

**PCBs as an Unlikely Cause of Urban Aquatic Sediment Toxicity:
Colorado Lagoon Sediment TMDL**

G. Fred Lee, PhD, PE, BCEE, F.ASCE and Anne Jones-Lee, PhD

Report of G. Fred Lee & Associates

El Macero, CA

gfredlee@aol.com  www.gfredlee.com

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The authors have experienced several situations where water quality regulatory agencies claim that PCBs in aquatic sediments are a cause of sediment aquatic life toxicity for waterbodies impacted by urban stormwater runoff. G. Fred Lee has been involved in investigating the sources, significance, fate, and control of PCBs for more than five decades; his first publication on such PCB issues was:

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>

The expanse of his experience and expertise in environmental pollution by PCBs is summarized in the report:

Lee, G. F., "Experience in Working with PCB Pollution Issues," Report of G. Fred Lee & Associates, El Macero, CA (2006).

<http://www.gfredlee.com/HazChemSites/PCBExperience.pdf>

Other of Dr. Lee's papers and reports devoted to PCBs as environmental pollutants are available on his website [www.gfredlee.com] and may be found by browsing the topic categories, or using the search feature, on the homepage. Dr. Anne Jones-Lee has worked with Dr. G. Fred Lee on these issues since the late 1970s.

Most recently, Drs. Lee and Jones-Lee served as technical consultants to the Brisbane Baylands Community Advisory Group (BBCAG), a citizens' group in Brisbane, CA, located just south of San Francisco. The Brisbane Baylands is an approximately 600-acre brownfield area, the site of a closed solid waste landfill and various former industrial facilities that is being considered for redevelopment for commercial, public areas and potentially residential units. The Baylands area are highly contaminated by petroleum hydrocarbons, VOCs, heavy metals and large amounts of unidentified hazardous chemicals. Area citizens are concerned about the adequacy of the investigations that have been done and are planned to assess potential public health and environmental quality impacts of chemicals known or anticipated to be at the site in light of the development and remediation concepts being considered. One of the issues of focus was sources of PCBs in stormwater runoff from the Brisbane Baylands area that are contributing to the bioaccumulation of PCBs to excessive levels in some aquatic organisms in San Francisco Bay, which causes increased cancer risk for those who eat the fish.

Their findings were presented to the BBCAG and published as:

Lee, G. F., and Jones-Lee, A., "Report on the Adequacy of the Investigation/Remediation

of the Brisbane Baylands UPC Property Contamination Relative to Development of That Property," Prepared for Brisbane Baylands Community Advisory Group (BBCAG), Brisbane, CA, Report of G. Fred Lee & Associates, El Macero, CA, November 1 (2010). <http://www.gfredlee.com/Landfills/BrisbaneBaylands.pdf>

Lee, G. F., and Jones-Lee, A., "Report on the Adequacy of the Investigation/Remediation of the Brisbane Baylands UPC Property Contamination Relative to Development," PowerPoint Slides for Presentation prepared for Brisbane Baylands Community Advisory Group (BBCAG), Brisbane, CA, October 19 (2010). <http://www.gfredlee.com/Landfills/BrisbaneBaylandsSlides.pdf>

As discussed in the BBCAG report and in Lee's Storm Water Runoff Water Quality Newsletter Vol. 12, no. 7/8 [<http://www.gfredlee.com/Newsletter/swnewsV12N7-8.pdf>], it has recently been found that urban stormwater runoff can contain PCBs derived from PCB-laden caulk used as sealants in buildings and in expansion joints in concrete. This finding is pertinent to the PCB TMDL goal for the Colorado Lagoon in Long Beach, CA since caulk could be expected to be a potential source of PCBs in urban stormwater that accumulates in the Colorado Lagoon sediments.

PCBs in Caulk: Concerns for Stormwater Runoff

The San Francisco Regional Water Quality Control Board (SFRWQCB) has adopted a TMDL to control the excessive bioaccumulation of PCBs in some San Francisco Bay area fish in an effort to protect the health of those who use those fish for food. In November 2006, the State Water Resources Control Board awarded the Association of Bay Area Governments/San Francisco Estuary Project a "Proposition 50 Coastal Nonpoint Source Pollution" grant that included funds to advance the implementation of the TMDL for the control of PCBs used in historic buildings. A fact sheet entitled, "PCBs in Bay Area Building Materials," covering this project is available at <http://www.sfestuary.org/userfiles/PCBsInBuildingMaterialsFact%20Sheet%2012-08.pdf>.

Based on information provided during the October 26, 2010 telephone conference to review progress being made in the "PCBs in Caulk Project," the crushed concrete that is piled on the Brisbane Landfill could contain PCBs that could, in turn, be present in stormwater runoff from that area. The fact sheet, "The San Francisco Bay PCBs TMDL Project Report, San Francisco Bay Water Board (2004). PCBs in San Francisco Bay, TMDL Project Report, January 8, (2004)" states:

"report that urban runoff was one of the major sources of PCBs loads to the Bay and concluded that controlling PCBs sources in urban runoff was one of two top priorities for TMDL implementation. Based on this recommendation, the Clean Estuary Partnership (CEP) evaluated available data on sources of PCBs in urban runoff and recommended approaches for addressing two potentially significant sources, past PCBs releases that have contaminated soil and sediments and PCB-containing historic building materials, specifically uncontained materials like sealants, caulking and paint. When the building materials fail or buildings are remodeled or demolished, PCBs may be released onto the ground and can be washed off by urban runoff."

