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March 3, 2004

Comments on Water Quality Aspects of Draft EIR for the Proposed New South Coast County Golf Course

Dated September 2003

Mr. Larry Hensley, Chief of Planning
County of Los Angeles
Department of Parks and Recreation
433 S. Vermont Ave.
Los Angeles, CA 90020

Dear Mr. Hensley:

South Bay CARES has requested that I review the adequacy of the Draft EIR for the development of the Proposed New South Coast County Golf Course on the existing Palos Verdes Landfill in conforming to the CEQA requirement of full disclosure of the potential water quality impacts of this proposed project. I have reviewed the pertinent sections of the Draft EIR discussing the approach that will be used to control releases of hazardous and detrimental chemicals from the Palos Verdes Landfill when the proposed New South Coast County Golf Course is developed on the landfill. **I find that this Draft EIR is significantly deficient in adequately and reliably discussing the potential water quality impacts of this proposed project.**

Overall Deficiency

This draft EIR misleads the public, the Los Angeles County Board of Supervisors, and other decision-makers into believing that it is readily possible to develop the proposed golf course on the Palos Verde municipal/hazardous waste landfill, a landfill which is already under California Department of Toxic Substances Control remediation orders to control hazardous chemical releases. The proposed golf course with the proposed "upgraded" landfill cover will cause increased releases of hazardous chemicals to the groundwater and increased landfill gas emissions from the landfill. Further, the use of pesticide and fertilizer chemicals on the golf course will lead to increased pollution of stormwater runoff from the landfill area. A certifiable EIR must discuss these issues reliably so that decision-makers and public have the opportunity to understand the potential environmental impacts of this proposed project.

CEQA Requirements for Full Disclosure of Potential Environmental Impacts

The draft EIR in Chapter 1 Introduction section 1.1 DRAFT EIR PURPOSE states,

> *"The purpose of a Draft EIR is to serve as an informational document that will generally inform public agency decision makers and the public of the significant environmental effects of a proposed project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the proposed project."*

As documented below this draft EIR fails to fulfill this purpose.

Title 14, California Code of Regulations, Chapter 3. "Guidelines for Implementation of California Environmental Quality Act," Article 10. "Considerations in Preparing and Negative Declarations," Section 15143. "Emphasis" states,

> *"The EIR shall focus on the significant effects on the environment. The significant effects should be discussed with emphasis in proportion to their severity and probability of occurrence."*

The inevitable increased pollution of groundwaters by this proposed landfill/golf course project will increase the threat to public health that already exists at this site.

Section 15151. "Standards for Adequacy of an EIR," states,

> *"An EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure."*

The failure of this draft EIR to discuss the inevitable failure of the cover liner system to prevent increased infiltration of water into the hazardous and municipal wastes in the landfill causes this Draft EIR to fail to comply with minimum CEQA requirements for **full disclosure**.

Further, the failure of the draft EIR to discuss the adequacy of the proposed mitigation measures for controlling pesticide and fertilizer pollution of surface waters that receive the stormwater runoff from the landfill/golf course is another example of failure to conform to CEQA requirements for full disclosure.

Qualifications to Review This EIR.

I obtained a bachelors degree in environmental health sciences from San Jose State College in 1955 and a Masters of Science in Public Health degree from the University of North Carolina in 1957, focusing on water quality. I obtained a PhD degree from Harvard University in environmental engineering in 1960. For 30 years I held university graduate level teaching and research positions in environmental engineering at several major US universities. During that

period I conducted over $5 million in water quality research and published over 500 papers and reports on this research. One of my major areas of teaching and research was devoted to the impacts of landfills on public health and the environment. My research included work on landfill liner issues sponsored by the US EPA. I have been involved in the review of over 75 landfills located in various areas of the world, the majority of which are located in California.

I initiated research on stormwater runoff water quality impacts in the 1960s. I have been active in this area for over 40 years. In my work I have given particular attention to deficiencies in the current regulatory approach for controlling the water quality impacts of stormwater runoff on the beneficial uses of receiving waters.

