

Pollution of Coastal Zone Wetlands by the IPI C&D Landfill
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June 8, 2012

The Tulane Environmental Law Clinic (TELC) requested that we provide an assessment of the potential for the proposed Industrial Pipe, Inc. (IPI) landfill expansion to cause pollution of the Louisiana coastal zone wetlands. Based on our review of the reports and documents provided to us by TELC (see list appended), review of the professional literature, and extensive background and experience in evaluating impacts of various types of solid waste landfills including C&D landfills in various areas of the US, including the coastal zone of Louisiana, we conclude that,

the existing IPI C&D landfill and proposed landfill expansion have a significant potential to release pollutants to the adjacent coastal zone wetlands to the detriment of the ecology of the area that receives the pollutants as well as the wildlife that inhabit or visit area of polluted wetlands.

A summary of our expertise and experience that serve as foundation for this conclusion is appended to these comments. It includes more than 30 years of professional experience in reviewing the potential impacts of various types of more than 80 landfills including more than a half-dozen C&D landfills across the US and in Louisiana. We have published extensively on these issues; many of our technical findings are discussed in our summary “Flawed Technology” review referenced below:

Lee, G. F., and Jones-Lee, A., “Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste,” Report of G. Fred Lee & Associates, El Macero, CA, December (2004). Updated July (2011). <http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf>

That review contains an extensive section on environmental quality impacts of C&D Landfill, a copy of which is attached to these comments.

Additional information on our qualifications to develop this conclusion is available in our website, www.gfredlee.com. This site also contains many of our over 1100 papers and reports on environmental quality impact studies.

Presented below are comments on the potential for the proposed IPI C&D landfill expansion to pollute the coastal wetlands near the proposed landfill.

Comments on:

Industrial Pipe, Inc., v. Plaquemines Parish Council et al., “Petition for Trial De Novo of Coastal Zone Permit Application,” filed November 3 (2011) [IPI (2011)]

Item 19 on page 4 of IPI (2011) stated:

“19.

On April 15, 2010 Industrial Pipe then re-submitted its "Joint Permit Application for Work within the Louisiana Coastal Zone" with the DNR, Office of Coastal Management ("OCM"). Permit Number P20100453 (See Exhibit "B"). The CUP [coastal use permit] application was again referred to Plaquemines Parish Coastal Zone Management as a matter of local concern. Industrial Pipe again furnished the same CUP application and complied with mitigation and all other requirements necessary for re-issuance of the same permit which had been granted in 2003.”

Item 23 on page 6 stated:

“At a public meeting of the Plaquemines Parish Council held on September 22, 2011, the Parish Council nevertheless improperly denied Industrial Pipe's permit application for Industrial Pipe's CUP, which the Parish Council itself had previously approved, and with which Industrial Pipe was in compliance.”

“The vote was followed by a letter dated October 5, 2011, together with its decision document. (see Exhibit "D" letter, and Exhibit "E" "Basis of Decision" document).”

Item 24 on page 6 stated:

“The Parish Council's action in denying the permit which it had previously granted was in error; not consistent with the goals, policies and provisions of La. R.S. 49:214, et seq., LAC 43:I.723, et seq.; and is in violation of Plaquemines Parish local ordinances. For example, the Parish Council improperly concluded that C&D landfills require liners and leachate collection systems under the "best practical techniques" principle (see “Basis of Decision” pg. 6). This is an improper application of this principle. LDEQ does not require C&D landfills to have leachate collection systems or liners. There is no practical reason to require these protections at any C&D landfill.”

IPI has failed to reliably represent the technical information concerning the need for a liner for the proposed landfill to protect environmental quality. A review of the literature on regulations for C&D landfills across the US shows, for example:

“Of the 50 states, 27 permit the disposal of general C&D waste into unlined landfills; the remaining 23 states have varying requirements for liner systems (Clark, et. al., 2004:8).

Groundwater monitoring for landfills is required by 27 states (Clark, et. al., 2004:12).”

“Because of growing awareness that C&D debris can contain hazardous materials such as lead-based paint, asbestos, or wood coated with CCA (copper chromated arsenate), some states are in the process of revising their C&D debris regulations.”

(Source: C&D Debris Regulations, Texas Commission of Environmental Quality, July 31 (2005). <http://www.recyclecddebris.com/rCDd/Resources/WasteStudy/Chapter05.aspx>)

The LDEQ C&D landfilling regulations are badly out-of-date with respect to providing protection of public health and the environment from pollutants in C&D wastes.

A September 28, 2010 letter from URS to Ms. Albertine M. Kimble, Local Coastal Program Manager Plaquemines Parish Government, “Re: Comment Responses P20100453 Coastal Use Permit Application, Industrial Pipe, Inc.” [URS (September 2010)] begins:

“On behalf of Industrial Pipe, Inc., (IPI), URS Corporation (URS) submits the following information in response to your letter of May 14, 2010 (as clarified during our June 22, 2010 meeting), regarding comments on the Phase I Coastal Use Permit Application for IPI’s Belle Chasse facility.”

A section of that letter devoted to “Potential Impacts to Coastal Resources” begins on page 7. There it is stated:

“Potential Impacts to Coastal Resources

The facility purpose is to dispose of nonhazardous C&D debris, woodwaste, and yard waste from off-site sources. C&D debris, woodwaste, and yard waste are defined as follows:

‘C&D Debris - nonhazardous waste generally considered not water-soluble, including but not limited to, metal, concrete, brick, asphalt, roofing materials (shingles, sheet rock, plaster), or lumber from a construction or demolition project, but excluding asbestos-contaminated waste, white goods, furniture, trash, or treated lumber. The admixture of construction and demolition debris with more than five percent by volume of paper association with such debris or any other type of solid waste (excluding woodwaste or yard waste) will cause it to be classified other than construction/demolition debris.

Woodwaste - Yard trash and types of waste typically generated by sawmills, plywood mills, and woodyards associated with the lumber and paper industry, such as wood residue, cutoffs, wood chips, sawdust, wood shavings, bark, wood refuse, wood-fired boiler ash, and plywood or other bonded materials that contain only phenolic-based glues or other glues that are approved specifically by the administrative authority. Treated or painted lumber is not considered woodwaste under this definition.

