Comments on the Revised Draft Environmental Impact Report for the Proposed Gregory Canyon Landfill

Prepared by
San Diego County Department of Environmental Health
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Submitted by

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Introduction

In January 1999 the San Diego County Department of Planning and Land Use and the San Diego County Department of Environmental Health released a draft environmental impact report (EIR) which was purported to present a discussion that meets California Environmental Quality Act (CEQA) requirements of the potential public health and environmental impacts of the proposed Gregory Canyon Landfill. RiverWatch requested that I critically review the adequacy of that Draft EIR to reliably inform decision-makers and the public of the potential significant adverse public health, groundwater quality, and environmental impacts associated with the development of the proposed Gregory Canyon Landfill. Those comments focused on the inadequate and unreliable information provided in this Draft EIR relative to the ability of the proposed landfill waste containment systems and monitoring systems, and the proposed mitigation measures to protect public health, groundwater resources and the environment for as long as the wastes in the landfill remain a threat.

In December 1999, the San Diego County Department of Planning and Land Use released a recirculated revised Draft EIR for the proposed Gregory Canyon Landfill project. Presented herein are our comments on the recirculated revised Draft EIR for this proposed landfill project. As documented in these comments on the recirculated revised Draft EIR, the San Diego Department of Planning and Land Use and the San Diego County Department of Health has still failed to reliably address the issues that decisions makers and the public need to understand to properly evaluate the potential public health, resources and the environment of the proposed Gregory Canyon Landfill.

This recirculated revised Draft(called Draft in these comments) EIR like the original draft EIR makes statements about issues as conclusions in the Executive Summary and in the Introductory sections, followed by more detailed discussion of these issues in Chapters 3.0 and 4.0. The comments presented herein provide general comments on the unreliability of the conclusion statements made in the Executive Summary and body of the EIR. They also provide detailed comments with appropriate reference to the literature on specific issues that are or should have been discussed in the Draft EIR.

These comments are based upon extensive experience with evaluation of the impacts of municipal landfills. I (Dr. G. Fred Lee) have been involved in evaluating the potential impacts of landfills on groundwater quality for over 35 years. As discussed in a subsequent section, my involvement has included extensive research on landfill liners, the reliability of groundwater monitoring systems, etc. as they apply to municipal and industrial waste landfills. Further, we have published extensively on these issues. Background information for many of the comments that are presented below, which summarize the deficiencies in the recirculated Draft EIR for the proposed Gregory Canyon Landfill, is discussed more extensively in the comprehensive reviews developed by me that are attached to these comments. These reviews, such as "Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches," which was presented at the Air and Waste Management Association national conference held in San Diego in June, 1998, contain over 90 references to the literature on the issues discussed. This paper is appended to these comments.

The comments made herein are not just my findings. They represent substantial literature on the topic. Unfortunately, as is documented herein, the San Diego Department of Planning and Land Use and the consultants who assisted with the preparation of the Gregory Canyon Draft EIR have largely ignored the scientific and technical literature that should have been considered in developing this Draft EIR. This causes this Draft EIR to be non-certifiable as complying with CEQA requirements for full disclosure of the potential impacts of this landfill on public health, groundwater resources, the environment and the interests of those within the sphere of influence of the landfill.

In accord with CEQA guidelines, these comments summarize deficiencies in the Draft EIR. Extensive reports and associated bibliographies appended to these comments, as well as in referenced supporting documents, are incorporated by reference into these comments.

Overall Findings

This Draft EIR falls far short of complying with CEQA requirements of providing **full disclosure** of the potential public health, groundwater and environmental impacts of the proposed Gregory Canyon Landfill. This Draft EIR supports the development of the Gregory Canyon Landfill without reliably discussing the significant problems with the proposed landfill design for the Gregory Canyon site, operation, closure and especially post closure monitoring and maintenance as they relate to the releases of hazardous and/or deleterious chemicals from this landfill that can take place over the period of time that the wastes in this landfill will be a threat to public health and the environment. This Draft EIR presents a superficial discussion of the ability of the landfill liner system that is proposed for the Gregory Canyon Landfill to prevent groundwater pollution by landfill leachate for as long as the wastes in the landfill will be a threat. The ultimate failure of this type of liner system and the significant pollution of groundwaters by leachate generated within the landfill represent significant threats to valuable groundwater resources, public health and the environment that should be fully and reliable discussed in a certifiable EIR.

Of the over one dozen draft EIRs that we have reviewed on proposed landfill projects, this EIR is still one of the weakest that we have encountered from a technical perspective in providing information on the characteristics of the proposed Gregory Canyon Landfill liner system and groundwater monitoring system in protecting public health, groundwater resources and the environment from pollution by landfill leachate for as long as the wastes in the landfill represent a threat. Basically, this Draft EIR presents such a limited understanding of landfill containment component performance compared to current regulatory requirements and the protection of public health and the environment from waste-derived constituents that it should be found non-certifiable.

This Draft EIR was prepared by the County of San Diego, Department of Environmental Health. It is somewhat surprising that a health agency was not more knowledgeable and/or did not more reliably report on the readily available information in the referenced literature and in various US EPA and other government publications on the inevitable failure of the landfill liner system and the unreliability of the groundwater monitoring systems of the types that are proposed for the Gregory Canyon Landfill. This is apparently a case where a health agency does not have the expertise and experience necessary to prepare a credible Draft EIR on a landfill project of this type. It is indeed unfortunate that the County did not correct this problem in developing this recirculated Draft EIR. As discussed about a year ago in the comments on the Draft EIR, if this proposed landfill project is to be further considered, the San Diego County Department of Health must acquire staff who are knowledgeable in municipal landfill groundwater protection issues and who can and will reliably report on these issues. Decision-makers, the public, and residents throughout the county are entitled to this level of review of the potential public health, groundwater resource and environmental impacts of the proposed Gregory Canyon Landfill.

This Draft EIR is significantly deficient in informing decision-makers and the public of the full range of public health, groundwater resource and environmental impacts that the proposed Gregory Canyon Landfill will cause during the time that the wastes in this landfill will be a threat. While this Draft EIR cursorily mentions some of the issues of concern, it does not provide a full disclosure discussion of them. For many of the issues, such as liner leakage rates and reliability of groundwater monitoring, the information provided is unreliable regarding likely impacts over the period of time that the wastes in the landfill will be a threat.

In 1988 the US EPA, as part of promulgating the current Subtitle D municipal landfill regulations, discussed the ability of a single composite liner of the type proposed for the proposed Gregory Canyon Landfill to prevent groundwater pollution for as long as the waste in the landfill will be a threat. The US EPA Solid Waste Disposal Criteria (August 30, 1988) 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 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."*

In 1991, and again in 1998, we checked with the US EPA administration regarding their current views on the ultimate failure of a single composite liner being able to prevent groundwater pollution by landfill leachate for as long as the waste in the landfill will be a threat. Clay (1991) Assistant Administrator, US EPA Office of Solid Waste Emergency Response, and Dellinger (1998), Director, US EPA, Office of Solid Wastes, indicated that the US EPA still finds that a single composite liner will eventually leak leachate into underlying groundwaters. This Draft EIR does not adequately and reliably address the inevitable leakage of the landfill liner system that has been proposed for the Gregory Canyon Landfill, and, therefore, does not conform to the CEQA requirements for full disclosure.

A summary of some of the specific deficiencies in this Draft EIR with respect to CEQA required full disclosure include the following. Additional details on these issues is provided in these comments.

- **The Containment System Design Is Inappropriate for the Geology of the Site.** The proposed Gregory Canyon Landfill site is a geologically unsuitable site for the proposed design of the Gregory Canyon Landfill. This landfill containment system will, at best, only postpone for a short period of time the pollution of groundwater by landfill leachate, compared to the time that the wastes in this landfill will be a threat. This issue should have been discussed in this Draft EIR. Without this discussion, the Draft EIR fails to meet CEQA requirements for full disclosure of potential environmental impacts.

  Landfill Wastes Will Be a Threat to Public Health and the Environment Forever. Failure to disclose that the wastes in the proposed Gregory Canyon Landfill will be a threat to public health, groundwater resources and the environment for a very long period of time extending over thousands of years is one of the most significant deficiencies with this Draft EIR. Decision-makers and the public are entitled to know this so that they can evaluate the adequacy of proposed landfill design, closure and post-closure maintenance and monitoring in protecting public health, groundwater resources and the environment for as long as the wastes represent a threat as required by Title 27, Chapter 15 regulations governing the landfilling of municipal solid wastes.

- **Geologically Unsuitable Site for a Minimum Design Municipal Solid Waste Landfill.** This Draft EIR should have discussed that the complexity of the geology and hydrogeology, with its fractured rock aquifer system, requires that a far more protective and expensive design, operation, closure and post-closure monitoring and maintenance be used for the proposed Gregory Canyon Landfill from the proposed minimum design described in the EIR.

The proposed Gregory Canyon Landfill does not have adequate bufferlands between the areas where wastes are to be deposited and adjacent properties to dissipate the gaseous and water-borne release of wastes from this landfill on the landfill property. This will almost certainly lead to trespass of waste component releases to adjacent properties, which will be a threat to public health, groundwater quality, air quality, the environment and those within the sphere of influence of this landfill.

Unreliability of Landfill Liner System to Prevent Groundwater Pollution by Landfill Leachate for as Long as the Wastes in the Landfill Will Be a Threat. Decision-makers and the public should have been informed about the well-known fact that the plastic sheeting liner and compacted soil liner that are proposed for the Gregory Canyon Landfill have limited periods of time, compared to the time that the wastes are a threat, when they can be expected to effectively collect the leachate generated in the landfill and convey the leachate to a sump where it can be removed. This situation is discussed in US EPA publications, as well as the referenced literature. Decision-makers and the public should have been informed of this situation as part of their review of the Draft EIR.

U**nreliability of the Underdrain System.** There is no discussion of the significant potential for the underdrain system to fail to collect all leachate that penetrates through the liner and pollute the groundwaters underlying the landfill. This Draft EIR should have informed decision-makers that the underdrain is not proposed under some parts of the proposed landfill. In these areas, such as side slopes, the leachate will enter the underlying groundwater system, after it penetrates through the liner.

Further, the statement about how any leachate that enters an underdrain would be collected and carried in the underdrain through a pipe that discharges below the toe of the landfill is unreliable. This Draft EIR should have pointed out that municipal solid waste (MSW) leachate typically has a density greater than that of water and can pass through the underdrain into the underlying groundwater system. Further, this Draft EIR should have also pointed out that underdrain systems are subject to clogging over the long period of time that it will have to work perfectly if it is to collect the leachate that passes through the liner.

Unreliable Groundwater Monitoring. This Draft EIR should have discussed the inadequacies of the proposed groundwater monitoring system in which four monitoring wells are to be placed about 300 feet apart across the downgradient face of the landfill. In addition, it should have discussed the unreliability of trying to sample leachate in fractured rock fissures where the groundwater monitoring system is attempting to rely on pumping these six wells sufficiently so that leachate polluted fissures at considerable distances from the wells would be reliably sampled. Further, it should have discussed the unreliability of using this sampling approach due to the significant dilution that will occur to mixing waters sampled by the monitoring wells with leachate polluted waters that occur in fractures at considerable distances from the wells. In addition with respect to the unreliability of the groundwater monitoring, the Draft EIR should have discussed the significant potential for

their being fissures in the groundwater system underlying the landfill that are not connected to all other fissures that would be sampled by the monitoring wells, especially those that are present at greater depth underlying the landfill.

Unreliable Estimates of Leachate Generation. The Draft EIR's estimates of the amount of infiltration that will occur into this landfill through the cover for as long as the wastes in the landfill will be a threat are unreliable. Decision-makers and the public should have been informed about the fact that the estimates that were made of the amount of infiltration that will occur into this landfill are based on a new cover with high quality construction. This Draft EIR does not discuss the impact of a variety of factors that can cause the cover to develop cracks, points of deterioration, etc. over the long period of time that the wastes in the landfill will be a threat. This discussion should include mention of the fact that far greater amounts of leachate will be generated in this landfill than predicted based on the calculations presented in the Draft EIR.

Unreliable Estimates of Landfill Gas Production Rates. The Draft EIR should have discussed the unreliability of the gas production estimates. This conclusion is based on the fact that much of the waste that will be placed in this landfill will be present in plastic garbage bags which will greatly slow down the interaction of water that infiltrates into the landfill through the landfill cover or the sides of the landfill through the high groundwater table which may not be adequately controlled by the underdrains. The plastic garbage bags will extend the period of time that landfill gas production will occur.

- **Dioxin Production.** This Draft EIR should have mentioned the potential for dioxin formation associated with the flaring of the landfill gas.

- **Inadequate Post Closure Care Funding.** The Draft EIR should have discussed the fact that inadequate assured post closure funding is available to maintain the landfill cover, monitor surface and groundwaters, and eventually remediate the Superfund-like conditions that will likely develop when widespread groundwater pollution occurs by landfill leachate.

- **Inadequate Protection of the San Luis Rey River Municipal Water District Water Quality.** Decision-makers and the public should have been informed that the agreement signed between the landfill developers and the San Luis Rey River Municipal Water District fails to provide adequate funding for clean-up of the leachate polluted groundwater and to stop further pollution when the District wells become polluted.

Current Regulatory Requirements

Throughout this Draft EIR the statement is made that the proposed Gregory Canyon Landfill will meet regulatory requirements. As documented herein, however, this Draft EIR has failed to reliably present the regulatory requirements that will govern this landfill for as long as the wastes in this landfill will be a threat. The basic regulatory requirement for this landfill, as well as all new

landfills in California, is the protection of groundwater quality as set forth in the State Water Resources Control Board's (SWRCB) Chapter 15. Chapter 15 was originally adopted by the SWRCB in 1984. I served as an advisor to the SWRCB staff in helping to develop the original version of Chapter 15, and I am familiar with its content and intent. As presented in Exhibit A, Chapter 15 requires the protection of groundwater quality for as long as the wastes in this landfill are a threat to impair the uses of groundwater.