In 1989 I retired from 30 years of university teaching and research and expanded my part-time consulting to governmental agencies, industry and public groups to a full-time activity. Since then I have published another 300 plus papers and reports on my professional activities. These papers and reports are available from my website, www.gfredlee. This website contains my recent papers and reports that serve as technical backup to these comments. Attached is additional information on my qualification to conduct this Draft EIR review.

My professional experience includes consulting on two different situations where I was asked to evaluate the existing and potential problems of developing a golf course on a landfill. I have been asked to conduct detailed reviews of about a dozen draft EIRs. I have also developed the water quality section of an EIR for Yolo County, CA.

Inadequate Discussion of Reliably Preventing Golf Course Irrigation Water from Infiltrating into the Landfill

The Draft EIR indicates that infiltration of water into the landfill leads to groundwater pollution by landfill leachate (garbage juice). The landfill soil cover is currently allowing sufficient moisture to enter the landfill to continue to cause groundwater pollution. The Draft EIR indicates that it will be necessary to irrigate the golf course develop and maintain the vegetation associated with the golf course. It is stated in the Draft EIR that the total water added to the golf course/landfill cover will be doubled thereby greatly increasing the potential for increased amounts of water to enter the landfill leading to increased groundwater pollution. As documented below the Draft EIR repeatedly claims that through the use of a plastic sheeting "geomembrane" liner in the cover, moisture monitoring, and control of irrigation water application rates it will be possible to prevent the irrigation water from entering the landfill thereby preventing increased groundwater pollution.

The Draft EIR Executive Summary page ES-7 states,

> *"The successful integration of the golf course with the landfill site requires, among other things, that provisions be made to prevent moisture penetrating the existing soil cap and entering the landfill waste below. This will be done in two ways, with an upgraded cover system where needed, and with a computerized irrigation monitoring system that*

manages water application rates in response to measured weather and soil moisture conditions.

Certain areas of the golf course will require more irrigation than others and will require additional protection measures in the form of the upgraded cover system. A geomembrane liner would be placed beneath all areas of the golf course where the monthly water application rate through irrigation would exceed three inches per month, which the Department of Toxic Substances Control (DTSC) at this point in time has determined to be the monthly maximum amount of water that can be accommodated by the existing soil cover system at the site without any mitigation such as a geomembrane liner.[5] *Although the bunkers (also known as sand traps) will not be irrigated, the upgraded cover system would also be placed under the bunkers because, without vegetation there, moisture is naturally removed at a lower rate than if vegetation were present. Accordingly, the areas that will receive the upgraded cover system are the fairways, the greens, the tees, and the bunkers.*

The rough and out-of-play areas are anticipated to have lower irrigation requirements, less than three inches per month, and are anticipated to be below the amounts that would cause moisture to penetrate the existing soil cover and enter the landfill waste below. The rough area would be permanently irrigated at a rate not to exceed three inches per month. The out-of-play area would only be irrigated temporarily during plant establishment, which is estimated at two years or less.

[5] *Dan Zogaib, Hazardous Substances Engineer, State of California Department of Toxic Substances Control, email communications, August 20, 2002 and November 22, 2002.*

During plant establishment, the irrigation rate would be less than three inches per month. Soil moisture sensors will be employed in these areas to control the irrigation rates, if necessary, to achieve the objective of preventing the advance of soil moisture into the waste below. Due to the lower irrigation requirements of the rough and out-of-play areas, it is anticipated that a geomembrane liner would not be required for these areas. These areas, however, would have surface drainage systems installed.

All areas of the golf course receiving irrigation would have a computerized irrigation monitoring system to monitor moisture levels and to control the amount of water being applied. Monitoring equipment would include automatic switches to prevent watering during rain and automatic shutoff valves to prevent flooding if line breaks or leaks occur. An on-site weather station would also be incorporated into the control system to relay daily weather changes. In addition to the improvements to the existing soil cover, the proposed project in conjunction with the Districts would also upgrade the existing landfill gas collection."

Further, the Executive Summary Table ES-1 states on page ES-19 under Mitigation Measures M-3E.6,

"M-3E.6 During operation of the proposed project, soil moisture beneath golf course areas that are not underlain by the upgraded cover system, will be monitored daily by the Project Proponent. In these areas, irrigation volumes shall not exceed 0.1 inches per day (approximately 3 inches per month) and will be adjusted accordingly to account for precipitation. The Project Proponent shall prepare and maintain appropriate records for periodic review and inspection as determined by representatives of the County of Los Angeles and the Districts.

