yet allows MSW landfilling at costs less than the real costs to those who generate the wastes. The Agency's current approach for landfilling is strongly contrary to the practice of the 3Rs and passes most of the costs of landfilling of MSW to future generations in terms of threats to their health, loss of groundwater resources and having to pay the "Superfund" costs for polluted groundwater resources, and other long term impacts of Subtitle D landfills. Attached is preprint of a paper that I will be presenting at the AWMA June 2000 national conference session devoted to MSW 3Rs that discuss these issues.

The current US EPA efforts to promote landfill leachate recycle should be properly evaluated in terms of the potential to cause increased and more severe groundwater pollution. Attached is a paper that I will present at the AWMA national conference in June 2000 that discusses problems with leachate recycle in minimum Subtitle D landfills. Also discussed are recommended approaches for promoting wet cell MSW landfilling.

Background to these comments and recommendations are provide in the appended papers. Further additional information is presented in papers and reports available from our web site, www.gfredlee.com.

We strongly recommend that the US EPA not continue its current approaches of weakening Subtitle D as occurred with the adoption of less assured long term funding of postclosure monitoring and maintenance. Instead, the US EPA should significantly strengthen Subtitle D so that it provides true protection of public health, groundwater resources and the environment for as long as the wastes in the landfill are a threat.

If anyone attempts to claim that our assessment of deficiencies in Subtitle D landfills is technically incorrect, please have him/her provide written documentation on the technical bases for the claim(s) so that they can be independently peer-reviewed by experts in the field.

Please contact me if there are comments or questions on these comments.

G. Fred Lee, PhD, PE, DEE
Anne Jones-Lee, PhD

Qualifications to Undertake This Review

My (Dr G. Fred Lee) work on municipal landfill impact matters began in the mid-1950s while I was an undergraduate student in environmental health sciences at San Jose State College in San Jose, California. My course and field work involved review of municipal solid waste landfill impacts on public health and the environment.

I obtained a Master of Science in Public Health degree from the University of North Carolina, Chapel Hill in 1957. The focus of my masters degree work was on water quality evaluation and management with respect to public health and environmental protection from chemical constituents and pathogenic organisms.

I obtained a PhD degree specializing in environmental engineering from Harvard University in 1960. As part of this degree work I obtained further formal education in the fate, effects and significance and the development of control programs for chemical constituents in surface and groundwater systems. An area of specialization during my PhD work was aquatic chemistry.

For a 30-year period, I held university graduate-level teaching and research positions in departments of civil and environmental engineering at several major United States universities, including the University of Wisconsin-Madison, University of Texas at Dallas and Colorado State University. During this period I taught graduate-level environmental engineering courses in water and wastewater analysis, water and wastewater treatment plant design, surface and groundwater quality evaluation and management, and solid and hazardous waste management. I have published over 850 professional papers and reports on my research results and professional experience. My research included, beginning in the 1970s, the first work done on the impacts of organics on clay liners for landfills and waste lagoons.

In the 1980s, I conducted a comprehensive review of the properties of HDPE liners of the type being used today for lining municipal solid waste and hazardous waste landfills with respect to their compatibility with landfill leachate and their expected performance in containing waste-derived constituents for as long as the waste will be a threat.

My work on the impacts of municipal solid waste landfills began in the 1960s where, while directing the Water Chemistry Program in the Department of Civil and Environmental Engineering at the University of Wisconsin-Madison, I became involved in the review of the impacts of municipal solid waste landfills on groundwater quality. In the 1970s, while I was Director of the Center for Environmental Studies at the University of Texas at Dallas, I was involved in the review of a number of municipal solid waste landfill situations, focusing on the impacts of releases from the landfill on public health and the environment.

In the 1980s while I held the positions of Director of the Site Assessment and Remediation Division of a multi-university consortium hazardous waste research center and a Distinguished Professorship of Civil and Environmental Engineering at the New Jersey Institute of Technology, I was involved in numerous

situations concerning the impact of landfilling of municipal solid waste on public health and the environment. I have served as an advisor to the states of California, Michigan, New Jersey and Texas on solid waste regulations and management.

In the early 1980s while holding a professorship in Civil and Environmental Engineering at Colorado State University, I served as an advisor to the town of Brush, Colorado on the potential impacts of a proposed hazardous waste landfill on the groundwater resources of interest to the community. Based on this work, I published a paper in the Journal of the American Water Works Association discussing the ultimate failure of the liner systems proposed for that landfill in preventing groundwater pollution by landfill leachate. In 1984 this paper was judged by the Water Resources Division of the American Water Works Association as the best paper published in the journal for that year.

In 1989, I retired after 30 years of graduate-level university teaching and research and expanded the part-time consulting that I had been doing with governmental agencies, industry and community and environmental groups into a full-time activity. A principal area of my work since then has been assisting water utilities, municipalities, industry, community and environmental groups, agricultural interests and others in evaluating the potential public health and environmental impacts of proposed or existing hazardous, as well as municipal solid waste landfills. I have been involved in the review of approximately 50 different landfills in various parts of the United States and in other countries.

Dr Anne Jones-Lee obtained a bachelors degree in biology form Southern Methodist University and a PhD degree in Environmental Sciences from the University of Texas at Dallas in 1978. For 11 years she taught and conducted university graduate level environmental engineering and environmental sciences courses and conducted research on various aspects of water quality management. She and Dr. G. Fred Lee have worked together as a team since the mid 1970s.

Dr. Anne Jones-Lee and Dr. G. Fred Lee have published extensively on the issues that should be considered in developing new or expanded municipal solid waste and hazardous waste landfills in order to protect the health, groundwater resources, environment and interests of those within the sphere of influence of the landfill. Our over 40 professional papers and reports on landfilling issues provide guidance not only on the problems of today's minimum US EPA Subtitle D landfills, but also how landfilling of non-recyclable wastes can and should take place to protect public health, groundwater resources, the environment, and the interests of those within the sphere of influence of a landfill. I make many of my publications available as downloadable files from my web site (www.gfredlee.com).

In the early 1990s, I was appointed to a California Environmental Protection Agency's Comparative Risk Project Human Health Subcommittee that reviewed the public health hazards of chemicals in California's air and water. In connection with this activity, Dr. Jones-Lee and I developed a report, "Impact of Municipal and Industrial Non-Hazardous Waste Landfills on Public Health and the Environment: An Overview" (Lee and Jones-Lee, 1994a), that served as a basis for the human health advisory panel to assess public health impacts of municipal landfills.

In addition to teaching and serving as a consultant in environmental engineering for over 39 years, I am a registered professional engineer in the state of Texas and a Diplomate in the American Academy of Environmental Engineers (AAEE). The latter recognizes my leadership roles in the environmental engineering field. I have served as the chief examiner for the AAEE in north-central California and New Jersey, where I have been responsible for administering examinations for professional engineers with extensive experience and expertise in various aspects of environmental engineering, including solid and hazardous waste management.

My work on landfill impacts has included developing and presenting several two-day short-courses devoted to landfills and groundwater quality protection issues. These courses have been presented through the American Society of Civil Engineers, the American Water Resources Association, the National Ground Water Association in several United States cities, including New York, Atlanta, Seattle and Chicago, and the University of California Extension Programs at several of the UC campuses, as well as through other groups. I have been and continue to be an American Chemical Society tour speaker, where I am invited to lecture on landfills and groundwater quality protection issues, as well as domestic water supply water quality issues throughout the US.

SUMMARY BIOGRAPHICAL INFORMATION

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EDUCATION

Ph.D. Environmental Engineering & Environmental Science, Harvard University, Cambridge, Mass. 1960

M.S.P.H. Environmental Science-Environmental Chemistry, School of Public Health, University of North Carolina, Chapel Hill, NC 1957

B.A. Environmental Health Science, San Jose State University 1955

ACADEMIC AND PROFESSIONAL EXPERIENCE

Current Position:

Consultant, President, G. Fred Lee and Associates

Previous Positions:

Distinguished Professor, Civil and Environmental Engineering, New Jersey Institute of Technology, Newark, NJ, 1984-89

Senior Consulting Engineer, EBASCO-Envirosphere, Lyndhurst, NJ (part-time), 1988-89

Coordinator, Estuarine and Marine Water Quality Management Program, NJ Marine Sciences Consortium Sea Grant Program, 1986-1988

Director, Site Assessment and Remedial Action Division, Industry, Cooperative Center for Research in Hazardous and Toxic Substances, New Jersey Institute of Technology et al., Newark, NJ, 1984-1987

Professor, Department of Civil and Environmental Engineering, Texas Tech University, 1982-1984

Professor, Environmental Engineering, Colorado State University, 1978-1982

Professor, Environmental Engineering & Sciences; Director, Center of Environmental Studies, University of Texas at Dallas, 1973-1978

Professor of Water Chemistry, Department of Civil & Environmental Engineering, University of Wisconsin-Madison, 1961-1973

Registered Professional Engineer, State of Texas, Registration No. 39906

PUBLICATIONS AND AREAS OF ACTIVITY

Published over 850 professional papers, chapters in books, professional reports, and similar materials. The topics covered include:

Studies on sources, significance, fate and the development of control programs for chemicals in aquatic and terrestrial systems.

Analytical methods for chemical contaminants in fresh and marine waters.

Landfills and groundwater quality protection issues.

Impact of landfills on public health and environment.

Environmental impact and management of various types of wastewater discharges including municipal, mining, electric generating stations, domestic and industrial wastes, paper and steel mill, refinery wastewaters, etc.

Stormwater runoff water quality evaluation and BMP development for urban areas and highways

Eutrophication causes and control, groundwater quality impact of land disposal of municipal and industrial wastes, environmental impact of dredging and dredged material disposal, water quality modeling, hazard assessment for new and existing chemicals, water quality and sediment criteria and standards, water supply water quality, assessment of actual environmental impact of chemical contaminants on water quality.

LECTURES

Presented over 750 lectures at professional society meetings, universities, and to professional and public groups.

GRANTS AND AWARDS

Principal investigator for over six million dollars of contract and grant research in the water quality and solid and hazardous waste management field.

GRADUATE WORK CONDUCTED UNDER SUPERVISION OF G. FRED LEE

Over 90 M.S. theses and Ph.D. dissertations have been completed under the supervision of Dr. Lee.

ADVISORY ACTIVITIES

Consultant to numerous international, national and regional governmental agencies, community and environmental groups and industries.