Several years ago SWRCB Chapter 15 and the California Integrated Waste Management Board's (CIWMB) landfill regulations were merged into Title 27, Division 2. The combined regulations are available from the SWRCB Chapter 15 web site. Excerpts from Title 27 that are pertinent to understanding the regulations that will govern the development of the Gregory Canyon Landfill are presented in Exhibit A These regulations set forth the **minimum** landfill containment system design, operation, closure and post closure monitoring and maintenance requirements. The regulations specify that the landfill containment system used for Class III (municipal solid waste) landfills shall prevent the pollution of groundwaters by waste-derived constituents for as long as the wastes in the landfill will be a threat.

In summary the current regulatory requirements include:

- Protection of groundwater and surface water quality from waste-derived constituents for as long as the wastes in the landfill are a threat to water quality.
- Site-specific design of the landfill containment system and monitoring systems that adequately considers the geological and other characteristics of the site.
- Minimum liner design requirements are not considered to be adequate to comply with the groundwater protection requirements set forth in Title 27 of no impairment of use of groundwater or surface waters for as long as the wastes are a threat.
- Protection of water quality for as long as the wastes are a threat.
- Adequate post closure funding for landfill monitoring, maintenance and remediation. There is no 30-year limitation on the post closure requirements.

These are the standards that must be met by the Gregory Canyon Landfill. The Draft EIR must consider these standards and discuss how the proposed project will comply with them.

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, my wife, and I 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. We 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.

This is not the first time that I have conducted an environmental review of the proposed Gregory Canyon Landfill. In 1990, as part of providing assistance to the Metropolitan Water District of Southern California and the San Diego Water Authority, I was asked to review the potential problems associated with the proposed Gregory Canyon Landfill based on what was then the limited information available on this site (Lee 1990, "Review of January 1990 Draft Environmental Impact Report Environmental Impact Statement for the Proposed North County Class III Landfill"). I concluded then that the Gregory Canyon Landfill site was not a suitable site for a minimum-designed municipal solid waste landfill, and that the construction of such a landfill would almost certainly lead to inevitable groundwater pollution of valuable groundwaters in the vicinity of the landfill and down hydraulic gradient from the landfill. Now that substantial additional information has been developed on the Gregory Canyon site and the proposed Gregory Canyon Landfill, my original conclusions on the inappropriateness of developing the proposed Gregory Canyon Landfill as proposed have been strongly reinforced by the new information. The 1990, as well as the 1999 and 2000, Draft EIRs for this proposed landfill project have failed to provide full disclosure information on the potential impacts on this proposed landfill on public health, groundwater resources and the environment.

Specific Comments

Duration of Landfilled Waste Threat to Groundwater Quality

Title 27, Chapter 15, requires that the landfill containment system protect groundwaters from waste-derived constituents for as long as the wastes in the landfill will be a threat. A key issue that needs to be reviewed in connection with examining a draft EIR for a proposed landfill project is the adequacy of the draft EIR in informing decision-makers and the public about the duration that the wastes in the proposed landfill will be a threat. This is an issue on which I have published several papers and reports. As discussed by Lee and Jones-Lee (1992) in "Municipal Landfill Post-Closure Care Funding: The 30-Year Post-Closure Care Myth," and Jones-Lee and Lee (1993) in "Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance," the wastes in a "dry-tomb" type municipal solid waste landfill of the type proposed for the Gregory Canyon site will be a threat to cause groundwater pollution for a long period of time, extending over thousands of years.

Many of the constituents in these wastes will be a threat to public health, groundwater quality, and the environment for thousands of years. They will not disappear. The deposition in this landfill of such inorganics as heavy metals and salts, and many of the organics, which include a variety of hazardous chemicals normally present in the municipal solid waste stream (household and commercial garbage), as well as those introduced by illegal deposition of hazardous waste into the municipal solid waste stream by commercial and industrial establishments, will be a threat to groundwater quality for as long as the landfill exists. As discussed by Freeze and Cherry (1979) in "Groundwater," Roman Empire landfills developed over 2,000 years ago are still producing leachate. Belevi and Baccini (1989) in "Water and Element Fluxes from Sanitary Landfills," have predicted that Swiss municipal solid waste landfills will leach lead into the leachate above drinking water standards for over 2,000 years. These situations are associated with landfills where moisture was allowed to enter the wastes. In an effective "dry-tomb" type landfill, such as that proposed for the

Gregory Canyon site, where an attempt is made to try to keep the waste dry, the period where the wastes are a threat will be even longer than in a conventional, classical municipal sanitary landfill.

As discussed by Lee and Jones (1992) in "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality," and Lee and Jones-Lee (1996) in "Dry Tomb Landfills," the "dry-tomb" type landfill involves placing the wastes in a plastic sheeting and compacted soil/clay-lined landfill cover and liner. The purpose of this cover/liner system is to try to isolate the wastes from moisture that generates landfill gas and leachate. Moisture is the key to controlling the amount of landfill gas and leachate produced. So long as the wastes are kept dry, they do not decompose. However, they are still a threat to groundwater quality since, upon contact with water such as through an inadequately maintained cover, the waste will start to produce leachate and landfill gas. This process can take place at any time (50, 100, 1,000, 5,000 years) in the future. It is, therefore, essential that, for planning purposes, as far as providing for public health, groundwater quality and environmental protection, the wastes in the proposed Gregory Canyon Landfill should be considered to be a threat for very long periods of time extending over thousands of years. The Draft EIR for the proposed Gregory Canyon Landfill is significantly deficient in reliably informing decision-makers and the public about the period of time that the wastes that are proposed to be placed in this landfill will be a threat.

Characteristics of Landfilled Waste and Leachate

As part of reviewing the adequacy of the information provided in a draft EIR for a proposed landfill, it is important to examine the information on the characteristics of the wastes that will be deposited in the proposed landfill. Page 3-29, section 3.4.1 "Waste Source, Types and Volume" states,

> *"As a Class III landfill, only non-hazardous solid wastes and inert wastes will be accepted. Non-hazardous solid and inert wastes include all putrescible and non-putrescible solid and semi-solid wastes, including household refuse, paper, rubbish, ashes, commercial wastes, industrial wastes, demolition and construction wastes, abandoned vehicles, tires, vehicle parts, discarded home and industrial appliances, manure, animal solids, dewatered sewage sludge, and other solid or semi-solid waste, provided that such wastes do not contain wastes that must be managed as hazardous wastes, or wastes that contain soluble pollutants in concentrations which exceed applicable water quality objectives, or could cause degradation of waters of the state."*

This Draft EIR has provided inadequate and unreliable information on issues that decision-makers and the public should understand. First, excluding so-called hazardous waste from a Class III landfill, while required by law, is impossible to achieve. The high cost differential between disposal of a waste in a municipal landfill compared to a hazardous waste landfill creates a significant incentive for commercial and industrial firms to dispose of hazardous waste in a municipal solid waste stream. The typical approach used to screen municipal solid waste for hazardous waste at the landfill is not adequate to prevent the deposition of hazardous waste.

Page 3-32, in the third paragraph, states,

"Landfill staff stationed at the unloading areas continuously observe the refuse as it is being unloaded to monitor for prohibited wastes."

Such an approach, while inexpensive and typical of that used at landfills, is not adequate to prevent prohibited wastes from being deposited in the landfill. Unless all the plastic bags and other containers are opened, which is not done, there is no way to be sure that prohibited wastes will not deposited in the landfill.

Page 3-32, section 3.4.4 is devoted to the hazardous waste exclusion program. If this program is implemented it can reduce the amount of hazardous materials entering the landfill. It will not eliminate them.

Another aspect of this situation is that the municipal solid waste stream legally contains significant quantities of hazardous chemicals that, while not classified as a hazardous waste, are the same as those that cause industrial and commercial wastes to be classified as hazardous wastes. The public, without restriction, can purchase from the local hardware, garden, automotive supply stores or other establishments, solvents and other constituents which are well-know carcinogens that can legally be disposed of by residential users in a municipal solid waste stream (garbage). A half gallon of trichloroethylene (used for degreasing), which can be purchased in many locations, when disposed of in a municipal solid waste stream can pollute over a million gallons of groundwater above the drinking water standard for vinyl chloride. Vinyl chloride is a known human carcinogen that is one of the most hazardous constituents present in municipal solid waste leachate (US EPA 1988a, "Solid Waste Disposal Facility Criteria; Proposed Rule"). It is formed in the landfill from the trichloroethylene that is purchased in a local store when the can of unused residual is deposited in the trash.

Another factor to consider is that the US EPA is having problems managing PCB wastes. In order to help facilitate the disposal of PCB wastes the Agency is developing regulations that will allow PCBs to be put into municipal landfills. They are also proposing to allow large amounts of lead in lead based paint removed from residential and commercial properties to be placed into municipal landfills. These proposals are not based on the fact that these constituents do not represent a threat to public health and the environment in some landfills such as the proposed Gregory Canyon Landfill. They are based on the fact that the cost of managing PCBs or lead paint residues is sufficiently high so that there is a problem in disposal of these wastes. The US EPA is opting for short-term reduction in costs associated with managing these types of wastes at the expense of future generations' health, welfare and groundwater resources. While the State Water Resources Control Board could take action to prevent this, this Board thus far has not demonstrated willingness to take the necessary action to prevent groundwater pollution by landfill leachate, even though its staff and others have pointed out for years that allowing minimum Class III landfill liner design at many locations will not be protective of groundwater quality.

Another aspect of the inappropriateness of the above quoted statement regarding the character of wastes that will be deposited in the proposed Gregory Canyon Landfill that needs to be understood is the part of the statement dealing with wastes that contain soluble pollutants in concentrations that exceed applicable water quality objectives or that could cause degradation of the waters of the state. While this statement, as presented, applies to all wastes, it should have been restricted just to so-called inert wastes. There are many wastes in the category of garbage, trash, refuse, rubbish, ashes, industrial waste, vehicular parts, discarded home and industrial appliances, manure, animal solids, dewatered sewage sludge, which contain soluble components that will be present at concentrations above water quality objectives.

With respect to regulating so-called inert wastes, while state regulations require that inert wastes shall not contain soluble constituents that exceed applicable water quality objectives, neither the State Water Resources Control Board nor all of the regional boards have developed a testing procedure to determine whether so-called inert wastes are, in fact, inert. Basically, the definition of inert waste is arbitrary in which the wastes are not tested to be sure that they comply with regulations. So-called inert wastes, such as construction wastes and demolition debris, can readily contain soluble components which would exceed water quality objectives.

It is important to understand that even if no hazardous chemicals were present in the Gregory Canyon Landfill leachate, which cannot be achieved, it still would be a significant threat to groundwater quality through conventional pollutants and the non-conventional pollutants that are present in municipal solid wastes, for which there are no water quality standards. These issues have been discussed by Jones-Lee and Lee (1993) in "Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance."

The issue that should have been discussed in this Draft EIR is that there will be a variety of hazardous and deleterious constituents in the waste which will generate leachate which is a threat to groundwater quality for thousands of years. This Draft EIR is significantly deficient in properly characterizing the nature of the wastes that will be deposited in this proposed landfill and the threat that these wastes represent to public health, groundwater resources and the environment.

Geologically Unsuitable Site for the Proposed Gregory Canyon Landfill

Title 27, Chapter 15 requires that a landfill containment system (liners and cover) protect groundwaters from impaired use for as long as the wastes in the landfill will be a threat for those sites where the geology of the site does not provide natural protection of groundwater quality from pollution by landfill leachate. These regulations require that the developer of a landfill critically evaluate whether a proposed site for a landfill provides natural protection of groundwater quality. For the proposed Gregory Canyon Landfill, the geology/hydrogeology for this site, with its associated underlying fractured rock aquifer system and the hydraulic connection to the Pala Basin groundwater system, do not provide natural protection of groundwater quality required by Title 27, Chapter 15. In fact, of all the landfill sites that I have examined over the years, the proposed Gregory Canyon site is one of the most inappropriate sites for any landfill. In addition to leachate-polluted groundwaters' being able to travel through fractures in the underlying geological strata, Goodrich

(1990a) in "Geraghty & Miller, Inc. Phase II Hydrogeologic Investigation on the Proposed Gregory Canyon Class II Landfill Site," has raised the possibility of major faults occurring under the proposed landfill footprint, which could provide additional pathways for leachate polluted groundwaters to migrate to the Pala Basin. This issue still has not been adequately addressed in the recirculated Draft EIR.

Part of the "Geology and Soils" discussion is devoted to the geological hazards due to seismic activity within the region. From the information developed in connection with review of this area associated with the 1990 Draft EIR, as well as this updated Draft EIR for the Gregory Canyon site, this is an extremely complex site which can readily experience significant problems due to seismic activity. The potential consequences of failure to detect significant faults that could damage the landfill containment system as well as the consequences of such damage, and how this will be addressed with particular reference to funding the repair of the damage for as long as the waste in the landfill will be a threat, have not been adequately discussed in this Draft EIR.

Page 4.3-2, section 4.3 "Hydrogeology," 4.3.1 "Existing Conditions," subsection 4.3.1.1 "Regional Hydrogeology,"third paragraph discusses the fact that the Gregory Canyon watershed is a tributary to the San Luis Rey River and is part of the San Luis Rey Hydrologic Unit. The San Luis Rey River reportedly "occupies a narrow valley filled with water-bearing alluvial sediments bounded by sedimentary rocks..." The discussion of "Regional Hydrogeology," pages 4.3-1 to 4.3-5, shows that there is groundwater in the region that can be polluted by the proposed Gregory Canyon Landfill.

Pages 4.3-8 to 4.3-12 describe the existing groundwater conditions within the Gregory Canyon and the adjacent areas. The aquifer is characterized as a fractured rock system. Such a system is an unsuitable site for the location of a landfill, since it is virtually impossible to reliably monitor the groundwaters underlying the landfill that will be polluted by landfill leachate. This issue is discussed further in a subsequent section of these comments.

Landfill Liner Design

Page 3-5, in the second paragraph of "Project Components," lists as a Proposition C, Section A issue, *"a lined landfill."* The issue is not that of a lined landfill, but an adequately and reliably lined and monitored landfill. Again, there is a deficiency in understanding of the difference between simply having a liner and having an adequate liner and an appropriate monitoring system for the liner, to detect its inevitable failure.

Title 27, Chapter 15 requires that the landfill liner containment system design be developed based on the geological characteristics of the proposed landfill site. While Title 27, Chapter 15 provides a minimum liner design that would be appropriate for certain types of landfill sites, contrary to the statements made in the Draft EIR, these regulations do not indicate that that minimum liner design is suitable for all landfill sites.