Yard Waste - Vegetative matter resulting from landscaping, maintenance, or land clearing operations, including tree and shrubbery leaves and limbs, grass clippings, and flowers.”

Those knowledgeable in the composition of materials that IPI plans to accept as C&D wastes in the proposed landfill expansion know that many of those wastes contain hazardous chemicals that pose a threat to aquatic life in coastal wetlands.

The Plaquemines Parish Government Parish Coastal Zone Management sent a letter, signed by P. Hahn, to Industrial Pipe, Inc. Attn: Kennett Stewart, dated October 5 (2011), “RE: P20100453, Coastal Use Permit Application Proposed expansion of the Industrial Pipe construction and demolition debris landfill.”

That letter stated:

“After a full and fair consideration of all information relative to the referenced permit application and after analyzing economic, social, and environmental factors as required by the LA State and Local Coastal Resources Management Act, R.S. 49:214.21 et seq. as amended) and the Coastal Management Regulations, (Louisiana Administrative Code Title 43: I, ' 701, et seq.

it has been determined that the proposed project does not comply with Coastal Use Guidelines 1.7e, 1.7p, 5.1, and 6.4. It has also been determined that the proposed activity does not comply with Guideline 1.8, which provides guidance in evaluating those Guidelines listed above that contain the Maximum Extent Practicable (MEP) modifier. Therefore, in accordance with Part III H (i) of the Rules and Procedures for Coastal Use Permits, the requested Coastal Use Permit application is hereby denied.”

The “Basis of Decision” signed by P. J, Hahn, Plaquemines Parish Director of Coastal Zone Management, and also dated October 5, 2011, appended to that letter states in Item 6:

“This guideline directs that the ‘location and operation of waste storage, treatment, and disposal facilities shall be avoided in wetlands to the maximum extent practicable.’ LAC 43:I.715.A But if they are, the guidelines require that ‘best practical techniques shall be used to minimize adverse impacts which may result from such use.’ LAC 43:I.715.A. Section 715 standards, or best practical techniques, require: (1) that the facility meet LDEQ’s solid waste requirements, LAC 43:I.715.B, (2) that ‘waste facilities located in wetlands shall be designed and built to withstand all expectable adverse conditions without releasing pollutants,’ LAC 43:I.715.C, and (3) that ‘waste facilities shall be designed and constructed using best practical techniques to prevent leaching, control leachate production, and prevent the movement of leachate away from the facility.’ LAC 43:I.715.D.

The applicant claims that ‘by complying with the LDEQ Solid Rule and Regulations ... the disposal guidelines outlined in this section will be fulfilled.’ July 15, 2011 letter to A. Kimble, p. 7 (referencing §§ 521.B.1 (p. 6-8), 521.H.1.b-g (p. 521-21-25) of LDEQ Solid Waste Permit application for the site dated 8/18/03). But compliance with LDEQ solid waste regulations is just one of the standards or best practical techniques the use must meet. The applicant must also meet additional design requirements to prevent the release of pollutants into wetlands and control leachate. LAC 43:I.715.C-D. The Council finds that materials referenced by applicant in its solid waste application do not these referenced the standards under LAC 43:I.715.C-D. In addition, evidence in the record shows that the proposed use will not have a liner or any kind of barrier between the waste and the wetlands, that C&D wastes can leach, and that the facility will not have system to collect contaminated leachate from the waste. Solid Waste Permit App., 521.B. The Council finds, therefore, that the applicant failed to meet the standards (or best practical techniques) required under LAC 43:I.715.”

The Plaquemines Parish Government Parish Coastal Zone Management has correctly determined that the proposed C&D landfill expansion has a significant potential pollute the LA coastal zone.

The “Potential Impacts to Coastal Resources” section of the URS September 28, 2010 permit application comment responses letter [URS (September 2010)] states (pages 7-8):

“Surface runoff from the C&D landfill is monitored/discharged in compliance with a Louisiana Pollutant Discharge Elimination System (LPDES) General Permit (Permit No. LAG 780000); this will not change. The likelihood of additional adverse environmental impacts associated with this Coastal Use Permit Application is minimal. The entire disposal area will be capped in accordance with regulatory requirements upon closure to prevent surface water contact with

waste after closure. Additionally, the entire facility is protected from the 100-year flood event by a perimeter levee designed to prevent the waste disposal area from flooding.”

“Upon completion of landfilling activities, the landfill will be capped with no less than 24 inches of clay and 6 inches of vegetated topsoil. The final cover will be designed to resist erosion and prevent storm water from contacting the encapsulated C&D debris. IPI will be required to complete closure inspections to ensure cap integrity for a maximum of three years after closure to demonstrate that the cap is functioning properly.”

While the design and closure provisions described for the proposed C&D landfill expansion may comply with current minimum LDEQ C&D landfill regulations, they fall far-short of providing adequate protection of the LA coastal zone resources that can be damaged by the pollutants in the proposed C&D wastes that IPI proposes to accept in the landfill expansion. The proposed landfill cover will not prevent water from entering the wastes and leaching pollutants, which will be released to the nearby coastal wetlands. Inspection and repair of the closed landfill cap for only three years is grossly inadequate compared to the many decades to hundreds of years that some of the C&D waste components will, when leached and released to the environment, be a threat to the ecology of the coastal zone near the landfill. Additional information on the deficiencies in the proposed cap and post closure monitoring and maintenance is provided in our “Flawed Technology” review referenced above.

Literature Review on Pollutant in C&D Wastes

The following is extracted from:

Lee, G. F., and Jones-Lee, A., “Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste,” Report of G. Fred Lee & Associates, El Macero, CA, December (2004). Updated July (2011). <http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf>

Construction and Demolition Waste Landfilling

Associated with the construction of new structures are various types of waste materials that are landfilled. Redevelopment of areas often requires demolition of existing structures wastes that also need to be landfilled. This leads to construction and demolition (C&D) wastes as a special category of solid waste materials that are landfilled. There are no federal regulations governing the landfilling of C&D wastes. Each state has developed its own regulatory approach. These approaches range from deposition of C&D wastes in MSW landfills, to landfilling with limited environmental protection with respect to liners for leachate collection, groundwater monitoring, etc. There is a basic problem with the regulation of the landfilling of C&D wastes, in that some regulatory agencies consider C&D wastes to be “inert,” and therefore a limited threat to cause environmental pollution. However, there is substantial evidence that C&D wastes generate leachate that is a threat to cause water pollution.

