

**Comments on OEHHA's
"April 2008 Draft Mercury-Based Safe Eating Guidelines for Fish and Shellfish
from the Sacramento River and Northern Delta"**

with additional comments on

"March 2007 Draft Safe Eating Guidelines for Fish and Shellfish
from the San Joaquin River and South Delta"

Submitted by
G. Fred Lee, PhD, BCEE and Anne Jones-Lee, PhD
G. Fred Lee & Associates
El Macero, CA
gfredlee@aol.com www.gfredlee.com

May 23, 2008

As discussed in the OEHHA April 2008 Fact Sheet,
"The Office of Environmental Health Hazard Assessment (OEHHA) is responsible for providing fish consumption guidelines for sport fish in California." "OEHHA has issued a draft report with safe eating guidelines for the Sacramento River from just below Shasta Lake to its junction with the San Joaquin River in Pittsburg; and creeks, sloughs, and other waterbodies in the "Northern Delta," north of Highway 12. The draft safe eating guidelines issued in March 2007 for the "South Delta," including the San Joaquin River from the Sacramento River to the Port of Stockton; and other rivers, sloughs, and flooded tracts in the Delta, south of the San Joaquin River and will be referred to as the "Southern Delta." In addition, the Southern Delta advisory boundary on the north has been changed from the San Joaquin River to Highway 12."

At the April 16, 2008 meeting of the Local Stakeholder Advisor Group (LSAG) of the Delta Watershed Fish Project/Fish Mercury Project, OEHHA staff members Drs. Margy Gassel and Robert Brodberg, presented and discussed "Mercury in Fish and Shellfish in the Sacramento River and Northern Delta," and its "April 2008 Draft Safe Eating Guidelines for Fish and Shellfish from the Sacramento River and Northern Delta." OEHHA staff also presented information on the adopted 2007 "Safe Eating Guidelines" for mercury-containing fish taken from what OEHHA has relabeled "Southern Delta" as well as the San Joaquin River. The OEHHA website contains information on these OEHHA guidelines for consumption of fish from the Delta and the Sacramento and San Joaquin Rivers:

OEHHA "Announcement of Draft Report, Public Workshop, and Public Comment Period Health Advisory and Safe Eating Guidelines For Fish and Shellfish from the Sacramento River and Northern Delta (Solano, Sacramento, Yolo, Sutter, Colusa, Yuba, Glenn, Butte, Tehama, And Shasta Counties" California Office of Environmental Health Hazard Assessment (OEHHA) Sacramento, CA (2008) http://www.oehha.ca.gov/fish/so_cal/srnd041108.html

FISH Announcement of Draft Report, Public Workshop, and Public Comment Period Health Advisory and Safe Eating Guidelines for Fish and Shellfish from the San Joaquin River and South Delta (Contra Costa, San Joaquin, Stanislaus, Merced, Madera, and Fresno Counties), California Office of Environmental Health Hazard Assessment (OEHHA), Sacramento, CA (2007)
http://www.oehha.ca.gov/fish/so_cal/sjrdsd030907.html

Presented herein are comments on OEHHA's proposed approach for developing safe eating guidelines based on mercury, for the Delta and its tributaries.

Background to These Comments

Dr. Lee is nearing his fifth decade in the water quality evaluation and management field, a career that has incorporated university teaching and research, as well as advising and performing investigations for public agencies and private concerns. He has been involved in evaluating the environmental impacts of mercury in terrestrial and aquatic systems since the early 1960s. At that time he held the position of Professor of Water Chemistry and Director of the University of Wisconsin graduate degree program in Water Chemistry. In the 1960s he served as a advisor to the state of Wisconsin on evaluating and managing the mercury pollution of several Wisconsin rivers due to paper mills use of mercury electrode generation of chlorine at chloralkali electrolysis facilities. Those facilities released considerable amounts of mercury to rivers to which they discharged that resulted in the excessive bioaccumulation of mercury in fish. His work on mercury pollution in the 1960s included investigating the use of mercury-based fungicides by paper mills that was leading to mercury pollution of areas near the paper mills where those fungicides were used.

