

Comments on the CBDA Delta Improvements Package

Comments Submitted by

G. Fred Lee, PhD, DEE and Anne Jones-Lee, PhD

G. Fred Lee & Associates

27298 E. El Macero Drive, El Macero, CA 95618

Ph: (530)753-9630 Fx: (530)753-9956 Em: gfredlee@aol.com

www.gfredlee.com

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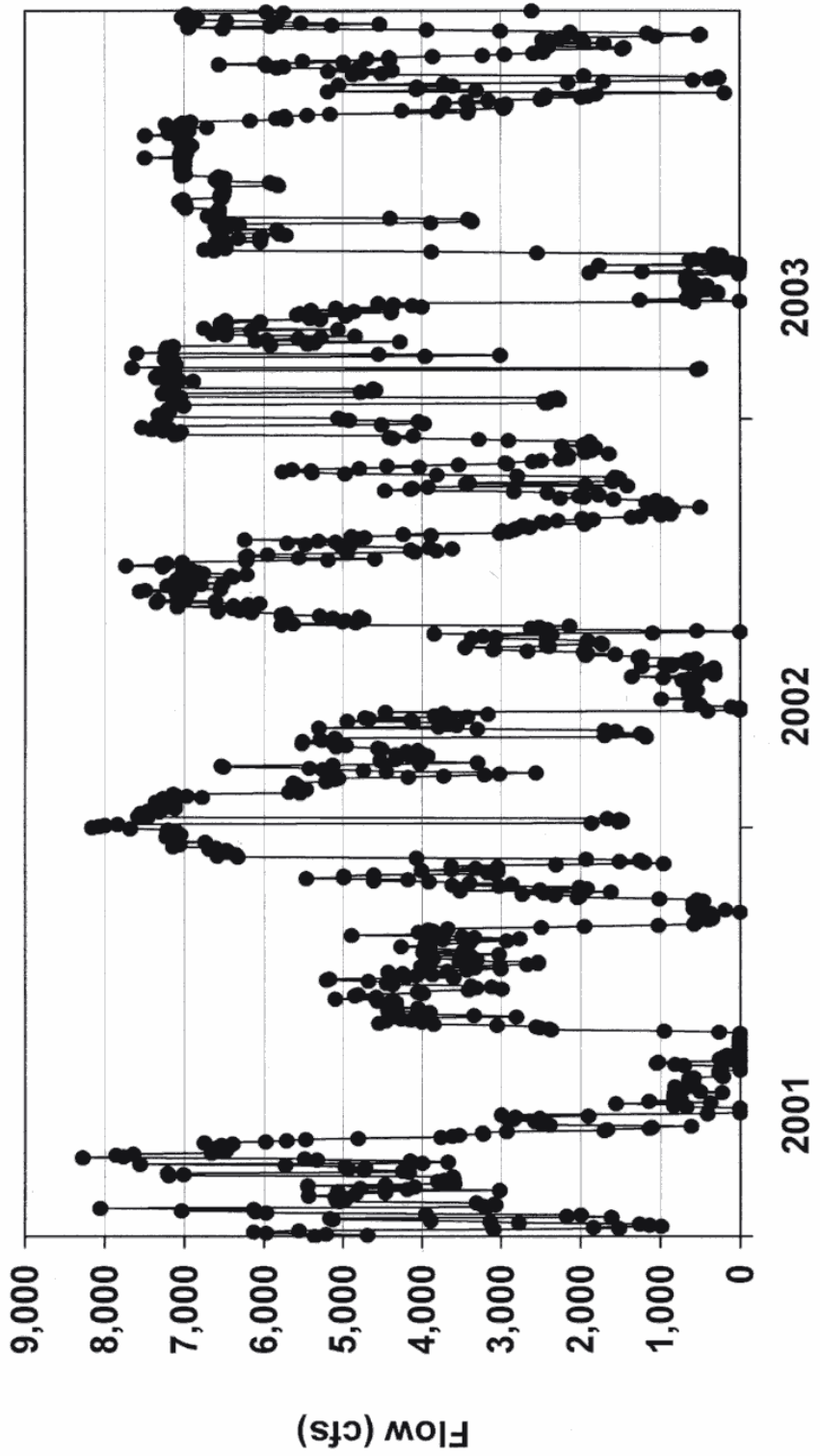
On May 27, 2004, the California Bay-Delta Authority (CBDA) held public workshops in Sacramento and Walnut Grove, California, to present and discuss the "Delta Improvements Package" (DIP). Dr. G. Fred Lee (G. F. Lee, senior author of these comments) attended both of these workshops. Prior to these workshops, G. F. Lee had heard several presentations by individuals, such as Tim Quinn of the Metropolitan Water District of Southern California, on the Napa Agreement which has evolved into the Delta Improvements Package. Over the past year, we have been developing a comprehensive review of Delta Water Quality Issues (Lee and Jones-Lee, 2004a). The first draft of this report (hereinafter referred to as "DWQI report") was made available to about 200 individuals for review about a month ago. Since then, based on reviewers' comments and additional work, there have been two supplements provided on this write-up. The most recent supplement was distributed about a week ago. We are allowing several weeks for comments before finalizing the overall report. It is available, however, from our website to anyone interested. One of the issues discussed in this report is the Delta Improvements Package, as presented in February on the CBDA website. We will be expanding our discussion of the Delta Improvements Package in the final DWQI report, to cover some issues raised at the two recent workshops.

Overall Assessment of the DIP

It is our assessment that the California Bay-Delta Authority is not in a position to reliably pursue adopting and implementing the currently proposed Delta Improvements Package. The information base upon which to develop adequate reviews of the potential water quality impacts of increasing the Harvey O. Banks pumping station's flow to 8,500 cfs does not exist. Figure 1 presents a plot of the Department of Water Resources (DWR) measured flow at the Banks pumping station for the period 2001 through 2003. As shown, increasing the Banks pumping station flows to 8,500 cfs, as proposed in the DIP interim implementation, will, at times, represent a significant additional export of Delta water by the State Water Project.

We have critically examined the current information base on the impacts of the State and federal export projects on Delta water quality. Our findings are presented in the DWQI report. It is found that CALFED, DWR, USBR and the State Water Resources Control Board (SWRCB) have not adequately and reliably evaluated the water quality impacts of the current exports of Delta water by the State and Federal export projects. Significantly increasing the amount of export, as proposed in the DIP, should not take place until an adequate evaluation of the current impacts of the export projects on Delta water quality has been conducted. Further, this

Figure 1
Discharge from Banks Pumping Station
2001-2003



evaluation of the current impacts should be conducted in such a way as to serve as a technical base for predicting the magnitude of the additional adverse impacts that will occur through increasing the Banks pumping station flows to a more consistent 8,500 cfs than has been occurring in the recent past. This information can then be used to develop appropriate mitigation measures to address the adverse impacts of further exports of Delta water through the State Water Project as proposed in the DIP.

Background to Comments

Appendix D of the DWQI report contains information on our background in water quality evaluation and management. As discussed, G. F. Lee's academic background includes bachelors, masters and PhD degrees focusing on water quality evaluation and management. The latter degree was obtained in 1960 from Harvard University. The emphasis of his academic and 44-year professional career work has been on aquatic chemistry, environmental engineering, public health and water quality evaluation and management. For a 30-year period he taught graduate-level environmental engineering/environmental science courses at several major US universities, focusing on water quality issues with particular emphasis on fate, transport, transformations and impact of potential pollutants. During this time he conducted over five million dollars in research and published about 500 papers and reports on these activities.