Page 4.3-15 states in the <u>Potential Degradation of Groundwater Quality</u>, section,

"The recognition in the early 1980's that degradation of groundwater quality is the most significant potential impact of landfill projects on the environment, led to the implementation of laws requiring low-permeability liners and leachate collection and recovery systems on all new landfills."

Page 1-6, under section 1.5 "Areas of Controversy and Issues to be Resolved," the second bulleted item states,

- "*Project-related impacts may potentially affect the groundwater resources."*

As documented herein and in the attached papers and reports (Lee and Jones-Lee, 1992, 1998a) in "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality" and "Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches," and references contained therein, this proposed landfill containment system and groundwater monitoring system will not prevent large-scale, widespread groundwater pollution by landfill-derived waste constituents. Here and throughout this Draft EIR, the statement is implied or made that the single composite liner proposed for the Gregory Canyon Landfill meets state and federal regulations. It appears that those who prepared the Draft EIR did not read these regulations, or if they did, they did not understand them.

State and federal regulations are explicit in requiring protection of groundwater quality from waste-derived constituents for as long as the waste in the landfill will be a threat. These regulations do not specify an acceptable liner that can be used at all sites. They specify a minimum liner that could be used at some locations where the natural geological strata or other factors protect groundwaters from pollution by landfill leachate when this minimum liner fails. This issue should have been discussed in the Draft EIR. Without it, this Draft EIR should be a non-certifiable EIR.

Page 3-11, the bulleted item, "*Composite Liner*," states,

- *"A composite liner, constructed according to all State and Federal regulations, will be placed over the entire excavated subgrade. Federal Subtitle D regulations define a composite liner as a system consisting of two low-permeability components."*

It appears that the authors of this section are not aware that the State of California Water Resources Control Board modified Chapter 15 requirements several years ago to include a minimum single composite liner as the **minimum** liner that can be used at a Class III landfill. The current requirements (SWRCB Resolution No. 93-62) are explicit in requiring, as a minimum, a single composite liner. The single clay liner that was adopted in Chapter 15 in 1984 could not be used at the Gregory Canyon site.

This paragraph also states,

> *"The lower component of the composite liner will consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1 x 10^{-7} cm/sec. In accordance with design criteria specified in 40 CFR, 258.40, the upper component of the liner system will consist of a 60-mil high-density polyethylene (HDPE) geomembrane."*

This statement is not accurate with respect to the federal or state requirements for composite liner design. Both the federal and state requirements specify that these requirements are the **minimum** requirements for a composite liner. They are not set forth as adequate for the protection of groundwater quality in accord with state and federal requirements for waste-derived constituents for as long as the wastes in the landfill will be a threat at all sites where landfills can be constructed.

Beginning in 1984 until 1993 the State Water Resources Control Board and especially the Regional Water Quality Control Boards allowed the development of Class III landfills within the state with a Chapter 15 minimum liner. This minimum liner consisted of one foot of compacted soil with a permeability equal to or less than 10^{-6} cm/sec. A simply Darcy's law calculation would have shown the Regional Boards that leachate would penetrate through this liner within a couple of months. It was generally realized by the late 1980s that this approach was not protective for landfills cited at geological unsuitable sites such as the proposed Gregory Canyon Landfill.

The State Water Resources Control Board was urged by its staff and others to take action to stop the development of landfills, which at best only postponed by a few months when groundwater pollution occurs. The State Water Resources Control Board refused to take this action. Finally, the State Water Resources Control Board was forced by the US EPA to adopt the single composite liner, which, while still not protective, does postpone groundwater pollution from a few months to a few years or longer depending upon a variety of factors.

In the late 1980s the state legislature required that the State Water Resources Control Board undertake the Solid Waste Assessment Test (SWAT) Program. This program was designed to determine the number of leaking landfills within the state. Mulder and Haven (1995) in "Solid Waste Assessment Test (SWAT) Program" published the most recent SWAT results. These results included examining the landfills that were developed between 1984 and 1993 that used the minimum liner design of one foot of compacted soil with a permeability of less than 10^{-6} cm/sec. The Mulder and Haven report states,

> "*Available data indicate no apparent correlation between the percentage of landfills which leaked and any of the different site-specific factors checked, including depth to ground water, average annual precipitation, waste acceptance rate, and rock type. Thus, information collected through the SWAT Program demonstrates that unlined or clay-lined landfills leak, regardless of factors such as climate or site-specific geology.*"

As discussed below the same kind of situation of ultimate groundwater pollution is occurring with the minimum single composite liner now allowed by Regional Boards.

The inevitable leakage of the proposed Gregory Canyon Landfill liner system and the associated pollution of groundwaters should have been discussed in this Draft EIR. The failure to discuss these well-known issues causes this Draft EIR to be considered noncertifiable.

Page 3-11, second bulleted item, discusses the *Leachate Collection and Removal System (LCRS),* which will be installed over the synthetic liner. The information provided would lead someone not knowledgeable in the topic to believe that this system will be reliable in collecting all leachate that is generated within the landfill and conveying this to a removal point from the landfill for as long as leachate can be generated in the landfill. This leachate collection and removal system will have to function reliably without maintenance over the period of time that the wastes in the landfill will be a threat. Those familiar with the characteristics of leachate collection systems know that the key to their ability to convey leachate to a sump where it can be removed is that the underlying HDPE liner is intact without holes for as long as the wastes represent a threat. However, as discussed in the literature (see Lee and Jones, 1992; "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality," and Lee and Jones-Lee, 1998a "Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches"), it is well known that an HDPE liner has a finite period of time where it can be effective in removing leachate due to the fact that this plastic sheeting layer will deteriorate over time and ultimately develop large holes which will allow leachate generated in the landfill to pass through the liner system into the underlying groundwater system.

Section 3.5.3 (page 3-51) devoted to Leachate Control and Monitoring Systems, fails to discuss the problems of leachate collection system plugging, which are well-known to occur in municipal landfill leachate collection systems (see discussions by Lee and Jones, 1992 ,"Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality"). This plugging is due to chemical precipitation, biological growth and the migration of fines (small particles) present in the soil layer and wastes. This plugging prevents the collection of the leachate as designed, which increases the depth of leachate on the liner ultimately leading to increased rates of leakage through holes that exist in the liner at the time of construction or that develop in the liner over time with the deterioration of the liner. Failure to discuss this well known problem with the functioning of leachate collection and removal systems represents unreliable reporting on issues that can mislead decision-makers into supporting the development of this landfill under conditions where they are not aware of the many problems that exist with the proposed landfill design.

Exhibit 3-5 (page 3-12) presents cross sections of the liner system for the bottom liner and the side slopes. The protective soil cover and LCRS gravel are the components of this system that are subject to plugging. The 60 mil HDPE geomembrane will have holes at the time of construction and can have increased numbers of holes due to the placement of the wastes, and will, over time, deteriorate and develop additional holes. The low-permeability liner material (clay/soil liner) placed

on the finished subgrade has a finite permeability where, if design characteristics are achieved and maintained, it is only 25 years until leachate that enters this layer penetrates through the liner into the underlying groundwaters. The side slope system in which the LCRS gravel is replaced by 16 ounce geotextile is subject to severe plugging, where leaks can develop through the side walls of the liner and penetrate the underlying groundwater system associated with the landfill. This design cannot prevent groundwater pollution by landfilled wastes. This issue should have been discussed in this Draft EIR.

Page 4.3-18, the third paragraph states,

> *"In addition, required environmental protection systems (base liner, leachate control and recovery and landfill gas collection systems) have proven efficiencies of at least 99 percent in the removal of leachate (and landfill gas) before it can leak from the landfill."*

No reference is given to this statement. This statement is not reliable for the period of time during which the waste in the Gregory Canyon Landfill will be a threat. Much lower rates of leachate collection will eventually occur as the landfill liner system begins to deteriorate. Rather than providing unreliable information on liner leakage rates, as has now been done in this Draft EIR, it should have discussed the well-known fact that over time, the liner leakage rates will increase as a result of deterioration of the liner leachate collection properties.

In this same paragraph the statement is made,

> *"This conclusion is supported by a recent study (Bonaparte et al., 1989) that indicates that a well designed, constructed, and inspected liner system can protect groundwater, so that impacts to groundwater would not occur."*

We are familiar with Bonaparte's statements on behalf of his clients-landfill applicants on the "protection" provided by landfill liners. Bonaparte has been repeatedly found to provide unreliable information on this issue when considered over the period of time that the wastes in the landfill will be a treat. Our writings have discussed significant problems in the writings of Bonaparte on these issues. He focuses on the short-term protection and fails to address the thousands of years that the wastes in the Gregory Canyon Landfill, and for that matter other Subtitle D landfills, will be a threat.

It should also be noted that 1989 cannot be considered to be a "recent" evaluation of this issue. Considerable new information has been developed on these issues over the past decade.

Further, even if this statement were true, the one percent of the leachate that gets through the liner can cause significant pollution because leachate can be such a potent source of pollutants. This issue should also have been discussed in this Draft EIR.

This same paragraph makes the statement,

> *"Assuming a liner with one 1 cm^2 hole per acre, 1.12 inches per year would be collected at the liner interface by the leachate collection and recovery system, which would result on a leakage rate of 0.001 inches per year."*

The one 1 cm^2 hole per acre is reportedly as what can be achieved with high quality landfill liner construction at the time of construction. It does not apply to the number of holes per acre over the period of time that the waste in the landfill will be a threat. As quoted above by the US EPA there is no question about the fact that over time, the liner will deteriorate and leak at a much higher rate than predicted in the Draft EIR.

The discussion of leakage in the third and following paragraphs on page 4.3-18 is a significant distortion of what is readily known about the expected behavior of landfill liner systems leakage over the period of time that the wastes are a threat. This statement misleads the public and decision-makers into believing that the leakage that will occur in the Gregory Canyon Landfill liner system will not represent a significant threat to groundwater quality. The facts are that just the opposite will occur, and the leakage through the liner will cause significant groundwater pollution during the time that the wastes in this landfill will be a threat. This Draft EIR should be found to be non-certifiable because it provides unreliable, inadequate information on landfill liner leakage issues.

The facts, with respect to landfill liner leakage, are that at the time of construction there can be holes in the liner. It is often said that there are from one to two 1 cm diameter holes in a plastic sheeting liner when the liner is new. It is also well-known that at the time of the filling of the wastes, even with substantial soil buffers, there are often holes poked in the liner through the deposition of wastes. Further, as described by the US EPA (1988a,b) in "Solid Waste Disposal Facility Criteria; Proposed Rule"and "Criteria for Municipal Solid Waste Landfills;" Lee and Jones (1992) in "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality;" and Lee and Jones-Lee (1998a) in "Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches," over time the plastic sheeting layer of the liner will deteriorate and allow leachate to pass through the liner at a high rate that can lead to substantial water pollution. These are not debatable issues. They will occur in any minimum Subtitle D-type landfill such as the Gregory Canyon Landfill where there are groundwaters underlying the landfill that can be polluted by landfill leachate.

It should be understood that even liners without holes can leak certain constituents in leachate through diffusion processes. Daniel and Shackelford (1989) in "Containment of Landfill Leachate with Clay Liners," discuss the rate of diffusion of chemicals through plastic sheeting and clay liners. They point out that break through due to diffusion for a 60 mil HDPE liner will occur in about two years. For a three foot thick clay liner the break through typically takes about 12 years under one foot of head. Workman and Keeble (1989) in "Design and Construction of Liner Systems," have presented a nomograph which shows that break 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 break through 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. Therefore the break through times can be much shorter than these values.

Further, Daniel (1990) in "Critical Factors in Soils Design for Covers," in a US EPA landfill cover liner seminar, 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. All of the issues on inherent liner leakage rates are well-known in the literature. None of it was discussed in this Draft EIR. This makes this Draft EIR non-certifiable since decision-makers and the public have not been reliably informed about the inherent rates of leakage that will occur when the liners are new, and the greatly increased rates of leakage that will occur over time as the liners deteriorate.

Another well-known fully documented mechanism for leakage through liners is the permeation by low molecular weight solvents, many of which are common constituents in municipal solid wastes. Park, *et al*. (1996 a,b) in "Transport of Organic Compounds in Thermoplastic Geomembranes. I: Mathematical Model," and"Transport of Organic Compounds in Thermoplastic Geomembranes. II: Mass Flux Estimates and Practical Implications," and Buss *et al.* (1995) in "Mechanisms of Leakage Through Synthetic Landfill Liner Materials," have discussed the permeation of organic solvents through HDPE liners. This permeation occurs in liners without holes where solvents that can be purchased at the local hardware store or automotive supply, many of which are carcinogens, can pass through an HDPE liner in a few days. This Draft EIR should have discussed that permeation is an inherent significant problem with today's plastic sheeting and compacted soil lined landfills.

High Ground Water Table/Underdrains

Both the US EPA and state of California landfilling regulations require that there be a five-foot separation between the bottom of the wastes and the expected high value for the watertable. The purpose of this separation is to keep groundwater from entering the landfill and generating leachate. The proposed Gregory Canyon Landfill site is not a geologically suitable site for this landfill based on the high groundwater table that exists in this area. In an effort to try to circumvent this situation, the landfill proponents have proposed to construct an underdrain system which would artificially lower the watertable. The draft EIR, however, fails to discuss the significant problems that can occur with this underdrain system over the period of time that the wastes in the landfill will be a threat.

Page 3-9, section 3.2.1 "Landfill Footprint," paragraphs three and four state,

"The lowest portion of the landfill footprint excavation will extend below the piezometric surface (i.e., the highest anticipated groundwater level) within Gregory Canyon. The waste containment system configuration for the project will maintain the required five-foot separation between the highest anticipated groundwater level and the refuse as specified in

27 CCR. In the event that groundwater is encountered during construction operations, dewatering procedures will be implemented to facilitate completion of the excavation and subdrain installation.

"To maintain the required five foot separation between the highest groundwater level and the refuse, the proposed liner system below the piezometric surface will be a minimum of five feet thick and will consist of the following components: 1) a two-foot thick soil liner, 2) a one-foot thick leachate collection and removal system (LCRS), and 3) a two or three-foot thick protective layer. The liner design for the slope area LCRS does not include the gravel blanket. Below the piezometric surface, the slope liner will include a three foot protective cover layer in order to maintain a five foot thick liner section."