The Project Proponent shall implement protection measures in the form of the upgraded cover system described in Section 2.3.3. As part of the upgraded cover system, a geomembrane liner would be placed on top of the existing landfill soil cover and beneath all areas of the golf course where the monthly water application through irrigation would exceed three inches per month. The upgraded cover system would also be placed under the bunkers.

To minimize any water infiltration into the soil cover and into the landfill in the rough and out-of play areas there would be computer modeling of water movement in the cover soil. The computer modeling would incorporate: a) root penetration and water application/utilization data for the proposed plantings, b) weather data and water application rates which approximate daily variations over the course of a year, and c) soil cover characteristics and depths derived from sampling and testing of a sufficient number of samples to obtain representative data for the areas designated as "rough". Based upon the results of the computer modeling the irrigation standard of three inches per month may be adjusted to accommodate plant growth. Alternatively, and if necessary, the Project Proponent may elect to install a geomembrane liner under these areas."

Page 3-E.6 under Mitigation Measures states,

"During operation of the proposed project, soil moisture beneath golf course areas that are not underlain by the upgraded cover system, will be monitored daily by the Project Proponent. In these areas, irrigation volumes shall not exceed 3 inches per month and will be adjusted accordingly to account for precipitation. The Project Proponent shall prepare and maintain appropriate records for periodic review and inspection as determined by representatives of the County of Los Angeles and the Districts.

The Project Proponent shall implement protection measures in the form of the upgraded cover system described in Section 2.3.3. As part of the upgraded cover system, a geomembrane liner would be placed on top of the existing landfill soil cover and beneath all areas of the golf course where the monthly water application through irrigation would exceed three inches per month. The upgraded cover system would also be placed under the bunkers. To minimize any water infiltration into the soil cover and into the landfill in the rough and out-of-play areas there would be computer modeling of water movement in the cover soil. The computer modeling would incorporate: a) root penetration and water application/utilization data for the proposed plantings, b) weather data and water

application rates which approximate daily variations over the course of a year, and c) soil cover characteristics and depths derived from sampling and testing of a sufficient number of samples to obtain representative data for the areas designated as "rough". Based upon the results of the computer modeling) the irrigation standard of three inches per month may be adjusted to accommodate plant growth. Alternatively, and if necessary, the Project Proponent may elect to install a geomembrane liner under these areas."

Page 3E-19 states,

"Implementation of mitigation measure M-3E.8 provides for the development of operation and maintenance protocols and procedures to maintain the integrity of the upgraded cover system. proposed golf course would not include any water features. Furthermore, the existing soil cover would be upgraded to include a geomembrane liner to minimize infiltration and a drainage layer that would collect irrigation/surface water percolating through the vegetative layer and direct it to a perimeter drainage collection system located in the out-of-play areas of the proposed golf course. Landscaping vegetation will be selected to prevent root penetration through the geomembrane liner. Implementation of mitigation measure M-3E.8 provides for the development of operation and maintenance protocols and procedures to maintain the integrity of the upgraded cover system.

Second, as an element of the landfill closure plan, the proposed project site was contoured to allow water to run off rather than ponding and percolating through the soil. Under the proposed project, the existing engineered minimum of three percent grade would be maintained throughout the proposed project site to ensure that ponding and percolation of irrigation and stormwater through soils does not cause high moisture content in soils at the apex of the slopes.

Third, the proposed project would include a state-of-the-art irrigation system to reduce the possibility of over-watering. The system would be electronically controlled (with a back-up generator) allowing the operator to pinpoint the exact location of the proposed project site receiving or needing irrigation. A computer program would maximize system efficiency by regulating the flow rate in each pipe in the network. An on-site weather station would monitor daily weather changes and evapotranspiration rates and change each sprinklerís daily run times accordingly. This state-of-the-art irrigation system would reduce the amount of water percolating through the soil. The irrigation system would also ensure that irrigation runoff is minimized and would remain similar to existing conditions.