Surface and Groundwater Quality Evaluation and Management
and
Municipal Solid & Industrial Hazardous Waste Landfills

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Dr. G. Fred Lee and Dr. Anne Jones-Lee have prepared professional papers and reports on the various areas in which they are active in research and consulting including domestic water supply water quality, water and wastewater treatment, water pollution control, and the evaluation and management of the impacts of solid and hazardous wastes. Publications are available in the following areas:

- Landfills and Groundwater Quality Protection
- Water Quality Evaluation and Management for Wastewater Discharges, Stormwater Runoff, Ambient Waters and Pesticide Water Quality Management Issues
- State Stormwater Quality Task Force Activities
- Impact of Hazardous Chemicals -- Superfund, LEHR Superfund Site Reports
- Contaminated Sediment -- Aquafund, BPTCP
- Domestic Water Supply Water Quality
- Excessive Fertilization/Eutrophication
- Reuse of Reclaimed Wastewaters
- Watershed Based Water Quality Management Programs:
  Sacramento River Watershed Program,
  Delta -- CALFED Program, and
  Upper Newport Bay Watershed Program
  San Joaquin River Watershed DO and OP Pesticide TMDL Programs

Stormwater Runoff Water Quality Science/Engineering Newsletter

Municipal Solid Waste Landfills and Groundwater Quality Protection Issues Publications

Drs. G. Fred Lee and Anne Jones-Lee have prepared several papers and reports on various aspects of municipal solid waste (MSW) management and hazardous waste management by landfilling, groundwater quality protection issues, as well as other issues of concern to those within a sphere of influence of a landfill. These materials provide an overview of the key problems associated with landfilling of MSW and hazardous waste utilizing lined "dry tomb" landfills and suggest alternative approaches for MSW management that will not lead to groundwater pollution by landfill leachate and protect the health and interests of those within the sphere of influence of a landfill. Copies of many of these papers and reports are available as downloadable files from Drs. G. Fred Lee's and Anne Jones-Lee's web page (www.gfredlee.com). Copies of these papers and reports listed below as well as a complete list of their publications on this and related topics are available upon request.

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Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches[1]

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Abstract

The US EPA Subtitle D regulations specify as a minimum, MSW landfills be lined with a single composite liner which is part of a leachate collection and removal system. Upon reaching the landfill capacity, a low-permeability cover is installed. A groundwater monitoring system is used to detect liner failure during the 30-year mandated post-closure care period. The waste in a minimum Subtitle D "dry tomb" landfill will be a threat to pollute groundwaters by leachate, effectively forever. The landfill liner and cover have a finite period of time when they can be expected to function effectively to keep moisture out of the landfill that generates leachate and to collect leachate formed within the landfill. The groundwater monitoring systems typically used with monitoring wells having zones of capture of about one foot on each side, spaced hundreds of feet apart, have low probabilities of detecting landfill liner failure that leads to groundwater pollution before off-site pollution occurs. The 30 years of mandated post-closure care is an infinitesimally small part of the time that the waste in a minimum Subtitle D "dry tomb" landfill will be a threat to generate leachate that can pollute groundwater. Fundamentally, the minimum Subtitle D MSW landfill is a technologically flawed approach that, at best, only postpones when groundwater pollution occurs for those landfills sited at geologically unsuitable sites, i.e. those without natural groundwater quality protection. The US EPA Subtitle D regulations also fail to address the justifiable NIMBY associated with active life releases (odors, dust, blowing paper, etc.) from the landfill to the surrounding area. This paper discusses the deficiencies in minimum Subtitle D landfilling of MSW and provides guidance on alternative landfilling approaches that can protect public health, groundwater resources, environment and the interests of those within the sphere of influence of the landfill.

The complete paper is available from www.gfredlee.com.

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1. Lee, G.F. and Jones-Lee, A., "Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches," Proc. Air and Waste Management Assoc. 91st Annual Meeting, San Diego, CA, available on CD ROM as paper 98-WA71.04(A46), 40pp, June (1998). Also available at http://www.gfredlee.com.

Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring[1]

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Abstract

The US EPA (1991) MSW Subtitle D landfill regulations require a groundwater monitoring system based on vertical monitoring wells located at a point of compliance for monitoring that is no more than 150 meters from the down groundwater gradient edge of the landfill. The regulations specify that a detection monitoring program be implemented which has a high reliability of determining when leachate-polluted groundwaters reach the point of compliance. A critical review of the implementation of the Subtitle D landfill liner failure detection approach using the typical current groundwater monitoring approach shows that minimum Subtitle D landfills are being permitted with monitoring wells spaced one hundred to one thousand feet apart. The 1990 work of Dr. J. Cherry showed that plastic sheeting lined landfills such as a minimum Subtitle D landfill, will initially produce narrow plumes of groundwater pollution that arise through leachate leakage through the plastic sheeting liner that could readily pass by the typical point of compliance groundwater monitoring well array without being detected by the monitoring wells. This paper reviews the deficiencies in the Subtitle D groundwater monitoring approach in detecting groundwater pollution associated with the inevitable liner failure before widespread, off-site pollution occurs. Also presented is information on alternative monitoring approaches that have a high reliability of detecting liner failure before significant groundwater pollution occurs. The recommended monitoring system involves the use of a double composite liner with a leak detection system between the two liners where the lower composite liner functions as a pan lysimeter for the upper composite liner.

The complete paper is available from www.gfredlee.com.

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[1]. Presented at US EPA national Water Quality Monitoring Conference Reno, NV July (1998)

Petition

To the State Water Resources Control Board

to Review
California Regional Water Quality Control Board
Waste Discharge Requirements
for University of California, Davis
Class III Landfill
Yolo County
Order 96-228
Adopted on August 9, 1996

Submitted by

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September 9, 1996

On August 9, 1996, the Central Valley Regional Water Quality Control Board (CVRWQCB) adopted Waste Discharge Requirements (WDR's) for the University of California, Davis "west" landfill WMU-1 closure and the development of an expanded but non-contiguous "west" landfill in the same region (WMU-2). Prior to that time the petitioner, Dr. G. Fred Lee, had submitted several sets of detailed written comments on the inability of the CVRWQCB staff's proposed closure of WMU-1 and the development of WMU-2 to conform to WRCB's Title 23, California Code of Regulations (23 CCR), Division 3, Chapter 15 (hereafter Chapter 15) as well as the state Landfilling Policy adopted in June 1993. A copy of these comments is appended to this Petition. Order No. 96-228, adopted by the CVRWQCB on August 9, 1996, covering the closure of WMU-1 and the development of WMU-2, will not conform to State Water Resources Control Board (State Board or WRCB) Chapter 15 requirements of protecting groundwaters from pollution (impaired use) by landfill leachate for as long as the wastes in the existing landfill (WMU-1) and in the proposed landfill (WMU-2) will be a threat.

Requested Action

It is requested that the State Board conduct a technical review of the adequacy of Order No. 96-228 to protect the groundwater resources in the vicinity of landfill WMU-1 from further pollution by landfill leachate and from landfill leachate that will be developed in the proposed new landfill WMU-2 for as long as the wastes in the landfill will be a threat. As part of this review, the WRCB should provide guidance to

the CVRWQCB on how, in light of current understanding of the ability of today's landfill containment systems and groundwater monitoring systems, the closure of WMU-1 and the development of WMU-2 can be achieved to protect groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. It is requested that the State Board remand Order No. 96-228 back to the Regional Board with specific instructions that this Board should comply with the full requirements set forth in Chapter 15 and in today's Landfilling Policy of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat.

Background Information

The University of California, Davis has a long history of constructing campus landfills that cause highly significant groundwater pollution. At this time, UCD has four such campus landfills. Three of these (landfills 1, 2, and 3) are located at the LEHR site. This is a national superfund site because of the groundwater pollution that has occurred at UCD's campus landfills. Landfill 2 has a chloroform plume of groundwater pollution that extends over a mile under adjacent properties. It is known that there are other groundwater pollution plumes associated with hazardous and radioactive wastes that have been placed in UCD campus landfills at the LEHR site. The full extent of the pollution from landfill 2, as well as other LEHR site landfills and waste disposal areas, is not known.

In 1966 UCD closed landfill 3 at the LEHR site and began to operate, what it calls now, the campus landfill (the "west" campus landfill, landfill 4, WMU-1). That landfill has received campus wastes, which include materials typically representative of municipal solid wastes, hazardous wastes, and, according to the former dump-tender for landfill 4, radioactive waste from the LEHR site. As with the LEHR site landfills, large amounts of chloroform were dumped as wastes by UCD at landfill 4. This has caused a chloroform and other VOC groundwater pollution plume that extends for some unknown distance beyond a mile to the northeast of the landfill. There are also other groundwater pollution plumes that are characterized as municipal solid waste leachate associated with the "west" landfill.

Closure of WMU-1

Under threat of a proposed Cease and Desist Order, drafted by the Central Valley Regional Water Quality Control Board staff, which was scheduled to be reviewed by the Board on August 9, 1996, the UCD L. Vanderhoef administration, without public review, signed a Stipulated Agreement with the Yolo County Department of Public Health that calls for termination of waste receipt at WMU-1 and the closure of this landfill in a five year period by November 1, 2001 (see Order No. 96-228, page 9). To the public, this period of time appears to have been selected to enable the UCD L. Vanderhoef administration to develop the fifth campus landfill (WMU-2).

The petitioner finds that since WMU-1 has been polluting and continues to pollute groundwaters with landfill leachate, the five year period of time that the Central Valley Regional

Water Quality Control Board and Yolo County Department of Public Health allowed the UCD L. Vanderhoef administration to terminate accepting campus wastes at WMU-1, is an excessive period of time of continued groundwater pollution by this landfill before its closure.

The petitioner requests that the State Board remand Order No. 96-228 back to CVRWQCB for reconsideration of the period of time that WMU-1 shall remain active and be allowed to continue to pollute groundwaters by landfill leachate.

As discussed in the attachments, including the August 5, 1996 and especially the September 1, 1996 letters to Tom To, Director Yolo County Environmental Health, there are several aspects of the Stipulated Agreement and Order No. 96-228 of concern to the petitioner and to the public on the continued operation of WMU-1. These include the following:

- WMU-1 has been and is currently polluting groundwater with landfill leachate.

- Continued acceptance of wastes at this landfill will increase the total amount of groundwater pollution that will occur under the current closure provisions adopted by the CVRWQCB on August 9, 1996. The taxpayers of California who must fund the remediation of the UCD L. Vanderhoef administration's continued pollution of groundwater by WMU-1 should be entitled to closure of WMU-1 as soon as possible.