ICF Inc. (1995a), under contract with the US EPA Office of Solid Waste, conducted a review of the characteristics of leachate generated by construction and demolition waste landfills. Construction and demolition landfill leachate sampling data were collected from 21 C&D landfills. Data were provided for 305 parameters. Potentially significant concentrations, compared to drinking water maximum contaminant levels (MCLs), were found of 1,2-

dichloroethane, methylene chloride, cadmium, iron, lead, manganese and total dissolved solids (TDS).

ICF Inc. (1995b) conducted a review of the “damage cases” caused by construction and demolition waste landfills. ICF Inc. (1995b) identified 11 damage cases where there was groundwater contamination by the C&D landfill. Constituents causing groundwaters to exceed the drinking water MCL were iron, manganese, TDS and lead. According to ICF Inc. (1995a), there were over 1,800 C&D landfills operating in the United States in the mid-1990s. Therefore, only a small number of the C&D landfills have been examined for groundwater pollution.

The state of Ohio Environmental Protection Agency, Division of Solid Wastes, has been conducting studies on the characteristics of C&DD waste leachate. This agency has developed, “A Comparison of Selected Parameters From Ohio Construction & Demolition Debris Leachate with Ohio Municipal Solid Waste Leachate - June 2009” and Ohio EPA 2007 C&DD Leachate Raw Chemical Analytical Data [Excel].”

Waste Age (2009b) has reported that the St. Louis Post-Dispatch reported, “Dangerously High” Methane Levels Recorded at St. Louis from a former C&D landfill. According to this article, “The Missouri Department of Natural Resources (DNR) issued a statement on Friday that recent tests had shown methane gas levels at the St. Louis Demolition Landfill are “dangerously high.” DNR officials warned that methane levels are well above the regulatory limit and, in some cases, are concentrated enough to be explosive. The landfill is located in the northern part of St. Louis and is near several residential areas.

Subsequent testing by firefighters did not indicate elevated methane levels in houses in the nearby Baden neighborhood, according to the St. Louis Post-Dispatch. Testing continues and residents are being offered methane detectors as a precaution.

The St. Louis Demolition Landfill was built 50 years ago, predating current landfill regulations. It has not accepted waste for 12 years. The city of St. Louis (which purchased the landfill 30 years ago) has been working with DNR to try and cap the site.”

In addition to the recognized pollutants in household items, there is increasing recognition that homes contain a wide variety of chemicals that when placed in a landfill will cause environmental pollution. As discussed above, Daughton (2002; 2004a,b) has reviewed the fact that the current water quality monitoring programs for characterizing landfill leachate in groundwaters polluted by landfills are significantly deficient in describing the full range of pollutants that are a threat to public health and the environment.

PCBs in Caulk in Older Buildings. Recently, it has become more widely recognized that construction and demolition wastes can contain appreciable concentrations of PCBs. For many years PCBs were used in sealants in concrete joints and wooden structures. This means that construction and demolition wastes can contain PCBs. This issue has been recognized in Europe, Australia and other countries. There are a number of papers and reports on this issue from other countries, which provide additional information on the presence of PCBs in various types of structures. Of particular concern are the publications by Åstebro et al. (2000), BUWAL

(date unknown) and CFMEU (date unknown). A comprehensive review of what was known in 2004 about PCBs in structures as a diffuse source of PCBs for the environment has been developed by Kohler et al. (2005).

According to the US EPA, “Caulk is a flexible material used to seal gaps to make windows, door frames, masonry and joints in buildings and other structures watertight or airtight. At one time caulk was manufactured to contain PCBs because PCBs imparted flexibility. The US EPA has developed Preventing Exposure to PCBs in Caulking Material at, <http://www.epa.gov/pcbsincaulk/caulkexposure.htm> discusses that PCBs are found in high levels in building caulk. Caulk containing high levels of PCBs (polychlorinated biphenyls) has been found in many schools and other buildings built or remodeled before 1978. Because PCBs can migrate from the caulk into air, dust, surrounding building materials, and soil, EPA is concerned about potential PCB exposure to building occupants.

In general, schools and buildings built after 1978 do not contain PCBs in caulk. On September 25, 2009, EPA announced new guidance for school administrators and building managers with important information about managing PCBs in caulk and tools to help minimize possible exposure. Through EPA's Regional PCB Coordinators, the Agency will also assist communities in identifying potential problems and, if necessary, developing plans for PCB testing and removal. The Agency has prepared a Fact Sheet (PDF) “Questions and Answers information is provided in, <http://www.epa.gov/pcbsincaulk>.”

Additional information on the potential presence of PCBs in C & D wastes is presented by Lee, and Jones-Lee (2010 d,e). Studies in the San Francisco Bay area have been found that urban stormwater runoff contains sufficient PCBs to contribute to excessive PCBs concentrations in receiving water fish. One of the sources of the PCBs in urban stormwater runoff has been found to be runoff from residential/commercial/industrial demolition areas where there is release of PCBs from caulking compounds used as sealant at wood and concrete joints.

Dr. Lee has been involved in investigating the occurrence of PCBs in water, wastes, and fish since the late 1960s. Veith and Lee (1970) study and paper were among the first published on PCBs as water pollutants in US waters. Dr. Lee has continued to be active in investigating PCBs pollution since that time. A summary of work on his PCBs pollution studies is available in Lee (2006h).

The authors of this flawed technology report have been involved in the review of several C&D landfilling situations. These include evaluating the potential threat of expanding the Taylorsville Road Hardfill Landfill in Huber Heights, Ohio (Lee 2002a). It was concluded that the expansion of this landfill was a threat to the domestic groundwater supply water quality for Huber Heights. Lee have been involved in the review of two proposed C&DD landfills in Morrow County, Ohio (Lee 2006f), and in evaluating the potential impact of city of New Orleans hurricane Katrina household and commercial wastes and demolition wastes that were deposited on top of the city's unlined, closed MSW Gentilly Landfill (Lee, 2006g,h,i). In both cases, the state regulatory agencies allow landfilling of C&D wastes in landfills that only have a compacted soil liner. In the case of the Gentilly Landfill, the Louisiana Department of Environmental Quality (LDEQ) issued a permit which enabled the city to increase the height of the Gentilly Landfill from 18 feet

to 130 feet above ground level. LDEQ also significantly relaxed the restrictions on the types of so-called C&D landfill wastes that could be deposited at this landfill to include painted furniture, mattresses and many other types of household items that were destroyed by the flooding of homes associated with the hurricane Katrina situation.