Fourth, the proposed project would include a gravel drainage layer, used to collect irrigation/surface water flowing through the vegetative layer, to be placed above the geomembrane liner. A geotextile would be placed between the gravel and a geotextile separator placed over the gravel to prevent soil fines from entering the gravel and reducing performance. Irrigation and surface water would be directed to a perimeter

drainage collection system located in the out-of-play areas of the golf course. Water from the drainage layer is conducted by underground pipes to meet up with the rest of the site drainage system.

Fifth, the proposed project would include a surface drainage control system to be installed in all areas of the proposed golf course to accommodate surface water runoff. This drainage control system would consist of lined surface drains and corrugated steel pipes as necessary, as well as drainage installed below the greens, bunkers, and in low areas following standard golf course design practice.

Page 3G-11 states under **Project Impacts, Impact 3G1: The proposed project could violate wate quality standards or waste discharge requirements,**

"In general, any irrigation and/or rain water that seeps down to the porous drainage layer (above the geomembrane liner) would drain off to the perimeter drainage system located in the out-of-play areas, which are connected to the site ís storm drainage system."

Beginning in the 1960s, I have had extensive experience in investigating water infiltration into landfills that leads to groundwater pollution. I have been and continue to be involved in evaluating the reliability of plastic sheeting (geomembrane) layers in landfill covers to prevent moisture from entering landfills. I have published several peer reviewed articles on these issues. A credible EIR discussion of the ability of the proposed approach to prevent the golf course irrigation water from entering the landfill wastes would have stated that while it is possible, with high quality construction to construct a plastic sheeting layer in the landfill cover that would essentially prevent water from passing through it when first constructed, over time the plastic sheeting layer will deteriorate and allow the irrigation water and some of the rainwater falling on the golf course to enter the wastes.

Further, the reader of the EIR should be informed that with conventional landfill cover inspection techniques it is not possible to detect when the landfill cover plastic sheeting layer no longer prevents moisture from entering landfill wastes. It is not possible to see the points of deterioration in the plastic sheeting layer since it is buried below several feet of soil. Without a discussion of these issues decision-makers and the public are mislead to believe the Draft EIR statements that the plastic sheeting layer will reliably prevent water from entering the landfill.

As discussed in my writings on this issue, while it is possible to construct a leak-detectable landfill cover that would indicate when and where the plastic sheeting layer has deteriorated and needs repair, thus far regulatory agencies are not requiring this approach because of the increased cost. Even if a leak-detectable cover were constructed making it possible to know the exact location at which the plastic sheeting layer has deteriorated, the areas of the golf course where the geomembrane liner has deteriorated would have to be excavated from the top of the landfill in order to repair the plastic sheeting layer.

Page 3E-6 states,

> *"The State Water Resources Control Board (SWRCB) requires that landfill covers achieve a permeability coefficient of 1 x 10-6 cm/sec or demonstrate equivalent protection against water penetration. Because the proposed use of the site as a golf course requires increased irrigation in certain areas, the existing soil cover system will be upgraded (see discussion in Chapter 2 Project Description)."*

While this statement is correct for unlined landfills, it does not reflect the fact that this allowed permeability allows large amounts of water to infiltrate into the landfill where it will generate leachate that leads to groundwater pollution. In the early 1980s, I served as an advisor to the California Water Resources Control Board on the development of Chapter 15 establishing landfill regulations. It is well-understood that Chapter 15, now Title 27, is badly out of date in allowing such a highly porous landfill cap. Landfills with this type of cap are causing significant groundwater pollution throughout the state.