In the 1970s, under a US Army Corps of Engineers Dredged Material Research Program contract, Dr. Lee conducted an approximately \$1-million study of the potential release of mercury and about 30 other potential pollutants associated with dredged sediments during open water disposal of contaminated dredged sediments taken from about 100 waterways located throughout the US. It was found that the mercury in those sediments was not released to the water column during dredged sediment disposal operations. The results of those studies were published in 1978 in several Corps of Engineers DMRP comprehensive reports. A summary of the findings of those studies was published as.

Lee, G. F. and Jones-Lee, A., "Water Quality Aspects of Dredging and Dredged Sediment Disposal," In: Handbook of Dredging Engineering, Second Edition, McGraw Hill, New York, NY, pp. 14-1 to 14-42 (2000).

<http://www.gfredlee.com/dredging.html>

and in

Jones-Lee, A. and Lee, G. F., "Water Quality Aspects of Dredged Sediment Management," In: Water Encyclopedia: Water Quality and Resource Development, Wiley, Hoboken, NJ, pp 122-127 (2005).

<http://www.members.aol.com/annejlee/WileyDredging.pdf>

as well in a series of professional papers, some of which are located on www.gfredlee.com in the “contaminated sediment” section (<http://www.gfredlee.com/psedqual2.htm>).

In the mid-1980s Dr. Lee was a consultant to the American Dental Association helping the ADA evaluate the potential water quality impacts of the mercury in dental amalgam discharged by dental offices to municipal sewerage systems. He was involved in studies that demonstrated that dental office disposal of mercury in amalgams typically represented a few percent of the total mercury in the domestic wastewater wastewaters. Little of that mercury was present in the treatment plant effluent since it was removed in the treatment process, and did not represent a threat to the environment in the treatment plant sludge.

In the early 2000s Dr. Lee developed an EIR for the Yolo County Department of Public Works covering the water quality impacts of Cache Creek improvement projects that have the potential to impact water quality in the Creek and downstream. Of particular concern were projects that involved the removal of invasive vegetation that is blocking Cache Creek flow, the dredging of sand bars, and creek bank stabilization projects, all of which had the potential to mobilize sediment-associated mercury. The results of Dr. Lee’s part of the EIR review are summarized in,

Lee, G. F., “Water Quality,” Chapter 4.6 of Yolo County’s Supplemental Environmental Impact Report for the Cache Creek Resources Management Plan and Cache Creek Improvement Program County of Yolo Planning and Public Works Department, Woodland, CA (2002).

Lee, G. F. and Jones-Lee, A., “Review of Yolo County Lower Cache Creek Water Quality,” Report of G. Fred Lee & Associates, El Macero, CA (2002). Available as WQ 003 from gfredlee@aol.com.

Throughout Dr. Lee’s professional career he has been involved in the development of water quality criteria/standards and their appropriate use in water quality management. The US EPA’s California Toxics Rule (CTR), developed in 2000, contained new criteria for mercury in water. As discussed by Lee (2003), the US EPA’s approach to developing

Lee, G. F., "Regulating Mercury in the Water Column and Sediments," Report to Dredge Tailings Workgroup, by G. Fred Lee & Associates, El Macero, CA (2003). <http://www.gfredlee.com/TotalMercuryandDissolvedMercuryStandards-rev.pdf>

the CTR criteria for mercury is not protective of the public, because it does not adequately consider the excessive bioaccumulation of mercury in edible fish. The adopted CTR criterion for mercury of 50 ng/L is about ten times higher than would be necessary to prevent excessive mercury bioaccumulation in some fish in some waters. Since the aquatic chemistry of mercury in aquatic systems is complex and not well-understood, Dr. Lee recommended that excessive bioaccumulation of mercury in fish be regulated based on fish tissue concentrations and the use of USEPA proposed fish tissue consumption guidelines, rather than on total recoverable mercury in the watercolumn.

