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Via email sdparker@nas.edu

Stephen D. Parker, Director
NRC Water Science and Technology Board
Washington, DC

Stephen,

Following up on our discussions at the NAS NRC Bay Delta Biological Opinion review, I wish to bring to the attention of the review panel some of Dr. Anne Jones-Lee's and my writings on Delta Water Quality issues that could be expected to adversely influence fish populations in the Delta. From our considerable work on Delta water quality, it is our conclusion that toxic pollutants have not been a major factor in the recent decline of the SJR salmonid populations.

While pollutants have not been found to directly cause Delta POD, it is not possible to rule out regulated, and most important unregulated and unmonitored potential pollutants, as contributing to adverse impacts on the aquatic resources of the Delta. Whatever the impact of contaminants, it is clear that the export of Delta waters by DWR and the Bureau of Reclamation export projects is adverse to the aquatic resources of the Delta and likely to listed fish species as well.

I offer these conclusions with an overview of my professional background to our studies on Delta water quality issues. After obtaining my PhD degree in environmental engineering and environmental sciences, with emphasis in aquatic chemistry and public health, from Harvard University in 1960, I taught and conducted research in university graduate programs at several US universities for 30 years. During that time I supervised the masters and PhD degree research and thesis/dissertation work of about 100 students; I conducted about \$5 million in research on water quality issues and developed about 500 papers and reports.

In 1989, I retired from university teaching and research and expanded my consulting activities to a full-time activity through my firm, G. Fred Lee and Associates. I was joined in consulting by Dr. Anne Jones-Lee who also had held university graduate level teaching and research positions. We are the two principals of our firm which provides specialty consulting to governmental agencies, industry, and public groups on issues of water supply water quality, water and wastewater treatment, water pollution control, and solid and hazardous chemical/wastes and their management. We have continued to develop papers and reports on issues of concern; many of our approximately 1150 papers/reports are available on our website, www.gfredlee.com. Additional information on our expertise and experience is available on that website.

One of our major professional education-focused activities is the publication of our Stormwater Runoff Water Quality Newsletter in which I discuss timely topics and issues pertaining to evaluation and management of stormwater runoff and wastewater discharges. Now in its 13th year of publication, this email-based newsletter is sent, at no-cost, at approximately monthly intervals, to its more than 10,400 subscribers. An index and past newsletters is available at <http://www.gfredlee.com/newsindex.htm>. A number of the newsletters have specifically addressed Delta water quality issues including NL-10-10/11, 10-12, 11-5, 11-7/8, 12-4, and 12-5.

In the spring of 1989, while I held a Distinguished Professorship of Civil and Environmental Engineer at the New Jersey Institute of Technology, I became a consultant to Delta Wetlands, Inc. on water quality issues associated with the proposed development of water supply reservoirs on Delta Islands. That work marked the beginning of Dr. Jones-Lee's and my two decades of involvement in Delta water quality issues. In July of 1989 I retired from my NJIT position and moved to the Davis, California area to serve that client as well as other projects on which I had begun to work in California, including impacts of the development of the Lake Tahoe watershed on lake water quality, and impacts of a proposed expansion a large municipal solid waste landfill in the San Gabriel Basin in Southern California on behalf of the Metropolitan Water District of Southern California.

Beginning in 1989 we served as technical advisors to the San Joaquin River Deep Water Ship Channel (DWSC) DO TMDL Steering Committee and later became the Principal Investigators for a \$2-million, two-year CALFED project devoted to investigating the causes of, and proposed approaches for controlling, the low-DO conditions that develop in SJR DWSC near the Port of Stockton. We developed an initial report and then synthesis reports (copies of which are available on our website as listed):

Lee, G. F., and Jones-Lee, A., "Synopsis of Issues in Developing the San Joaquin River Deep Water Ship Channel DO TMDL," Report to SJR DO TMDL Steering Committee and the CVRWQCB, G. Fred Lee & Associates, El Macero, CA, August (2000).
<http://www.gfredlee.com/SJR-Delta/SJRsynopsis.pdf>