- Yolo County Department of Public Works operates a municipal solid-waste landfill that could accept UCD campus wastes immediately.

- While the UCD L. Vanderhoef administration claims that five more years of groundwater pollution by WMU-1 is needed for economic reasons before it can be closed, the economic analysis conducted by the UCD L. Vanderhoef administration is fundamentally flawed in that it fails to consider the true cost of landfilling in WMU-1. The UCD L. Vanderhoef administration has chosen to ignore in its economic analysis the cost of groundwater pollution and the associated remediation of the polluted groundwaters.

- The primary justification for continued operation of WMU-1 for a five year period is that this period of time would be needed for the UCD L. Vanderhoef administration to develop and place in operation UCD campus landfill 5 (WMU-2). However, as discussed herein, the UCD L. Vanderhoef administration's economic analysis, which purports to show that it is cheaper for this administration to continue to operate campus landfills rather than disposing of its campus wastes in the Yolo County landfill, is unreliable. Dr. L. Wegge, Professor of Economics Emeritus, has conducted a review of the reliability of the UCD L. Vanderhoef administration's analysis which attempts to justify continued landfilling of wastes (see July 27, 1996 letter from the petitioner to Karl Longley) in which Dr. Wegge has found that UCD's economic analysis of near-term economics is flawed. Further, as the petitioner has pointed out in his comments on the UCD L.

Vanderhoef administration's self-certified draft and FEIRs, the UCD L. Vanderhoef administration's economic analysis totally ignores the long-term costs associated with remediation of groundwater pollution that will occur if WMU-2 is constructed as allowed in the CVRWQCB's August 9, 1996 Order No. 96-228.

A proper economic analysis will show that it is cheaper for the University of California, Davis and the taxpayers of California to terminate, as soon as possible, i.e. within no more than a two year period, the operations of WMU-1. Further, a proper economic analysis would show that it is improper for the UCD L. Vanderhoef administration to burden the taxpayers of the state with the large costs that will accrue associated with the eventual pollution of groundwaters by the proposed WMU-2.

It is requested that the State Board take the necessary action to cause the CVRWQCB to issue a revised Order that will allow WMU-1 to continue to accept wastes only until June 30, 1998. By that date, the UCD L. Vanderhoef administration must make arrangements to, and implement, management of campus solid wastes at the Yolo County landfill.

Closure of WMU-1

Order No. 96-228 states on page 8, item 19, under the section "Landfill Closure Specifications"

"At closure, WMU-1 shall receive a final cover consisting, at a minimum, of a two-foot think foundation layer which may contain waste materials, overlain by a one-foot thick clay liner that has an hydraulic conductivity of no more than 1 x 10^{-6} cm/sec, and finally by a one-foot thick vegetative soil layer, or an engineered equivalent final cover approved by the Board pursuant to Sections 2510(b) and (c) of Chapter 15."

On January 18, 1996, the petitioner provided Chairman Longley with a detailed discussion of the inadequacies of the proposed approach for closing WMU-1 (see pages 5-8 of the January 18, 1996 correspondence). The petitioner specifically quoted from a CVRWQCB December 1, 1995 memorandum, authored by Mr. Morris of the Regional Board staff, which states,

"The discharge shall neither cause nor contribute to the contamination, degradation, or pollution of ground water via the release of waste constituents in either liquid or gaseous phase."

"The discharge shall not cause any increase in the concentration of waste constituents in soil-pore gas, soil-poor liquid, soil, or other geologic materials outside of the new waste management units if such waste constituents could migrate to waters of the State--in either the liquid or the gaseous phase—and cause a condition of contamination, pollution, degradation, or nuisance."

Chapter 15, Article 8, Section 2580(a) states,

"Classified waste management units shall be closed according to an approved closure and post-closure maintenance plan which provides for continued compliance with the applicable standards for waste containment and precipitation and drainage controls in Article 4 of this subchapter, and the monitoring program requirements in Article 5 of this subchapter, throughout the closure and post-closure maintenance period. The post-closure maintenance period shall extend as long as the wastes pose a threat to water quality."

The wastes in WMU-1 will be a threat to groundwater quality effectively forever. Therefore, UCD must close WMU-1 in such a way as to prevent further and continued pollution of groundwaters, including, in accord with Porter-Cologne "threat," the unsaturated (vadose) zone under the landfill forever. It is obvious upon examination of the CVRWQCB Order No. 96-228, item 19 under landfill closure specifications quoted above, that a two-foot foundation layer overlain by a one-foot thick clay layer with a hydraulic conductivity of less than 1×10^{-6} cm/sec that is covered with a one-foot thick vegetative soil layer as specified in Order No. 96-228 cannot conform to the prevention of further groundwater pollution by WMU-1 for as long as the waste in this landfill will be a threat. At best, the prescribed cover will only slow down for a short period of time the generation of leachate in the landfill that will lead to further groundwater pollution. Therefore, Order No. 96-228 will lead to a violation of Chapter 15 requirements in the closure of WMU-1.

Basically the CVRWQCB staff and Board are perpetuating the highly inappropriate approach that was adopted in the mid-1980s for closing landfills by allowing landfill owners to construct the minimum landfill cover requirements irrespective of the suitability of the site for a landfill. The University of California, Davis "west" landfill location has been demonstrated to be a highly unsuitable site for a landfill. The site does not provide natural protection of the groundwater resources underlying the landfill from pollution by landfill leachate. This is well demonstrated by the fact that there is large groundwater pollution plume associated with WMU-1. Therefore, in order to stop further groundwater pollution by landfill leachate in accord with the explicit requirements set forth by Mr. Morris and Chapter 15, it will be necessary to construct a landfill cover on landfill WMU-1 that is far more effective in preventing moisture that enters the landfill cover from precipitation than can be achieved with one foot of clay with a permeability less than 1×10^{-6} cm/sec at the time of construction. The petitioner's January 18, 1996 letter to Chairman Longley provides additional information on why the landfill cover specified in Order No. 96-228 cannot comply with regulatory requirements.

One of the key issues that has been discussed in previous correspondence (see petitioner's August 8, 1996 letter to Karl Longley) is the ability of the University of California, Davis to comply with the monitoring requirements set forth in the Order of detecting dessication cracks that occur in the low permeability layer of the cover within a short time after installation. While the CVRWQCB staff have stated that UCD must be able to do this, they have not responded to the petitioner's request of how, in fact, this can be done. As discussed above, the low permeability layer of compacted clay is buried under a

topsoil layer. This overlying layer will not necessarily show dessication cracks. If it does experience such cracks, the cracks will not necessarily be at the same location as the cracks that will occur in the low permeability layer. As the petitioner has discussed, this situation represents an impossible requirement since it cannot, in fact, be implemented under the cover design set forth in the Order.

In the past, as discussed in the petitioner's previous correspondence on this matter, and at the time the current practice for closing landfills was adopted in the mid-1980s, it was assumed a landfill owner could not develop a landfill cover that could, in fact, prevent moisture from entering the landfill and generating leachate that leads to groundwater pollution for as long as the wastes in the landfill represented a threat. By the late 1980s, it was becoming well known by professionals in the field that landfill covers of the type specified in Order No. 96-228 would not prevent appreciable moisture from entering a landfill generating leachate that, at a geologically unsuitable site such as the UCD "west" landfill location, would lead to groundwater pollution. As discussed in the enclosed correspondence, (see in particular the January 18, 1996 letter to Karl Longley from the petitioner) this problem has become so well recognized today among professionals in the landfill design and water pollution control field that the American Society of Civil Engineers held a national conference in San Diego, California in the fall of 1995 to discuss this problem. Several of those, such as Dr. David Daniel of the University of Texas, Austin and the petitioner, presented invited papers at this conference addressing this issue. Dr. Daniel, again, pointed out as he had in 1990, in the US EPA seminar lectures he gave around the country on landfill closure issues, including in San Francisco, that today's landfill covers will not prevent moisture from entering the landfill which generates leachate that can lead to groundwater pollution.

In the petitioner's January 18, 1996 letter to Karl Longley, which responded to correspondence from the Regional Board's staff to UCD, concerning closure of WMU-1, the petitioner provided additional references to the literature on this topic as well as discussed again the findings of the state of Wisconsin in their studies of the late 1980s on the deficiencies in compacted soil layers of the type that are prescribed for the closure of WMU-1 in Order No. 96-228 to prevent moisture from entering the landfill for as long as the waste represents a threat and could generate leachate and cause further groundwater pollution.

There is no question about the fact that if WMU-1 is closed as prescribed in Order No. 96-228 it is likely that within the first summer after closure, significant dessication cracks will occur in the low permeability layer that cannot be discerned from the surface. These cracks will allow moisture that penetrates through the top soil layer to enter the landfill and generate leachate. While this problem is well understood by Regional Board and State Board staff and other professionals in the field, no one is willing to change the approach. This approach has been allowed to be used for closing landfills for those landfills cited at a geologically unsuitable site, i.e. does not have natural protection of the groundwater resources hydraulicly connected to the landfill. It has been known for many years that closing landfills with one foot of compacted soil with a permeability of less than 1×10^{-6} cm/sec will not develop a closure that for any significant period of time complies with the Chapter 15 requirements, as well as those prescribed by Mr. Morris in his letter to the University of California, Davis quoted above, of protecting groundwaters from further pollution by landfill leachate. In the past, the Regional Board's staff and Board, to the extent that

they were informed by their staff of the deficiencies in the landfill closure approaches that have been approved since the late 1980s, apparently took the attitude that there was little else that could be done, and besides Chapter 15 specifies the one foot of less than 1 x 10^{-6} cm/sec as the minimum landfill cover closure low permeability layer design. Regional Board staff have informed the petitioner that so long as the State Board does nothing to correct this minimum design requirement, they will continue to recommend to their Boards what they know to be an inadequate landfill closure approach in terms of complying with the Chapter 15 requirements of protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. Basically, the Regional Board's staff are passing the buck on this issue to the State Board. The State Board and its staff, however, claim that in accord with Chapter 15 requirements, it is the responsibility of the Regional Boards to ensure that an adequately designed low permeability layer is, in fact, designed, constructed, and maintained to prevent further groundwater pollution by landfill leachate for as long as the waste in the landfill will be a threat.

The situation today is significantly different than it was just a couple of years ago with respect to developing landfill covers that will, in fact, comply with Chapter 15 requirements of preventing further groundwater pollution by waste-derived constituents. As discussed in the petitioner's previous correspondence with the Board, there are now several companies that manufacture leak detectable covers for landfills. These systems can be installed and operated at a reasonable cost and, thereby, enable the landfill owner to comply with Chapter 15 requirements of preventing further leachate pollution of groundwaters by an existing landfill.