In 1995, Dr. Lee was appointed as the US EPA-supported Technical Assistance Grant advisor to the public through the Davis South Campus Oversight Committee (DSCSOC) in the matter of the adequacy of investigation and remediation of the University of California Davis and US Department of Energy (DOE) LEHR national Superfund site located on the UC Davis campus. As part of that activity he was able to cause the US EPA and the Agency for Toxic Disease Registry (ATSDR) to conduct studies to define whether fish taken from Putah Creek, near the LEHR site, contain excessive concentration of hazardous chemicals including mercury that would be a threat to the health of those who eat Putah Creek fish. Those studies were the first of their type conducted on Putah Creek. They showed that some fish taken from Putah Creek near the LEHR Superfund site contained excessive mercury and that the LEHR site and/or the UCD campus wastewater treatment plant discharges could be source(s) of that mercury. Dr. Lee developed a series of reports on this situation that may be downloaded from the DSCSOC website, <http://members.aol.com/dscsoc/dscsoc.htm>. Those reports served as a part of the technical basis for the Central Valley Regional Water Quality Control Board's (CVRWQCB) listing of Putah Creek as a 303(d) listed impaired waterbody due to excessive mercury bioaccumulation in some creek fish.

Dr. Lee's review of the stormwater runoff water quality data that UCD and DOE had been collecting on runoff from the LEHR showed that at times the stormwater contained total mercury in concentrations more than 10 times the CTR criterion. It is clear that LEHR site stormwater runoff has contributed to the excessive bioaccumulation of mercury in some Putah Creek fish. It was Dr. Lee's reports on this issue through DSCSOC that caused the CVRWQCB to issue an order to UCD and DOE to implement management practices to prevent discharges of mercury from the LEHR site stormwater runoff above the CTR criterion. That requirement is being implemented at this time.

Dr. Lee was a member of the CALFED dredged tailings review group that reviewed the potential for using dredged tailings from former gold recovery operations as a source of gravel to improve fish spawning habitat. Those dredged tailings contain mercury, which, when dumped into a stream for habitat improvement, could lead to excessive bioaccumulation of mercury in stream fish. Dr. Lee found that the approach being used by DFG to evaluate whether or not the mercury in the dredged tailings were a threat to cause excessive bioaccumulation when reused in this manner, was technically invalid. He developed a report presenting his recommended approach for evaluating this situation as:

Lee, G. F., "Comments on the CA Bay Delta Authority Dredge tailings issue paper: Draft 1/14/05 Mercury in Dredge Tailings: Considerations for Restoration, prepared by D. Podger," Report of G. Fred Lee & Associates, El Macero, CA, January (2005). <http://www.members.aol.com/annejlee/DredgSedHgcom.pdf>

For the past decade or so, Dr. Lee has been following the CVRWQCB staff's presentations on the ongoing studies of the bioaccumulation of mercury in edible fish in the Delta and its tributaries. He has participated in many of the Delta Mercury Tributary

Council meetings, and served as a member of the CALFED-supported Fish Mercury Project steering committee.

Of particular relevance to the present comments is Dr. Lee's involvement in Delta water quality issues over the past 20 years. From late-1989 through 2004 he was involved in the CALFED-supported studies of the San Joaquin River (SJR) Deep Water Ship Channel (DWSC) low-dissolved-oxygen problem near the Port of Stockton. He served as coordinating principal investigator for that more than \$2-million project devoted to investigating and defining the nature of, causes for, and potential approaches for developing solutions to, the low dissolved oxygen in the DWSC near the Port of Stockton. Through that work he became familiar with how waters that enter the Delta from the Sacramento and San Joaquin Rivers move through the Delta and transport nutrients, algae, and other potential pollutants including mercury and methylmercury. He and Dr. Anne Jones-Lee developed a series of reports on that work, including the comprehensive synthesis report:

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 and CALFED Bay-Delta Program, G. Fred Lee & Associates, El Macero, CA, March (2003).
<http://www.gfredlee.com/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.members.aol.com/duklee2307/SynthRptSupp.pdf>

Their papers and reports on Delta water quality issues are available on their website, www.gfredlee.com at <http://www.gfredlee.com/psacriv2.htm>.