Additional information on the San Francisco Bay Estuary Project is available in the document, "Taking Action for Clean Water — PCBs in Caulk Project," available at [<http://www.sfestuary.org/projects/detail.php?projectID=29>]

Related issues are also discussed in the following reports:

Lee, G. F., and Jones-Lee, A., "Issues in Monitoring Hazardous Chemicals in Stormwater Runoff/Discharges from Superfund and Other Hazardous Chemical Sites," *Journ. Remediation* 20(2):115-127 Spring (2010).
<http://www.gfredlee.com/HazChemSites/MonitoringHazChemSW.pdf>

Lee, G. F., and Jones-Lee, A., "Monitoring Pollutants in Stormwater Runoff from Superfund Sites and Other Locations," Report of G. Fred Lee & Associates, El Macero, CA, November 5 (2009).
<http://www.gfredlee.com/HazChemSites/MonitorRunoffSuperfund.pdf>

Lee and Jones-Lee addressed PCBs as pollutants in ambient waters, aquatic sediments, and aquatic and terrestrial life in:

Lee, G. F., and Jones-Lee, A., "Comments on 'US Gypsum Draft Environmental Impact Statement for the Development of the US Gypsum Proposed Wallboard Plant to be Located on Port of Stockton West Complex,'" Comments submitted to Lozeau/Drury, Alameda, CA by G. Fred Lee & Associates, El Macero, CA, December 15 (2008).
<http://www.gfredlee.com/HazChemSites/USGypsumDEIR.pdf>

On behalf of the Sierra Club of Canada, Lee reviewed PCB pollution associated with the Sydney Tar Ponds and the remediation of the PCB-contaminated estuary sediments near Sydney, Nova Scotia, Canada. The issue of concern was the pollution of aquatic sediments by many chemicals including PCBs that had been discharged without treatment by a large steel mill over the course of a century. Reports on that investigation include:

Lee, G. F., "Comments on Joint Review Panel Environmental Assessment Report - Sydney Tar Ponds and Coke Ovens Sites Remediation Project," Report of G. Fred Lee & Associates, El Macero, CA, July (2006). <http://www.gfredlee.com/Landfills/STPAES-Comments.pdf>

Lee, G. F., "Assessment of the Adequacy & Reliability of the STPA Proposed Approach for Remediation of the Sydney Tar Ponds' Sediments," Presentation to the Sydney Tar Ponds and Coke Ovens Sites Remediation Project Joint Review Panel, Sydney, Nova Scotia, CANADA, PowerPoint Slides; G. Fred Lee & Associates, El Macero, CA, May 15 (2006). <http://www.gfredlee.com/Landfills/SydneyTarPondsPowerPt.pdf>

Lee, G. F. and Jones-Lee, A., "Progress toward Remediation of the Sydney Tar Ponds: A Major Canadian PCB/PAH 'Superfund' Site," *Journal Remediation* 17(1):111-119 (2006). <http://www.gfredlee.com/Landfills/STP-Remediation-pap.pdf>

Lee, G. F., "Comments on 'Remediation of Sydney Tar Ponds and Coke Ovens Sites Environmental Impact Statement, Sydney, Nova Scotia,' dated December 2005," Report of G. Fred Lee & Associates, El Macero, CA, USA, May 15 (2006).

<http://www.gfredlee.com/Landfills/SydneyTarPondsReport.pdf>

Lee, G. F., "Unreliable/Inadequate Information on the Efficacy of Solidification/Stabilization of Sydney Tar Pond Sediments," Report of G. Fred Lee & Associates, El Macero, CA, February (2007).

<http://www.gfredlee.com/Landfills/SydneyTPSedSolidif.pdf>

Lee, G. F., and Jones-Lee, A., "Comments on the Adequacy of the Sydney Tar Ponds Agency SS Remediation Objectives," Report of G. Fred Lee & Associates, El Macero, CA, June 14 (2010). http://www.gfredlee.com/Landfills/STP_SSRemObjectives.pdf

Lee, G.F., and Jones-Lee, A., "TCLP Not Reliable for Evaluation of Potential Public Health and Environmental Hazards of PCBs or Other Chemicals in Wastes: Unreliability of Cement-Based Solidification/Stabilization of Wastes," Report of G. Fred Lee & Associates, El Macero, CA, September (2009).

http://www.gfredlee.com/Landfills/TCLP_Solidification.pdf

Lee, G. F., "Update on the Remediation of the Sydney Tar Ponds: Potential Health Effects of Offsite Odor Problems," Report of G. Fred Lee & Associates, El Macero, California November (2009).