The petitioner requests that the State Water Resources Control Board take the necessary action to cause the Central Valley Regional Water Quality Control Board to amend Order No. 96-228 to require that the University of California, Davis develop a landfill cover low permeability layer that will be designed, constructed, operated, monitored, and maintained for as long as the waste in WMU-1 will be a threat. This cover must comply to the high degree of certainty with Chapter 15 requirements of preventing further groundwater pollution by WMU-1 waste-derived constituents. It should be understood for the purpose of planning, that the period of time that this low permeability layer must function as prescribed should be considered infinite and, therefore, will require effective monitoring and maintenance.

These proposed amended Order requirements can be readily implemented through the incorporation of one of several leak detectible covers that are commercially available today.

Development of WMU-2

Page 4, item 28 of Order No. 96-228 states,

"The Discharger proposes to construct WMU-2 with a composite liner system that meets the prescriptive requirements of federal Subtitle D regulations of landfill liners. The liner will consist of two feet of compacted soil having a maximum hydraulic conductivity of 1 x 10^{-7}

cm/sec covered by a 60-mil high density polyethylene geomembrane. A blanket type leachate collection and recovery system (LCRS) overlying the composite liner will be covered by a one foot thick operations layer. The LCRS will consist of a one foot layer of gravel on the base of the WMU and a geosynthetic net on sideslopes."

Page 4, item 32 of Order No. 96-228 states,

"This Order implements (1) the Water Quality Control Plan for the Sacramento River and San Joaquin River Basin Third Edition; (2) the prescriptive standards and performance goals of Chapter 15, Division 3, Title 23 of the California Code of Regulations, effective 27 November 1984, and subsequent revisions; (3) the prescriptive standards and performance criteria of Part 258, Title 40 of the Code of Federal Regulations (Subtitle D of the Resource Conservation and Recovery Act); and (4) State Water Resources Control Board Resolution No. 93-62, Policy for Regulation of Discharges of Municipal Solid Waste, Adopted 17 June 1993."

As discussed herein, a critical review of the regulatory requirements as set forth in the Central Valley Regional Water Quality Control Board Basin Plan shows that the Water Quality Objectives For Groundwaters, Chemical Constituents requires that,

"Ground waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses."

There is no question that Order No. 96-228 provisions covering the design of WMU-2 with a single composite liner of the minimum Subtitle D type quoted above cannot comply with the CVRWQCB Basin Plan requirements quoted above in preventing groundwater pollution by chemical constituents derived from WMU-2 that adversely affect beneficial uses of the groundwater.

Chapter 15, Article 4, Section 2540(c) states,

"Class III landfills shall have containment structures which are capable of preventing degradation of waters of the state as a result of waste discharges to the landfills if site characteristics are inadequate."

Chapter 15, Article 5, Section 2550(a) states,

"The siting, design, construction, and operation standards contained elsewhere in this subchapter and in Title 22 of this code are intended to prevent adverse impacts on water quality."

Chapter 15, Article 5, Section 2550(d) states,

"The regulations under this article apply during the active life of the waste management unit (including the closure period). After closure of the waste management unit, the regulations in this article apply during the post-closure maintenance period unless all waste, waste residues, contaminated containment system components, and contaminated geologic materials have been removed or decontaminated at closure."

Article 1, Section 2510(a) states,

"Requirements in this subchapter are minimum standards for proper management of each waste category. Regional boards may impose more stringent requirements to accommodate regional and site-specific conditions." [emphasis added]

As quoted above, the Chapter 15 performance standard to which WMU-2 must conform is the prevention of impaired use of groundwaters from waste-derived constituents for as long as the wastes in the landfill represent a threat. It is important to note that this performance standard is far more strict than that of the US EPA's RCRA Subtitle D requirements. The US EPA, as part of adopting Subtitle D minimum single composite liner, stated in the Federal Register covering the proposed regulations (August 30, 1988),

"First, even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvements in MSWLF (municipal solid waste landfill) containment technologies suggest that releases may be delayed by many decades at some landfills."

The US EPA Criteria for Municipal Solid Waste Landfills (July 1988) stated,

"Once the unit is closed, the bottom layer of the landfill will deteriorate over time and, consequently, will not prevent leachate transport out of the unit."

US EPA, "Solid Waste Disposal Facility Criteria; Proposed Rule," Federal Register 53(168):33314-33422, 40 CFR Parts 257 and 258, US EPA, Washington, D.C., August 30, (1988).

US EPA, "Criteria for Municipal Solid Waste Landfills," US EPA Washington D.C., July (1988).

The petitioner has provided, as an addendum to this Petition, several of Dr. Jones-Lee's and the petitioners reports which review the ability of a Subtitle D single composite liner to prevent leachate from passing through the liner and causing groundwater pollution for as long as the waste in a Subtitle D landfill of the type that UCD proposes to construct as WMU-2 will be a threat. These papers and reports provide references to the literature covering the publications of others on this topic as well. A review of the current literature pertinent to the US EPA's 1988 statements on the eventual failure of Subtitle D liners quoted above shows they are applicable to today's Subtitle D landfills.

There is no doubt Order No. 96-228 statements on page 4, items 28 and 32 are not reliable. A minimum Subtitle D liner system as proposed for WMU-2 cannot comply with either the Basin Plan requirements for groundwater quality protection or the groundwater protection performance requirements of Chapter 15. Even Mr. J. Stagner of the University of California, Davis, who is responsible for UCD's landfilling operations, admitted at a public meeting held in May 1996 that UCD's proposed WMU-2 will cause groundwater pollution. Order No. 96-228 must, based on this issue alone, be remanded back to the Central Valley Regional Water Quality Control Board to resolve the highly significant inconsistency between items 28 and 32 on page 4 of the Order.

It is recommended that the WRCB remand Order No. 96-228 back to the CVRWQCB to require that if the UCD L. Vanderhoef administration proceeds with developing WMU-2, this landfill be designed, constructed, operated, closed, and provided with post-closure care (monitoring and maintenance) so there is a high probability that the waste constituents in this landfill will not pollute-impair the groundwater resources in the vicinity of the landfill for as long as the wastes in the landfill are a threat.

In the accompanying attachment "Recommended Design, Operation, Closure and Post-Closure Approaches for Municipal Solid Waste and Hazardous Waste Landfills," the petitioner has discussed how such a landfill could be developed. The minimum requirements for WMU-2 should be those set forth in this report. Failure of the State and Regional Boards to adopt this approach will ultimately lead to yet another landfill in California that is polluting the groundwater resources of the state.

Closure of WMU-2

Order No. 96-228 does not provide any information on the proposed approach for closure of WMU-2 other than a general statement that it shall conform to the requirements set forth in Chapter 15. This can be interpreted to mean that since the proposed design of WMU-2 involves the use of a minimum Subtitle D liner, a plastic sheeting layer shall be incorporated into the landfill cover. As discussed in previous correspondence and is well known in the literature, a minimum Subtitle D landfill closure cover that incorporates a single plastic sheeting layer will not prevent moisture from entering the landfill and generating leachate that can cause groundwater pollution. As with the compacted clay layer that UCD proposes for closing WMU-1, the plastic sheeting layer will be buried below covered materials and, therefore, is not available for visual inspection. As with the liner materials, the plastic sheeting layer in a landfill cover will deteriorate, likely at a greater rate than the liner, ultimately becoming ineffective in preventing moisture that penetrates the top soil layer of the cover from entering the wastes and generating leachate.

It is recommended that the WRCB remand Order No. 96-228 back to the CVRWQCB to require that, as a minimum, this Order specify the closure of WMU-2 shall be done in such a way as to provide a high degree of reliability in preventing moisture from entering the landfill that

generates leachate that could lead to groundwater pollution for as long as the wastes in the landfill represent a threat.

The UCD L. Vanderhoef administration should know now that minimum Subtitle D landfill closure approaches will not be allowed at WMU-2. WMU-2 could, based on current technology, be closed with a leak detectible cover system of the type described above for WMU-1.

Groundwater Monitoring

Order No. 96-228 requires on page 2, second paragraph, under the section "Required Monitoring Programs,"

> *"For any given monitored medium, a sufficient number of samples shall be taken from all Monitoring Points and Background Monitoring Points to satisfy the data analysis requirements for a given Reporting Period, and shall be taken in a manner that ensures sample independence to the greatest extent feasible."*

Article 5, Chapter 15, Section 2550.1 requires,

> *"detection monitoring...to provide the best assurance of the detection of subsequent releases from the waste management unit."*

Further, Chapter 15 requires that a sufficient number of monitoring wells be located so that they,

> *"...provide for the best assurance of the earliest possible detection of a release from a waste management unit."*

Article 5, Chapter 15, Section 2550.5 states,

> *"(a) For each waste management unit, the regional board shall specify in the waste discharge requirements the point of compliance at which the water quality protection standard of Section 2550.2 of this article applies. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management unit that extends through the uppermost aquifer underlying the unit."*

Examination of Order 96-228, Attachment B shows that the UCD L. Vanderhoef administration has proposed, and the CVRWQCB has accepted, one upgradient (MW-8) and three downgradient (MW-6, MW-12, and MW-13) at the point of compliance, groundwater monitoring wells for WMU-2. The three downgrading monitoring wells are spaced approximately 300 to 400 feet apart. The sampling of these wells in accord with conventional requirements will result in extraction of water from the aquifer at a maximum distance of about one foot from each well, i.e. the zone of each capture has a radius of about

one foot. Therefore, for the wells that are spaced 300 feet apart at the point of compliance, there is 298 feet at this point through which leachate that will leak through the liner system could pass without being detected by the monitoring wells.

Cherry (1990) (see enclosed) has discussed the leakage of leachate through flexible membrane-lined landfills of the WMU-2 type. He points out that the initial leakage will occur at tears, rips, and points of deterioration in the plastic sheeting layer. These leaks will produce finger plumes of leachate of a few feet wide at the point of compliance for groundwater monitoring. It is obvious that the groundwater monitoring approach proposed by UCD and accepted by Central Valley Regional Water Quality Control Board, as set forth in Order NO. 96-228, is fundamentally flawed. Obviously, it cannot conform to Chapter 15 requirements or Subtitle D requirements of detecting leachate-polluted groundwaters arising from leakage through the Subtitle D liner before widespread groundwater pollution occurs.