Dr. Anne Jones-Lee (A. J. Lee) obtained a bachelors degree in biology, and masters and PhD degrees in environmental sciences from the University of Texas at Dallas. For 11 years she held university professorial teaching and research positions at several major US universities. The focus of her academic background and professional career has been on aquatic biology, aquatic toxicology and water quality. G. F. Lee and A. J. Lee have worked together as a team in water quality investigation/evaluation and management since the mid-1970s.

In 1989, G. F. Lee retired from 30 years of university teaching and research and expanded the part-time consulting that he had been doing while a university professor into a full-time activity. At that time A. J. Lee terminated her professorial position and joined with G. F. Lee in his full-time consulting activities, where they moved to El Macero, California (next to Davis) to service several clients, which included work on Delta water quality. They have been involved in Delta water quality issues over the past 15 years, which beginning in 1999 included detailed work on the low-DO problem in the Deep Water Ship Channel (DWSC) near Stockton. G. F. Lee, with A. J. Lee's assistance, served as the coordinating PI for a two-million-dollar CALFED-supported study on this problem. In March 2003 they developed a Synthesis Report (Lee and Jones-Lee, 2003) covering about four million dollars of studies over a four-year period on the San Joaquin River (SJR) DWSC low-DO problem. Further, during the past year, they have expanded their work to include detailed review of Central and South Delta water quality issues. This has resulted in the development of a supplement to the Synthesis Report (Lee and Jones-Lee, 2004b) and several other reports referenced in the supplemental synthesis report. Their various papers and reports are available from their website, www.gfredlee.com, in the San Joaquin River Watershed and Delta section.

Major Deficiencies in Evaluating the Impact of the Export Projects on Delta Water Quality

The initiation of CALFED in the mid 1990s included a major effort devoted to evaluating water quality within the Delta. G. F. Lee served on several CALFED committees devoted to

developing a water quality evaluation and management program for the Delta. The initial CALFED efforts in this regard were conducted by a CALFED-selected consultant that appointed staff to the water quality activities who did not understand water quality. G. F. Lee, as well as many others, provided detailed comments on the lack of reliability of the consultant's reports on water quality issues. Eventually, the consultant's efforts on water quality were discarded as being unreliable.

Subsequently, CALFED initiated a new water quality program development effort in which experts in water quality developed reports on various aspects of Delta water quality, which ultimately became the Water Quality Program Plan (CALFED, 1998). Further, CALFED led the development of the Comprehensive Monitoring, Assessment and Research Program (CMARP, 1999), which, as discussed by Lee and Jones-Lee in the DWQI report, led to the development of a detailed water quality monitoring and evaluation program for the Delta. Information on this program is provided by Lee and Jones-Lee (2004a). While CALFED has a ROD commitment (CALFED, 2000) to undertake detailed water quality monitoring and evaluation in the Delta, CALFED management has not fulfilled this commitment. Further, and most importantly, CALFED management, as part of gaining approval for implementation of the DIP, is limiting the definition of "water quality" to water quality interests of the water exporters (TOC and EC). While repeatedly in the backup documentation for the DIP mention is made of "water quality actions and commitments," none of these actions address the major water quality problems that have been impacted by the current State and federal project export of Delta waters or that will be impacted by further expansion of the exports as proposed in the DIP.

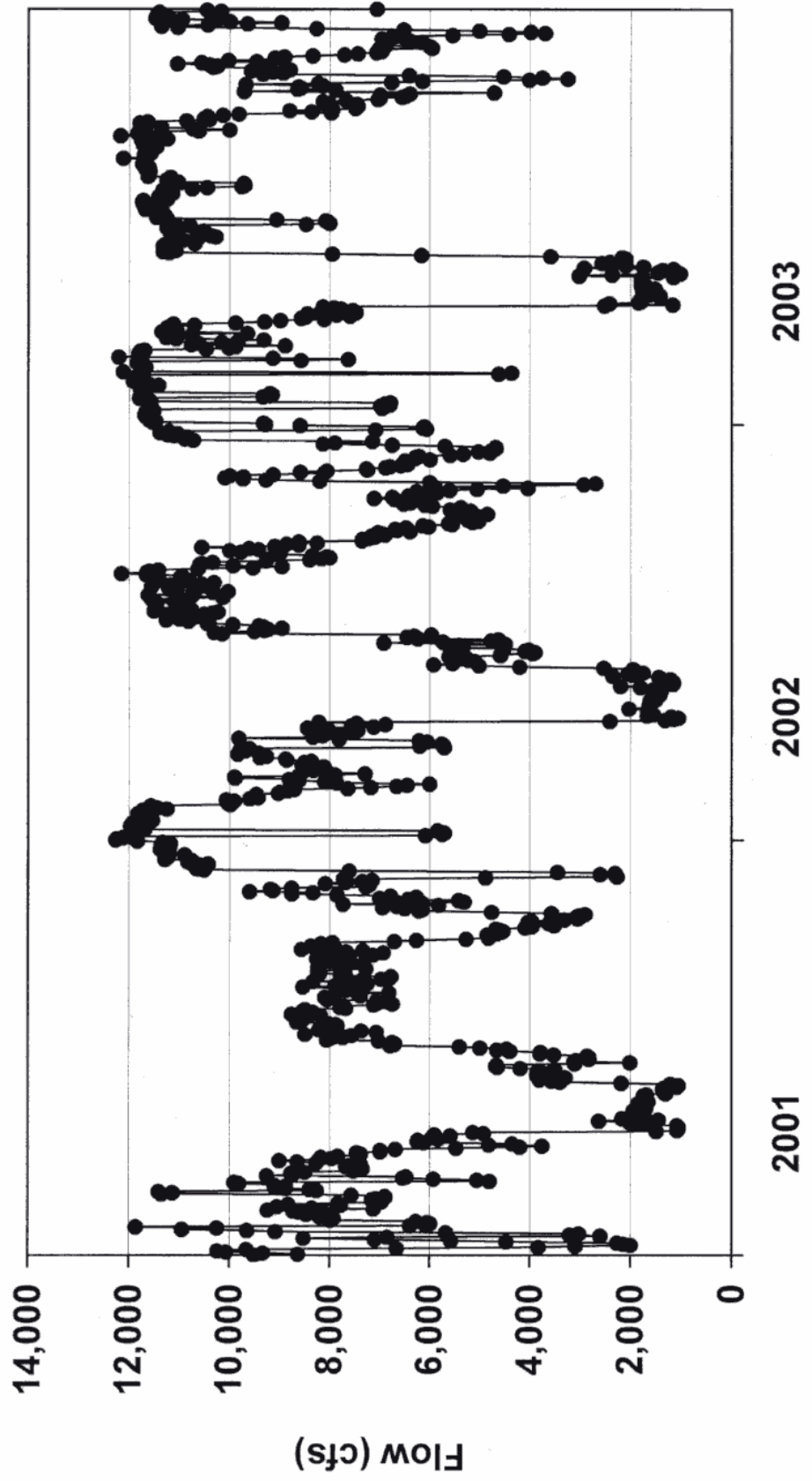
Another significant deficiency in the current CALFED approach for supporting the DIP is the limited attention being given to the impact of the exports on water quality that can affect fisheries. A critical review of the DIP draft Memorandum of Understanding (MOU) statements regarding the expansion at Banks pumping station to 8,500 cfs shows that fisheries considerations are essentially limited to reducing the capture of fish by the pumps. There is no consideration given to the fact that the current exports, as well as the proposed expanded exports, impact the pollutants present in Delta waters that are causing impairment of the beneficial uses of these waters with respect to fish and other aquatic life propagation.