Dubey, et al.(2007) reported on the “Quantities of Arsenic-Treated Wood in Demolition Debris Generated by Hurricane Katrina,” According to the article abstract, “The disaster debris from Hurricane Katrina is one of the largest in terms of volume and economic loss in American history. One of the major components of the demolition debris is wood waste of which a significant proportion is treated with preservatives, including preservatives containing arsenic. As a result of the large scale destruction of treated wood structures such as electrical poles, fences, decks, and homes a considerable amount of treated wood and consequently arsenic will be disposed as disaster debris. In this study an effort was made to estimate the quantity of arsenic disposed through demolition debris generated in the Louisiana and Mississippi area through Hurricane Katrina. Of the 72 million cubic meters of disaster debris generated, roughly 12 million cubic meters were in the form of construction and demolition wood resulting in an estimated 1740 metric tons of arsenic disposed.

Management of disaster debris should consider the relatively large quantities of arsenic associated with pressure-treated wood.”

An issue of increasing concern about waste wood is the potential for treated wood to leach arsenic, copper and chromium. Townsend and his associates at the University of Florida have conducted a number of studies on the leaching of these chemicals from treated wood (Townsend, et al. 1998; Jambeck et al. (2008), Khan, et al. 2004, et al. 2008 and Engelhaupt,2007). They have found that the chemicals are somewhat leachable over a long period of time and represent a threat to groundwater quality. Lee (2007) has discussed the importance of properly managing waste treated wood in appropriately designed and monitored landfills, in order to prevent groundwater pollution by chromium and arsenic.

McDilda (2010) presented a discussion of the potential pollution of groundwaters by chromium used to treat wood to control decay. This report discusses the threat that allowing treated wood in C & D landfills. The disposal of chromate copper treated wood is one of the types of wastes of greatest concern for disposal in C & D landfills.

An issue of particular concern at C&D waste landfills is the management of hydrogen sulfide emissions from the landfill. Wallboard (which is composed of calcium sulfate), in the presence of decomposable organic matter and water, can produce large amounts of hydrogen sulfide, where the sulfate in wallboard is reduced by bacteria to sulfide. The US EPA (2005) is developing a guidebook on managing hydrogen sulfide at C&D waste disposal facilities. This guidance discusses the potential for hydrogen sulfide generated from the decomposition of wallboard in C&D landfills to not only cause an airborne nuisance to nearby individuals, but, at high concentrations, also a health threat. This guidance discusses approaches that can be used to minimize hydrogen sulfide production at C&D landfills.

The state of California does not have specific C&D landfilling regulations. It does have regulations governing the disposal of “inert” wastes. Inert waste is defined as “that subset of solid waste that does not contain hazardous waste or soluble pollutants at concentrations in excess of applicable water quality objectives, and does not contain significant quantities of decomposable waste” (SWRCB Division 2, Title 27, §20230). Inert wastes do not require deposition in a managed area. It is, however, up to the proponent for managing such waste to demonstrate that the wastes comply with the inert waste definition. Since many construction and demolition wastes have leachable components, much of this type of waste is placed in MSW landfills in the State. In some areas of the State, MSW landfills require a double composite liner.

The only water quality threat posed by these inert wastes is siltation. according to Marshack (1989) of the State Water Resource Control Board, Marshack (1989) has discussed the approach used to determine whether a waste is an “inert waste.” The California Department of Health Services and the State Water Resources Control Board have established regulations which provide detailed criteria on how wastes are to be classified, with the exception of the “designated waste” category. According to Marshack, “The lower boundary of this category is described only as the limit above which a waste could impair water quality at the site of discharge. This boundary can be more clearly defined by establishing ‘Designated Levels’ for specific constituents of a waste which provide a site specific indication of the water quality impairment potential of the waste. [The Marshack (1989)] report provides a methodology for calculating such levels. Designated Levels are calculated by first determining the bodies of water that may be affected by a waste and the present and probable future beneficial uses of these waters. Next, site-specific ‘water quality goals’ are selected, based on background water quality or accepted criteria and standards, to protect those beneficial uses. Finally, these water quality goals are multiplied by factors which account for environmental attenuation and leachability. The result is a set of Soluble and Total Designated Levels which are applicable to a particular waste and disposal site and which, if not exceeded, should protect the beneficial uses of waters of the State. Wastes having constituent concentrations in excess of these Designated Levels are assumed to pose a threat to water quality and are, therefore, classified as ‘designated wastes’ and directed to waste management units which isolate these wastes from the environment.”

According to this approach, inert wastes would be those that do not contain soluble components at concentrations that, when deposited at a particular location, would leach constituents that, through the Designated Level Methodology, would be considered a threat to ground and surface water quality in the disposal area. Implementation of this approach requires a site specific evaluation of the leaching characteristics of the types of wastes that are proposed to be classified as inert wastes, the hydrogeology of the proposed inert waste deposition area, as well as information on the present and probable future designated beneficial uses of the ground and surface waters that would be impacted by materials potentially released from the inert wastes. Wastes that do not meet the inert waste classification must be deposited in a managed waste disposal landfill, such as an MSW landfill or hazardous waste landfill.

Buske, et al. (2005) have presented a discussion of the characteristics of landfill odors and some of the approaches for assessing the magnitude of odor, and its control. The focus of their discussion is the potential adverse impacts of using fines from C&D wastes as landfill daily

cover. They report that this approach has led to severe, persistent offsite odors, where it was necessary to terminate this approach.

It is evident that C&D wastes should not be considered inert. These wastes can leach components that can cause groundwater pollution. They should be managed in properly sited, designed, operated and closed landfills that receive postclosure care (maintenance and monitoring) for as long as the wastes in the landfill are a threat, upon contact with water, to generate leachate.”