Page 3-9, under,

"The containment system components from the excavated subsurface to the refuse interface are: ! A Subdrain System . . .".

This subdrain (underdrain) system will consist of gravel-filled trenches and pipes which are designed to keep the high groundwater from entering the landfill. The trenches and pipes are supposed to convey the groundwater by gravity flow to the mouth of the canyon. Such subdrain systems are prone to problems due to plugging over the long period of time that they have to function properly without maintenance in order to achieve the design purpose. The consequences of such plugging should have been discussed in the Draft EIR.

Page 4.3-28, the section, Potential encroachment of groundwater into the landfill, discusses the potential for the high groundwater table to cause uplift pressure on the liner. It is stated that a geonet side slope and a gravel drain under the bottom of the landfill will collect groundwater and remove it from under the landfill. Again, no mention is made of how such a system will work over the extended period of time that the wastes in this landfill will be a threat. Groundwater elevations can change significantly over this period of time, which makes the GLA calculations of little or no reliability as to the development of a reliable subdrain system. Further, these subdrains can readily experience plugging which will significantly alter flow regimes associated with the subdrains. Basically, this EIR assumes that the climatic conditions that occur in the late 1990s will occur for as long as the wastes are a threat. This is clearly not a worst-case assumption. In fact, a true worst-case analysis would have considered the full range of conditions that could occur over the next several thousand years that the wastes in this landfill will be a threat.

Landfill Cover

As part of closure of the landfill, a low permeability cover is to be installed to minimize moisture infiltration into the landfill. Page 3-31 Exhibit 3-12, which shows a typical cross-section of the proposed Gregory Canyon Landfill, is misleading with respect to the characteristics of the final cover area. This exhibit shows trees and shrubbery growing on the landfill cover. Such plant growth will destroy the integrity of the cover. The cover for this landfill will have to be maintained without

vegetation with deep roots that could penetrate the landfill cover system as long as the interaction of water with the waste may create leachate or landfill gas. This issue should have been discussed in this Draft EIR. As part of this discussion the source of the funds that will be used for maintenance of the cover, including controlling deep-rooted plants, should have been delineated.

Page 3-51, section 3.5.3 "Leachate Control and Monitoring Systems," states,

"The quantity of leachate expected to be generated within the lined portion of the landfill was estimated by modeling the water balance in the landfill site."

Such modeling cannot be done reliably to predict the rate of leachate generation that will occur over the time that the wastes in the landfill will be a threat. Such models are applicable to newly constructed landfill covers and have little or no applicability to the long-term situation, where the composite liner in the cover will deteriorate and allow much greater amounts of moisture to enter the landfill which will in turn generate larger amounts of leachate than predicted. The inability to reliably estimate leachate production over the time when the waste in the landfill will be a threat is an issue that should have been discussed in this Draft EIR as part of providing the CEQA required full disclosure of potential environmental impacts.

Page 3-66, section 3.7.1.2 "Barrier Layer," states,

"State and federal regulations dictate that the final cover design have a permeability less than or equal to any bottom liner or natural underlying soil. Therefore, because the Gregory Canyon Landfill will be a lined refuse disposal facility, the final cover system design will include a barrier layer consisting of a synthetic cover (i.e., 60-mil liner low-density polyethylene (LLDPE) geomembrane)."

No discussion is provided, however, on the fact that the integrity of the 60-mil LLDPE low-permeability layer in the cover cannot be inspected since it will be buried below a topsoil and drainage layer since the wastes in the landfill will be below a two-foot vegetative cover. Moreover, the HDPE layer in the cover will have significant stresses placed on it that can cause it to deteriorate and develop holes at a much higher rate than the landfill liner. It is only a period of time until the low-permeability layer of the cover is no longer functioning to effectively prevent moisture from entering the landfill. These issues are discussed by Lee and Jones (1992) in "Municipal Solid Waste Management in Lined, `Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality," and Lee and Jones-Lee (1995, 1998a) in "Overview of Landfill Post Closure Issues," and "Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches." As discussed, the closure of a "dry tomb' type landfill should be done with a leak detectable cover, such as that described by Robertson (1990) in "The 'Robertson Barrier Liner' A Testable Double Liner System;" Nosko and Andrezal (1993) in "Electrical Damage Detection System in Industrial and Municipal Landfills;" and Peggs (undated) in "Leak Location and Flaw Detection Technologies for Quality Assurance and Analysis of Geomembrane Lining Systems," which is operated and maintained for as long as the wastes remain a threat. For planning purposes,

this period of time should be considered to extend over thousands of years, since so long as the wastes are kept dry they will be a threat to generate leachate once moisture enters them. Again, these issues should have been discussed in the Draft EIR.

Exhibit 3-25 shows the typical so-called deck cover section, where there is a 24-inch vegetative layer, a 60-mil LLDPE liner and soil cover. The key component of this cover is the LLDPE membrane. An issue of particular concern that should have been discussed in the Draft EIR is that cracks and points of deterioration can develop in that plastic sheeting layer which would not be revealed by visually inspecting the landfill cover. There is no mechanism provided to detect these problems in the LLDPE liner that is used to cover the landfill.

Page 4.3-19, under Estimated Leachate Production Rates, states in the first paragraph that the HELP3 model was used to predict leachate generation rates. The Draft EIR should have stated that the HELP model is not reliable for predicting moisture infiltration through the cover and leachate generation over the period of time that the waste in the proposed Gregory Canyon Landfill will be a threat. This arises from the fact that the rate of precipitation infiltration depends on the integrity of the low permeability layer in the cover. The low permeability layer (plastic sheeting layer) in the Gregory Canyon Landfill situation has an unpredictable rate of deterioration. It is well-known, however, that it will deteriorate and that large holes, rips, cracks, tears, or points of deterioration will occur in this plastic sheeting layer over the time that the wastes are a threat to generate leachate that can cause groundwater pollution. Basically, the leachate generation discussion that is presented in this Draft EIR is unreliable in predicting leachate generation over the period of time that the wastes in the landfill will be a threat.

Page 4.3-16 quotes from McBean *et al.* (1995) on the processes of decomposition of wastes. While McBean *et al.* present the classical understanding of the decomposition of municipal solid wastes, their discussion has a number of significant deficiencies that are not in accord with the situation that exists in today's landfills.

The statement in the first quoted paragraph about aerobic decomposition usually characterized as one to two years is totally inappropriate. Aerobic decomposition of municipal solid wastes takes place over a few days to a few weeks to a month. The dissolved oxygen content of municipal solid wastes is rapidly depleted during that time. This is immediately followed by anaerobic decomposition.

The statement in that same paragraph about leachate's not usually being produced in this decomposition stage is wrong. Leachate production is not related to the decomposition of the waste. Decomposition is related to a biochemical phenomenon associated with bacterial action on certain waste components. Leachate production is influenced by this reaction but not controlled by it. The characteristics of leachate are dependent on the leaching of the waste. There are components in municipal solid wastes which are solubilized as soon as water comes in contact with them.

The statement in the same paragraph that leachate production is dependent on reaching field capacity is also incorrect. Leachate can be produced under unsaturated flow conditions, where the wastes appear dry but, as a result of the movement of a thin film of water over the wastes under unsaturated flow conditions, leachate is being produced that can pollute groundwaters.

Groundwater Quality Monitoring

The US EPA (1988a, "Solid Waste Disposal Facility Criteria; Proposed Rule"), as part of promulgating the Subtitle D municipal solid waste regulations acknowledges that the landfill liner system will ultimately fail to collect leachate that is generated within the landfill over the period of time that the waste in the landfill will be a threat to generate leachate. The US EPA also acknowledges that it is not possible with conventional landfill cover design to keep the wastes within the landfill dry so they do not generate leachate. In considering this situation, the US EPA and the SWRCB in Title 27, Chapter 15, have specified that groundwater protection will be achieved through the development of a reliable groundwater monitoring system that will detect leachate-polluted groundwaters when they first reach the point of compliance for groundwater monitoring. The point of compliance is just downgradient from the location where wastes have been deposited.

Page 3-45, section 3.5.2.3 "Groundwater Monitoring," states,

"The groundwater monitoring program will be implemented in accordance with State water protection requirements under 27 CCR, Chapter 3, Subchapter 3, Article 1 (Article 1)."

As discussed herein, the information provided in this Draft EIR on the proposed groundwater monitoring system shows that it has a low probability of detecting polluted groundwaters before widespread pollution occurs for as long as the wastes in the landfill will be a threat. Contrary to the above-quoted statement, the proposed groundwater monitoring system for the proposed Gregory Canyon Landfill does not conform to groundwater monitoring requirements for municipal landfills.

Page 3-45, section 3.5.2.3 "Groundwater Monitoring," refers to Exhibit 3-16 which shows that six groundwater monitoring wells will be installed with an interwell spacing of 150 - 300 feet apart. There is substantial literature (Cherry, 1990, "Groundwater Monitoring: Some Deficiencies and Opportunities;" Lee and Jones-Lee, 1994b "A Groundwater Protection Strategy for Lined Landfills;" 1998b "Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring;" Parsons and Davis, 1992 "A Proposed Strategy for Assessing Compliance with the RCRA Ground Water Monitoring Regulations") that shows that monitoring wells spaced 300 feet apart across a down groundwater gradient edge of a landfill can have a low probability of detecting leachate-polluted groundwaters before off-site groundwater pollution occurs. Unless extensive pumping of the groundwater wells occurs as part of sampling the wells and all of the fractures that could transport leachate through the groundwaters will be reliably sampled by this pumping, without significant dilution of the leachate- polluted groundwater in a fracture, this monitoring system will not be reliable for detecting leachate- polluted groundwater at the point of compliance for groundwater monitoring in accord with Title 27. Those requirements state:

"(b) ***Ground Water Monitoring System.***
(1) ***General —*** *Except as provided under &(e)(3), the discharger shall establish a ground water monitoring system for each Unit. This ground water monitoring system shall include:*

(A) ***For All Programs —*** *for all monitoring and response programs, a sufficient number of Background Monitoring Points (as defined in §20164) installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that represent the quality of ground water that has not been affected by a release from the Unit;*

(B) ***For DMP — for a detection monitoring program under §20420:***

1. a sufficient number of Monitoring Points (as defined in §20164) installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that represent the quality of ground water passing the Point of Compliance and to allow for the detection of a release from the Unit;

2. a sufficient number of Monitoring Points installed at additional locations and depths to yield ground water samples from the uppermost aquifer to provide the best assurance of the earliest possible detection of a release from the Unit;

3. a sufficient number of Monitoring Points and Background Monitoring Points installed at appropriate locations and depths to yield ground water samples from portions of the zone of saturation, including other aquifers, not monitored pursuant to &(b)(1)(B)1. and &(b)(1)(B)2., to provide the best assurance of the earliest possible detection of a release from the Unit;"

This statement is not reliable with respect to describing the ability of the six proposed monitoring wells to reliably detect leachate-polluted groundwaters that will occur under the proposed Gregory Canyon Landfill. It is inappropriate to assume, as this Draft EIR does, that all of the deeper fractures that underlie the Gregory Canyon Landfill that can be polluted by landfill leachate are interconnected and can be reliably sampled in accord with regulatory requirements of providing "*the best assurance of the earliest possible detection of a release from the Unit."* There can readily be fractures that are polluted by landfill leachate that are not interconnected with these monitoring wells or that the nature of the interconnection is such that the groundwater pumped by these wells is not representative of the groundwater fracture that can pollute a down gradient production well. These issues should have been discussed in this Draft EIR. They are well understood by professionals in the field.

Page 4.3-25, last paragraph, discusses the potential for the reliability of the groundwater monitoring wells to detect leakage from the liner system in the groundwaters; there it is stated,

> *"Also, the purging protocols may need to be modified (e.g., by pumping a volume significantly larger than the traditional three borehole volumes), to impose enough "stress" in the aquifer to force convergence into the borehole of water carried by distant fractures."*

No information is provided, however, on how much water would have to be pumped to ensure an accurate sampling of leachate-polluted groundwaters that could be present in distant fractures from the monitoring wells. The Draft EIR discussion about the potential ability to reliably sample

leachate-polluted groundwaters in fractures that exist under the Gregory Canyon Landfill footprint misleads the reader into believing that this approach could lead to reliable groundwater monitoring. However, distant fractures from the six proposed monitoring wells could be polluted with leachate that would be significantly diluted with water from non-polluted fractures by the time the polluted groundwaters reach the monitoring wells. Further, it is inappropriate to assume that because some degree of interconnectability of fractures underlying the Gregory Canyon Landfill exist, that all fractures, especially deeper fractures, would be interconnected and could be reliably sampled by the proposed sampling approach in which only six vertical monitoring wells would be used across the downgradient face of the landfill.

The sampling of fractured rock aquifer systems such as those that underlie the proposed Gregory Canyon Landfill are well known to be virtually impossible to be reliably achieved. Haitjema (1991) in "Groundwater Water Hydraulics Considerations Regarding Landfills," states:

> *"An extreme example of Equation (I) (aquifer heterogeneity) is flow through fractured rock. The design of monitoring well systems in such an environment is a nightmare and usually to more than a blind gamble."*
> *"Monitoring wells in the regional aquifer are unreliable detectors of local leaks in a landfill."*

This Draft EIR is deficient with respect to describing the potential reliability of the proposed Gregory Canyon Landfill groundwater monitoring system. This situation alone should cause this Draft EIR to be revised and recirculated in draft. Basically this Draft EIR presents an overly optimistic assessment of the reliability of the groundwater monitoring system to comply with regulatory requirements.

This Draft EIR should have discussed the work of Cherry (1990) in "Groundwater Monitoring: Some Deficiencies and Opportunities," in which he showed that initial leakage from plastic sheeting-lined landfills will form finger-like plumes of leachate-polluted groundwater. These plumes will be of limited lateral dimensions and, therefore, monitoring wells spaced hundreds of feet apart in a homogeneous sand aquifer system will have a low probability of detecting leachate-polluted groundwater at the point of compliance for groundwater monitoring when this polluted groundwater first reaches this point. In fractured rock systems, where the leachate-polluted groundwater will move through fractures, it is virtually impossible to reliably sample groundwater with the approach that has been proposed for the Gregory Canyon Landfill. This Draft EIR is deficient in providing full disclosure of the potential reliability of the groundwater monitoring system that is proposed for the Gregory Canyon Landfill.