As discussed by Lee and Jones-Lee in the DWQI report, the Central Valley Regional Water Quality Control Board (CVRWQCB) has listed various Delta channels as Clean Water Act (CWA) 303(d) impaired because of violations of water quality objectives. Many of the objectives that are violated relate to adverse impacts on fish or fish food. It is well known that the impact of a pollutant is dependent on its fate and transport. The export projects have significantly changed the flow of water within the Delta. As such they have changed the impact of recognized and yet to be defined pollutants in the Delta. As shown in Figure 2, in recent years the projects are exporting up to about 12,000 cfs of water from the South Delta with most of this water being derived from the Sacramento River. This large amount of water exported from the South Delta has changed the impacts of pollutants on aquatic life, including fisheries.

There have been low-DO-related fish kills in the Delta, the magnitude of which are influenced by the export projects' pumping of Delta waters, such as the fish kills discussed in the Lee and Jones-Lee (2003) Synthesis Report and the Lee and Jones-Lee (2004b) supplement to

Figure 2

Total Exports from Delta
2001-2003



the Synthesis Report, as well as the Lee, et al. (2004b) South Delta Tour report. These fish kills are related to low-DO situations arising from a lack of flow through the DWSC and/or the South Delta Old River channel. An issue of primary concern with respect to the impact of the export projects' manipulation of flows in the Delta is the altered fate and transport of toxic chemicals which can be adverse to critical life stages of fish and other aquatic life. While these impacts are not as readily documented as an adult fish kill, since the impacts are on larval fish or fish food, they can have dramatic impacts on fisheries-related beneficial uses of a waterbody.

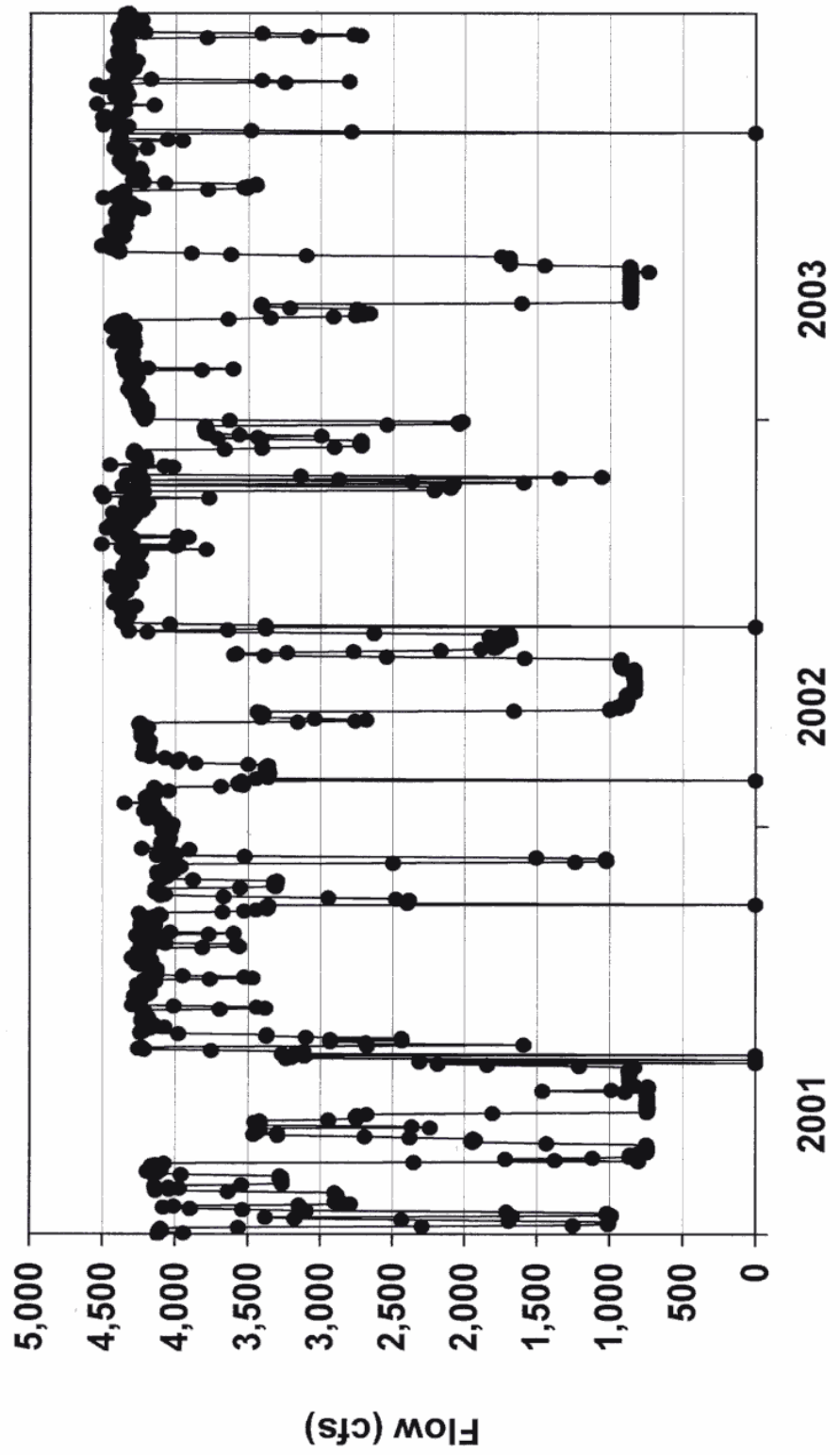
The current CALFED DIP draft MOU fails to acknowledge the impacts of the current and DIP proposed altered flows on the fate and transport of chemical pollutants in the Delta and their impacts on fisheries, much less begin to meaningfully address this issue. Without this information it will not be possible to reliably assess the impact of increasing the Banks pumping station export to a more consistent 8,500 cfs in the interim, and then full, implementation of the DIP. The CALFED administration responsible for failing to implement the water quality management plan of the late 1990s and CMARP have now created a situation where the DIP should not proceed until the information that was originally planned to be developed, as part of the CALFED (1998) Water Quality Program Plan and CMARP (1999), is developed and evaluated.

Another issue of particular importance to fisheries and aquatic life resources in the Delta, which is being significantly impacted by the current operations of the export projects, is the Delta aquatic food web. Lee and Jones-Lee (2004a) have discussed this issue, pointing out that a number of investigators have determined that there has been a significant decline in the aquatic life resources of the Delta which is coincident with the initiation and operation of the export projects. The export projects' transport of large amounts of low-nutrient Sacramento River water through the Central Delta on its way to the Banks and Tracy export pumps has been coincident with a significant alteration of the primary productivity of many of the Delta channels. This in turn is adverse to the aquatic food web in the Delta and therefore the fisheries and other aquatic life resources of the Delta.

As Lee and Jones-Lee (2004a) discuss, invasive species, such as clams, have also altered the aquatic food web of the Delta. At this time, the relative significance of invasive species' harvesting of phytoplankton, versus reduced nutrients, in impacting the aquatic food web in various parts of the Delta is not understood. Diverting additional Sacramento River water from its current flow path to upper San Francisco Bay, to the Central Delta, as proposed in the DIP, could further aggravate the current reduced productivity of the Delta. Before any further diversions of Sacramento River water are undertaken, such as those proposed in the DIP, an understanding of how these diversions impact the aquatic food web of the Delta should be developed.