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Lee, G. F., and Jones-Lee, A., "PCBs as Contaminants in Construction and Demolition (C&D) Wastes," *Report of G. Fred Lee & Associates, El Macero, CA, December 5 (2010h).* <http://www.gfredlee.com/Landfills/CD-LandfillsPCB.pdf>

Marshack, J., "The Designated Level Methodology for Waste Classification and Cleanup Level Determination," *Staff Report of the California Regional Water Quality Control Board, Central Valley Region, Rancho Cordova, CA, October 1986, Updated June (1989).* http://www.waterboards.ca.gov/centralvalley/plans_policies/guidance/dlm.pdf

McDilda, D., "CCA Treated Wood: The End of the Line," *MSW Management, Web Article Editorial* [<http://www.mswmanagement.com/web-articles/cca-treated-wood-3.aspx>], August 2 (2010). <http://www.gfredlee.com/Landfills/CCA-TreatedWood-Mcdilda.pdf>

Ohio EPA, "Construction and Demolition Debris Rule Updates," *State of Ohio Environmental Protection Agency, Division of Solid Wastes, Columbus, OH, June (2009).* http://www.epa.ohio.gov/dsiwm/pages/news_pages/n_cddrules.aspx

Solo-Gabriele, H. M.; Dubey, B.; Townsend, T. G. and Cai, Y., "Arsenic Speciation of Solvent-Extracted Leachate from New and Weathered CCA-Treated Wood," *Environmental Science and Technology* 38:4527-4534 (2004). Concentrations in Leachate," *Environ. Sci. Technol.* 42(15):5740-5745 (2008). <http://www.sciencedirect.com/science/journal/01959255>

Townsend, T. G.; Jang, Y. C. and Weber, B., "Characteristics of Leachate from Construction and Demolition Waste Landfills," *Report #98-4, State University System of Florida, Florida Center for Solid and Hazardous Waste Management, Gainesville, FL, August (1998).*

US EPA, "Guidebook: Hydrogen Sulfide Prevention & Control at Construction and Demolition Debris Disposal Facilities," *Draft Report of the USEPA Region 5, Waste, Pesticides, and Toxics Division, Chicago, IL, December (2005).* in Lee (2006h).

Veith, G., and Lee, G. F., "A Review of Chlorinated Biphenyl Contamination in Natural Waters," *Water Research* 4:265-269 (1970). <http://www.gfredlee.com/HazChemSites/Veith-Lee-ReviewPCB.pdf>

Another issue of concern about the potential for C&D landfills to cause environmental pollution is stormwater runoff from C&D landfills. The following section is a discussion of the inadequate monitoring of stormwater runoff from landfills that is presented in the "Flawed Technology" review. While this discussion focused on MSW landfills it is equally applicable to C&D landfills.

“Inadequate Stormwater Runoff Parameter Monitoring.

Current water quality regulatory programs only regulate 100 to 200 of the many thousands of chemicals present in municipal and industrial solid wastes that can be legally added to the waste stream that is deposited in MSW landfills. The monitored/regulated chemicals in landfill leachate and stormwater runoff represent a very small part of the chemicals present in MSW that are a threat to public health and the environment. The regulation of landfill stormwater runoff water quality impacts occurs under the US EPA National Stormwater Runoff permit system. Nationally and in states, stormwater runoff from a landfill is regulated as an “industrial” source. Critical review of the existing landfill stormwater runoff monitoring requirements shows that they are seriously deficient in providing the monitoring needed to insure with a reasonable degree of certainty that the landfill stormwater runoff will not pollute the waters receiving the runoff from the landfill. MSW and its leachate contain thousands of chemicals that are not monitored/regulated, which are a threat to public health and the environment. Some of the unmonitored constituents can be adverse to public health at very low concentrations. Dr. Christian Daughton (2005), Chief of the Environmental Chemistry Branch, National Exposure Research Laboratory, Office of Research and Development, US EPA, Las Vegas, Nevada, has discussed the inadequacy of water quality monitoring programs in identifying pollutants in wastewaters/stormwater runoff for the range of chemicals that could be impacting public health and the environment. In his presentation he stated,

“Further Truisms Regarding Environmental Monitoring

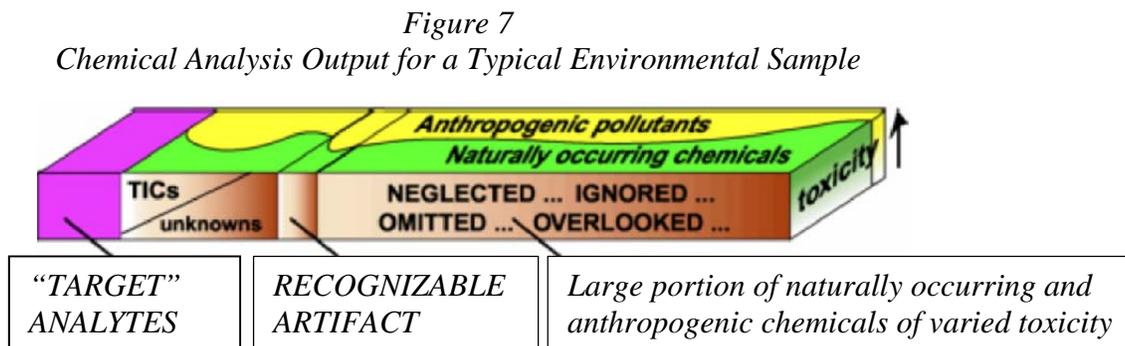
- What one finds usually depends on what one aims to search for.
- Only those compounds targeted for monitoring have the potential for being identified and quantified.
- Those compounds not targeted will elude detection.
- The spectrum of pollutants identified in a sample represent but a portion of those present and are of unknown overall risk significance

Figure 7 presents a diagram of this situation. This figure is from web page: “The Critical Role of Analytical Chemistry,” C.G. Daughton, July 2002.

<http://www.epa.gov/nerlesd1/chemistry/pharma/critical.htm>

Background information on unrecognized/unregulated chemicals as environmental pollutants is available at <http://www.epa.gov/nerlesd1/chemistry/pharma/> and at

<http://www.epa.gov/nerlesd1/chemistry/ecb-posters.htm>.



TICs = tentatively identified compounds, from: C.G. Daughton, US EPA (July 2002)

In addition, Lee and Jones-Lee (2005b) have recently published a review on unrecognized pollutants.