Following the completion of the SJR DWSC low-DO synthesis report, he and Dr. Jones-Lee conducted several special-purpose studies with the support of the DeltaKeeper (William Jennings). Those studies focused on the flow of the San Joaquin and Sacramento Rivers through the Delta as they enter the Delta and move through the Delta channels to the USBR and DWR water export projects at Tracy and Banks, as well as to San Francisco Bay. Their reports on those studies provide important information on how the water and associated pollutants, including total mercury and methylmercury, in the SJR are transported through the Delta.

Lee, G. F.; Jones-Lee, A. and Burr, K., "Results of the August 5, 2003, Tour of the South Delta Channels," Report of G. Fred Lee & Associates, El Macero, CA (2004). <http://www.members.aol.com/duklee2307/South-Delta-Tour.pdf>

Lee, G. F.; Jones-Lee, A. and Burr, K., "Summary of Results from the July 17, 2003, and September 17, 2003, Tours of the Central Delta Channels," Report of G. Fred Lee & Associates, El Macero, CA (2004).
<http://www.members.aol.com/duklee2307/Central-Delta-Tours.pdf>

Subsequently, Monsen et al. published a report on their investigation into the flow of water through the Delta.

Monsen, N., Cloern, J., and Burau, J., "Effects of Flow Diversions on Water and Habitat Quality: Examples from California's Highly Manipulated Sacramento–San Joaquin Delta," *San Francisco Estuary & Watershed Science*, Vol. 5, Issue 3, Article 2, July (2007) <http://repositories.cdlib.org/jmie/sfews/vol5/iss3/art2>

Their findings regarding the water flow through the Delta channels were similar to those reported in the Lee et al. (2004) reports. As discussed in these comments, those findings should be considered in OEHHA's development of "Safe Eating Guidelines" for fish consumption in the "Southern Delta."

It is with this background that the following comments are made on the problems with the OEHHA-adopted fish consumption guidelines for the "South/Southern Delta" and San Joaquin River, and the proposed guidelines for the "Northern Delta" and Sacramento River.

Overall Conclusions

Overall, the authors support the approach OEHHA used to develop the mercury-based "safe eating guidelines" to inform those who consume fish from the Central Valley waterbodies. As discussed below, however, there are problems with the existing and proposed guidance in how OEHHA assigned areas of application of the levels of consumption to various areas of the Delta, which have ramifications for public health protection from mercury.

Designation of the South/Southern Delta

According to the OEHHA staff's proposed mercury fish consumption guidance ("Safe Eating Guidelines") for the Sacramento River and Northern Delta, the staff is proposing to categorize all Delta waters south of Highway 12 as "Southern Delta." The desire for simplicity and the slight alteration in name from "South" to "Southern" notwithstanding, such labeling is at odds with the long-standing labeling of regions of the Delta. The demarcations within the Delta – North, South, and Central – have well-established meanings that should be maintained in conjunction with fish consumption guidelines.

The "South Delta" is a well-defined area of the Delta that is typically considered to be south of about Highway 4. That area of the Delta is highly influenced by SJR water that flows through the Head of Old River (HOR) into Old River. It is also highly influenced by the operation of the State (DWR) and Federal (USBR) export projects at Banks and Tracy. The proposed OEHHA redefinition of the boundary between "Northern Delta" and "Southern Delta" as Highway 12, moves the boundary further north in the Central Delta.