Lee, et al. (2004a), in their report on the Central Delta, discussed the current situation with respect to exports of water from the Delta. The projects' exports of Delta water shown in Figure 2 is primarily composed of the Banks pumping station flows shown for recent years in Figure 1 and the Federal export project at the Tracy pumps shown in Figure 3. Examination of Figure 3 shows that the Tracy pumps export about 4,500 cfs while the Banks pumping plant exports ranged in recent years from zero to almost 8,500 cfs. The DIP proposes to increase the

Figure 3
Discharge from Tracy Pumping Station
2001-2003



Banks pumping to more consistently pump 8,500 cfs. The increased pumping at Banks would represent a significant increase in the Delta exports. The Banks export pumps have the capacity to export 10,300 cfs which has been indicated as the current ultimate goal of the State Water Project. As discussed by Lee and Jones-Lee (2004a), there is essentially no definition of the water quality/beneficial use impacts of the current Delta exports; before these exports are increased at Banks to 8,500 cfs, an understanding the water quality impacts of the current exports should be achieved.

One of the major problems with the approach of CALFED management and other proponents of increased Delta water exports is that, while they mention meeting the SWRCB Delta water quality standards for EC, those responsible for formulating/supporting DIP do not include the Clean Water Act water quality standards that are applicable to Delta waters as part of protecting and enhancing Delta water quality. While the listing of the Delta channels as CWA 303(d) impaired due to violations of CVRWQCB Basin Plan objectives has been in place for several years, and reaffirmed by the CVRWQCB, SWRCB and the USEPA in 2002/2003, no action has been taken by CVRWQCB, SWRCB, US EPA and CALFED/CBDA to define the current magnitude of the water quality/beneficial use impairments caused by the violations of the CWA-based water quality standards/objectives.

The past export of Delta waters, which at times represents over 13,500 cfs, changes the flow of water in Delta channels, which is impacting how the pollutants impact water quality/beneficial uses of the Delta waters. There are numerous discharges of pollutants by irrigated agriculture, municipal wastewaters and stormwater runoff, industrial wastewaters, former mining activities, boating, marinas, etc., that have been found to violate the CVRWQCB Basin Plan water quality objectives (WQO). One of the issues of major concern is the discharge of pesticides by irrigated agriculture and urban areas that cause the Delta channels to be toxic to aquatic life. This toxicity is a violation of the CVRWQCB Basin Plan WQO of no toxicity. The magnitude and areal extent of aquatic life toxicity is dependent on the flow characteristics of the receiving waters for the discharge. The discharge of urban stormwater and/or irrigated agriculture tailwater/stormwater into a Delta channel that has limited net flow will be significantly different than will occur when the Delta receiving water flows are being influenced by Delta export pumping.

The San Joaquin River has been found to be toxic to aquatic life as its enters the Delta. The export projects will draw the upstream of the Delta sources of aquatic life toxicity into the Delta where they would not exist if it were not for the export projects. This situation could readily adversely impact fisheries and other aquatic-life-related beneficial uses of the Delta. Also, the local in-Delta sources of aquatic life toxicity impacts are being changed by the export projects' large-scale changes in flow of water in the Delta. This in turn impacts toxicity to aquatic life. It is possible that the export projects are causing aquatic life toxicity to occur at locations in the Delta where it would not occur if it were not for the projects. Some of these areas could be ecologically sensitive areas that result in a significant impact on Delta fisheries and other aquatic-life-related beneficial uses.

In addition to Delta water aquatic life toxicity being due to known currently used pesticides such as the organophosphorus compounds (diazinon and chlorpyrifos), other

pesticides are being used in increasing amounts. Of particular importance are the pyrethroid-based pesticides. These pesticides are being used in large amounts in both agricultural and urban areas. In addition to water column toxicity, the pyrethroid-based pesticides cause sediment toxicity. The export projects are changing the movement of sediments in the Delta and therefore sediment toxicity magnitude and location. Lee and Jones-Lee (2004a) have discussed that there is a variety of unknown-caused aquatic life toxicity in Delta waters and sediments. These chemicals need to be identified and their impacts evaluated under current Delta export conditions and what will occur under the DIP proposed elevated Delta exports at the Banks pumps.

One of the most important water quality problems in the Delta is the excessive bioaccumulation of hazardous chemicals in edible fish and other edible aquatic life that causes the fish to be hazardous to those who use the fish as food. The details of this situation have been discussed by Lee and Jones-Lee (2004a). The constituents of primary concern are the organochlorine legacy pesticides (such as DDT, chlordane, dieldrin and toxaphene) that were formerly used in Delta and Delta watershed irrigated agriculture and urban areas. Also of concern are PCBs and dioxins/furans, which are a threat to cause cancer and neurological damage in those who eat fish that contain elevated concentrations of these chemicals.

Mercury is another chemical that bioaccumulates to excessive levels in edible Delta fish to be a threat to fetuses and young children. While the State and federal Delta export projects have changed the amount of bioaccumulation of these hazardous chemicals in Delta fish by changing the flow of San Joaquin River and the Sacramento River through the Delta on the way to the export pumps, there has been no investigation of this problem. For example, the San Joaquin River as it enters the Delta has been found to contain elevated concentrations of organochlorine legacy pesticides. The export projects have drawn more of these pesticides into the South Delta than would have occurred if the export projects had not been initiated. Since this situation is likely still occurring, further increases in Banks pumping will likely aggravate this problem.

A similar situation occurs with mercury, where it has been found that the Sacramento River contains sufficient mercury to lead to excessive bioaccumulation in Delta fish. The export pumps' drawing of up to 10,000 cfs of Sacramento River water to the South Delta brings mercury into the Central and South Delta that would not be there if the export projects had not been constructed. Increasing the amount of Sacramento River water and its associated mercury that is exported under the proposed DIP increased Banks pumping will increase the amount of mercury that enters the Central and South Delta which could worsen the excessive mercury bioaccumulation problem in Delta fish.

Another group of chemicals that is found in Sacramento River water fish above OEHHA human health guidelines is the PCBs. It is possible that the proposed expanded Banks pump exports will bring more PCBs into the Central and South Delta than would be occurring if the projects did not exist. The current situation for both the local and upstream sources of organochlorine pesticides, PCBs and mercury leading to excessive bioaccumulation of hazardous chemicals in Delta fish and other aquatic life needs to be defined before initiation of any further increased export of Delta waters as proposed in the DIP.

The McCormick & Baxter NPL Superfund site located adjacent to the Port of Stockton has been found to be a source of dioxins/furans in the SJR DWSC that accumulate to sufficient concentrations in fish in this area to cause the area to be posted as an area where certain fish should not be eaten. The distribution of dioxins/furans in the SJR DWSC is influenced by the Head of Old River (HOR) diversion of water by the projects. Increasing the exports can likely further influence the bioaccumulation of dioxins/furans in fish. The McCormick & Baxter Superfund site is also a significant source of PAHs in the Port of Stockton area. PAHs are known to be highly toxic to aquatic life. The export projects' changing of the flow of the SJR through the DWSC would be expected to influence the distribution of PAHs in the DWSC.

The export projects' diversion of SJR Vernalis water into the South Delta via the Head of Old River at times greatly reduces the amount of SJR flow past the city of Stockton. Figure 4 presents the USGS reported 2001-2003 SJR Vernalis flows. Figure 5 shows the USGS recorded SJR DWSC flows at the Garwood Bridge just upstream of the DWSC for the same period. Comparing the SJR flows at Vernalis and in the DWSC near Stockton shows that the export projects are responsible for greatly reducing the amount of flow through the DWSC past the city of Stockton. At times so much of the SJR water at the HOR is drawn into the South Delta to cause the net SJR flow to be upstream from the DWSC. As discussed by Lee and Jones-Lee (2003, 2004b) and summarized below, the export pumping of SJR Vernalis water into the South Delta is a documented cause of the low-DO problem in the DWSC. This water diversion causes the wastewater discharges and stormwater runoff at Stockton to cause greater adverse impact due to less dilution than would occur if the export projects did not divert large amounts of the SJR Vernalis water into the South Delta. This diversion of SJR Vernalis water is causing the city of Stockton to have to achieve greater wastewater treatment to prevent violations of water quality objectives in the receiving waters for the treated wastewater discharges. This is especially important for the control of ammonia in the domestic wastewaters.