The highly significant deficiencies in the proposed groundwater monitoring approach have been previously brought to the attention of the CVRWQCB and its staff on several occasions (see the January 18, 1996 letter from the petitioner to Karl Longley as one example). The staff and the Board have chosen to ignore this situation and have proceeded with accepting an obviously flawed groundwater monitoring approach that, at best, can be described as cosmetic. It is important to note that over almost two years ago, the petitioner, in connection with the review of the UCD L. Vanderhoef administration's then Draft EIR, pointed out that the groundwater monitoring approach proposed for WMU-2, as well as other aspects of the proposed approach for development of WMU-2, would not be protective of the groundwater resources in the vicinity of that landfill. The UCD L. Vanderhoef administration, in response to the petitioner's comments made on the Draft EIR, claimed that since the Central Valley Regional Water Quality Control Board would approve the groundwater monitoring program, it must be an adequate program to satisfy Chapter 15 requirements.

Once again, it is the deficiencies in which the way the Central Valley Regional Water Quality Control Board's staff have been and continue to implement Chapter 15 requirements that are allowing the development of landfills in the Central Valley Region that will obviously not prevent groundwater pollution for as long as the waste in the landfill will be a threat as a result of leakage through the Subtitle D liner. Further, this leakage will not be detected at the point of compliance for groundwater monitoring by a groundwater monitoring program of the type specified in Order No. 96-228 before wide-spread pollution of groundwaters has occurred.

It is recommended that the WRCB remand Order No. 96-228 back to CVRWQCB with instructions that the Regional Board must develop a groundwater monitoring program for WMU-2 that will, in fact, provide, in accord with Chapter 15 requirements, "...for the best assurance of the earliest possible detection of a release from a waste management unit."

In the petitioner's previous correspondence to the Board and as discussed herein, it is possible to readily develop a groundwater monitoring program that will have a high probability of detecting leachate leakage through the Subtitle D liner when it occurs in a sufficient amount to potentially pollute the groundwaters under the landfill. The approach recommended is the one that has been adopted in the state of Michigan under that state's Rule 641. The approach that should be used at WMU-2 is to require, as a number of other states now require, a double composite liner be constructed at WMU-2. The lower composite liner is separated from the upper composite liner by a leak detection layer of the type typically used in RCRA Subtitle C landfills. When leachate is detected in the leak detection layer in sufficient quantities to potentially pollute groundwaters underlying the landfill, if the lower composite liner were not present, the landfill owner/operator must stop this leakage or remove the waste from the landfill (landfill mining). Landfill mining is becoming recognized as an effective tool in preventing groundwater pollution by landfill wastes. If the UCD L. Vanderhoef administration wishes to proceed with the development of WMU-2, a groundwater monitoring system of this type must be required. Failure to do so will result in WMU-2 being in violation of Chapter 15 groundwater monitoring requirements.

A review of other aspects of the surface and groundwater monitoring requirements set forth in Order No. 96-228 shows that an inadequate frequency of monitoring and parameters for monitoring is specified in this Order. These issues can be addressed when this Order is remanded back to the Central Valley Regional Water Quality Control Board.

In summary, as documented herein, the Central Valley Regional Water Quality Control Board's Order No. 96-228 does not require that UCD construct WMU-2 in such a manner as to conform to Chapter 15 and to the WRCB Landfilling Policy. If this landfill is allowed to be constructed as proposed, it will cause groundwater pollution. The natural strata at the location of WMU-2 has been demonstrated, based on the situation at nearby WMU-1, to be unsuitable for a landfill of this type. While, as discussed herein, a landfill could be developed at the WMU-2 site that would be protective, it will have to be of significantly different design than that specified in Order No. 96-228.

Need for Timely Action by State Board

Order No. 96-228 sets forth the general aspects of the minimum design and other requirements for WMU-1 closure and for the development of WMU-2. While the details of the design of WMU-1 closure and WMU-2 development will be submitted by UCD to the Central Valley Regional Water Quality Control Board at some time in the future, the way that this Order is implemented by the Regional Board mandates that the public petition the State Board at this time on the deficiencies in the Order in order to have the State Board review these deficiencies. The public does not have a mandated opportunity to review the details of the design of the landfill cover for WMU-1 or the liner, leachate collection and removal system, groundwater monitoring system, and proposed approach for closing WMU-2. The review of the details of the design, etc. is done by the Regional Board's staff without Board and public review.

The public has substantial reason to question, based on previous correspondence discussed by the petitioner and Order No. 96-228, whether the Regional Board's staff will, in fact, require the University of California, Davis to meet current regulatory requirements for protection of surface and groundwaters. As discussed herein, the Regional Board's staff have chosen to interpret Chapter 15 and Subtitle D minimum design standards as equivalent to Chapter 15's groundwater protection performance standard. This approach is contrary to the State Water Resources Control Board's statement at the June 1993 hearing where the State Board adopted the current Landfilling Policy which incorporated Subtitle D minimum design standards into Chapter 15 requirements, where Chapter 15's minimum design standards were less protective than Subtitle D requirements. At this hearing, in response to a question the petitioner raised with the Board, the Board members explicitly stated that Chapter 15's groundwater protection standard must be achieved by the new Landfilling Policy. Further, they stated that the minimum design standards set forth in the new Landfilling Policy should not be interpreted to be equivalent to the groundwater protection requirements set forth in Chapter 15.

Favorable action on this Petition will be the first step in correcting a significant error that has been made by the Regional Water Quality Control Boards in implementing Chapter 15. As a result of having served as an advisor to the State Board's staff in the early 1980s in the development of Chapter 15, the petitioner is well aware of the intent of this regulation. It clearly was not that of the approach used by the Regional Boards in its implementation of allowing the construction of new landfills and the closure of existing landfills in such a way as to only postpone for a relatively short period of time, compared to the time the wastes in the landfill will be a threat, the pollution of groundwaters by the wastes.

At this time, the Regional Board's staff claim, in an attempt to justify their obvious technically invalid approach for developing orders for landfill closure and development of new landfills, it is the responsibility of the State Board to correct Chapter 15 so the Regional Boards cannot use the minimum design containment component standards for landfills where such standards are inadequate for groundwater quality protection. Further, Regional Board staff have informed the petitioner that because of political and other pressures, they must require the same design for landfill closure and new landfill development for all landfills in their region. Obviously, such claims are strongly contrary to the intent of Chapter 15, which was to require landfill developers select more appropriate sites for landfills, i.e. those that provide natural protection. Chapter 15 explicitly states that an unsuitable site for a landfill can be used provided that an engineered alternative containment system design, construction, operation, closure and post-closure care is provided which will perform in accord with the Chapter 15 groundwater protection standard of no impaired use of groundwaters by waste-derived constituents for as long as the wastes represent a threat. While in the past there was limited understanding of the deficiencies in how Chapter 15 was being implemented at the Regional Board level, today these deficiencies are well known. It is time for the State Board to take action on this matter to either correct the deficiencies on how the Regional Boards are implementing Chapter 15 or to amend Chapter 15 so it is clear that the landfilling of waste in this state, as well as the closure of existing landfills, will not be done in such a way to protect the groundwater resources in the state from pollution by landfill leachate.

If the State and Regional Boards are unwilling to require that all future closures of landfills and the development of new landfills comply with a high degree of certainty with Chapter 15 requirements, then the WRCB should immediately take action to amend Chapter 15 so the groundwater protection standard of protecting groundwaters from pollution-impaired use from landfill leachate set forth in this regulation are no longer part of the regulation. It is time for the State Water Resources Control Board, the Regional Water Quality Control Boards, and the state of California to stop living a lie about the protection being provided for groundwater resources by the approaches being used in the design, construction, closure, and post-closure care of municipal solid waste landfills. The public should be reliably informed about the protection being provided by the State Water Resources Control Board and by the Regional Water Quality Control Boards in their implementation of the regulations governing the landfilling of municipal solid wastes as well as the closure of existing landfills. With few exceptions, all of the Chapter 15 as well as Subtitle D landfills will eventually pollute groundwaters by landfill leachate in violation of Chapter 15 requirements. In some cases, these violations will generate leachate plumes that extend well over a mile down groundwater gradient from the landfill.

Today the state of California is practicing a defacto “zone of attenuation” landfilling approach in which landfill leachate is allowed to pollute groundwaters at distances of up to a mile or more from the landfill. Often these leachate plumes extend under adjacent property owners lands. The least that should be done, if the Regional and State Boards are unwilling to implement the technology available today in the design, construction, operation, closure, and post-closure care of municipal solid waste landfills to comply with Chapter 15 requirements of protection of groundwater quality from impairment by landfill leachate, is for the Water Resources Control Board to amend Chapter 15 to eliminate the overall groundwater protection performance standard set forth in it and require that landfill owners acquire sufficient buffer lands so that the leachate plumes generated by today’s landfills will occur under landfill owner property lands.

Inadequacies of Order to Conform to Legal Requirements

Order No. 96-228 governing the closure of UCD "west" landfill, WMU-1, and the development of a new "west" landfill, WMU-2, will lead to violations of the groundwater protection requirements set forth in Title 23, Division 3, Chapter 15. As discussed herein, various sections of this regulation explicitly require that the landfill containment system components achieve the same degree of groundwater quality protection as that achieved by a landfill sited where the natural strata protect the groundwaters from impaired use for as long as the wastes in the landfill will be a threat. Today's understanding of the behavior of municipal solid wastes in a Subtitle D "dry tomb" landfill as well as the understanding of the behavior of the various components of the landfill containment system (cover, liners, leachate collection and removal system, etc.) and an understanding of the reliability of the groundwater monitoring systems based on vertical monitoring wells spaced hundreds of feet apart clearly and unequivocally leads to the conclusion that the development of WMU-2 as proposed by the University of California, Davis L. Vanderhoef administration and the closure of WMU-1 as proposed in Order No. 96-228 will, in time, cause violations of Chapter 15 requirements of protecting groundwaters from impaired use for as long as the wastes represent a threat.

These specific issues have been discussed in detail in this Petition. Specific citation of sections of Chapter 15 that are pertinent to this Order are provided herein.

Interested Parties

There are a large number of individuals who are interested in the proper closure of the UCD "west" landfill, WMU-1, and the proposed development of WMU-2. Appended to this Petition are two petitions that have been signed by members of the public who have expressed an interest in this matter. It can be concluded that those listed on these public petitions represent part of the public who are highly concerned about the inadequacies of UCD's solid waste management activities.