<http://www.gfredlee.com/Landfills/SydneyTarPondsOdors.pdf>

As discussed in those cited papers/reports, based on US EPA water quality criteria for PCBs [<http://water.epa.gov/scitech/swguidance/waterquality/standards/current/upload/nrwqc-2009.pdf>], PCBs present in stormwater runoff in concentrations that are below analytical detection can, in fact, bioaccumulate in receiving water fish to levels that pose a threat to the health of those who eat the fish. This situation has important implications for the implementation of TMDLs for controlling the excessive accumulation of PCBs in Colorado Lagoon and other urban waterbody sediments and aquatic life; "non-detectable" levels of PCBs in stormwater runoff to the lagoon can still be sufficient to continue to cause major water quality problems in sediments and aquatic life in that lagoon.

This and related issues are discussed in the following comments submitted to the US EPA:

Lee, G. F., "Comments on US EPA Draft 'Contaminated Sediment Remediation Guidance for Hazardous Waste Sites,' Dated November 2002," Comments Submitted to the US EPA, Washington, D.C., Submitted by G. Fred Lee & Associates, El Macero, CA, March 24 (2003) <http://www.gfredlee.com/HazChemSites/HazWasteSed-Comments.pdf>

Urban Pesticides as a Cause of Sediment Toxicity

Based on findings in similar situations, to the extent that there is aquatic life toxicity in an urban area aquatic sediments it is most likely due to pyrethroid-based pesticides derived from the use of such pesticides in residential properties in the waterbody's watershed. Lee has had extensive experience in water quality impacts of pyrethroid pesticides; his work was the first to find that these types of pesticides were a cause of part of the aquatic life toxicity in the tributaries of Upper Newport Bay, CA. On behalf of the Santa Ana Regional Water Quality Control Board he and his colleagues conducted a major study of aquatic life toxicity in those tributaries during

stormwater runoff events and developed several reports discussing the findings, including:

Lee, G. F. and Taylor, S., "Results of Aquatic Toxicity Testing Conducted During 1997-2000 within the Upper Newport Bay Orange County, CA Watershed," Report of G. Fred Lee & Associates, El Macero, CA (2001).

<http://www.gfredlee.com/Watersheds/295-319-tox-paper.pdf>

Lee's Stormwater Runoff Water Quality Newsletters 1-1, 2-1, 3-5, 3-6, 6-3, 6-4, 7-6/7, 8-1/2, 9-3, 9-4, 9-6, 9-7, 9-8, 10-3, 10-8, 10-12, 11-4, 11-7/8, 12-4, 12-7/8, 13-1, 13-2 available at, <http://www.gfredlee.com/newsindex.htm> provides discussion of many aspects and issues of aquatic life toxicity in urban stormwater runoff. Since completing the original studies in the 1990s he and others have found that pyrethroid pesticides are a common cause of aquatic life toxicity in water and sediments of urban waterbodies. They are likely to be the cause of aquatic life toxicity in Colorado Lagoon sediments, as well, and this toxicity will likely continue for many years to come since the pesticide regulatory agencies have indicated that it will likely be many years before the pyrethroid based pesticides are regulated to control aquatic life toxicity in urban stormwater runoff and waterbody sediments. Since the PCBs in the sediments of Colorado Lagoon are unlikely to be contributing to toxicity of those sediments, and since pyrethroid pesticides and other real potential causes of toxicity are not being addressed in a reliable manner, in this TMDL the dredging of the lagoon sediments to remove PCBs will not address, much less remedy, the problem.

Overall Assessment of the Unreliability of TMDL ERL Targets

Overall, the ERLs-based TMDL goal adopted by regulatory agencies has its foundation in what is recognized in the technical community to be a technically invalid approach. The TMDL sediment remediation goal needs to be redefined and re-focused on the real significant water quality problems in the waterbody. Aquatic organisms need to be evaluated for excessive bioaccumulation of hazardous chemicals. If PCBs are found in edible aquatic organisms, studies need to be conducted to define the sources of the PCBs, including caulk found in demolition materials from buildings and concrete. Studies are also needed to determine whether the waterbodies sediments are toxic; if they exhibit aquatic life toxicity the cause(s) of the toxicity and sources of the toxic materials need to be defined, with particular attention to pesticides used on residential and commercial properties in the lagoon watershed. Adoption and proper implementation of this approach can lead to a reliable definition of the true significant water quality problems in the Colorado Lagoon, and provide a foundation for the control of these problems in a technically valid, cost-effective manner. Proceeding to implement the current TMDL ERL-based goals will cause the public to spend large amounts of funds without addressing and solving the real, significant water quality problems in this lagoon.

These comments on the lack of toxicity of PCBs in aquatic sediments is also applicable to DDT and other organochlorine legacy pesticides and many heavy metals. Additional information on aquatic life toxicity in urban stormwater runoff and waterbody sediments is available at www.gfredlee.com in the Surface Water Quality and Contaminated Sediment sections.

Questions on this discussion of this matter should be directed to Dr. G. Fred Lee gfredlee@aol.com.