*Lee, G. F., and Jones-Lee, A., "Unrecognized Environmental Pollutants," In: Water Encyclopedia: Surface and Agricultural Water, Wiley, Hoboken, NJ, pp 371-373 (2005b).
<http://www.gfredlee.com/SurfaceWQ/WileyUnrecognizedPollutants.pdf>*

Appendix A
List of Documents Reviewed

(Corinne please review the discussion of each document for its appropriateness)

10-5-11-LtrofDecision.pdf

Plaquemines Parish Government, “Basis of Decision,” Denial of Coastal Use Permit Application P20100453 of Industrial Pipe, Inc., Belle Chasse, LA, by Plaquemines Parish Government Coastal Zone Management, Belle Chasse, LA, October 5 (2011).

FinalSiteActivitiesSoilClassReport.pdf – includes two items

Materials Management Group, Inc. (MMG), “Final Site Activities and Soil Classification Report, Phase II Environmental Site Assessment, Oakville Levee Extension, Plaquemines Parish, Louisiana,” Report to US Army Corps of Engineers, New Orleans District, by MMA, New Orleans, LA, October 10 (2006).

“Comments and Response on Gulf Engineers & Consultants Sediment Sampling and Analysis Plan, Lakes District, City/Parish of East Baton Rouge, LA” Reviewers: USACE-NOD; Respondent: Materials Management Group, Inc., September 26 (2006).

Attachment P – 2-1-07-seagulls, odors, misc.unauth.waste.pdf

Attachment P, Louisiana Department of Environmental Quality Field Interview Form, Inspection date 2/1/07 Industrial Pipe CID, Belle Chasse, LA in response to Incidents 93369 (1/19/07), 93600 (1/30/07), 93607 (1/30/07), 93620 (1/31/07) concerning odors, seagulls, and dirt in buffer zone, February 1 (2007).

Attachment Q- 2-8-07-Odors.pdf

Attachment Q, Louisiana Department of Environmental Quality Field Interview Form, Inspection date 2/8/07 Industrial Pipe CID, Belle Chasse, LA in response to Incidents 93723 (2/5/07), 93743 (2/5/07), 93744 (2/5/07), 93749 (2/6/07) concerning ongoing unknown odor problems, February 8 (2007).

Attachment R – 2-23-07Odors.pdf

Attachment R, Louisiana Department of Environmental Quality Field Interview Form, Inspection date 2/23/07 Industrial Pipe, Belle Chasse, LA, Solid Waste CEI Inspection and Response to Incidents 93876, 93922, 93948, 94149 concerning odors, buffer zone, seagulls, fires, etc., February 23 (2007).

Attachment S – 2-23-07-Odor Complaints.pdf – includes several items:

Attachment S, Louisiana Department of Environmental Quality Incident Reports:
Incident 93876, Industrial Landfill Oakville, odors, fire, February 9 (2007)
Incident 93922, Belle Chasse, LA, odor, February 12 (2007)
Incident 93948, Industrial Pipe 230, odor, February 9 (2012)
Incident 94149, Industrial Pipe C&D Landfill, soil, February 22 (2007)

Attachment T – 7-12-07-inadequate cover-erosion.pdf

Attachment T, Louisiana Department of Environmental Quality Referral Form, Industrial Pipe Landfill, Complaint regarding erosion, Field Interview form, Compliance Inspection Report, July 11 (2007)

Attachment U – 11-1-7-Dust Complaint.pdf

Attachment U, Louisiana Department of Environmental Quality Incident Report, Incident 100681 concerning dust and Field Interview form, November 1 (2007)

Attachment V – 6-14-07-Creosote Waste Tires.pdf

Attachment V, Louisiana Department of Environmental Quality Field Interview Form, Inspection date 6/14/07 Industrial Pipe Landfill in response to Incident 97063 concerning creosote waste and tires at site, June 14 (2007)

Attachment W – 4-21-9-Creosote Pilings.pdf

Attachment W, Louisiana Department of Environmental Quality Waste compliance Inspection Report, response to Incident 114147, creosote treated lumber, Inspection April 21 (2009)

Attachment X – 11-18-10 IP Coal Coke Creosote.pdf

Attachment X, Louisiana Department of Environmental Quality Field Interview Form, Inspection date 11/18/10 Industrial Pipe Landfill in response to concern about household waste at site, November 18 (2010)

Attachment Y – 11-15-10 Tires.pdf

Attachment Y, Louisiana Department of Environmental Quality, Waste Tire One Time Cleanup/Trash Bash Form, November 9 (2010)

Attachment Z – 10-15-08-Seepage.pdf

Attachment Z, Louisiana Department of Environmental Quality Referral Form, Inspection Report for Incident T107055, Riverside Recycling & Disposal, Inspection 10/15/2008, Report by permittee 1/28/2009, follow-up inspection 5/18/2009, Facility Interview Form, photos, May (2009)

10-20-10-Supp.App.Info.pdf

Romanowsky, P. (URS Corp.), Letter to A. Kimble, Local Coastal Program Manager, Plaquemines Parish, LA, concerning location of proposed hurricane protection levee, with figures, URS Corp., Baton Rouge, LA, October 20 (2010).

9-28-10-Supp.App.pdf

Romanowsky, P. (URS Corp.), Letter to A. Kimble, Local Coastal Program Manager, Plaquemines Parish, LA, in response to May 14, 2010 letter regarding comments on Phase I Coastal Use Permit Application for IPI Belle Chasse facility, with figures, URS Corp., Baton Rouge, LA, September 28 (2010).

5-14-10-Ltr.Parish.to.IP.pdf

Kimble, A., Local Coastal Program Manager, Plaquemines Parish, LA, to URS Corp. concerning additional information needed to process P20100453 Coastal Use Permit Application Industrial Pipe, Inc. expansion of landfill, May 14 (2010).

4-15-10-IP.CUP-404 App.pdf – includes the following items:

Louisiana Department of Natural Resources Office of Coastal Management (OCM) and US Army Corps of Engineers, New Orleans District, Joint Permit Application for Work within Louisiana Coastal Zone, Permit No. P20100453, April 15 (2010).

Attachment 1: Richardson, J., “An Economic Analysis of the Impact of the Construction and Operation at the Riverside Recycling and Disposal Facility in Belle Chasse, Louisiana: A Transfer Station and a C&C Landfill,” Prepared for URS Corporation by J. Richardson, Economic Consultant, Baton Rouge, LA, July (2001).