In addition to those specifically concerned with the UCD "west" landfill matters, there is also a large number of people who are concerned with Putah Creek water quality issues. Putah Creek water quality is intimately tied to UCD's mismanagement of its campus solid wastes in landfills that do not protect the groundwaters from impaired use, since at least thus far the UCD L. Vanderhoef administration's approach to remediation of the "west" landfill leachate-polluted groundwaters is to discharge these groundwaters after minimal treatment to Putah Creek. Therefore, it is appropriate to conclude that the public members of the "interested parties" listed in the Petition filed by the petitioner on the technical deficiencies in Order No. 96-227 also have an interest in the Petition on Order No. 96-228.

The CVRWQCB has indicated through its mailing of the "Notice" of the "Adopted New Waste Discharge Requirements" as set forth in Order No. 96-228 of August 16, 1996, that the following agencies and/or individuals are interested in this Order:

Ms. Betsy Jennings, State Water Resources Control Board, OCC, Sacramento
Ms. Liz Haven, State Water Resources Control Board, DCWP, Sacramento
Ms. Beatrice Poroli, California Integrated Waste Management Board, Sacramento
Office of Drinking Water, Department of Health Services, Sacramento
Environmental Mgmt. Branch, Department of Health Services, Sacramento
Department of Fish and Game, Rancho Cordova
Mr. Craig Walker, Yolo County Department of Environmental Health, Woodland
Yolo County Planning Department, Woodland
Mr. Eric Vanderbuilt, Sacramento County Public Works, Sacramento
Mr. Wayne Pickus, Camp Presser & McKee, Inc., Walnut Creek
Mr. Stephen Chen, City of Stockton, Stockton
Solano County Environmental Health Department
Solano County Planning Department
Mr. Wesley Wooden, Davis
Ms. Jeane-Marie Olmo-Resendiz, Davis
Mr. Chris Horsley, Davis
Mr. Mark Bonetti, Davis

Ms. Julie Roth, Davis
Mr. [sic] *G. Fred Lee, El Macero*

Addresses for these agencies and individuals are available from the CVRWQCB.

In addition, the following individuals have attended CVRWQCB meetings on UCD landfill matters. Some of these may be duplicate of some of those who have signed the enclosed petitions.

Richard Winger
Dos Pinos Ranch
37884 Russell Boulevard
Davis, CA 95616

Yvonne Le Maitre
23090 Myrtle Lane
Woodland, CA 95695
Represents T. S. Glide Estate

Molly Webster
26880 Cassidy Lane
Davis, CA 95616

George Crum
19 Priscilla Court
Winters, CA 95694

Hearing

The petitioner requests that, if necessary, a hearing be held to discuss these issues. While the petitioner believes that adequate evidence has been presented to enable the State Board to act on this matter in affirmation of the Petition, if the State Board concludes otherwise, then a hearing is requested for full public review of the issues.

The petitioner requests that, if necessary, a hearing be held to discuss these issues. While the petitioner believes that adequate evidence has been presented to enable the State Board to act on this matter in affirmation of the Petition, if the State Board concludes otherwise, then a hearing is requested for full public review of the issues.

Notice of Appeal

A copy of this Petition has been provided to the Central Valley Regional Water Quality Control Board and Chancellor L Vanderhoef of the University of California, Davis.

A copy of the request that was made by the petitioner to the Regional Board is enclosed.

Overall Conclusions and Recommendations

The location where the UCD L. Vanderhoef administration has proposed to construct a new minimum Subtitle D landfill (WMU-2) is a geologically unsuitable site for such a landfill. It has been found that the substrata under that proposed landfill, which is the same as that under WMU-1, will allow waste-derived constituents in landfill leachate to pass through the vadose zone into the saturated groundwaters under the site. The minimum Subtitle D single composite liner will, at best, only postpone when leachate generated in the landfill will pass through the landfill containment system into the underlying groundwater system. The groundwater monitoring requirements set forth in Order No. 96-228 are highly ineffective in complying with the Chapter 15 requirements of detecting leachate-polluted groundwaters at the point of compliance before widespread pollution occurs beyond this point. Basically, the construction of WMU-2 as proposed and allowed by Order No. 96-228 will result in a landfill that will violate Chapter 15 requirements for protection of groundwater quality from impaired use by waste-derived constituents for as long as the wastes in the landfill represent a threat.

Requiring that the UCD L. Vanderhoef administration comply with Chapter 15 requirements in developing WMU-2 in accord with providing a high degree of certainty that the groundwaters in the vicinity of this landfill will be protected from impaired use by waste-derived constituents will not represent a significant economic hardship to the University of California, Davis. Alternative waste disposal facilities are readily available to UCD at the Yolo County landfill. The use of these facilities will result in a significant economic savings to the taxpayers of California since future generations will not have to pay for the high costs of remediating WMU-2 leachate-caused groundwater pollution.

It is time for the State Water Resources Control Board to start to correct the errors that are being made at the Regional Board level throughout the state where Regional Boards such as the Central Valley Regional Water Quality Control Board are adopting landfill closure and landfill development orders that obviously cannot conform to Chapter 15 and the WRCB Landfilling Policy requirements of protecting groundwaters from impaired use by landfill-derived waste components for as long as the wastes in the landfill will be a threat. In the mid-1980s, when the current landfill development and landfill closure approaches were adopted by the Regional Boards, there was limited understanding in the deficiencies of these approaches in complying with Chapter 15 requirements. In the past half dozen years sufficient new information has developed on the ability of compacted clay and/or plastic sheeting-lined and/or covered landfills to prevent groundwater pollution by landfill leachate for as long as the wastes in the landfill represent a threat, so that today the State Board and the Regional Boards have an obligation to the public, and especially to future generations, to implement this new information into an updated landfill closure and development implementation approach that will, in fact, comply with Chapter 15 requirements. As

discussed herein, the technology is available today to develop landfills in California that will be protective of the state's highly valuable groundwater resources. While the initial cost of developing such landfills is a few cents per day per person more for those who contribute waste to a landfill than the current minimum Subtitle D landfilling approach, the true cost of this approach is far cheaper when proper consideration is given to the fact that ultimately today's Subtitle D landfills and those that are closed with minimum Chapter 15 landfill cover requirements will pollute groundwaters necessitating expensive groundwater remediation.

The petitioner would be happy to answer questions on any aspects of this matter. He strongly, in the name of future generations' groundwater resources, recommends that the State Water Resources Control Board take the necessary action to correct the highly significant errors being made in implementing Chapter 15 by the Regional Water Quality Control Boards. This process can be initiated through the State Board acting favorably on this Petition.

List of Correspondence Pertinent to Petition

Letter to Karl Longley, Chairman, regarding G. Vaughn December 1, 1995 letter to UCD on closure of UCD west landfill, WMU-1, and the development of WMU-2, from G. Fred Lee, dated January 18, 1996.

Letter to Karl Longley, Chairman, responding to T. Pinkos' letter of February 22, 1996 regarding UCD landfill matters, from G. Fred Lee, dated May 19, 1996.

Letter to Karl Longley, Chairman, regarding Notice for comment on the Board's Draft Cease and Desist Order No. 94-226 for the continued operation of the UCD "west" landfill, from G. Fred Lee, dated July 27, 1996.

Letter to Karl Longley, Chairman, regarding staff reports covering the UCD landfill matters that are to be reviewed by the CVRWQCB on August 9, 1996, from G. Fred Lee, dated August 3, 1996.

Letter to Tom To, Director, regarding UCD Stipulated Agreement of July 10, 1996, from G. Fred Lee, dated August 5, 1996.

Letter to Karl Longley, Chairman, responding to Mr. Pinkos' August 5, 1996 letter on UCD landfill matters, from G. Fred Lee, dated August 8, 1996.

Letter to Karl Longley, Chairman, regarding a complaint on the inappropriate approach followed by the Board in the admission of reports into the record for the August 9, 1996 hearing, from G. Fred Lee, dated August 18, 1996.

Letter to Tom To, Director, regarding UCD Stipulated Agreement covering the closure of WMU-1, from G. Fred Lee, dated September 1, 1996.

Lists of Professional Paper and Report Enclosures

List of Municipal Solid Waste Landfills and Groundwater Quality Protection Issue Papers Developed by Drs. G. Fred Lee and Anne Jones-Lee

Jones-Lee, A. and Lee, G.F., "Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance," Proc. Sardinia '93 IV International Landfill Symposium, Sardinia, Italy, pp. 1093-1103, October (1993).

Lee, G.F. and Jones-Lee, A., "A Groundwater Protection Strategy for Lined Landfills," Environmental Science & Technology, 28:584-5 (1994).

Cherry, J.A., "Groundwater Monitoring: Some Deficiencies and Opportunities," Hazardous Waste Site Investigations; Towards Better Decisions, Lewis Publishers, Proc. 10th ORNL Life Sciences Symposium, Gatlinburg, TN (1990).

Parsons, A.M., and Davis, P.A., "A Proposed Strategy for Assessing Compliance with the RCRA Ground Water Monitoring Regulations," Current Practices in Ground Water and Vadose Zone Investigations, ASTM STP 1118, David M. Nielsen and Martin N. Sara, Eds., American Society for Testing and Materials, Philadelphia, PA (1992).

Lee, G.F. and Jones-Lee, A., "Detection of the Failure of Landfill Liner Systems," Report of G. Fred Lee & Associates, El Macero, CA, April (1996).

Lee, G.F. and Jones-Lee, A., "Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability," IN: Proc. 1994 Federal Environmental Restoration III & Waste Minimization II Conference, Hazardous Materials Control Resources Institute, Rockville, MD, pp. 1610-1618, April (1994).

Lee, G.F. and Jones-Lee, A., "Dry Tomb Landfills," MSW Management, 6(1):82-89 (1996).

Lee, G.F. and Jones-Lee, A., "Landfill Leachate Management: Overview of Issues," MSW Management 6:18-23 (1996).

Lee, G.F. and Jones-Lee, A., "Overview of Landfill Post Closure Issues," Presented at American Society of Civil Engineers Convention session devoted to "Landfill Closures - Environmental Protection and Land Recovery," San Diego, CA, October (1995).

Lee, G.F. and Jones-Lee, A., "Geosynthetic Liner Systems for Municipal Solid Waste Landfills: An Inadequate Technology for Protection of Groundwater Quality?" Waste Management & Research, 11(4):354-360 (1993).

Lee, G.F. and Jones-Lee, A., "Evaluation of the Potential for a Proposed or Existing Landfill to Pollute Groundwaters," Report of G. Fred Lee & Associates, El Macero, CA, 18 pp, July (1996).