Page 4.3-30 states under 4.3.3.3 "Site Closure Impacts,"

> *"As required by Title 27 of the California Code of Regulations, groundwater monitoring will continue following closure of the landfill for a minimum of 30 years. With long-term groundwater monitoring features and the enforcement of environmental control measures*

through the mitigation monitoring and reporting process, impacts to post-closure hydrogeology will remain insignificant."

Regulatory requirements will not relieve the owner of the landfill from further responsibility in year 31, 100 or 500, etc. However, what is the likelihood that the proponents of the Gregory Canyon Landfill will still be financially viable and willing and able to provide monitoring, maintenance and remediation of this landfill and polluted groundwaters for as long as the wastes in the landfill are a threat? This is the requirement set forth in Title 27, Chapter 15, "Subchapter 5. Closure and Post Closure Maintenance Article 1. General Standards For All Waste Management Units." This is an issue that has to be addressed in a credible EIR.

Page 13B-1, Chapter 13.0 "Bibliography," does not contain sections on landfill design, the inadequacies of groundwater monitoring at lined landfills, etc. This is yet another example of the significant deficiencies in this Draft EIR. There is substantial literature, as referenced in the attached reports, that discusses these issues. Failure to present and discuss this literature in this Draft EIR is another reason why this Draft EIR does not conform to minimum CEQA requirements for full disclosure.

Page 3-41, section 3.5.2.1 "Subdrain System Monitoring," states that the subdrain (underdrain) waters will be monitored. There are a variety of situations which can cause a subdrain monitoring system to be unreliable for detecting landfill liner leakage before off-site groundwater pollution occurs. These include failure of the subdrain system to collect leachate that penetrates to the side walls of the liner. Also of concern are changes in climate over time which can cause a change in the position of the watertable that can allow leachate-polluted groundwaters to enter the underlying groundwater system and not be collected by the subdrain. Another factor to consider is that the leachate that penetrates through the liner can have a density significantly greater than that of groundwater and, therefore, it will tend to pass through the subdrain into the underlying groundwaters without mixing with the subdrain waters. Basically, the subdrains are not a reliable monitoring system for landfill liner leakage and should not be relied on. This Draft EIR is significantly deficient for failing to discuss these issues.

Landfill Gas and Odors

The Gregory Canyon Landfill is an unsuitable site for a landfill from several perspectives, including the potential for inadequate waste management operations to be adverse to those within the sphere of influence of the landfill through release of landfill gases, including obnoxious odors. This sphere of influence, because of the canyon's setting and narrow valley, can extend for considerable distances from the landfill, often for several miles.

Gaseous emissions from MSW landfills represent significant threats to the nearby property users' health, safety and aesthetic enjoyment of the property. They also can be a significant cause of groundwater pollution. In addition to containing methane which is an explosive gas, landfill gases contain a variety of hazardous chemicals which are a threat to public health and the environment. Hodgson *et al*. (1992) in "Soil-Gas Contamination and Entry of Volatile Organic Compounds into a House Near a Landfill," have discussed this situation based on problems that have developed with

landfill gas migration in California. The US EPA EIIP (1997) in *"Landfills,"* in its AP-42, has provided information on the chemical characteristics of landfill gas, in which they have reported that landfill gas contains a variety of hazardous chemicals that are a threat to public health and wildlife.

Page 3-39, section 3.5.1 "Landfill Gas Monitoring and Control Systems," presents information on the landfill gas collection system without discussing the significant problems that frequently occur with such systems. Basically, this Draft EIR assumes that the landfill gas collection system will collect 90 percent of all the landfill gas that will be generated in this landfill for as long as the wastes in this landfill can generate landfill gas. Such an assumption, under conditions where there is no assured funding for landfill gas collection/management systems, maintenance and operation, is inappropriate. The reliability of this assumption, and the potential problems associated with it, as they may impact public health, groundwater resources and the environment, should have been discussed in this Draft EIR.

The Draft EIR relies on a report prepared by Dames & Moore (1999), "Evaluation of Air Toxics Health Risks-Final Report, Gregory Canyon Landfill," as a source of information on landfill gas generation for the proposed Gregory Canyon Landfill. A review of this report shows that Dames & Moore used a standard US EPA landfill gas estimation generation rate equation for estimating the expected landfill gas generation rate at the proposed Gregory Canyon Landfill. A critical review of the origin of this equation shows that it was not developed for and should not be applied to estimating landfill gas generation rates in the proposed Gregory Canyon Landfill.

Landfill gas generation will occur at this landfill for very long periods of time due to the fact that there will be an attempt to keep the waste dry. Dry wastes do not generate landfill gas. Landfill gas generation is proportional to moisture content of the wastes (Christensen and Kjeldsen, 1989) in "Basic Biochemical Processes in Landfills." Upon closure of the Gregory Canyon Landfill, where an HDPE liner will be placed over the landfill, the rate of moisture entering the landfill will be greatly reduced. If high quality construction is achieved at the time of cover placement, the landfill gas and leachate generation will essentially stop. There can, therefore, be a considerable period of time in the Gregory Canyon Landfill where no landfill gas or leachate generation occurs. However, failure to adequately maintain the cover throughout the long period of time that the wastes in this proposed landfill will be a threat will allow moisture into the landfill that will interact with the waste to produce landfill gas. Further, since much of the waste deposited in the proposed landfill will be present in plastic garbage bags that are crushed but not shredded, any moisture that enters this landfill will have difficulty interacting with the waste in plastic garbage bags until the bags decompose. Plastic garbage bag decomposition is a slow process taking many decades to hundreds of years. These issues were reviewed by Lee and Jones (1991) in "Municipal Solid Waste Management: Long-Term Public Health and Environmental Protection."

Maintenance of a gas collection system is a key to its effective operations and its public health and environmental protection. As discussed by Lee and Jones (1991) in "Municipal Solid Waste Management: Long-Term Public Health and Environmental Protection," and in subsequent publications (Lee and Jones, 1992) in "Municipal Solid Waste Management in Lined, `Dry Tomb'

Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality," differential settlement of the waste can be disruptive to the reliable functioning of landfill gas collection systems. There will be need to maintain the gas collection system for long periods of time. Dames & Moore estimated, using the US EPA standard equation, that landfill gas production would occur well beyond 75 years. Actually, because of the "dry-tomb" character of this landfill, the period of time that gas production will occur will be longer than that estimated by Dames & Moore. There is no assurance that funding will be available for this period of time to operate or maintain the gas collection system so that it controls gaseous emissions.

Another factor to consider, that is not addressed in this Draft EIR, is that the characteristics of municipal solid wastes that will be placed in the Gregory Canyon Landfill will be significantly different than that assumed by Dames & Moore in developing the risk assessment for gaseous emissions. In general, Dames & Moore used standard US EPA emission factors for landfill gas composition. These factors are based on operating landfills. Some adjustments were made in the emission rates for landfill gas characteristics in the San Diego area. However, neither the standard US EPA nor the San Diego area landfill gas characteristics will be applicable to the Gregory Canyon Landfill because of the significantly different character of the types of wastes that will be deposited in this proposed landfill compared to the wastes that were deposited in the landfills used by the US EPA and those investigated in the San Diego area.

The most significant change in waste composition is the diversion of the green yard wastes from the landfill solid waste stream as part of the State of California mandated 50 percent diversion of the municipal solid waste stream by the year 2000. This diversion will remove about 20 percent of the waste components that can lead to landfill gas production of methane and CO_2. Therefore, there would be expected to be less methane production in the Gregory Canyon Landfill than in the landfills that were used to estimate the emission of landfill gas and its associated hazardous components. While there would also be some reduction of hazardous components in the waste stream, that issue has been addressed somewhat in the landfills that were used as a basis for estimating the hazardous gas component emission rates. The consequences of these diversions need to be evaluated as part of estimating the hazards that the Gregory Canyon Landfill gaseous emissions will represent to public health and the environment. This was not done in this Draft EIR.

The Draft EIR mentions that the collected landfilled gas will be flared (burned) as a means of disposal. There is no mention that typical landfill gas flares tend to produce dioxins, which then are a significant threat to the people who live or work within the region of the landfill. This issue (see Eden 1993, "Toxic Emissions from Different Types of LFG Burners,") is known in the literature and should have been discussed in this Draft EIR.

Another issue that should have been discussed in this Draft EIR is the potential for uncontrolled landfill gas generation to cause groundwater pollution. Landfill gas generation can lead to below soil surface gas migration under conditions such as those that can occur with inadequate long-term maintenance of the landfill gas collection system so that the assumed 90 percent collection efficiency is achieved for as long as the wastes in the landfill will be a threat to produce landfill gas.

Prosser and Janechek (1995) in "Landfill Gas and Groundwater Contamination," have reviewed the potential for subsurface soil gas migration to cause groundwater pollution by hazardous chemicals. They point out that at some landfills appreciable groundwater pollution occurs as a result of inadequate control of landfill gas. This could be a particularly important issue at the Gregory Canyon Landfill because of the high groundwater table that exists in some parts of this area.

Another issue that was ignored in this Draft EIR associated with landfill gas generation is the potential for wildlife that would graze on the landfill cover to be exposed to hazardous chemicals. Based on US EPA (US EPA EIIP, 1997 "*Landfills*") studies, vinyl chloride is one of the most hazardous gaseous constituents in landfill gas emissions. Vinyl chloride is a known human carcinogen that is typically present in landfill gas at potentially significant concentrations. In many situations, the hazardous concentrations of vinyl chloride that occur at the surface of the landfill due to escape of the landfill gas through the cover that is not collected in the landfill gas collection system are often diluted to non-hazardous concentrations during their transport to off-site receptors (people). Wildlife grazing on the landfill cover will be exposed to much higher concentrations of vinyl chloride than those predicted by Dames & Moore to occur at the landfill property line. The potential significance of vinyl chloride emissions through the landfill cover in the estimated 10 percent of the landfill gas that will not be collected under optimum projected operating conditions for the landfill gas collection system, as well as the landfill gas that will escape through the cover as the landfill gas collection system deteriorates through inadequate funding/maintenance that exposes wildlife to high levels of carcinogens, should have been discussed in this Draft EIR.

Page 3-53, section 3.5.7 "Odor Control Measures," states,

> *"Odors from the refuse prism will be controlled by confining the active working face to as small an area as practical and by the application of daily or intermediate soil cover or approved AD cover placed over the refuse at the end of each operating day. In addition, a landfill gas control system will be installed to further control odors."*

This Draft EIR has provided unreliable and inadequate information on this issue. There are many landfill owners/operators who claim that by keeping a small working face and by applying daily cover, they are able to control odors yet those within a mile or so of the landfill often experience severe odor problems. The canyon setting of this landfill and the accompanying valley are almost certain to create off-site odor problems at considerable distances from the landfill. This Draft EIR is significantly deficient in addressing these issues.

Page 4.7-13, section 4.7.2.2 "Odor" states under section 4.7 "Air Quality and Air Toxics Health Risks,"

> *"Although odors are generally regarded as an annoyance rather than a hazard to health, not all odors should be considered as simply an annoyance. Manifestations of a person's reaction to foul odors can range from the psychological (i.e., irritation, anger, or a simple*

unease) to the physiological, including circulatory and respiratory effects, nausea, vomiting, and headache."

While, as indicated, obnoxious odors such as those associated with municipal solid waste landfill emissions are typically only considered to be a nuisance to those who are exposed to them, the facts are that landfill gas odors may be a tracer of other chemicals that represent potential health hazards to those who experience the odors. Further, Shusterman (1992) in "Critical Review: The Health Significance of Environmental Odor Pollution," has discussed how obnoxious odors such as those from municipal solid waste landfills can be significantly adverse to the health of those who experience the odors.

An owner/user of an adjacent property as well as those who use public roadways should be able to be present at the property line or on the roadway and not smell any landfill odors. Because of the undesirable setting for this landfill in which there are inadequate bufferlands between existing and potential residents and the proposed location of the waste management units, the owner/operator of this landfill should be put on notice that if odors from this landfill are detected at the property line more than twice in one year, that the landfill will have to be closed, all wastes removed, and the property restored to its original condition.

Page 3-35, section 3.4.5.2 "Intermediate Cover Placement" states under "Alternative Intermediate Cover,"

"Title 27, Section 20700 allows an operator to place alternative materials of alternative thickness for intermediate cover as approved by the LEA with the concurrence of the CIWMB."

The Draft EIR has not discussed the fact that the daily cover that is proposed to be used will not prevent the release of hazardous or deleterious materials from the landfill to the air which will be adverse to those within the sphere of influence to this landfill. This sphere of influence can extend several miles from the landfill in the form of obnoxious odors, hazardous chemicals, etc.

In summary, the Draft EIR's discussion of landfill gas emissions and their potential impact on public health, groundwater quality and the environment is significantly deficient where errors were made in estimating landfill gas generation rates over the time that the wastes in this landfill will be a threat to produce landfill gas. The conclusions that the landfill gas emissions will not be adverse to public health presented in this Draft EIR are not necessarily reliable. The lack of assured funding to ensure that the gas collection system will be operated and maintained to collect 90 percent of the gas generated within this landfill can readily lead to inadequate gas collection maintenance. Under these conditions uncontrolled releases of landfill gas can occur which will be a threat to public health, groundwater resources and the environment. This Draft EIR is significantly deficient in complying with CEQA requirements for full disclosure of the potential environmental impacts of landfill gas generation/emission at the proposed Gregory Canyon Landfill.

Page 3-52, section 3.5.5 "Vector and Bird Control Measures," states that the application of daily cover and refuse compaction will be effective in prevention of propagation of vectors (i.e., insects, rodents and birds) on the landfill site. Programs of the proposed type involving the application of daily cover and refuse compaction and other actions as described in the Draft EIR do not prevent bird and rodent problems. If properly implemented, they may reduce these problems to some extent. However there can be severe problems for those on adjacent and nearby properties to the landfill associated with trying to control vector and birds with this approach. This issue should have been discussed more realistically in this Draft EIR. It is well known in the landfill literature (See Lee and Jones-Lee, 1993b, "Environmental Impacts of Alternative Approaches for Municipal Solid Waste Management: An Overview," for a review of this topic.).