Attachment 2: Alternate Site Study Belle Chasse Real Estate, Inc. January 23 (2003). Belle Chasse Real Estate, Inc., Letter to Industrial Pipe, Inc., regarding Alternate site study, January 23 (2003).

Attachment 3: Discussion of Alternatives and Minimization of Impacts URS, Baton Rouge, LA, Letter to R. Ventola, US Army Corps of Engineers New Orleans District concerning Comment Responses Phase I Wetland Permit Application, Industrial Pipe, Inc., January 31 (2003).

Attachment 4: Adjacent Landowner Approval Hero, A., Manager, Wharves & Docks Co., Letter to K. Stewart, Industrial Pipe, Inc., Belle Chasse, LA regarding Wetland permit, May 10 (2002).

Attachment 5: Mitigation Correspondence Breaux, B., US Army Corps of Engineers, Environmental Resources Specialist Regulatory Branch, Letter to K. Stewart regarding offsite compensatory mitigation options, May 2 (2006).

8-11-11-FINAL CUP Comments.pdf

VanDalen, C., Tulane Environmental Law Clinic, New Orleans, LA, Letter to A. Kimble, Plaquemines Parish Coastal Zone Management Department, Braithwaite, LA, regarding comments on behalf of Oakville Community Action Group et al. concerning Industrial Pipe, Inc. Application for Coastal Use Permit no P20100453, August 11 (2011).

LDEQ.SolidWasteRegs.7-08.pdf

Louisiana Environmental Regulatory Code, Title 33, Environmental Quality, Part VII. Solid Waste, Subpart 1. Solid Waste Regulations, July (2008).

La. CUP Regulations.pdf

Louisiana Administrative Code, Title 43, Part I, Subpart 1, Chapter 7, Subchapter C. Coastal Use Permits and Mitigation, Section 723. Rules and Procedures for Coastal Use Permits [copied May 24, 2012]

7-20-11-Supp.App.pdf

Romanowsky, P. (URS Corp.), Letter to A. Kimble, Plaquemines Parish Coastal Zone Management Department, Belle Chasse, LA, providing supplemental information and references in support of Phase I Coastal Use Permit application for IPI's Belle Chasse facility, July 15 (2011). [Note: some of the items included in this 364 page document have been provided as separate pdf files]

8-1-03-pt.1.pdf

URS Corp., "Permit Application Type III Construction/Demolition Debris Facility, Industrial Pipe, Inc.," Prepared for Industrial Pipe, Inc., Belle Chasse, LA by URS Corp., Baton Rouge, LA, August (2003). [136 pages]

8-1-03-pt.2.pdf

URS Corp., "Permit Application Type III Construction/Demolition Debris Facility, Industrial Pipe, Inc.," Prepared for Industrial Pipe, Inc., Belle Chasse, LA by URS Corp., Baton Rouge, LA, August (2003). [This file is apparently a continuation of the Permit Application – Note: some of the items included in this 362 page document have been provided as separate pdf files]

Oakville 1st RFA 2nd Set of IROG, RFP & Attachments.pdf

VanDalen, C., 25th District Court for the Parish of Plaquemines, No. 59-189 Division B, Industrial Pipe, Inc., v. Plaquemines Parish Council et al., Oakville Community Action Group and Louisiana Environmental Action Network's First Set of Request for Admissions, Second Set of Interrogatories, and Second Set of Requests for Production to Industrial Pipe, Inc., May 25 (2012).

IP Resp. to Oakville First Set Discovery.pdf

Attorneys for Industrial Pipe, Inc., 25th District Court for the Parish of Plaquemines, No. 59-189 Division B, Industrial Pipe, Inc., v. Plaquemines Parish Council et al., Industrial Pipe's Response to Intervenors' First Set of Interrogatories and First Set of Requests for Production, May 30 (2012).

5960825.pdf

LDEQ, Louisiana Pollutant Discharge Elimination System General Permit Number LAG780013 Reauthorizing Riverside Recycling & Disposal Industrial Pipe Landfill, Belle Chasse, LA, November 9 (2007).

1-2-12-DMR.pdf

NPDES Discharge Monitoring Report, Data Sheets, Monitoring Period 2/1/2012–2/29/2012, Riverside Recycling & Disposal LLC, Industrial Pipe Landfill, Belle Chasse, LA, April 9 (2012).

2-27-08-LPDES Modification.pdf

LDEQ, Modifications of LPDES General Permit for Construction/Demolition Debris and Woodwaste Landfills LAG780013, February 27 (2008).

5-27-12-Reauthorization of Gen.Stormwater Permit.pdf

LDEQ, Letter to T. Schotsch, Industrial Pipe, Inc., Belle Chasse, LA, Reissuance of LPDES Storm Water Multi-Sector General Permit for Industrial Pipe, Inc. Transfer Station, Effective May 4, 2011 (without enclosures), May 27 (2011).

9-6-06-Notice of Termination LPDES.pdf

LDEQ, Letter to K. Stewart, Industrial Pipe, Inc., Belle Chasse, LA, Notice of Termination–Louisiana Pollutant Discharge Elimination System (LPDES) Storm Water General Permit for Construction Demolition Debris Landfill, Belle Chasse, LA, September 6 (2006).

7-21-06-LPDES Modification Request.pdf

Industrial Pipe, Inc., Letter to C. Brown, LDPQ, Permit Modification Request for Construction and Demolition Debris Landfill, Belle Chasse, LA, July 21 (2006).

11-3-11-Pet Trial De Novo.pdf

Attorneys for Industrial Pipe, Inc., 25th District Court for the Parish of Plaquemines, No. 59-189 Division B, Industrial Pipe, Inc., v. Plaquemines Parish Council et al., Petition for Trial De Novo of Coastal Zone Permit Application, with attachments, filed November 3 (2011).

OakvillePhaseIFinal.pdf

USACE (US Army Corps of Engineers, New Orleans District), “Draft Phase I Environmental Site Assessment Report, West Bank Hurricane Protection Project–East of Harvey Canal in the Vicinity of Hero Canal (Oakville Levee Expansion) Plaquemine Parish, Louisiana,” July 19 (2006).