Overall, the known and yet to be defined pollutants that are transported into the Delta by tributaries and those that are discharged into Delta channels are having an adverse impact on Delta water quality/beneficial uses. The magnitude of the adverse impact is dependent on the amount of export projects' pumping of South Delta water to central and Southern California. The proposed DIP will increase the amount of Delta water exported by the Banks pumping station. This will further modify the flow of water through the Delta and therefore impact water quality in the Delta.

Comments on Draft Memorandum of Understanding Regarding CALFED Bay Delta Program Activities in the Delta

At the May 27, 2004, DIP Workshop, a draft Memorandum of Understanding Regarding CALFED Bay Delta Program Activities in the Delta, dated May 21, 2004, was made available. This draft MOU states on page 4,

“San Joaquin River Dissolved Oxygen: To help improve water quality beyond their water project obligations, the DWR, and USBR, in coordination with USFWS, NOAA, Fisheries, DFG, and other CALFED agencies and local interests, will develop and implement a comprehensive strategy to improve dissolved oxygen conditions in the Deep Water Ship Channel near Stockton.

Figure 4
Mean Daily Flow of SJR at Vernalis
2001-2003

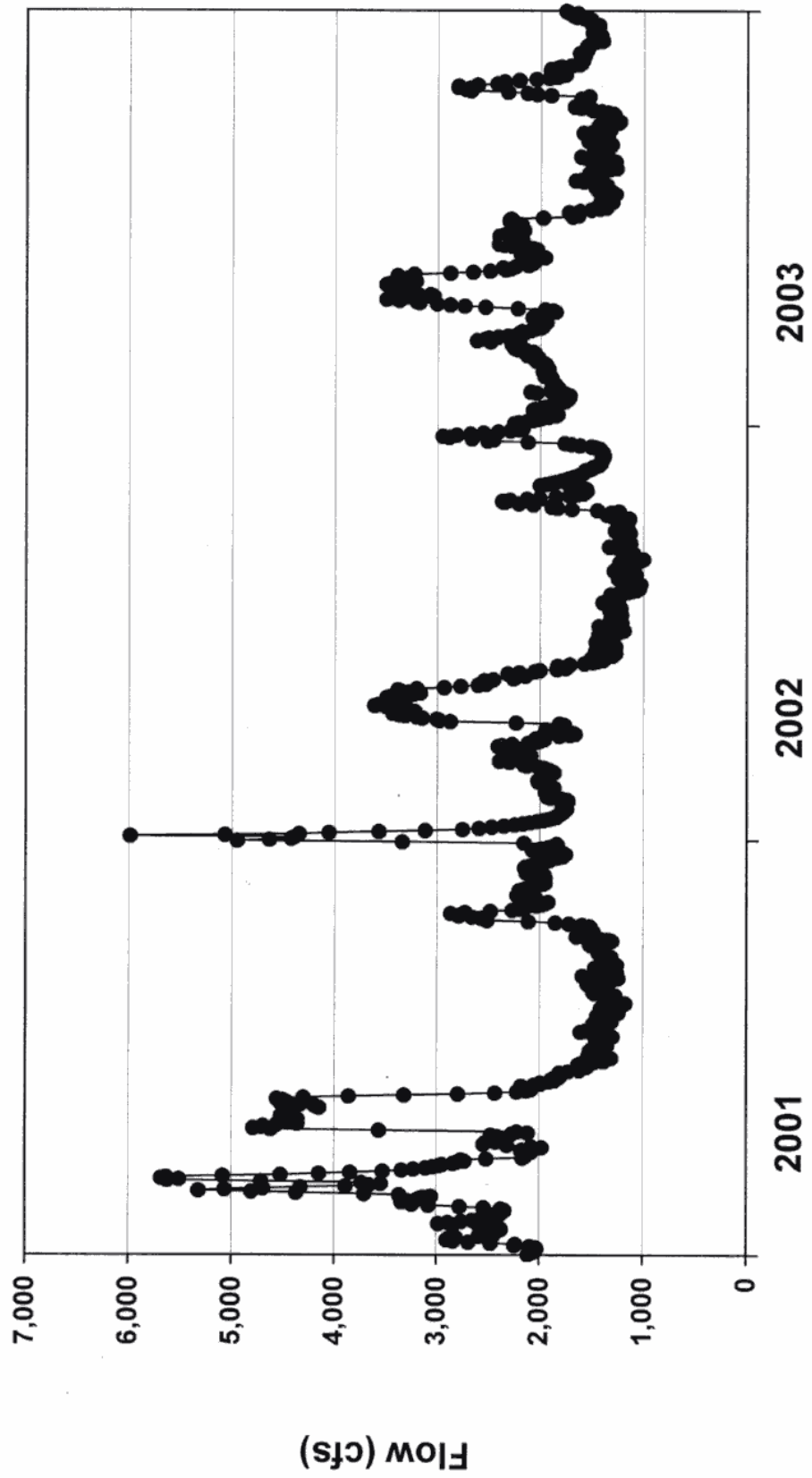
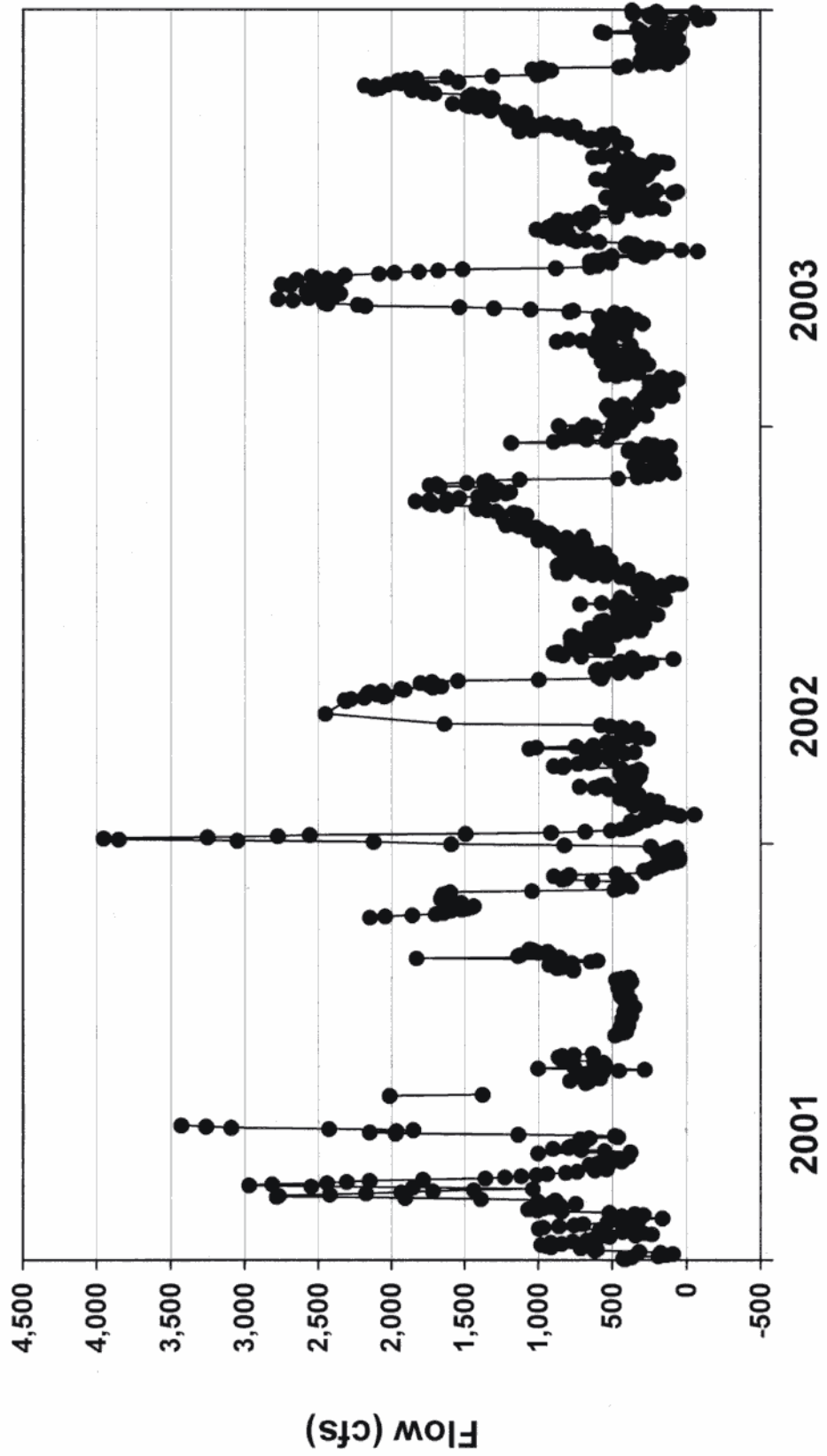