The SJR water that is not drawn to the export pumps through the HOR proceeds north toward the Port of Stockton, which is the southernmost boundary of the DWSC, and typically provides the dominant water in the first seven miles of the DWSC. Turner Cut joins with the SJR DWSC about 7 miles north of the Port of Stockton.

The area of the Delta north of about Highway 4 (at Stockton) to south of about Highway 12 is typically labeled “Central Delta.” This area of the Delta typically contains a mixture of SJR water and Sacramento River water owing to the influence of the export project pumps’ drawing water. The State and Federal export project pumps draw water from the SJR at Turner Cut, mixing and transporting SJR water from the first seven miles of the DWSC to the south as well as Sacramento River water from the north. The mixture of SJR and Sacramento River water that is present in Turner Cut is drawn to the export projects’ pumps via Middle River and, to a lesser extent, Old River in the Central Delta. The area of the Delta north of about Turner Cut is typically dominated by Sacramento River water, with little or no SJR water except during the periods of VAMP, of high SJR flows such as occurs during flood flows, and of limited pumping by the USBR and DWR export projects.

The CVRWQCB and CALFED Fish Mercury Project and other studies have shown that in general, the concentrations of mercury in fish and methylmercury in the waters of the Central Delta and some areas of the South Delta are lower than those typically found in the Sacramento River and San Joaquin Rivers. Dr. Chris Foe of the CVRWQCB staff has found in his studies that the concentration of mercury in fish tissue in the Delta is proportional to the methylmercury concentrations in the water. This finding has important implications for developing “Safe Eating Guidelines” for areas of the Delta for which there is insufficient fish tissue data to adequately define the concentrations of mercury in fish taken from the area.

Studies by Dr. Foe have recently indicated (personal communication) that methylmercury concentrations in the Delta decrease with distance from the SJR and the Sacramento River. He has indicated that there is no sharp change in methylmercury concentration in the various areas of the Delta, for example between the east side and the west side of the SJR waters of the HOR. Aqueous methylmercury concentrations exhibit a gradation with movement from the rivers toward the USBR and DWR export project pumps. Methylmercury concentrations at particular locations also change with volume of water passing through. This is in contrast to the sharp line demarcation that OEHHA has established for fish consumption guidelines in the SJR between the east side of the HOR and the west side. This is discussed further below.

Recommendation for South Delta Guidelines It is recommended that OEHHA change its proposed “Southern Delta” label for the mercury-based fish Safe Eating Guidelines for the area south of Highway 12 to: “Central and South Delta.” This would maintain consistency with conventional nomenclature for the Delta, remove the confusion associated with re-designation of the Central Delta as part of the “Southern Delta,” and better reflect how the Delta flow system operates.

In addition as discussed below, based on the current data for mercury concentrations in tissue of South Delta fish and the flow of the SJR water (and associated methylmercury) through the HOR in the South Delta, there is need to change the guidelines for certain of the South Delta channels to better protect public health from the potential adverse impacts of mercury in edible fish. According to OEHHA, the proposed northern/southern

division of the Delta at Highway 12 reflects a difference in fish tissue concentrations of mercury, with fish to the north containing elevated concentrations and those to the south containing lower concentrations. However, Dr. Foe has indicated (personal communication) this is not necessarily in accord with the occurrence of methylmercury concentrations in the water, and, by extension, the expected mercury concentrations in tissue of edible fish. This is especially true during periods of elevated flow in the Sacramento River. When that occurs, the methylmercury concentrations in the western Delta near Highway 12 are elevated; this could lead to increased bioaccumulation of mercury in fish. This issue needs to be critically examined to be certain that fish taken from waters just south of Highway 12 are properly covered by Safe Eating Guidelines.