6-5-12-IP’s responses to PPC’s RFA & rogs.pdf

Attorneys for Industrial Pipe, Inc., 25th Judicial District Court for the Parish of Plaquemines, No. 59-189 Division A, Industrial Pipe, Inc., v. Plaquemines Parish Council et al., Industrial Pipe, Inc.’s Responses to Defendants’ Requests for Admissions and Interrogatories, served June 5 (2012).

Biographical Information for G. Fred Lee and Anne Jones-Lee

Expertise and Experience in Hazardous Chemical Site and Municipal/Industrial Landfill Impact Assessment/Management

Dr. G. Fred Lee's work on hazardous chemical site and municipal/industrial 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 and industrial 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 ground water 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 (surface and ground water) 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 ground water quality evaluation and management, and solid and hazardous waste management. He has published over 1,100 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 piles/lagoons.

His work on the impacts of hazardous chemical site and municipal/industrial solid waste landfills began in the 1960s when, 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 and industrial (hazardous) 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 Distinguished Professor 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. He was involved in evaluating the potential threat of uranium waste solids from radium watch dial painting on groundwater quality when disposed of by burial in a gravel pit. The public in the area of this state of New Jersey proposed disposal site objected to the State's proposed approach. Dr. Lee provided testimony in litigation, which caused the judge reviewing this matter to prohibit the State from proceeding with the disposal of uranium/radium waste at the proposed location.

Dr. Lee's expertise includes surface and ground water quality evaluation and management. This expertise is based on academic course work, research conducted by Dr. Lee and others and consulting activities. He has served as an advisor to numerous governmental agencies in the US and other countries on water quality issues. Further, he has served on several editorial boards for professional journals, including Ground Water, Environmental Science and Technology, Environmental Toxicology and Chemistry, J. Stormwater, J. Remediation etc. Throughout his over-50-year professional career, he has been a member of several professional organization committees, including chairing the American Water Works Association national Quality Control in Reservoirs Committee and the US Public Health Service PCBs in Drinking Water Committee.

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 and mining waste management issues. His work included evaluating the impacts of a number of municipal and industrial solid waste landfills. Much of this work was done on behalf of water utilities, governmental agencies and public interest groups who were concerned about the impacts of a proposed landfill on their groundwater resources, public health and the environment.

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 and C&D landfills. He has been involved in the review of approximately 85 different landfills and waste piles (tailings) in various parts of the United States and in other countries,

including 12 hazardous waste landfills, eight Superfund site landfills and five construction and demolition waste landfills. He has also served as an advisor to a hazardous waste landfill developer and to IBM corporate headquarters and other companies on managing hazardous wastes.

Dr. Anne Jones-Lee is vice president of G. Fred Lee & Associates. She earned her BS degree in biology from Southern Methodist University in 1973 and her PhD degree in environmental science from the University of Texas Dallas in 1978. For 11 years she held teaching and research positions in graduate degree programs of several US universities, where she specialized in evaluating the impact of chemicals and pathogens on public health and water quality. Dr. Jones-Lee is editor of Drs. Lee and Jones-Lee's "Stormwater Runoff Water Quality Newsletter." She has worked with Dr. G. Fred Lee since 1975 in research and consulting, and has co-authored many papers and reports.

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 150 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 on 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/waste management unit. They make many of their publications available as downloadable files from their web site, www.gfredlee.com.

Their work on landfill issues has particular relevance to "Superfund" and hazardous waste site remediation, since regulatory agencies often propose to perform site remediation by developing an onsite landfill or capping waste materials that are present at the Superfund site. The proposed approach frequently falls short of providing true long-term health and environmental protection from the landfilled/ capped waste.

In the early 1990s, Dr. Lee 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 committee to assess public health impacts of municipal landfills.

In 2004 Dr. Lee was selected as one of two independent peer reviewers by the Pottstown (PA) Landfill Closure Committee to review the adequacy of the proposed closure of the Pottstown Landfill to protect public health, groundwater resources and the environment for as long as the wastes in the closed landfill will be a threat.

In addition to teaching and serving as a consultant in environmental engineering for over 50 years, Dr. Lee is a registered professional engineer in the state of Texas and an American Academy of Environmental Engineers (AAEE) board certified Environmental Engineer. The latter recognizes his leadership roles in the environmental engineering field. He served as the chief examiner for the AAEE in north-central California during 1990-2010 and in the 1980s in 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.

In November 2009 Dr. Lee was elected as a fellow of the American Society of Civil Engineers. This election recognizes Dr. Lee five decade career as a national/international leader university graduate level educator and environmental consultant recognizing his leadership role in the environmental quality management field. In September 2010 the Sacramento Section of the American Society of Civil Engineers awarded Dr. Lee as the Outstanding ASCE Life Member.

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, and 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 also participated in a mine waste management short-course organized by the University of Wisconsin-Madison and the University of Nevada. He has been 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 United States.

Throughout Dr. Lee's 30-year university graduate-level teaching and research career and his subsequent 23-year private consulting career, he has been active in developing professional papers and reports that are designed to help regulatory agencies and the public gain technical information on environmental quality management issues. Drs. Lee and Jones-Lee have provided a number of reviews on issues pertinent to the appropriate landfilling of solid wastes. Their most comprehensive review of municipal solid waste landfilling issues is what they call the "Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste," which was originally developed in 1992, and redeveloped and updated in the fall of 2004. Between the two versions they have published numerous invited and contributed papers that provide information on various aspects of municipal solid waste landfilling, with emphasis on protecting public health and the environment from waste components for as long as they will be a threat. The "Flawed Technology" review has been periodically updated, including the most recent update in June 2010, which can be found on their website at <http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf>

This review provides a comprehensive, integrated discussion of the problems that can occur with minimum-design Subtitle D landfills and landfills developed in accord with state regulations that conform to minimum Subtitle D requirements. The "Flawed Technology" review contains a listing of the various reviews that Drs. Lee and Jones-Lee have developed, as well as peer-reviewed literature. Over 40 peer-reviewed papers are cited in "Flawed Technology" supporting issues discussed in this review.

Drs. Lee and Jones-Lee have developed guidance on the evaluation of the potential impacts of landfills. This guidance is available as,

Lee, G. F., and Jones-Lee, A., "Guidance on the Evaluation of the Potential Impacts of a Proposed Landfill," Report of G. Fred Lee & Associates, El Macero, CA January (2007).<http://www.gfredlee.com/Landfills/EvaluationImpactLF.pdf>.