Lee, G. F., and Jones-Lee, A., "Synthesis and Discussion of Findings on the Causes and Factors Influencing Low DO in the San Joaquin River Deep Water Ship Channel near Stockton, CA: Including 2002 Data," Report Submitted to SJR DO TMDL Steering Committee/Technical Advisory Committee and CALFED Bay-Delta Program, G. Fred Lee & Associates, El Macero, CA, March (2003). <http://www.gfredlee.com/SJR-Delta/SynthesisRpt3-21-03.pdf>

Lee, G. F. and Jones-Lee, A., "Supplement to Synthesis Report on the Low-DO Problem in the SJR DWSC," Report of G. Fred Lee & Associates, El Macero, CA, June (2004).
<http://www.gfredlee.com/SJR-Delta/SynthRptSupp.pdf>

Lee, G. F. and Jones-Lee, A., "San Joaquin River Deep Water Ship Channel Low DO Problem and Its Control," PowerPoint slides presented at SETAC World Congress Portland, OR, November 2004. Updated December (2004).
<http://www.gfredlee.com/SJR-Delta/LowDOSummaryDec2004.pdf>

We have developed several additional reports and papers on SJR DWSC water quality issues including:

Lee, G. F., "Impact of San Joaquin River Deep Water Ship Channel Watershed and South Delta Flow Manipulations on the Low-DO Problem in the Deep Water Ship Channel," Submitted to the US Bureau of Reclamation OCAP Biological Assessment, Sacramento, CA, Report of G. Fred Lee & Associates, El Macero, CA, July 10 (2003).
<http://www.gfredlee.com/SJR-Delta/FlowImpact.pdf>

Lee, G. F., and Jones-Lee, A., "SJR Deep Water Ship Channel Water Not SJR Watershed Water below Columbia Cut," Report of G. Fred Lee & Associates, El Macero, CA (2003). Submitted for publication in the IEP Newsletter, October (2003).
<http://www.gfredlee.com/SJR-Delta/IEP-SJR-Delta7-24-03Final.pdf>

The latter report discusses the impact of Delta flow manipulations on SJR home stream water signal through the Delta during the summer, fall, and early winter.

On behalf of the Central Valley Regional Water Quality Control Board we developed the following reports:

Lee, G. F. and Jones-Lee, A., "Organochlorine Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance," California Water Institute Report TP 02-06 to the California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 170 pp, California State University Fresno, Fresno, CA, December (2002).
<http://www.gfredlee.com/SurfaceWQ/OCITMDLRpt12-11-02.pdf>

Lee, G. F., and Jones-Lee, A., "Excessive Bioaccumulation of Organochlorine Legacy Pesticides in Central Valley Fish," Report of G. Fred Lee & Associates, El Macero, CA, September 23 (2007).
<http://www.gfredlee.com/SJR-Delta/LegacyPestCentralValleyFish.pdf>

Lee, G. F., and Jones-Lee, A., "Managing Nutrient (N & P) Water Quality Impacts in the Central Valley, CA," [Excerpts from: Lee, G. F. and Jones-Lee, A., "Review of Management Practices for Controlling the Water Quality Impacts of Potential Pollutants in Irrigated Agriculture Stormwater Runoff and Tailwater Discharges," California Water Institute Report TP 02-05 to California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 128 pp, California State University Fresno, Fresno, CA, December (2002)], Report of G. Fred Lee & Associates, El Macero, CA (2002). <http://www.gfredlee.com/SJR-Delta/CentralValleyNutrientMgt.pdf>

In 2004 Dr. Jones-Lee and I completed the first comprehensive report on Delta water quality issues:

Lee, G. F. and Jones-Lee, A., "Overview of Sacramento-San Joaquin River Delta Water Quality Issues," Report of G. Fred Lee & Associates, El Macero, CA (2004).
<http://www.gfredlee.com/SJR-Delta/Delta-WQ-IssuesRpt.pdf>

That report was updated and issues discussed at a CALFED Science Conference:

Lee, G. F., and Jones-Lee, A., "Overview—Sacramento/San Joaquin Delta Water Quality," Presented at CA/NV AWWA Fall Conference, Sacramento, CA, PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, October (2007).
<http://www.gfredlee.com/SJR-Delta/DeltaWQCANVAWWAOct07.pdf>

Lee, G. F., and Jones-Lee, A., "Delta Nutrient-Related Water Quality Problems," PowerPoint Slides Presented at CALFED Science Conference, Sacramento, CA, October 24 (2008).
http://www.gfredlee.com/SJR-Delta/CALFED_SciConf10-08.pdf