The Draft EIR claims that the increased water that will be used to irrigate the golf course rough areas will be controlled by soil moisture monitoring to control the amount of irrigation water applied to prevent infiltration of irrigation and presumably, to some extent, rainwater. Again this issue is presented as though this can readily be reliably achieved. While soil moisture measurements are used to control application of irrigation water, the approach normally followed will not prevent some of the applied irrigation water and rainwater from entering the landfill. I am familiar with unsaturated moisture monitoring through my involvement in large-scale university research on this issue. The flow of irrigation water through the upper soil layers is extremely complex with the major transport of water through the soil layer being controlled by small-diameter preferential flow paths. A very large number of soil moisture sensors would be needed to reliably detect soil moisture transport through the higher-permeability preferential pathways. A few soil moisture sensors will not reliable detect the rapid flow paths of irrigation water into the landfill wastes. There is no doubt that some of the landfill irrigation water will enter the landfill wastes and increase leachate production that will lead to increased groundwater pollution. This issue should have been discussed in this Draft EIR. Without this discussion the EIR does not provide decision-makers and the public with full disclosure of the potential environmental impacts of the proposed project.

Specific questions that need to be addressed in detail include;

How will the deterioration of the plastic sheeting layer (geomembrane liner) in the cover be reliably detected so that none of the golf course irrigation water enters the landfill?

How will the preferential pathways for water flow through the soil cover be detected by the moisture sensors to insure that none of the irrigation water used on the golf course inters the landfill wastes?

Stormwater Pollution by Golf Course Chemicals

Golf courses are notorious for causing stormwater runoff pollution. The large amounts of pesticides and fertilizers used to maintain a desirable golf course often occur in stormwater

runoff from golf courses in concentrations that are a threat to aquatic life and other beneficial uses of the receiving waters. The Draft EIR states, in the Executive Summary page ES-26

> *M-3F.5 Biofilters provide physical treatment of run off, through structural means, to help storm water quality and management. Two types of biofilters, swale and strip, shall be incorporated as part of the final design* of the proposed golf course to physically treat/clean run-off.

Table ES-1 states,

> *"Project Proponent shall:*
> *- Implement BMPs best suited to minimize, to the maximum extent practicable, the introduction of pollutants of concern to the storm water conveyance system."*

Further the ES Table 1 states on page ES-39,

> *M-3G.3 Prior to commencement of golf course operations, the Project Proponent will develop and implement a pesticide, herbicide, and fertilizer management plan that will describe application methods and application schedules, and submit the plan to the County of Los Angeles for review and approval.*

Page 3G-11 states,

"Project Impacts

> ***Impact 3G1: The proposed project could violate water quality standards or waste discharge requirements.***
> *The proposed project would be required to comply with all applicable federal, state and regional regulations to protect water quality during construction as well as during the life of the project. Prior to construction, preparation of a SWPPP would be required to minimize impacts from storm water to local receiving water. The SWPPP would be submitted to the SWRCB in compliance with the general statewide construction NPDES permit."*

Page 3G-13 states under Mitigation Measures,

> *"- Implement BMPs best suited to minimize, to the maximum extent practicable, the introduction of pollutants of concern to the storm water conveyance system."*

And

> **M-3G.3** *Prior to commencement of golf course operations, the Project Proponent will develop and implement a pesticide, herbicide, and fertilizer management plan that will describe application methods and application schedules and submit the plan to the County of Los Angeles for review and approval.*

These statements are highly misleading with respect to the ability of the approach proposed in the Draft EIR and the current BMPs implemented to the maximum extent practicable, to prevent pollution of the runoff receiving waters by pesticides and other chemicals used on the golf course. This pollution will be a consequence of developing this golf course. It should have been

discussed. Without this discussion the EIR does not provide full disclosure of the consequences of developing the proposed golf course.

A specific question that needs to be addressed is,

How much of the pesticides and fertilizers used on the golf course will be in the BMP treated stormwater runoff from the golf course?

Overall

This Draft EIR for the New South Coast County Golf Course project is designed to support the development of a golf course on a landfill without discussing the significant environmental problems that will be encountered if the project proceeds as presented in the EIR. This EIR does not conform to CEQA requirement of adequately and reliably informing decision-makers and the public of water quality impacts of the development of this project as proposed. Since water quality impacts are among the most important issues associated with attempting to develop a golf course on a landfill, this EIR cannot be certified and conform to CEQA requirement of full disclosure.

Dr. G. Fred Lee, PE (TX), DEE

Expertise and Experience in Landfill Impact Assessment

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

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

Dr. Lee obtained a PhD degree specializing in environmental engineering from Harvard University in 1960. As part of this degree work he 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 his PhD work was aquatic chemistry which focused on the transport, fate and transformations of chemical constituents in aquatic and terrestrial systems as well as in waste management facilities.