Further, provisions - such as requiring that odor/dust control, etc. be carried out with a high degree of reliability so that there is no trespass of dust, odors, etc. across the property line more than twice in one year, or the landfill is permanently shut down - would provide a stronger incentive for the owner/operator of the landfill to conduct the operations of this landfill in accord with regulations. This can be accomplished through site-specific evaluation of the magnitude of the bufferlands that are needed to dissipate all odors and dust that will be generated at the landfill site during the active life of the landfill and post-closure care period. These bufferlands would have to be acquired as part of developing the landfill.

Page 4.3-16 focuses on the methane generation associated with leachate. Methane generation relates to gas formation. Methane generation does not necessarily relate to leachate characteristics. While the processes that influence the formation of landfill gas do influence the composition of leachate, leachate characteristics are not necessarily related to methane gas formation since gas formation and waste leaching are different processes.

Surface Water Monitoring

Stormwater runoff from active as well as closed municipal solid waste landfills can contain a variety of hazardous and deleterious chemicals that are a threat to public health and the environment. This Draft EIR does not provide an adequate discussion of these issues.

Page 3-50, section 3.5.2.4 "Surface Water Monitoring," and 3.5.2.5 "National Pollutant Discharge Elimination System (NPDES) Stormwater Monitoring Program," present information on the monitoring system to be used for stormwater runoff from the site. If this system is similar to what is typically done at landfills, it will not be adequate to detect emissions of waste-derived constituents through the landfill cover. The surface water monitoring that should be undertaken at the proposed Gregory Canyon Landfill site has been discussed by Lee and Jones-Lee (1998c) in "Stormwater Runoff Water Quality Evaluation and Management Program for Hazardous Chemical Sites: Development Issues."

Page 4.3-15, section 4.3.3 "Potential Impacts," subsection 4.3.3.2 "Long-Term (Operational) Impacts" fails to mention the problems of break out of leachate through the sides of landfills of the proposed Gregory Canyon type where perched leachate will occur within the landfill and break out

through the sides of the landfill above ground. This is a significant long-term threat to surface water quality, especially under conditions where there is inadequate monitoring of the site as can readily occur when there is no long-term assurance of funding to monitor and maintain the landfill cover for as long as the waste in the landfill will be a threat.

Another mechanism for pollution of surface waters from the Gregory Canyon Landfill is through the underdrains. The Gregory Canyon Landfill, if proper construction is achieved, could likely not show any significant groundwater pollution during the 30-year minimum post-closure monitoring and maintenance period. With no assured monitoring and maintenance after that date there could readily be a situation developed where leachate breaks through a liner system in large quantities which, while somewhat polluting groundwaters, would become part of the underdrain waters. With no one monitoring the underdrains 50, 100, 200 or 500 years from now the landfill could readily cause surface water pollution.

Page 4.4-9, section 4.4.3.2 "Long-Term (Operational) Impacts," fails to mention the problem associated with the break-out of leachates through the sides of the landfill above the ground surface.

The issue of long-term impacts on surface water quality is not addressed pointedly or adequately in the Draft EIR. In the last paragraph of Page 4.4-10, in section 4.4.3.2 "Long-Term (Operational) Impacts," it states,

> *"To reduce the potential long-term impacts of the landfill and associated facilities on surface water quality, a number of drainage features would be in place to direct runoff away from the landfill working face and borrow/stockpile areas, to provide desiltation prior to runoff discharge into the San Luis Rey River, and to minimize erosion and sedimentation that could result from stormwater runoff. ... No significant erosion and sedimentation impacts would occur, associated with the operation of the landfill and associated facilities. In addition, no significant impacts to the beneficial uses of the San Luis Rey River would occur."*

There can also be pollution of surface waters through break-out of leachate due to perched leachate situations that develop within municipal solid waste landfills due to the plastic garbage bags effectively forming a liner within the waste which causes the leachate to exit the landfill through the sides of the landfill above the ground surface.

Another issue that needs to be addressed is the approach that will be used for as long as the wastes will be a threat to prevent significant pollution of surface waters by erosion of the cover associated with the intense rainfall events that occur in this region, where several inches of rain can occur in a 24-hour period. This type of rainfall event can cause deep fissures in the landfill cover that can lead to exposure of the wastes and the pollution of surface waters. This is another of the potential environmental impacts that will almost certainly occur over the long period of time that the waste in the proposed Gregory Canyon Landfill will remain a threat. This Draft EIR is significantly deficient in failing to discuss this issue.

Page 4.4-11 under section 4.4.3.2 "Long-Term (Operational) Impacts," the seventh paragraph states,

> *"The SWRCB requires Class III solid waste disposal facilities to obtain site-specific WDRs. These would be issued by the RWQCB, San Diego Region for the proposed project. The WDRs would reflect the proposed design and operational aspects of the landfill facility as well as include a Stormwater Monitoring Program and Reporting Requirements (MPRR) Plan."*

This Draft EIR should have discussed the significant deficiencies that exist today in implementing the MPRR plans for landfills throughout the state, where the monitoring that is done is superficial compared to the potential threat that is present in surface water runoff from the landfill to public health and the environment.

Page 4.4-13, section 4.4.4 "Mitigation Measures," under Proposition C, states,

> *"Section 5G of Proposition C contains the following mitigation measure relative to potential surface water impacts:*
> *MM 4.4.C5G: The project shall comply with all requirements of the Regional Water Quality Control Board to ensure protection of surface and underground water quality."*

A properly developed Draft EIR would discuss the adequacy of enforcement of regulations governing stormwater runoff by the Regional Board in ensuring protection of water quality at this site. This is a significant problem throughout the state that is known by those working in the field.

Page 4.4-8, under section 4.4.3.1 "Short-Term (Construction-Related) Impacts," discusses the compliance of the proposed landfill construction to current regulations. This discussion reflects a lack of understanding of the impacts of developing the Gregory Canyon Landfill at this site. I am familiar with stormwater runoff BMPs and have developed a report, "Stormwater Managers Beware of Snake-Oil BMPs for Water Quality Management," Jones-Lee and Lee (1998). BMPs for stormwater runoff water quality management represent a compilation of practices that have been used over the years which have been compiled in some type of BMP manual. Simply incorporating BMPs into a project does not mean that the problems associated with the stormwater runoff will, in fact, be properly controlled. A number of the BMPs that have been developed are based on not causing the project proponent to have to spend any significant amount of funds in controlling problems. Such an approach is contrary to public health, the environment and the interests of the public.

Protection of San Luis Rey Water District Groundwater Quality

At several locations in the Draft EIR discussions are presented on the special provisions being made to attempt to protect several of the water supply wells in the San Luis Rey Water District.

Page 3-25, the fourth paragraph briefly discusses the agreement that was executed by the proponents of the Gregory Canyon Landfill, San Luis Rey Municipal Water District (SLRMWD) and several landowners located downstream of the landfill project. It states,

> *"The purpose of the agreement is to ensure that the construction, operation, and closure of the Gregory Canyon Landfill project are carried out in a manner that will protect the Pala Basin of the San Luis Rey River and the quality of the water downgradient basin areas."* (sic)

There are key components of this agreement that will not likely be carried out in accord with the terms of the agreement for as long as the wastes represent a threat. In order to carry out the terms of providing the monitoring, maintenance and groundwater remediation for the thousands of years that the wastes may remain a threat, substantial funds need to be set aside in a dedicated trust to ensure that adequate funding needed for these activities will, in fact, be available when needed. While there is a small dedicated trust established as part of this agreement, the amount of the funds in this trust will likely be significantly deficient compared to what will ultimately be needed to stop the pollution of the Pala Basin groundwater and San Luis Rey River by the Gregory Canyon Landfill.

The Draft EIR should have discussed the adequacy of the funding arrangements in order to reliably inform decision-makers and the public on this issue. As it stands now, decision-makers and the public are being misled to believe that the funding arrangements developed in this agreement are adequate to protect the Pala Basin groundwater quality for as long as the waste in the proposed Gregory Canyon Landfill will be a threat.

Page 4.3-21, states under *Potential Contamination of Adjacent Groundwater Supplies,*

"GLA (1995) performed computer model simulations of groundwater flow for the Pala basin in the vicinity of the proposed landfill, estimated worst-case leakage from the landfill, and identified production wells (ones from which water is extracted) within the basin that could be impacted by a leachate release. The analysis assumed that the leachate containment systems incorporated in the project design meet the requirements for environmental protection mandated by U.S. and California EPAs."

Such an approach is unreliable and represents a significant distortion of readily available information on the potential impacts of the Gregory Canyon Landfill on the groundwater wells in the flow path of the Gregory Canyon groundwater that will be polluted by landfill leachate. First, to assume, as GLA did, that the leachate containment systems incorporated in the project design meet the requirements of environmental protection mandated by the US EPA and California EPA means that any leachate polluted groundwaters would be detected at the point of compliance for groundwater monitoring when it first reaches this point. Both the US EPA and California Water Resources Control Board have this requirement. Therefore, there can be no off-site pollution if it is assumed that these conditions are met. Rather than meeting the "groundwater protection mandated

by U.S. and California EPAs," what was apparently assumed in the GLA modeling was that the minimum landfill liner design was used. As discussed herein, it is obvious that the minimum landfill liner design will not comply with US EPA and WRCB groundwater protection requirements at the Gregory Canyon site for as long as the wastes in the landfill will be a threat.

Page 4.3-21 in the third paragraph, under *Potential Contamination of Adjacent Groundwater Supplies*, states that GLA assumed a worst-case leakage rate through the liner of 10 gallons per acre per day. Ten gallons per acre per day is a low rate of leakage compared to what will almost certainly occur as the plastic sheeting layer in the cover and in the liner deteriorate.

Page 4.3-24, the fourth paragraph discusses the number of pounds per day of various constituents occurring under the so-called "worst-case" leakage scenario of 10gal/acre/day. This worst-case leakage scenario is not worst-case. It is actually far from it and comes closest to an optimistic best-case leakage rate.

Since what was assumed by GLA in the modeling was some arbitrary, but nominal, leakage rate, such as the one discussed above, that would apply over the thousands of years that this landfill will be a threat, then this so-called worst-case evaluation of the potential impacts on the groundwater wells in the Gregory Canyon groundwater flow path has no reliability for the real world conditions that will exist. Basically, the GLA (1995) so-called worst-case model simulation is unreliable in predicting the groundwater pollution that will occur by the Gregory Canyon Landfill over the period of time that the wastes in the landfill will be a threat. Rather than worst-case, GLA has assumed optimistically low conditions for the rate of leakage through the liner over the period of time when the wastes in the landfill will be a threat.

This Draft EIR misleads the readers in believing that the leakage rate that could occur when the liner is new would be applicable throughout the period of time that the wastes in the landfill would be a threat. The San Luis Rey Municipal Water District, decision-makers and the public have been provided with unreliable information that does not properly assess the potential for this landfill to eventually pollute the groundwater resources of the Water District.

Page 4.3-31, Section MM4.3-1b discusses the proposed program for groundwater remediation. It states,

> *"If contamination is detected in any monitored well, the landfill operator shall be responsible for treatment and disposal of contaminated water. The landfill operator shall ensure that impacted water is treated to acceptable drinking water standards as provided in CCR Title 27. Adequate treatment shall be implemented to maintain background levels established by the RWQCB at the time of issuance of the waste discharge requirements."*

No mention is made, however, of the source of the large amounts of funds well beyond the trust fund established in the Agreement with the San Luis Rey Municipal Water District that will be used to implement this remediation program in year 31, or 50 or 100 or 200 or 500 years from now. There

is no evidence that the landfill owner or operator will establish a dedicated trust of sufficient magnitude to ensure that funds will always be available to maintain this landfill, to monitor the groundwaters, and to eventually remediate the polluted groundwaters when the liner systems and the groundwater monitoring fail to prevent groundwater pollution and detect it before off-site pollution occurs. The Water District and the people who use that water will want high quality groundwater for their domestic water supply. There is no assurance that adequate funds will be available to carry out this Agreement for as long as the wastes represent a threat. Basically, the Agreement fails to protect groundwater quality for as long as the wastes in the landfill will be a threat.

Page 4.3-29 discusses some of the characteristics of the Agreement between the proponents of the Gregory Canyon Landfill and the San Luis Rey Municipal Water District. An issue that is not addressed, which should be addressed in a credible discussion of this agreement, is the ability to enforce the Agreement over the period of time that the wastes are a threat. Where will the money to implement the groundwater remediation, such as reverse osmosis, etc., beyond the limited trust fund required by the Agreement, come from when the landfill liner system is deteriorated and the underdrains have now become plugged, and widespread groundwater pollution occurs? This issue should have been discussed in this Draft EIR.

Worst Case Analysis

Page 1-7, under section1.6 "Definitions," states as the eighth bulleted item,

- *"**Worst Case Analysis**: The basis for the environmental analysis presented in the Draft EIR."*

Contrary to this statement, this Draft EIR does not incorporate a readily plausible worst case analysis. It presents an overly optimistic, unreliable assessment of the ability of the proposed landfill liner system and groundwater monitoring systems to prevent groundwater pollution and to detect it once the liner systems have failed. In my comments on the 1990 Draft EIR/EIS for the proposed Gregory Canyon Landfill, I stressed the importance of conducting a plausible worst case based environmental assessment as part of preparing a credible EIR/EIS for this landfill. The 1999 Draft EIR for the proposed Gregory Canyon Landfill ignores my recommendations and has created yet another noncertifiable EIR for this proposed landfill project.

Protection Provided by Compliance with Regulatory Requirements

The fourth bulleted item on page 2-8, section 2.3 states,

- *"Minimize potential impacts of solid waste disposal facilities upon adjoining land uses."*

This landfill is not designed, and will not likely be operated in a public health, groundwater resource, and environmentally protective-safe manner because of the inadequate bufferlands and the inappropriate geological characteristics of the site. Significant environmental pollution will occur if this project is allowed to proceed as proposed. It will not be possible, with the current landfill

design, to fully comply with all environmental laws and regulations because of the inevitable failure of the liner system to prevent groundwater pollution by landfill leachate. These issues have not been discussed in this Draft EIR. Therefore, this Draft EIR should not be certified as complying with the full disclosure requirements of CEQA.

Page 3-70, Table 3-6 presents a summary of the permits that this landfill will have to obtain. Someone who is not familiar with this issue might conclude that these permits should result in high degrees of protection. This is not the case. They provide minimum standards which are not appropriate for sites such as the Gregory Canyon site.