Figure 5
Mean Daily Flow of SJR at DWSC
2001-2003



In 1999, with support arranged by DeltaKeeper, we developed an understanding of the linkage between low flow in the SJR DWSC and low-DO problems in the DWSC. Our work on this problem (Lee and Jones-Lee, 2000) involved examining the USGS SJR DWSC flow data and the DWR D-1641 compliance monitoring DWSC DO data. The data we examined had been collected since the mid-1990s; however, the data had not been properly evaluated for this relationship. Our subsequent work on this effort showed that it was the export pumping of South Delta water which caused the extremely low SJR DWSC flows that were related to severe low-DO problems in the DWSC. As discussed in our reports (Lee and Jones-Lee, 2003, 2004b), most of the SJR DWSC low-DO problem would be eliminated if the export projects stopped taking essentially all of the SJR Vernalis water via Old River to the export pumps, and instead allowed essentially all of the SJR Vernalis water to pass through the DWSC before it is exported to central and Southern California.

Our work on this matter demonstrates the importance of conducting a comprehensive water quality evaluation program in the Delta. If this program had been in place, the primary cause of the low-DO problem due to operations of the export projects could have been detected many years earlier.

In the spring 2003, when it was discovered that the Delta fisheries managers and CALFED management did not understand that the operations of the State and federal export projects were responsible for much of the low-DO problem in the DWSC, we initiated a self-funded effort to begin to educate those responsible for Delta flow management to consider how flow management impacts SJR DWSC DO. It appears that our efforts have the potential to be successful based on the above-quoted draft DIP MOU statement.

It is unclear what the authors of the above-quoted statement think the Delta exporters' obligation is for the DWSC low-DO problem. At times the Delta export projects are responsible for creating the low flow conditions that lead to severe low-DO conditions in the DWSC. We have recently provided guidance (Lee and Jones-Lee 2004c) on the recommended approach for solving the SJR DWSC low-DO problem, which includes specific information on how the operations of the export projects could be modified to essentially eliminate the SJR DWSC low-DO problems.

Export of Sacramento River Water to Upper San Francisco Bay

One of the issues that has not been adequately considered in the documents developed in support of the DIP is the impact of the current and proposed increased Banks pumping on the amount of Sacramento River water that enters upper San Francisco Bay. Figures 6 and 7 present the Sacramento River flows at Freeport (Sacramento River Delta inflow) and at DWR's "Delta Outflow," respectively. The difference in the flows between Figures 6 and 7 represents the amount of Sacramento River water that is drawn to the export pumps at Tracy and Banks and the amount consumed in north Delta irrigated agriculture. As discussed by Lee, et al. (2004a), frequently on the order of 10,000 cfs of Sacramento River water is drawn to the South Delta by the export pumps.

Examination of Figures 6 and 7 shows that at times large amounts of Sacramento River water that would normally enter upper San Francisco Bay Estuary if the export projects did not