For a 30-year period, he 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 he 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. He has published over 850 professional papers and reports on his research results and professional experience. His research included, beginning in the 1970s, the first work done on the impacts of organics on clay liners for landfills and waste lagoons.

His 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, he became involved in the review of the impacts of municipal solid waste landfills on groundwater quality. In the 1970s, while he was Director of the Center for Environmental Studies at the University of Texas at Dallas, he 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 early 1980s while holding a professorship in Civil and Environmental Engineering at Colorado State University, he 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, he 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 the 1980s, he 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.

In the 1980s while he 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, he was involved in numerous situations concerning the impact of landfilling of municipal solid waste on public health and the environment. He has served as an advisor to the states of California, Michigan, New Jersey and Texas on solid waste regulations and management.

Beginning in the 1960s, while a full time university professor, Dr. Lee was a part time private consultant to governmental agencies, industry and environmental groups on water quality and solid and hazardous waste management issues. His work included evaluating the impacts of a number of municipal solid waste landfills.

In 1989, he retired after 30 years of graduate-level university teaching and research and expanded the part-time consulting that he had been doing with governmental agencies, industry and community and environmental groups into a full-time activity. A principal area of his 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. He has been involved in the review of approximately 65 different landfills in various parts of the United States and in other countries.

Dr. Anne Jones-Lee, his wife, and he 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. Their 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. They make many of his publications available as downloadable files from his web site, www.gfredlee.com.

In the early 1990s, he 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 he

developed a report, “Impact of Municipal and Industrial Non-Hazardous Waste Landfills on Public Health and the Environment: An Overview” 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 40 years, he is a registered professional engineer in the state of Texas and a Diplomate in the American Academy of Environmental Engineers (AAEE). The latter recognizes his leadership roles in the environmental engineering field. He has served as the chief examiner for the AAEE in north-central California and New Jersey, where he has 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.

His 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. He has been and continues to be an American Chemical Society tour speaker, where he is invited to lecture on landfills and groundwater quality protection issues, as well as domestic water supply water quality issues throughout the US.

Experience and Expertise on Stormwater Runoff Water Quality

In the 1960s, while teaching at the University of Wisconsin, Madison, I pioneered in the assessment of the impacts of stormwater runoff on receiving water quality. We did some of the first work ever done on this topic. I have continued to be involved in this area throughout my 44-year professional career. I have conducted extensive research and presented a number of professional papers on these issues. One of the areas of particular emphasis in my work has been assessing the presence and impacts of pesticides and nutrients in stormwater runoff. I am highly familiar with the deficiencies in the current regulatory approaches for managing water quality impacts of stormwater runoff. I also publish the Stormwater Runoff Water Quality Science/Engineering Newsletter. This is an email-based Newsletter that is in its seventh year of publication and is distributed to about 7,500 professionals. Many of the significant problems that exist in the management of water quality impacts of stormwater runoff today are discussed in my publications and the newsletter which can be found on my website, www.gfredlee.com.

SUMMARY BIOGRAPHICAL INFORMATION

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EDUCATION

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

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

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

ACADEMIC AND PROFESSIONAL EXPERIENCE

Current Position:

Consultant, President, G. Fred Lee and Associates

Previous Positions:

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

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

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

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

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

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

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

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

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

PUBLICATIONS AND AREAS OF ACTIVITY

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

Studies on sources, significance, fate and the development of control programs for chemicals in aquatic and terrestrial systems.
Analytical methods for chemical contaminants in fresh and marine waters.
Landfills and groundwater quality protection issues.
Impact of landfills on public health and environment.
Environmental impact and management of various types of wastewater discharges including municipal, mining, electric generating stations, domestic and industrial wastes, paper and steel mill, refinery wastewaters, etc.

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

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

LECTURES

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

GRANTS AND AWARDS

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

GRADUATE WORK CONDUCTED UNDER SUPERVISION OF G. FRED LEE

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

ADVISORY ACTIVITIES

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

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://www.gfredlee.com). Copies of these papers and reports listed below as well as a complete list of their publications on this and related topics are available upon request.