Page 4.3-30, under 4.3.4 "Mitigation Measures and Projected Design Features," Proposition C states,

> *"Section 5E and 5G of Proposition C contain the following mitigation measures relative to potential groundwater impacts:*
> *MM 4.3.C5E - A liner and leachate collection system shall be installed and monitored as required by the Regional Water Quality Control Board.*
> *MM 4.3.C5G - The project shall comply with all requirements of the Regional Water Quality Control Board to ensure protection of surface and underground water quality."*

Neither of these mitigation measures will prevent pollution of groundwaters at the Gregory Canyon Landfill site. Meeting Regional Water Quality Control Board requirements, as have been implemented in the past, does not ensure that groundwater quality protection will occur. As discussed herein, in order to evaluate the reliability of the Regional Boards implementing groundwater quality protection requirements set forth in the regulations is to examine the track records of the Regional Water Quality Control Boards with respect to implementing Chapter 15 from 1984, when Chapter 15 was first adopted, through 1993, when the State of California Water Resources Control Board was forced by the US EPA, through Subtitle D, to upgrade the liner requirements from one foot of 10^{-6} cm/sec of compacted soil to a minimum single composite liner specified in Subtitle D. One foot of clay compacted to 10^{-6} cm/sec will leak in a few months and, therefore, fail to prevent groundwater pollution. This is a simple Darcy's law calculation.

The mitigation measures MM 4.3.C5E and MM 4.3.C5G are not adequate or reliable mitigation measures for protecting groundwaters from pollution by landfill leachate for as long as the wastes in the landfill will be a threat. There is no indication that the landfill owner/operator understands the period of time that the wastes will be a threat; and there is certainly no indication of provisions to ensure that funding will be available to address the expected situations that will occur, much less even plausible worst-case situations that could occur at this site.

Page 4.3-31, under "Impact 4.3-1," states,

"Although a liner, LCRS, and water quality monitoring program are incorporated into the project design, the potential release of leachate from the landfill could result in impacts to groundwater quality."

The mitigation measures for this "Impact" have no meaning unless a dedicated trust of sufficient magnitude is established and maintained for as long as the wastes in the landfill remain a threat to water quality to ensure that funds will be available to monitor and maintain the site and to eventually remediate the polluted groundwaters that will occur associated with this landfill.

Page 4.3-33, section 4.3.5 "Level of Significance After Mitigation," states,

"Implementation of the specific design features proposed for the landfill (e.g., liner, LCRS, groundwater monitoring, etc.) as well as the mitigation measures identified above, will reduce potential impacts to groundwater resources resulting from project implementation to an insignificant level."

This statement ignores the vast body of literature which documents the fact that the mitigation measures set forth will not protect groundwater resources from pollution by landfill leachate from the proposed Gregory Canyon Landfill for as long as the wastes in that landfill will be a threat. This Draft EIR has ignored the serious pollution that can occur even with compliance with current minimum regulatory requirements for a site such as Gregory Canyon as implemented by regional water quality control boards, and the importance of securing long-term funding for remediation. This EIR fails to provide full disclosure in accord with CEQA requirements so that decision-makers and the public understand that in permitting this landfill that they are creating a landfill that will be significantly adverse to those within the sphere of influence of the landfill through releases of hazardous and deleterious constituents, the most important of which are the pollution of groundwaters in the area downgradient from the landfill.

Assured Post Closure Funding

Current Title 27, Chapter 15 requirements specify that the owner/operator of a landfill provide funding for monitoring and maintenance of a landfill for as long as the wastes in the landfill will be a threat. Since the waste in the proposed Gregory Canyon "dry-tomb" type landfill will be a threat to cause groundwater pollution for long periods of time, likely on the order of thousands of years, the owner/operator of the Gregory Canyon Landfill will be required to provide the necessary funding to comply with this regulatory requirement over this period of time. However, a critical review of the Draft EIR shows that there is no funding mechanism established to provide this level and duration of funding.

In order to properly implement the operations of this landfill, the owner/operator of the landfill should, as part of disposal fees, collect sufficient additional funds to develop a dedicated trust of sufficient magnitude to address all plausible worst-case failure scenarios including waste exhumation that could occur while the wastes in this landfill represent a threat.

Chapter 3.0, Project Description. Page 3-5, under section 3.2 "Project Components," states in the first sentence,

> *"The Gregory Canyon Landfill Project includes the construction, operation, and closure of the landfill."*

The most important component of this project is omitted in this discussion, namely post closure monitoring and maintenance. Closure of the landfill means the development of a cap covering the wastes. A separate and extremely important component of groundwater quality protection is the post closure monitoring and maintenance of the project.

Page 3-61, section 3.7 "Site Closure," states that it will be in accord with US EPA and State of California requirements. There is no discussion, however, about the well-known fact that, as currently being implemented, these requirements do not ensure that funds will be available to maintain and monitor the closed landfill system for as long as the wastes represent a threat. This issue should have been discussed, since it is a key component of long-term public health and environmental protection.

Page 3-67, section 3.7.2 "Closure/Post Closure Financial Assurance," states that the proposed Gregory Canyon Landfill owner will comply with the regulatory requirements for providing post closure financial assurance. No information is provided on the well recognized deficiencies of current regulatory requirements in providing assured funding for post closure monitoring, maintenance and the eventual polluted groundwater remediation for as long as the wastes in the landfill are a threat.

The current regulations only require minimum limited funding for 30 years after the closure of the landfill. The wastes in the landfill will be a threat to cause environmental pollution for thousands of years. There is no funding assured, especially for private landfills such as the proposed Gregory Canyon Landfill, to provide post closure monitoring, maintenance and eventual groundwater remediation for the period of time that the wastes will be a threat. In addition, the approach that is followed by landfill applicants for funding during the 30-year minimum post closure funding period is typically less than that required to adequately maintain the landfill cover to keep moisture out of the landfill and, thereby, prevent significant leachate generation.

As discussed by Hickman, (1992 "Financial Assurance-Will the Check Bounce?"; 1995 "Ticking Time Bombs?"; 1997 "No Guarantee"), the former Executive Director of the Solid Waste Association of North America, the General Accounting Office of the United States Congress (GAO 1990 "Hazardous Waste - Funding of Postclosure Liabilities Remains Uncertain") and in the enclosed reports (Lee and Jones-Lee, 1992 "Municipal Landfill Post-Closure Care Funding: The 30-Year Post-Closure Care Myth;" 1993a "Landfill Post-Closure Care: Can Owners Guarantee the Money Will Be There?; 1994c "Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability"), there are significant concerns about the long-term financial assurance for monitoring, maintenance and remediation of landfilled wastes. Those familiar with the current financial

problems of garbage companies know that the financial stability of many companies is questionable and certainly cannot be relied on to meet regulatory requirements of providing adequate post closure funding throughout the period that the wastes are a threat.

This issue should have been discussed in the Draft EIR. It is well-known in the literature. The people of San Diego County should be aware that ultimately they will likely have to pay for the cost for this private landfill post closure monitoring and maintenance since the proposed design and the site have such undesirable characteristics. The ultimate costs for disposal of wastes at this site will certainly be on the order of many tens of millions of dollars that will have to be spent in remediating the polluted groundwaters that will occur there.

Citizen Oversight

Page 3-39, section 3.5 "Environmental Monitoring and Control Systems," begins a discussion of the various approaches that are proposed to control the emissions from the landfill. A discussion of the deficiencies in the various environmental controls is summarized herein, and additional information on these issues is provided in the supporting documents and references contained therein.

In the middle of page 3-39 it states,

"In addition, Proposition C creates a mechanism for ongoing environmental review by the public, which will be established at the appropriate time. Section 5Q of the Proposition requires that the applicant establish a Citizen Environmental Review Board, which in turn establishes an environmental review team consisting of qualified personnel to monitor the operations of the landfill."

In order for this approach to be effective, it is necessary that the independent public review be provided with sufficient funds derived from the landfill owner/operator to hire qualified consultants that can conduct their own independent sampling and analysis of the landfill operations during its active life and the extended post closure care period.

Compliance With CEQA

Chapter 4.0, Environmental Analysis. The introduction to Chapter 4 states,

"Chapter 4 describes the existing environmental conditions on the subject property and the surrounding area and identifies potential impacts or consequences that may result from implementation of the proposed project."

As documented herein, for many of the key issues, the environmental analysis presented in the Draft EIR Chapter 4 is superficial and in some areas grossly deficient. The Draft EIR falls far short of providing the full disclosure required by CEQA for a proposed project. Of particular concern is the long-term consequences associated with the inadequate design of the landfill containment and monitoring system relative to the significant deficiencies in the Gregory Canyon Landfill site.

Page 7-1, Chapter 7.0 "Significant Irreversible Environmental Impacts" fails to discuss the fact that the groundwater pollution that will occur from the proposed Gregory Canyon Landfill will be an irreversible impact on groundwater resources polluted by landfill leachate. Once leachate pollution of groundwaters occurs, there is no possibility of ever using that part of the aquifer again for domestic and many other water supply purposes. This should have been discussed in this Draft EIR.

Comments on Executive Summary

The Executive Summary of the Draft EIR presents a number of conclusions on issues pertinent to evaluating the potential environmental impact of the proposed Gregory Canyon Landfill. The comments presented herein on the unreliable information in the Executive Summary for this Draft EIR summarize key issues pertinent to reliably informing decision-makers and the public about the potential public health, groundwater and environmental hazards associated with the development of the proposed Gregory Canyon Landfill. Additional information on many of the issues has been discussed in these comments, as well as in the attached papers and reports that provide supplemental information on these issues.

In the first paragraph of page ES-3 the statement is made that this landfill project is needed to stop the trucking of solid waste generated in north San Diego County to other areas. However, there can readily be regions of an area where there is no suitable landfill location for minimum Subtitle D landfills of the type that is proposed for construction at the Gregory Canyon site.

Page ES-3 describes the proposed Gregory Canyon Landfill as a 196-acre-footprint, one million ton per year Class III landfill. Page ES-4, in the second paragraph of section ES 3.2 "Project Description", states,

> *"The proposed bottom liner system provides a five foot separation between the highest anticipated groundwater level and the refuse based on the following components: 1) a two-foot thick soil liner, 2) a one-foot thick leachate collection and removal system (LCRS), and 3) a two-foot thick protective layer. The leachate collection and removal system, leachate storage tank, and drainage system will also be constructed during the initial liner construction phase. The waste containment system will be constructed in stages as needed to provide continuous refuse disposal capacity through the landfill's projected service life."*

There are several problems with this discussion of achieving the mandated five-foot separation between the groundwater table and the bottom of the waste, which should have been discussed in the Draft EIR. These include that the two-foot thick protective layer above the leachate collection and removal system will not prevent waste components from migrating into this layer.

Further, as discussed herein, the approach of constructing an underdrain to artificially lower the groundwater table assumes that this underdrain system will work to prevent groundwater buildup under the landfill, for as long as the wastes in the landfill will be a threat. The wastes in this landfill will be a threat to cause environmental pollution for long periods of time. Underdrain systems which

cannot be inspected and cleaned, such as the proposed underdrain for the Gregory Canyon Landfill, cannot be expected to function perfectly for as long as the wastes in the landfill will be a threat. There can readily be plugging problems which would allow groundwaters to rise within the landfill, thereby violating one of the fundamental requirements of current regulations, i.e., the five-foot separation. A full-disclosure EIR would have discussed these issues. This Draft EIR cannot be certified based on the inadequate, unreliable discussion of the groundwater/waste five-foot separation issue.

Page ES-5, fourth paragraph, states,

> *"Although hazardous materials will not be collected at the site, a hazardous materials storage area will be maintained for use if such materials are found in the refuse during operations."*

This is another of the paragraphs in this Draft EIR which can mislead the reader into believing that the wastes that will be deposited in the Gregory Canyon Landfill will not be hazardous to public health and/or the environment. There is no regulatory prohibition against the deposition of hazardous materials in a municipal landfill. There is a prohibition against the deposition of "hazardous waste" in a municipal landfill. However, hazardous wastes are narrowly defined by federal and state regulations to be certain types of hazardous materials and exclude the large amounts of hazardous chemicals that are present in municipal solid wastes. There will be substantial amounts of hazardous chemicals legally deposited in this landfill and these chemicals will be a significant threat to groundwater quality, public health, and the environment.

Page ES-6, third paragraph, discusses the "Agreement" that was executed between the proponents of the Gregory Canyon Landfill and several other parties. It states in this paragraph,

> *"The purpose of the agreement is to ensure that the construction, operation, and closure of the Gregory Canyon Landfill project are carried out in a manner that will help protect the Pala Basin of the San Luis Rey River and the quality of the water in the Pala Basin."*

This Agreement is based on fundamentally flawed premises that this proposed landfill can be designed, operated, maintained, closed and provided with post closure care so that there will be no pollution of the Pala Basin by leachate derived from the landfill.

Further, while the Agreement contains provisions for "treating" any leachate-polluted groundwaters that enter certain water supply wells, the degree of treatment proposed including reverse osmosis may not render the leachate polluted water adequately treated so that it can be used for domestic or other purposes, including discharge to surface waters. While dedicated trust funds are part of the agreement, the amount of funding available from this trust and the assurance that the funds will be available for as long as the wastes will be a threat are issues that need to be discussed in this Draft EIR.

If this landfill is constructed as proposed now, there will be pollution of the groundwater resources in the Pala Basin. Rather than misleading decision-makers and the public that this agreement will be protective of the Pala Basin groundwater resources and the San Luis Rey River water quality, the Draft EIR should have critically examined the deficiencies of this agreement, so that the decision-makers and the public are aware of them.

Page ES-6, under section ES4 "Areas of Controversy and Issues to be Resolved," the second bulleted item mentions the concern about the potential for this proposed landfill to affect groundwater resources. The Draft EIR asserts that the composite liner, which is stated to meet federal and state regulations, together with the subdrain, the leachate collection and removal system, and groundwater monitoring system will protect groundwaters. However, as discussed herein and in the attached supporting documents, that assertion is a unreliable assessment of what the actual situation will become at the Gregory Canyon Landfill with respect to groundwater pollution. Using a minimum proscriptive design for the landfill liner system at the Gregory Canyon site ignores what is well-known in the literature, that this minimum design will not be protective of groundwater resources for as long as the wastes represent a threat at a Gregory Canyon Landfill-type site.