Figure 6
Sacramento River at Freeport Flow
2001-2003

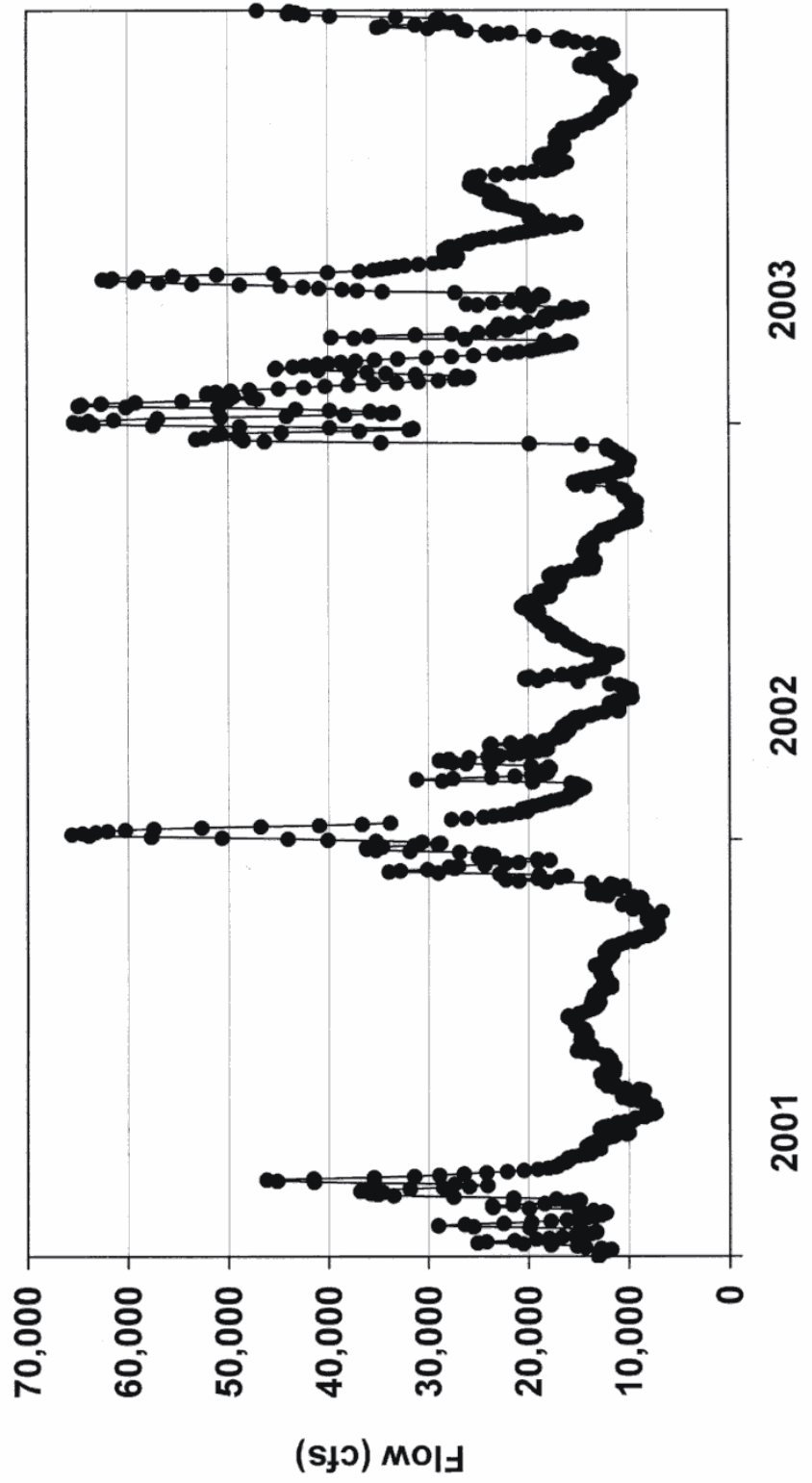
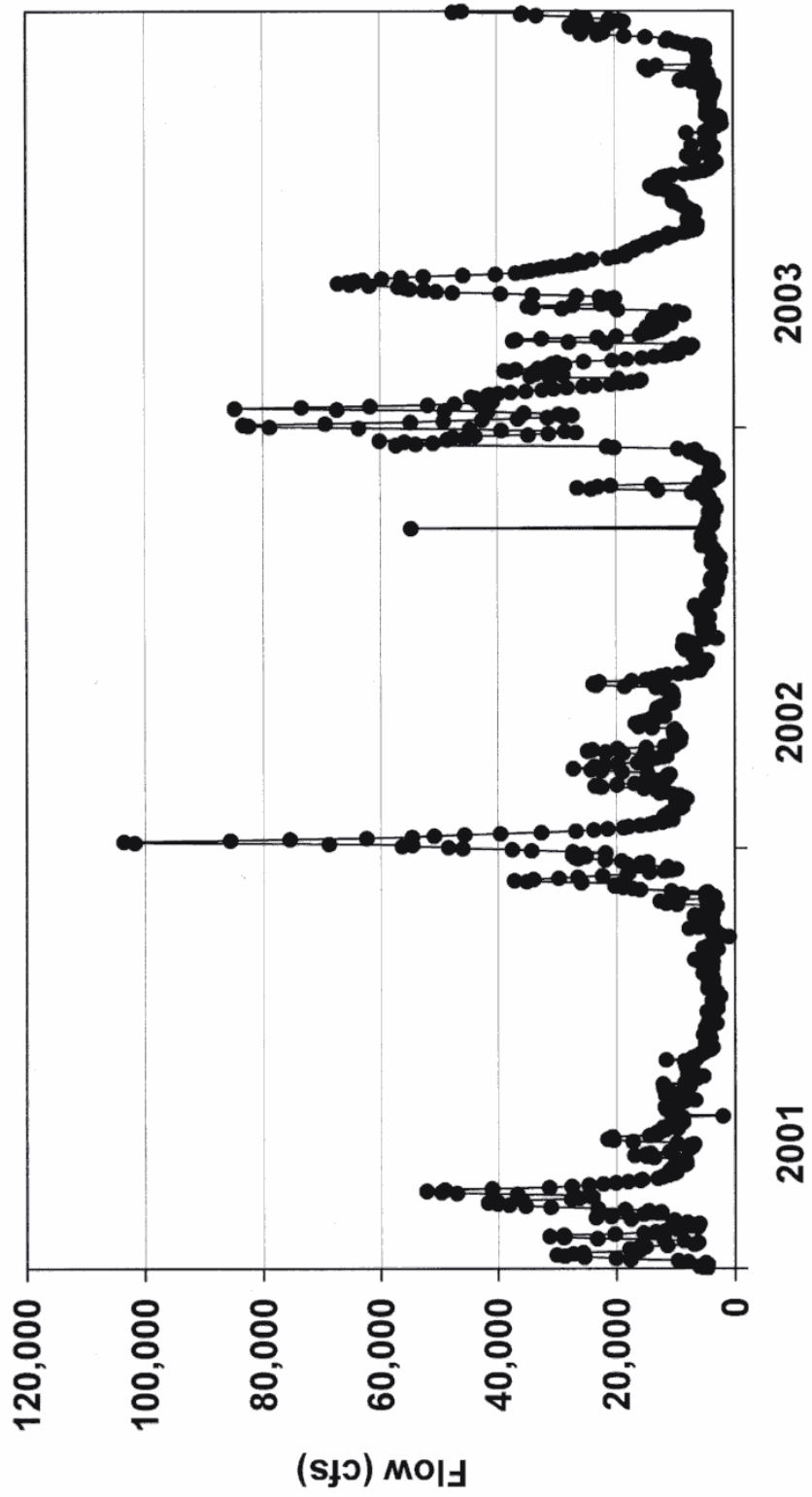


Figure 7
Delta Outflow
2001-2003



exist are drawn to the export pumps, thereby at times significantly decreasing the amount of fresh water entering upper San Francisco Bay. The amount of fresh water that enters an estuary greatly impacts the estuarine ecosystem. The existing export projects have drastically adversely impacted the upper San Francisco Bay ecosystem. Greater diversions of Sacramento River water to the Banks pumps as proposed in the draft DIP will be further adverse to the upper San Francisco Bay ecosystem by altering the numbers and types of organisms in the upper estuary.

Diverting large amounts of Sacramento River water through the Central Delta to the Banks pumps impacts water quality in the Central Delta. In addition, freshwater input to upper San Francisco Bay is a major factor in preventing saltwater intrusion into the Delta. Under low Delta outflows, increased salinity occurs in the Delta. An issue of concern to the Contra Costa Water District (CCWD) is the quality of water that is available at the CCWD intakes. At times the CCWD receives higher quality Sacramento River water at its intakes, and at other times, such as during the VAMP flows, the quality of water available to CCWD is poorer due to irrigation tailwater discharges.

Impact of DIP on Excessive Salt Concentrations in the South Delta

At the May 27, 2004, public workshops, mention was made by DWR staff that the DIP will help control the excessive salt concentrations that are present in San Joaquin River water at Vernalis. While the details of how this will be accomplished remain to be worked out, there are a number of issues associated with controlling salt concentrations in the SJR at Vernalis as they impact Delta water quality, which need to be incorporated into any SJR watershed salt management program. At the May 27, 2004, workshop, Herrick stated that Water Right Decision D-1641 contains a requirement that in 2005 the electrical conductivity (EC) standard for South Delta channels is to become 700 $\mu\text{mhos/cm}$. This value is the same as that proposed by the CVRWQCB as the TMDL objective for the SJR at Vernalis.

The issue that has not been adequately considered is that the current CWA 303(d) list of impaired waterbodies includes Delta Waterways (western portion) as impaired by electrical conductivity (US EPA, 2003). If the management of salt in the SJR watershed only reduces the salt down to 700 $\mu\text{mhos/cm}$ at Vernalis, then the export projects' drawing of SJR water into the South Delta will cause South Delta irrigated agriculture tailwater discharges to violate the 700 $\mu\text{mhos/cm}$ water quality objective that currently exists for the South Delta channels. As discussed by Lee, et al. (2004b), typically irrigated agriculture in the Delta causes a threefold increase in the salt concentrations in the tailwater, compared to the water that was pumped from the channel for irrigation. While the total loads of salt are the same in both the irrigation water and the tailwater, the concentrations in the tailwater are about three times those of the channel water taken for irrigation.