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Landfills Evaluated by G. Fred Lee and Anne Jones-Lee

Arizona	Verde Valley - Copper Tailings Pile Closure
California *(State Landfilling Reg.)*	Colusa County - CERRS Landfill San Gabriel Valley - Azusa Landfill City of Industry - Puente Hills Landfill North San Diego County, 3 landfills San Diego County - Gregory Canyon Landfill El Dorado County Landfill Yolo County Landfill Half Moon Bay - Apanolio Landfill Pittsburg - Keller Canyon Landfill Chuckwalla Valley - Eagle Mountain Landfill Barstow - Hidden Valley Broadwell Hazardous Waste Landfills Cadiz - Bolo Station-Rail Cycle Landfill University of California-Davis Landfills (4) San Marcos - San Marcos Landfill Placer County - Western Regional Sanitary Landfill Placer County – Turkey Carcass Disposal Pits Imperial County - Mesquite Landfill Los Angeles County - Calabasas Landfill Contra Costa County – Concord Naval Weapons Station Tidal Area Landfill
Colorado (*State Landfilling Reg.)*	Last Chance/Brush - Hazardous Waste Landfill Denver - Lowry Hazardous Waste Landfill Telluride/Idarado Mine Tailings
Florida (*State Landfilling Reg.*)	Alachua County Landfill
Illinois (*State Landfilling Reg.*)	Crystal Lake - McHenry County Landfill Wayne County Landfill
Indiana (*State Landfilling Reg.*)	Posey County Landfill New Haven-Adams Center Landfill (Hazardous Waste)
Michigan (*State Landfilling Reg.*)	Menominee Township - Landfill Ypsilanti- Waste Disposal Inc. (Hazardous Waste - PCB's)
Minnesota	Reserve Mining Co., Silver Bay - taconite tailings Wright County - Superior FCR Landfill
Missouri	Jefferson County - Bob's Home Service Hazardous Waste Landfill

New Jersey (*State Landfilling Reg.*)	Meadowlands - Landfill Fort Dix Landfill Scotch Plains Leaf Dump
New York	Staten Island - Fresh Kills Landfill, Niagara Falls - Hazardous Waste Landfill, New York City – Ferry Point Landfill
Ohio	Clermont County - BFI/CECOS Hazardous Waste Landfill, Huber Heights - Taylorville Road Hardfill Landfill
Rhode Island	Richmond – Landfill
South Carolina	Spartanburg - Palmetto Landfill
Texas (*State Landfilling Regulations*)	Dallas/Sachse - Landfill Fort Worth - Acme Brick Hazardous Waste Landfill City of Dallas - Jim Miller Road Landfill
Washington (*State Landfilling R*	Tacoma - 304th and Meridian Landfill
Wisconsin	Madison and Wausau Landfills
Belize	Mile 27 Landfill
Ontario, Canada (*Prov. Landfilling Reg.*)	Greater Toronto Area - Landfill Siting Issues Kirkland Lake - Adams Mine Site Landfill Pembroke - Cott Solid Waste Disposal Areas
Manitoba, Canada (*Prov. Landfilling Reg.*)	Winnipeg Area - Rosser Landfill
New Brunswick, Canada (*Prov. Landfilling Reg.*)	St. John's - Crane Mountain Landfill
England	Mercyside Waste Disposal Bootle Landfill
Hong Kong	Three New MSW Landfills
Ireland	Bottlehill Landfill, County Cork Central Waste Management Facility, Ballyduff, County Clare
Korea	Yukong Gas Co. - Hazardous Waste Landfill
Mexico (*Haz. Waste Landfilling*	San Luis Pontosi - Hazardous Waste Landfill
New Zealand	North Waikato Regional Landfill
Puerto Rico	Salinas - Campo Sur Landfill

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 which they are active in research and consulting including domestic water supply water quality, water a wastewater treatment, water pollution control, and the evaluation and management of the impacts of solid a hazardous wastes. Publications are available in the following areas:

- Landfills and Groundwater Quality Protection
- Water Quality Evaluation and Management for Wastewater Discharges, Stormwater Runoff, Ambi 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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