Page ES-9, under section 4.2 "Geology and Soils," Impact 4.2-1 states: "*During construction, the liner system of the landfill could be susceptible to sliding failures.*" but also indicates that this will not be a problem. However, there have been a number of problems of this type at various landfills where pre-construction/operation of the landfill liner system documents stated that this would not be a problem, yet significant problems occurred. The fact is that, at this time, it is not possible to fully understand and prepare for potential problems of this type.

Impact 4.2-3 (page ES-10) discusses the settlement of the landfill as it might affect the runoff from the landfill, gas collection system reliability, etc. The mitigation measure 4.2-3 states that quarterly inspections will be performed and repairs will be implemented. The issue that is not addressed is for how long. The wastes in this landfill will be a threat for thousands of years. Will the landfill applicant, or the County, or some other entity develop a dedicated trust fund of sufficient magnitude to ensure that any settlement problems in the landfill will be addressed for as long as the wastes are a threat? Without this type of funding there is no assurance that the mitigation measures can and will, in fact, be carried out as discussed. This issue should have been discussed in this Draft EIR. It is a fundamental issue to providing reliable post closure maintenance for this landfill.

Page ES-11, 4.3 "Hydrogeology," states as Proposition C mitigation measures,

"MM 4.3.C5E A liner and leachate collection system shall be installed and monitored as required by the Regional Water Quality Control Board."

"MM 4.3.C5G The project shall comply with all requirements of the Regional Water Quality Control Board to ensure protection of surface and underground water quality."

The San Diego Regional Water Quality Control Board, like other regional water quality control boards, will likely continue to follow a policy issued by the State Water Resources Control Board staff. This policy, which was not publicly reviewed by the Board, assumes, without technical justification, that meeting minimum Subtitle D landfill liner design as is proposed for the Gregory Canyon Landfill, will be protective of groundwater resources, public health and the environment for as long as the waste in the landfill will be a threat. An elementary understanding of the characteristics of the waste, the landfill liner components, groundwater monitoring, etc., shows that this policy was adopted as a political policy which ignores the well-established facts in the professional literature that the wastes will be a threat that extends over thousands of years, that landfill liner systems have a limited, finite period of time when they can be expected to be effective in collecting leachate and preventing groundwater pollution, and that the groundwater monitoring systems are unreliable in detecting groundwater pollution by landfill leachate at the point of compliance for groundwater monitoring before widespread off-site groundwater pollution occurs.

These issues are discussed further in these comments, as well as in the attached papers and reports. The basic issue that should have been discussed in this Draft EIR is that meeting minimum San Diego Regional Water Quality Control Board requirements does not necessarily provide for groundwater quality protection. At best, with high quality construction, it only postpones, for a relatively short period of time, when groundwater pollution will occur by the Gregory Canyon Landfill, compared to the period of time that the wastes in this landfill will be a threat.

The EIR mitigation measures for Impact 4.3-1 state that additional groundwater monitoring will be conducted on the San Luis Rey Water District production wells #34, #41, and #42, as well as an upgradient well. Further, it states that if contamination of these wells is detected that the landfill operator shall be responsible for treatment and disposal of contaminated water, that this treatment is to acceptable drinking water standards, and the landfill operator will provide financial assurance for such treatment and disposal. This type of mitigation measure is not adequate from several perspectives. First and foremost, the landfill owner will not necessarily be able to provide financial assurance that these mitigation measures will be carried out for as long as the wastes in this landfill are a threat. The wastes are a threat for a long period of time. Will the landfill owner exist as a viable financial source, and be able to provide these types of mitigation over the period of time that the wastes are a threat? It is unlikely that this is going to be the case, since private garbage companies are developing massive liabilities associated with constructing landfills that almost certainly will fail and eventually become “Superfund” sites throughout California and the rest of the country.

Another aspect of this situation that must be understood is that treating leachate-polluted groundwaters to meet drinking water standards, as called for in MM 4.3-1b, does not ensure that if these treated leachate-polluted groundwaters are discharged to surface waters that they will not be adverse to fish, aquatic life and terrestrial life. Those familiar with the potential impacts of chemical constituents on public health and the environment know that many of the constituents in leachate are

adverse to aquatic and terrestrial life at much lower concentrations than they are to humans who use the water for domestic purposes.

Page ES-14, 4.4 "Surface Hydrology" states under Proposition C, MM 4.4.C5G,

"The project shall comply with all requirements of the Regional Water Quality Control Board to ensure protection of surface and underground water quality."

This is a superficial approach that passes responsibility for pro-active, preventive, and re-active response approaches on to the Regional Board. Regional Water Quality Control Boards are not provided adequate funding to attend to such detail and reliably carry out such responsibilities. Unfortunately, Regional Water Quality Control Boards typically are limited to acting only after damage to groundwater quality has already occurred. The likely leakage of leachate from this landfill should have been discussed in a full-disclosure Draft EIR, so that the decision-makers and the public could reliably evaluate the public health and environmental impacts of the proposed Gregory Canyon Landfill.

Page ES-16, under MM 4.6-1c states,

"Construction, if within 1,500 feet of existing residential areas, shall be limited to between the hours of 7 a.m. and 7 p.m..."

It is documented in the literature (see Lee and Jones-Lee, 1993b "Environmental Impacts of Alternative Approaches for Municipal Solid Waste Management: An Overview") and obvious to anyone who has done work around or lives near today's landfills, that no less than one mile of bufferland owned by the landfill owner/operator should exist between any area where wastes are deposited and adjacent properties. In canyon and narrow valley situations, that distance may have to be extended to several miles in order to avoid the adverse impacts of releases from the landfill during its active life and post closure period.

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Exhibit A
Excerpts from Combined SWRCB/CIWMB Regulations Division 2, Title 27

'20080. SWRCB - General Requirements. (C15: §2510)

(a) **Scope** The regulations in this subdivision that are promulgated by the State Water Resources Control Board (**SWRCB**) pertain to water quality aspects of discharges of solid waste to land for treatment, storage, or disposal. The SWRCB-promulgated regulations in this subdivision establish waste and site classifications and waste management requirements for solid waste treatment, storage, or disposal in landfills, surface impoundments, waste piles, and land treatment units. Requirements in the SWRCB-promulgated portions of this subdivision:

(1) **Minimum standards—**are minimum standards for proper management of each waste category. Regional boards may impose more stringent requirements to accommodate regional and site specific conditions;

'20260. SWRCB - Class III: Landfills for Nonhazardous Solid Waste. (C15: §2533)

(a) **General** Class III landfills shall be located where site characteristics provide adequate separation between nonhazardous solid waste and waters of the state.

(b) **Geologic Setting.**

(1) MSW landfills are subject to the SWRCB-promulgated waste containment requirements of this subdivision and of SWRCB Resolution No. 93-62. New Class III and existing Class II-2 landfills shall be sited where soil characteristics, distance from waste to ground water, and other factors will ensure no impairment of beneficial uses of surface water or of ground water beneath or adjacent to the landfill.

Article 4. SWRCB - Waste Management Unit Construction Standards

'20310. SWRCB - General Construction Criteria. (C15: §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.

'20330. SWRCB - Liners. (C15: §2542)

(a) **Performance Standard —** Liners shall be designed and constructed to contain the fluid, including landfill gas, waste, and leachate, as required by Article 3 of this subchapter (§20240 et seq., and §20310).

(b) **Clay Liners** Clay liners for a Class II Unit shall be a minimum of 2 feet thick and shall be installed at a relative compaction of at least 90 percent. For a Class III landfill, a clay liner, if required, shall be a minimum of 1 foot thick and shall be installed at a relative compaction of at least 90 percent. For MSW landfills subject to the liner requirements in the federal MSW regulations of 40CFR258, after the Federal Deadline for liners at that Unit, the requirements of this paragraph are

superseded by those of SWRCB Resolution No. 93-62 for all portions of the Unit outside the Existing Footprint.

(c) **FMLs** Flexible membrane liners ("**FMLs**," or synthetic liners) shall have a minimum thickness of 40 mils (i.e., 0.040"). For an MSW landfill subject to the liner requirements in the federal MSW regulations (40CFR258), after the Federal Deadline for liners at that Unit, the requirements of this paragraph are superseded by those of SWRCB Resolution No. 93-62 for all portions of the Unit outside the Existing Footprint.

Subchapter 3. Water Monitoring

Article 1. SWRCB - Water Quality Monitoring and Response Programs for Solid Waste Management Units

'20415. SWRCB - **General Water Quality Monitoring and System Requirements**. [C15: §2550.7 // T15: §17783.5(d)]

(b) **Ground Water Monitoring System.**

(1) **General** Except as provided under &(e)(3), the discharger shall establish a ground water monitoring system for each Unit. This ground water monitoring system shall include:

(A) **For All Programs** for all monitoring and response programs, a sufficient number of Background Monitoring Points (as defined in §20164) installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that represent the quality of ground water that has not been affected by a release from the Unit;

(B) **For DMP** for a detection monitoring program under §20420:

1. a sufficient number of Monitoring Points (as defined in §20164) installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that represent the quality of ground water passing the Point of Compliance and to allow for the detection of a release from the Unit;

2. a sufficient number of Monitoring Points installed at additional locations and depths to yield ground water samples from the uppermost aquifer to provide the best assurance of the earliest possible detection of a release from the Unit;

3. a sufficient number of Monitoring Points and Background Monitoring Points installed at appropriate locations and depths to yield ground water samples from portions of the zone of saturation, including other aquifers, not monitored pursuant to &(b)(1)(B)1. and &(b)(1)(B)2., to provide the best assurance of the earliest possible detection of a release from the Unit;

1. **Closure** for landfills and for waste piles and surface impoundments closed as landfills, the goal of closure, including but not limited to the installation of a final cover, is to minimize the infiltration of water into the waste, thereby minimizing the production of leachate and gas. For such Units, after closure, the final cover constitutes the Unit's principal waste containment feature; and

2. **Post closure Maintenance** the goal of post closure maintenance at such Units is to assure that the Unit continues to comply with the performance standard of &(a)(2)(A)1. until such time as the waste in the Unit no longer constitutes a potential threat to water quality;

Subchapter 5. Closure and Post Closure Maintenance
Article 1. General Standards For All Waste Management Units

'20950. SWRCB - General Closure and Post Closure Maintenance Standards Applicable to Waste Management Units (Units) for Solid Waste. (C15: §2580)

[Note: For landfills, see also §21790 et seq.]

(a) **General.**

(1) **Applicability —**

Classified Units shall be closed according to an approved closure and post closure maintenance plan which provides for continued compliance with the applicable SWRCB-promulgated standards for waste containment and precipitation and drainage controls in Article 4, Subchapter 2, Chapter 3 of this subdivision (§20310 et seq.), and the monitoring program requirements in Article 5, Subchapter 2, Chapter 3 of this subdivision (§20380 et seq.), throughout the closure period and the post closure maintenance period. Relative to the applicable SWRCB-promulgated requirements of this title, the post closure maintenance period shall extend as long as the wastes pose a threat to water quality; for Units concurrently regulated by the RWQCB and by other state agencies (including the agents of such agencies), the RWQCB's finding that the waste in the Unit no longer poses a threat to water quality shall release the discharger only from the need to comply with the SWRCB-promulgated portions of this title, for that Unit.

Exhibit B
SUMMARY BIOGRAPHICAL INFORMATION

NAME: G. Fred Lee

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DATE & PLACE OF BIRTH:
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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

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, 197

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.

Exhibit C
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 (http://members.aol.com/gfredlee/gfl.htm). 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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Lee, G.F. and Jones-Lee, A., "Subtitle D Municipal Landfills vs. Classical Sanitary Landfills: Are Subtitle D Landfills a Real Improvement?" Report of G. Fred Lee & Associates, El Macero, CA, 5pp, May (1996).

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Groundwater Pollution by Leachate

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

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Hazardous Waste Landfills

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Lee, G.F. and Jones-Lee, A., "Evaluation of Surface Water Quality Impacts of Hazardous Chemicals," *Remediation*, 9:87-118, 1999) (1999).

Lee, G. F., "Review of the Adequacy of the BFI/CECOS Aber Road Hazardous Waste Landfill Facility Closure and Post-closure Plans to Protect Public Health and the Environment ," Report to Clermont County Board of Commissioners by G. Fred Lee & Associates, El Macero, CA, January (1999).

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

http://www.gfredlee.com

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

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Exhibit E
List of Enclosures

Summary Information on Drs. G. Fred Lee and Anne Jones-Lee

Water Quality and Solid & Hazardous Waste Landfills Evaluation and Management Drs. G. Fred Lee and Anne Jones-Lee's Web Site Announcement

Municipal Solid Waste Landfills and Groundwater Quality Protection Issues Publications by Drs. G. Fred Lee and Anne Jones-Lee

"Assessing the Potential of Minimum Subtitle D Lined Landfills to Pollute: Alternative Landfilling Approaches"

"Municipal Solid Waste Management in Lined, 'Dry Tomb' Landfills: A Technologically Flawed Approach for Protection of Groundwater Quality"

"Geosynthetic Liner Systems for Municipal Solid Waste Landfills: An Inadequate Technology for Protection of Groundwater Quality?"

"Detection of the Failure of Landfill Liner Systems"

"Questions that Regulatory Agencies Staff, Boards and Landfill Applicants and Their Consultants Should Answer About a Proposed Subtitle D Landfill or Landfill Expansion"

"Deficiencies in Subtitle D Landfill Liner Failure and Groundwater Pollution Monitoring"

"A Groundwater Protection Strategy for Lined Landfills"

"Environmental Impacts of Alternative Approaches for Municipal Solid Waste Management: An Overview"

"Dry Tomb Landfills"

"Groundwater Pollution by Municipal Landfills: Leachate Composition, Detection and Water Quality Significance"

"Landfill Leachate Management"

"Landfill Post-Closure Care: Can Owners Guarantee the Money Will Be There?"

"Landfilling of Solid & Hazardous Waste: Facing Long-Term Liability"

"Municipal Landfill Post-Closure Care Funding: The '30-Year Post-Closure Care' Myth"

"Overview of Landfill Post Closure Issues"

"Stormwater Runoff Water Quality Evaluation and Management Program for Hazardous Chemical Sites: Development Issues"

"Environmental Ethics: The Whole Truth"

Copies are available from Dr. Lee's web site: http://www.gfredlee.com