Lee, G.F. and Jones, R.A., "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality," Report of G. Fred Lee & Associates, El Macero, CA, 68 pp, March (1992).

Lee, G.F. and Jones-Lee, A., "Recommended Design, Operation, Closure and Post-Closure Approaches for Municipal Solid Waste and Hazardous Waste Landfills," Report of G. Fred Lee & Associates, El Macero, CA, 14 pp, August (1995).

Lee, G.F. and Jones-Lee, A., "Cost of Groundwater Quality Protection in MSW Landfilling," Report of G. Fred Lee & Associates, El Macero, CA, 8 pp, August (1993).

Lee, G.F. and Jones-Lee, A., "Impact of Municipal and Industrial Non-Hazardous Waste Landfills on Public Health and the Environment: An Overview," Report to State of California Environmental Protection Agency Comparative Risk Project, Berkeley, CA, 45 pp, May (1994).

Lee, G.F. and Sheehan, B., "MSW Recycling Protects Groundwaters: Reply to Recycling May be Our Most Wasteful Activity," Letter submitted to the Editor of the Sacramento Bee, July 16 (1996).

Lee, G.F. and Jones-Lee, A., "Three R's Managed Garbage Protects Groundwater Quality," Report of G. Fred Lee & Associates, El Macero, CA, 9 pp, July (1996).

Lee, G.F. and Jones-Lee, A., "Practical Environmental Ethics: Is There an Obligation to Tell the Whole Truth?," Civil Engineering Forum, p.6, October (1995).

Summary Biographical Data, G. Fred Lee, PhD, PE, DEE

Lee, G.F. and Jones-Lee, A., "Water Quality Evaluation and Management Solid and Hazardous Waste Landfills," Web Page: http://members.aol.com/gfredlee/gfl/htm

Lee, G.F. and Jones-Lee, A., Recent Publications of G. Fred Lee and Anne Jones-Lee

Lee, G.F. and Jones-Lee, A., "Lectures and Shortcourses"

Lee, G.F. and Jones-Lee, A., Summary of Experience & Activities

Summary of Information, G. Fred Lee and Anne Jones-Lee

Wegge, L., UCD Professor of Economics emeritus, "Financial Feasibility Study of the Campus Landfill, UCD 9 October 1992 Comments," July 9, 1996.

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March 28, 1997

John Caffrey, Chairman
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812

Supplement to Petition A-1042
Order 96-228

Dear Chairman Caffrey:

Recently, several significant events have occurred that are pertinent to the petition I filed last September on the technical deficiencies in the Central Valley Regional Water Quality Control Board's (CVRWQCB) Order 96-228 devoted to the WDRs covering the University of California-Davis's (UCD) development of another campus landfill that will ultimately pollute groundwaters. As discussed below, there is ample justification for amending my Petition A-1042 covering Order 96-228. The primary justification for amending this petition is a March 19, 1997 memorandum from H. Schueller which brings out for the first time that the State Water Resources Control Board has adopted a "position" with respect to the ability of minimum Subtitle D landfills to protect groundwaters from impaired use by waste-derived constituents for as long as the waste in the landfill will be a threat.

Mr. Schueller states in his memorandum that:

"The performance standards are:

- *For Class II landfills [§2540 (a)], 'Class II waste management units shall be designed and constructed to prevent migration of wastes from the waste management units to adjacent geologic materials, ground water, or surface water, during disposal operations, closure, and the post-closure maintenance period'; and*
- *For Class III landfills [§2540 (c)], 'Class III landfills shall have containment structures which are capable of preventing degradation of waters of the state as a result of waste discharges to the landfills if site characteristics are inadequate.'*

It is our position that a properly-installed single composite liner meets both performance standards, whereas a clay liner does not. It is important to note that these performance standards address the entire containment system for the landfill, not just the liner. The final cover also provides an important measure of protection over the lifetime of the landfill."

While Mr. Schueller did not define who *"our"* was or is, from his memo it appears that the WRCB has practiced rule-making on groundwater quality protection provided by a minimum Subtitle D landfill without public review, which is contrary to the public's interest and is leading to a highly inappropriate approach in the way in which the Regional Water Quality Control Boards are implementing Chapter 15 and Subtitle D requirements. Further, the "position" that Schueller described that has been adopted by the WRCB was at the time that it was adopted (during or post 1993) with the Board's incorporation of US EPA Subtitle D requirements and Chapter 15 requirements into the Board's current Landfilling Policy, not in accord to what was well known at the time of adoption of this position on the ability of a single composite liner and a minimum Subtitle D landfill cover as typically constructed and maintained and the groundwater monitoring systems that are allowed to be developed by Regional Water Quality Control Boards as part of issuing WDRs for new or expanded landfills to protect groundwaters from impaired use for as long as the waste in a MSW landfill will be a threat. It is highly inappropriate and contrary to the public's interest for the WRCB, without public rule-making, to allow its staff, H. Schueller et. al., to adopt this position since it was at the time of adoption and is now technically invalid.

While it is unclear whether H. Schueller understands the obvious technical deficiencies with a minimum Subtitle D landfill that he states in his March 19, 1997 memo, which sets forth the "position" that the WRCB has adopted on the protective nature of a Subtitle D landfill of the type being implemented today by Regional Water Quality Control Boards, members of the Clean Water Program Staff have for years understood these problems. In fact, as I testified at the CVRWQCB's February 28, 1997 hearing, former members of his staff (Gil Torres) have testified and produced documents concerned with specific landfill reviews (Azusa Landfill and Keller Canyon Landfill) that have been brought to the attention of the State Board that a single composite liner does not comply with Chapter 15's performance standards of protecting groundwater quality from impaired use for as long as the waste in the landfill will be a threat. Further, other members of the Clean Water Program staff who understand and will discuss landfill liner and cover properties and the unreliability of the current groundwater monitoring systems of the types being allowed by Regional Water Quality Control Boards in WDRs for minimum Subtitle D landfills have indicated to me, on a number of occasions, that a minimum Subtitle D landfill as it is being implemented by Regional Boards would not, in their opinion, prevent groundwater pollution by landfill leachate for as long as the waste in the landfill would be a threat.

Further, with respect to the Keller Canyon Landfill review that took place several years ago, the State Board staff documents clearly delineate that a single composite liner does not comply with Class II requirements of *". . .prevent(ing) migration of wastes from the waste management units to adjacent geologic materials."* It was in connection with the Keller Canyon Landfill review by the State Board that the State Board "management" decided to overrule the staff's position on this issue and inform the Board that a single composite liner in the Keller Canyon Landfill setting would conform to Chapter 15's Class II landfill liner requirements, even though it was obvious, as discussed by the State Board staff, that this was not a factual statement about the expected performance of a single composite liner. It appears that that may have been the situation where the Board adopted the position that Schueller referred to in his March 19,

1997 memorandum for Class II landfills. However, to my knowledge, the issue of whether a minimum Subtitle D landfill will conform to Chapter 15 groundwater protection performance standards of protecting groundwaters from impaired use for as long as the waste will be a threat has not been addressed by the WRCB, except in the case of the Azusa Landfill where the State Board concluded that BFI should not be permitted to expand that landfill with a single composite liner because of the inability of a single composite liner to protect the groundwaters in the San Gabriel Basin from landfill leachate pollution for as long as the waste in the Azusa Landfill will be a threat.

The ability of a minimum Subtitle D landfill of the type that is being permitted by Regional Boards across the state today to conform to Chapter 15's groundwater quality protection performance standard is the key issue that was raised in the Petition I filed to the State Water Quality Control Board on September 9, 1996 governing the waste discharge requirements for the University of California-Davis proposed expansion of its campus landfill. On August 9, 1996 the Central Valley Regional Water Quality Control Board adopted Order 96-228, allowing the development of a new campus landfill adjacent to an existing campus landfill that had produced a groundwater pollution plume of over one mile in length due to chloroform and other VOC's. This CVRWQCB Order allows UCD to construct a minimum Subtitle D landfill at a site where it is obvious that the natural strata underlying the location of the landfill will not prevent groundwater pollution by waste-derived constituents.

H. Schueller's March 19, 1997 memo has direct bearing on the adequacy of the State Board's review of this Petition. As it stands now, the focus of the Petition must be on the reliability of the "position" that was adopted by the State Board without rule-making that asserts that a minimum Subtitle D landfill such as that proposed by UCD for its fifth campus landfill covered by CVRWQCB Order 96-228 will prevent groundwater pollution by waste-derived constituents for as long as the waste in the landfill will be a threat. The UCD campus landfill situation is one where UCD administrations have been constructing campus landfills for managing the campus's solid wastes for over 50 years. While the past administrations and the current L. Vanderhoef administration assert that it is "cheaper" for UCD to continue to manage its campus solid wastes by constructing on-campus landfills, this economic evaluation has been found to be fundamentally flawed since it only considers the initial cost of landfilling and ignores the massive costs that the people of California are having to pay for cleaning up the polluted groundwaters that arise from UCD's campus landfills.

UCD now has four campus landfills, all of which are currently polluting groundwaters. The UCD Vanderhoef administration claims that it is cheaper to construct a fifth campus landfill, which even its own staff admitted to the public will also pollute groundwaters, rather than take the campus waste to the Yolo County landfill, which has the capacity to immediately accept these wastes. Three of UCD's former landfills are part of the UCD-DOE LEHR national Superfund site located on the UCD campus. It is important to note that it was not the DOE-sponsored activities that have led to the massive groundwater pollution by UCD's campus landfills. This pollution arises from the mismanagement of campus wastes by UCD. The fourth campus landfill is under clean-up orders because of the over one mile long plume of polluted groundwaters that it has created. It, too, should be part of the national LEHR Superfund site;

however, for political reasons the regulatory agencies are unwilling to act on the public's request to have this site declared as part of the LEHR Superfund site.

It is clear that preventing UCD from continuing to construct campus landfills is in the best interest of the state of California since the ultimate cost to the state taxpayers of managing UCD's campus wastes by landfilling at the Yolo County Landfill is far less than the cost that the taxpayers will have to pay when they spend the tens of millions of dollars that will be needed for cleaning up the groundwater pollution that will occur at the UCD proposed fifth campus landfill. Therefore, the review of the Petition covering the significant technical deficiencies in Order 96-228 can and should focus on the technical issues of whether a minimum Subtitle D landfill system will protect groundwaters from impaired use for as long as the waste in the landfill will be a threat.