In 2006 we developed a comprehensive review of the San Joaquin River water quality issues:

Lee, G. F. and Jones-Lee, A., "An Integrated Approach for TMDL Development for Agricultural Stormwater Runoff, Tailwater Releases, and Subsurface Drain Water," Proc. US Committee for Irrigation and Drainage conference on Helping Agriculture Adjust to TMDLs, pg. 161-172, Denver, CO, October (2002).
http://www.gfredlee.com/SJR-Delta/tmdl_07-2002.pdf

Lee, G. F. and Jones-Lee, A., "An Integrated Approach for TMDL Development for Agricultural Stormwater Runoff, Tailwater Releases, and Subsurface Drain Water," slides presented at the US Committee for Irrigation and Drainage conference on Helping Agriculture Adjust to TMDLs, Sacramento, CA, October (2002).
<http://www.gfredlee.com/SJR-Delta/USCIDSli.pdf>

Lee, G. F., and Jones-Lee, A., "Potential Water Quality Impacts of Agriculture Runoff/Discharges in the Central Valley of California," Presented at Central Coast Agricultural Water Quality Coalition's 2007 National Conference on Agriculture & the Environment, Monterey, CA, PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, November (2007).
<http://www.gfredlee.com/SJR-Delta/SJRAGImpactsMontereyNov2007.pdf>

Lee, G. F., and Jones-Lee, A., "Water Quality Issues of Irrigated Agricultural Runoff/Discharges—San Joaquin River, Central Valley, California," Presented at Agriculture and the Environment - 2007 Conference, Central Coast Agricultural Water Quality Coalition, Monterey, CA, November (2007).
<http://www.gfredlee.com/SJR-Delta/SJR-WQ-Ag-Monterey.pdf>

Lee, G. F., "New & Updated Presentations/Publications on Delta and SJR Water Quality Issues," Comments to J. Grindstaff, Director CALFED, Sacramento, CA, G. Fred Lee & Associates, El Macero, CA, October 2 (2007).
<http://www.gfredlee.com/SJR-Delta/PubsPresentsDeltaSJR.pdf>

Lee, G. F., and Jones-Lee, A., "Need for Reliable Water Quality Monitoring/Evaluation of the Impact of SWRCB Water Rights Decisions on Water Quality in the Delta and Its Tributaries," Submitted to CA Water Resources Control Board Workshop on D-1641 Water Rights, Sacramento, CA, March 22 (2005).

<http://www.gfredlee.com/SJR-Delta/DeltaWaterExportImpactsPaper.pdf>

Lee, G. F., and Jones-Lee, A., "Need for Reliable Water Quality Monitoring/Evaluation of the Impact of SWRCB Water Rights Decisions on Water Quality in the Delta & Its Tributaries," PowerPoint Slides Submitted to CA Water Resources Control Board Workshop on D-1641 Water Rights, Sacramento, CA, March 22 (2005).

<http://www.gfredlee.com/SJR-Delta/DeltaWaterExportImpactsPowerPoint.pdf>

Lee, G. F., and Jones-Lee, A., "Water Quality Issues That Could Influence Aquatic Life Resources of the Delta," Comments submitted to CALFED Science Program, Sacramento, CA, by G. Fred Lee & Associates, El Macero, CA, November 28 (2005).

<http://www.gfredlee.com/SJR-Delta/POD-Com.pdf>

Lee, G. F., "Comments on the CVRWQCB Review of Delta Water Quality Issues," Comments submitted to K. Longley, Chair Central Valley Regional Water Quality Control Board, by G. Fred Lee & Associates, El Macero, CA, March (2008).

<http://www.gfredlee.com/SJR-Delta/DeltaIssuesLongleyMarch08.pdf>

Lee, G. F., and Jones-Lee, A., "Delta Water Quality Standards Violations" and "Comments on Water Quality Sections of the Delta Vision Strategic Plan, Third Staff Draft – dated August 14, 2008," Submitted to Delta Vision Blue Ribbon Task Force, Sacramento, CA. Report of G. Fred Lee & Associates, El Macero, CA, September 1 (2008). <http://www.gfredlee.com/SJR-Delta/DeltaVisionWQViolations.pdf>

Lee, G. F. and Jones, R. A., "Effects of Eutrophication on Fisheries," Reviews in Aquatic Sciences, 5:287-305, CRC Press, Boca Raton, FL (1991).