Safe Eating Guidelines for “Southern Delta” Fish

There are significant inconsistencies with OEHHA Safe Eating Guidelines for the “San Joaquin River” and the “South Delta.” For example, the OEEHA fish consumption rate guideline applicable to fish taken from the SJR near Mossdale near the Head of Old River recommends for the more sensitive group: “*Avoid – largemouth or spotted bass.*” However OEHHA’s Safe Eating Guidelines applicable to fish in Old River just west of HOR (that has essentially the same water as flows in the SJR near Mossdale) recommends for the same group: “*Good Choices – largemouth, smallmouth, and spotted bass - eat up to 2 servings a week.*”

At the recent LSAG meeting, Dr. Brodberg stated that the difference in allowed consumption rate of fish in South Delta water west of the HOR compared to the SJR just east of HOR is justified based on mercury concentrations in fish tissue found in fish taken from several South Delta channels. Review of the “South Delta” locations from which fish were collected for mercury analysis, however, shows that those locations were not representative of the main “South Delta” channel areas that would be fished. The primary path of SJR water through the South Delta is through the HOR to Grant Line Channel to the export project pumps. However, according to the 2007 OEHHA fish tissue data base, tissue residues from fish collected in Paradise Cut and Old River near the Tracy Blvd bridge provided the primary basis for evaluating “South Delta” fish tissue mercury residues. Both the Paradise Cut and Old River areas of the South Delta are somewhat stagnant and outside the primary pathway for the movement of SJR water through the South Delta from HOR to the export project pumps. Methylmercury concentrations would be expected to be lower in those more stagnant areas, compared with the concentrations in the SJR water in the primary pathway of that channel, and hence the fish from those more stagnant areas would likely contain lower tissue mercury concentrations. Thus, the “Good Choice” recommendation was made based on fish that contained lower tissue mercury concentrations than would be expected in fish caught in the main South Delta channel areas.

At the LSAG meeting, Lee indicated that it is not technically valid to recommend a significantly different fish consumption rate for fish taken just to the east of HOR than for fish taken from just west of HOR on the basis of mercury concentrations in fish from Paradise Cut and Old River near the Tracy Blvd bridge. Waters from those locations are

not expected to have methylmercury concentrations that would lead to higher fish tissue mercury concentrations, in contrast with the situation in the main channel.

Lee commented at the meeting that OEHHA should consider how the SJR waters near Mossdale move through the South Delta from HOR to the export pumps in establishing the Safe Eating Guidelines. Dr. Brodberg responded that OEHHA did not need to consider how SJR flows through the South Delta in issuing fish Safe Eating Guidelines. This is a significant deficiency in the establishment of Safe Eating Guidelines for the parts of the South Delta in which the water and its associated methylmercury is determined primarily by the flow of the SJR through the HOR.

Recommended Revision of South Delta Guidance. OEHHA needs to conduct additional sampling of fish along the main flow path of the SJR water drawn through HOR, analyze the mercury in their flesh, and then develop Safe Eating Guidelines for fish consumption rates that are, in fact, applicable to the several South Delta channel areas that are fished. Until an adequate fish tissue database exists for fish taken from the primary flow path for the SJR through the South Delta, from Old River through Grant Line, OEHHA should assume that the fish tissue mercury concentrations are likely to be similar to those in the SJR at Mossdale for the SJR Safe Eating Guidelines. If the current OEHHA mercury fish consumption Safe Eating Guidelines for the South Delta are allowed to stand, those who consume fish from the Old River west of HOR – an important area of fishing – could be exposed to a greater-than-expected health hazard.

A related issue that needs to be considered is the potential for litigation against the State of California by individuals who believe that their children have been harmed by consuming fish from the South Delta from Old River just to the west side of HOR, following the OEHHA “Safe Eating Guidelines” for fish consumption listed for the Southern Delta, when fish taken there may have mercury concentrations the same as those taken from the SJR just east HOR. OEHHA needs to take responsibility to properly evaluate the fish mercury Safe Eating Guideline for fish taken from the west side of HOR as well as along the main flow path of the SJR in the South Delta.