Mr. Schueller did not indicate in his March 19, 1997 memorandum whether he understands and acknowledges that the municipal solid waste in a minimum Subtitle D "dry tomb" landfill that it permitted under Order 96-228 will be a threat to pollute groundwaters effectively forever. Therefore, Mr. Schueller, in his March 19, 1997 memorandum is either stating that the WRCB has, within the past few years since adopting his stated "position", critically reviewed the professional literature on the expected performance of minimum Subtitle D landfill containment and monitoring systems in preventing pollution of groundwaters from waste-derived constituents impairing their use over the effective infinite period of time the waste in such a landfill will be a threat, or the State Board adopted his stated "position" without reviewing what is well known in the literature on the inability of the minimum Subtitle D landfill liner, cover, and groundwater monitoring systems to prevent groundwater pollution by waste-derived constituents for as long as the waste in the landfill will be a threat. In either case, the Board's action with respect to adopting this position is highly inappropriate.

It is now clear that as long as Mr. Schueller's stated WRCB "position" stands, that there is no way that the public who are concerned about the quality of future generations' groundwater resources in the state can receive a fair review of the adequacy of WDRs issued by Regional Boards for proposed landfills or landfill expansions to incorporate what has been readily know for a number of years in the professional literature about the inability of a minimum Subtitle D landfill liner and cover system and groundwater monitoring system as typically implemented by Regional Boards for Subtitle D landfills to protect groundwaters of interest to the public and future generations from impaired use by MSW leachate for as long as the waste in the landfill will be a threat.

For a period of about a year in 1994-1995, I was involved in a review of the operations of Placer County's Western Regional Sanitary Landfill (WRSL). The client for whom I worked subsequently sold the property that is being significantly adversely impacted by the WRSL. I have not been involved with the new owners in review of the CVRWQCB's proposed WDRs for the proposed expansion of the WRSL. I did, however, on my own initiative, as part of my concern about more reliable groundwater quality protection than is being practiced in California by Regional Water Quality Control Boards in the permitting of landfills, submit comments to the CVRWQCB on the significant deficiencies in the staff's proposed

WDRs for the continued operation of the WRSL. Since, based on past experience, the CVRWQCB conducts its hearings for some issues, which the Board Chairman or certain Board members want to see approved, in a manner that the public finds is strongly contrary to enabling the public to express their concerns on issues, I attempted to ask the CVRWQCB staff at the February 28, 1997 Board hearing on the staff's proposed waste discharge requirements for the continued operation of the Placer County Western Regional Sanitary Landfill about the appropriateness of the review conducted by the staff in determining whether the proposed WDRs complied with Chapter 15's requirements of protecting groundwaters from impaired use for as long as the wastes represent a threat.

The questions focused on the appropriateness of the CVRWQCB's approach for developing the WDRs for the WRSL relative to the WRCB's regulatory requirements. It is this situation that led Mr. Pinkos to ask Mr. Schueller for information on the State Board's position on the protective nature of a minimum Subtitle D landfill single composite liner cover and groundwater monitoring systems to comply with Chapter 15's requirements of protecting the groundwater from impaired use where it is understood that the waste in such landfills will be a threat effectively forever. As I testified at the February 28, 1997 CVRWQCB hearing, in the past it has been the State Board's position as evidenced by testimony at hearings, memos, and personal discussions that a single composite liner would not comply with Chapter 15's requirements of protecting groundwater quality from impaired use at a geologically unsuitable sites where natural protection of groundwater resources was not available. It appears now from Mr. Schueller's memorandum in response to Mr. Pinkos's request, that the State Board has, since 1993, reversed its position on this matter without proper rule-making. Further, this reversal of its position is not in accord with what is known in the professional literature about the ability of a minimum Subtitle D landfill containment system and groundwater monitoring systems as being implemented by Regional Boards today to protect groundwaters from impaired use for as long as wastes in the landfill remain a threat.

Mr. Pinkos, through his request, has opened the door to a more comprehensive review of issues than would have been possible without Mr. Schueller announcing for the first time to my knowledge that *"our"*, presumably the Board, either directly or through delegated authority, had adopted a "position" that a minimum Subtitle D landfill could be sited anywhere in California and be protective of groundwater resources in accord with Chapter 15 requirements of no expected impaired use for as long as the waste in the landfill will be a threat. This represents a significant change in Board policy from what was adopted by the Board in connection with the Board's position on the expansion of the Azusa Landfill in the early 1990's.

It is important in reviewing this matter to incorporate the Porter-Cologne requirements for addressing a threat of pollution, in which,

> *"'Threaten,' for purposes of this section, means a condition creating a substantial probability of harm, when the probability and potential extent of harm make it reasonably necessary to take immediate action to prevent, reduce, mitigate damages to persons, property, or natural resources."*

Clearly, the permitting of a minimum Subtitle D landfill at a geologically unsuitable site such as the UCD West Landfill site, or the WRSL site, where it is obvious that the proposed WDRs will not be protective in accord with Chapter 15 requirements of preventing impaired use of groundwaters for as long as the waste in the landfill will be a threat would be in violation of Porter-Cologne "threaten" requirements.

Rather than filing another petition with the State Board to address these issues, such as could be filed on the significant technical deficiencies in the CVRWQCB's WRSL expansion, I have decided that the best way to address the issues that have arisen because of H. Schueller's March 19, 1997 stated State Board "position" on the protective nature of minimum Subtitle D landfills, would be to amend the Petition filed with the State Board on the CVRWQCB's inadequate WDRs set forth in Order 96-228 to ask the State Board to specifically address in a full public arena the appropriateness of the position that H. Schueller indicates was adopted by the Board that a minimum Subtitle D landfill has a high probability of protecting groundwaters from impaired use, i.e. does not threaten groundwaters, for as long as waste in the landfill remains a threat.

This amendment to my Petition includes asking the State Board members and their staff to review the questions that were originally developed for the WRSL's WDRs in the context of basically the same issues associated with the UCD's West Landfill site under Order 96-228. While I am not filing a petition on the significant technical deficiencies in the CVRWQCB's WDRs adopted for the expansion of the WRSL, I have included the questions that are pertinent to the WRSL situation in the set of questions since addressing these questions will demonstrate a pattern that has been adopted by the CVRWQCB's staff and Board in failing to conduct a proper analysis of site conditions in developing WDRs for landfills. With few exceptions, the same issues apply to the WDRs governing both landfills. Both landfills are proposed to be developed at geologically unsuitable sites, where natural protection has been demonstrated to not exist. Therefore, the basic question that the State Board must address is whether a minimum Subtitle D liner system, the minimum Subtitle D cover system, and the groundwater monitoring systems that the CVRWQCB has allowed for the UCD West Landfill development can be expected to have a high degree of reliability of containing waste-derived constituents effectively forever, i.e. that the construction of the UCD West Landfill as proposed under Order 96-228 has a low probability of threatening groundwater quality, impairing its use forever.

Please find enclosed a recent report that I have developed: "Deficiencies in US EPA Subtitle D Landfills in Protecting Groundwater Quality For As Long as MSW is a Threat." This report summarizes many of the key issues that need to be addressed in connection with evaluating whether a minimum Subtitle D landfill will protect groundwaters from impaired use for as long as the wastes in the landfill represent a threat. I ask that this report and the enclosed questions become part of the administrative record for this amended Petition and be reviewed by the State Board as part of addressing the issues raised in the Petition. These materials, coupled with the papers and reports that are part of the administrative record associated with my appeal of CVRWQCB Order 96-228 serve as a technical basis to the literature which demonstrates that since the early 1990s, it has been well understood by professionals in the landfilling field

that a minimum Subtitle D landfill containment system and groundwater monitoring system as typically implemented by Regional Boards cannot comply with Chapter 15's groundwater quality protection standards. Further, as discussed herein, the Regional Boards have been adopting WDRs for landfills that obviously cannot comply with Subtitle D requirements. While it may be possible after appropriate rule-making for the State Board to adopt Mr. Schueller's stated "position" which is contrary to the literature, such adoption must be done in a full public process where the public has the opportunity to review and inform the Board of the appropriateness of such a position.

I request as part of my Petition on the significant technical deficiencies of Order 96-228 that the Board conduct this review. If the Board concludes after proper public rule-making that it is in the best interest of the state of California to adopt a "position" on the ability of a minimum Subtitle D landfill containment system and groundwater monitoring system as implemented by Regional Boards to protect future generations' groundwaters from pollution by landfill leachate even though such a position is contrary to the professional literature pertinent to this topic, then the public will have had an appropriate opportunity to have reviewed this position as it should have had before it was adopted by the State Board without proper rule-making. Adopting that position is a clear indication that this Board wishes to continue to practice cheaper than real cost garbage disposal in minimum Subtitle D landfills at the expense of future generations' groundwater resources, as well as their health, welfare and interests.

Thank you for consideration of this matter. Please contact me if you have any questions about it.

Sincerely yours,

G. Fred Lee, PhD, DEE

Copy to: Governor P. Wilson
Members, SWRCB
Ed Schnabel, Chairman CVRWQCB
W. Pettit
J. Bennett
J. Leon SWRCB
L. Vanderhoef
Petition Order No.96-228 mailing list

GFL:ad
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Gray Davis Governor

April 17, 2000

CERTIFIED MAIL

Mr. G. Fred Lee
G.Fred Lee & Associates
27298 El Macero Drive
El Macero, CA 956 18-

Dear Mr. Lee:

PETITION OF G. FRED LEE (WDR ORDERS 96-227 AND 96-228 FOR THE UNIVERSITY OF CALIFORNIA AT DAVIS CAMPUS LANDFILL GROUND WATER CLEANUP SYSTEM)CENTRAL VALLEY REGION: DISMISSAL SWRCB/OCC FILE A-1042

The State Water Resources Control Board's regulations on review of water quality petitions provide, in relevant part:

If formal disposition of the petition is not made by the state board within 270 days of the written notification provided for in Section *2050.5,* the petition is deemed denied." (Title 23, California Code of Regulations, Section 2052(d).)

I am writing to inform you that this 270-day time period has elapsed in this matter.

If you have any questions about this matter, please contact Jorge A. Leon, Senior Staff Counsel, in the State Water Resources Control Board's Office of Chief Counsel, at (916) 657-2428.

Sincerely,

Craig M. Wilson
Assistant Chief Counsel

cc: Mr. Gary M. Canton Executive Officer
Central Valley Regional Water Quality
Control Board

3443 Routier Road
Sacramento, CA 95 827-3003