<http://www.gfredlee.com/Nutrients/fisheu.html>

Jones-Lee, A., and Lee, G. F., "Modelling Water Quality Impacts of Stormwater Runoff: Why Hydrologic Models Are Insufficient," Chapter 4 IN: Modelling of Pollutants in Complex Environmental Systems, Volume I, ILM Publications, St. Albans, Hertfordshire, UK, pp.83-95 (2009).

<http://www.gfredlee.com/Runoff/HydrologicModelsInadeq.pdf>

In 2007/8 on behalf of the California Water Environmental Modeling Forum we organized a Delta nutrient workshop:

"Overview of Delta Nutrient Water Quality Problems: Nutrient Load – Water Quality Impact Modeling," Agenda for Technical Workshop sponsored by California Water and Environmental Modeling Forum (CWEMF), Scheduled for March 25, 2008 in Sacramento, CA (2008).

http://www.gfredlee.com/SJR-Delta/CWEMF_Workshop_Agenda.pdf

Lee, G. F., and Jones-Lee, A., "Synopsis of CWEMF Delta Nutrient Water Quality Modeling Workshop – March 25, 2008, Sacramento, CA," Report of G. Fred Lee & Associates, El Macero, CA, May 15 (2008). http://www.gfredlee.com/SJR-Delta/CWEMF_WS_synopsis.pdf

More recently we developed a discussion of impacts of Delta water quality characteristics and water exports on fish populations in the SJR watershed:

Lee, G. F., and Jones-Lee, A., "Review of Impacts of Delta Water Quality and Delta Water Exports on the Decline of Chinook Salmon in the SJR Watershed," Comments submitted to NMFS Southwest Fisheries Science Center, NOAA, Santa Cruz, CA, by G. Fred Lee & Associates, El Macero, CA, August (2008).
<http://www.gfredlee.com/SJR-Delta/Salmon-NOAAcom.pdf>

It is our conclusion that toxic pollutants have not been a major factor in the recent decline of the SJR salmonid populations.

We continue to be active in developing information that is pertinent to understanding Delta water quality issues and future water quality management in the Delta with writings including:

Lee, G. F., and Jones-Lee, A., "Review of Need for Modeling of the Impact of Altered Flow through and around the Sacramento San Joaquin Delta on Delta Water Quality Issues," and "Summary: Water Quality Modeling Associated with Altered Sacramento River Flows in & around the Delta," Report to CWEMF Stormwater Committee, by G. Fred Lee & Associates, El Macero, CA, March (2009).
<http://www.gfredlee.com/SJR-Delta/Model-Impact-Flow-Delta.pdf>

Lee, G. F., and Jones-Lee, A., "Comments on 'NPDES Permit Renewal Issues Drinking Water Supply and Public Health Sacramento Regional County Sanitation District Sacramento Regional Wastewater Treatment Plant' dated 14 December 2009," Report of G. Fred Lee & Associates, El Macero, CA, January 20 (2010).
<http://www.gfredlee.com/SJR-Delta/SacRegPermitCom.pdf>

One of major unknowns in Delta water quality is the role of unmonitored, unregulated chemicals that are discharged to the Delta and its tributaries. We have addressed this concern in several issues of our Stormwater Runoff Water Quality Newsletter including NL-7-3, 8-5, 9-3, 10-7, 11-7/8, 11-11, 12-6, 13-1. Our most recent issue (NL-13-1) provides current information on the large number of unmonitored, unregulated chemicals that are introduced into the Delta, as well as other waterbodies, that can adversely impact Delta aquatic life resources.

As noted above, based on our experience and expertise, while pollutants have not been found to directly cause Delta POD, it is not possible to rule out regulated, and most important unregulated and unmonitored potential pollutants, as contributing to adverse impacts on the aquatic resources of the Delta. Whatever the impact of contaminants, it is clear that the export of Delta waters by DWR and the Bureau of Reclamation is adverse to the aquatic resources of the Delta and likely to listed fish species as well.

If there are questions or comments on these issues please contact me at gfredlee@aol.com.

G. Fred Lee and Anne Jones-Lee