Lee, et al. (2004b) and Lee and Jones-Lee (2004b) have discussed the current situation with respect to excessive salt (EC) present in the SJR at Vernalis. They point out that the current CVRWQCB draft Basin Plan objective of 700 $\mu\text{mhos/cm}$ in the SJR at Vernalis will not eliminate the excessive salt problem that occurs in the South Delta associated with the export projects' drawing of SJR water, with its elevated salt content, into the South Delta at the Head of Old River. In response to questions about the need to control the salt concentration in the SJR at Vernalis below 700 $\mu\text{mhos/cm}$, Alex Hildebrand (pers. comm., 2004) has indicated,

“In regard to water quality, there was extensive testimony that led to the need for a 700 $\mu\text{mhos/cm}$ salinity standard to prevent losses in crop yield. The salinity was almost always better than 700 $\mu\text{mhos/cm}$ pre CVP. Furthermore, even when the salinity standard is met at Vernalis it is not met downstream, particularly when flows are low and the salt load is high. Manteca, Tracy, Lathrop, and Mountain House wastewater enters the channel system. Furthermore, agricultural use of water necessarily concentrates whatever salt load is in the diverted water. The tributaries are not responsible for the salinity problem, but they aggravate the problem when they manipulate the time of flow from what it would be in the absence of VAMP.”

Figure 8 presents the electrical conductivity of the SJR at Vernalis for the period 2000 through 2003. Examination of this figure shows that in many years the EC at Vernalis at times exceeds 1,000 $\mu\text{mhos/cm}$. It is evident that there is need to determine the EC that can be present in South Delta channels and still allow irrigated agriculture in the South Delta to discharge tailwater to these channels without violating the water quality objective for EC established for these channels. This value can then be used to establish the EC that can be present in the SJR at Vernalis.

Figure 9 presents the electrical conductivity of the Sacramento River water at Hood. Examination of Figure 9 shows that the EC is typically between 100 and 200 $\mu\text{mhos/cm}$ ($\mu\text{S/cm}$). Therefore, the Sacramento River water is a major factor in diluting the high EC of the San Joaquin River water that enters the Delta through the Head of Old River or through Turner Cut and Columbia Cut. Lee, et al. (2004a) have discussed this issue in their Central Delta Tours report.

Figure 10 presents the EC data for 2001, 2002 and 2003 at the Banks and Tracy pumping stations. As discussed by Lee, et al. (2004b) and Lee and Jones-Lee (2004b), the water pumped by the two export projects frequently contains large amounts of Sacramento River water, with the result that the EC at the Tracy pumping station is normally below 650 $\mu\text{mhos/cm}$. Montoya (DWR, 2004) has recently provided a discussion of the amounts and factors influencing the EC at the Banks and Tracy pumping stations. He points out that the EC at the export project pumps is a function of SJR flow, tide, time of day, whether the Delta Cross Channel gates are open or closed, total export rate, the position of the temporary barriers, etc.

Conclusions and Recommendations

The large amounts of Delta water that are exported by the State Water Project at the Banks pumping station and the federal water project at the Tracy pumping station have significantly changed the flow of San Joaquin River and Sacramento River water through the Delta. Many of the Delta channels are listed as Clean Water Act 303(d) impaired due to excessive concentrations of one or more pollutants that can be adverse to fish and other aquatic life resources of the Delta. The export projects, through changing the flow of water in the Delta channels, have altered how chemical pollutants brought into the Delta from tributaries and discharged to Delta channels from irrigated agriculture and domestic and industrial wastewater and stormwater have affected water quality-beneficial uses of Delta waters. The proposed interim and full implementation of the Delta Improvement Package will further change the flow

Figure 8

Electrical Conductivity
San Joaquin River at Vernalis
2000-2003

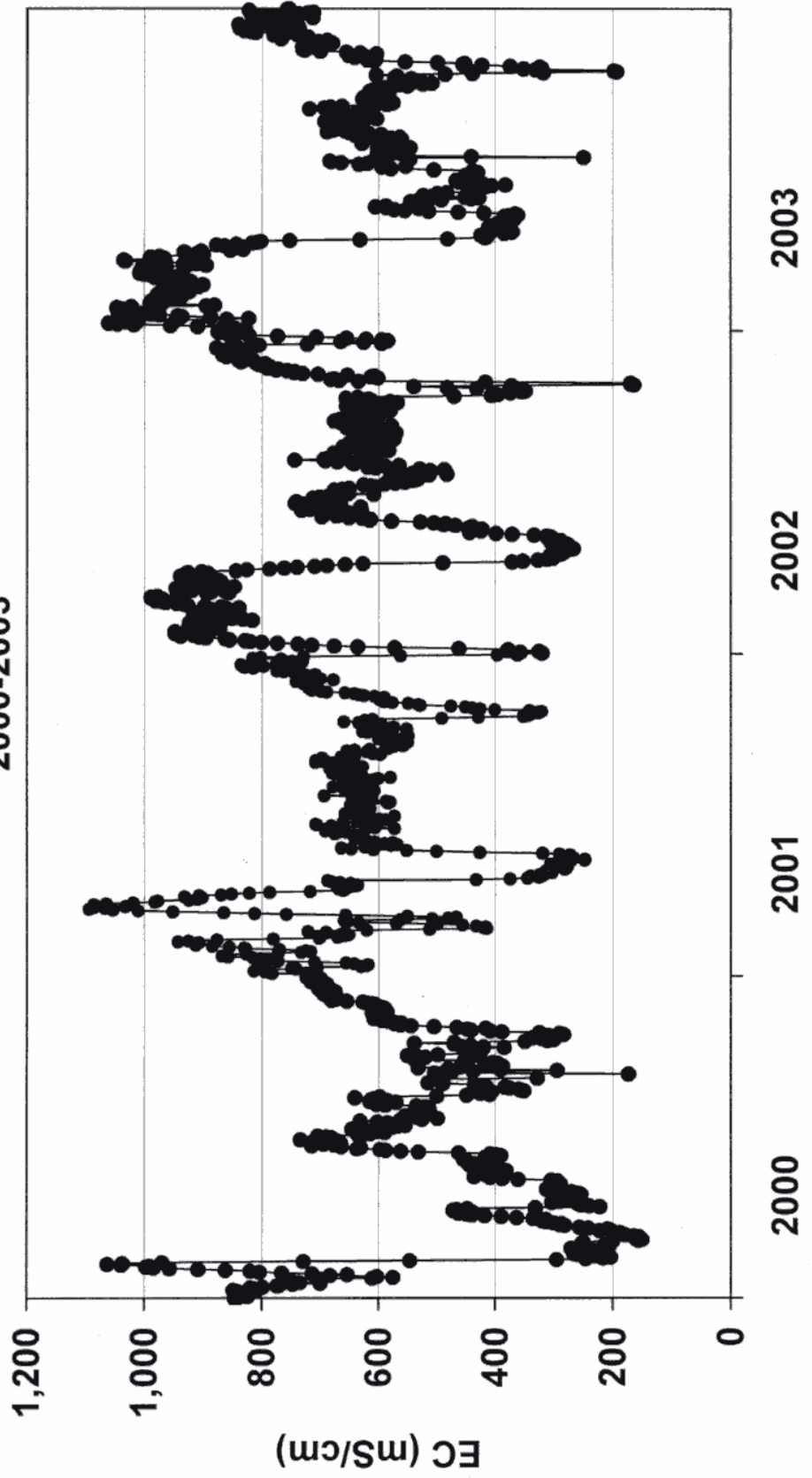


Figure 9
Electrical Conductivity
Sacramento River at Hood
2001-2003

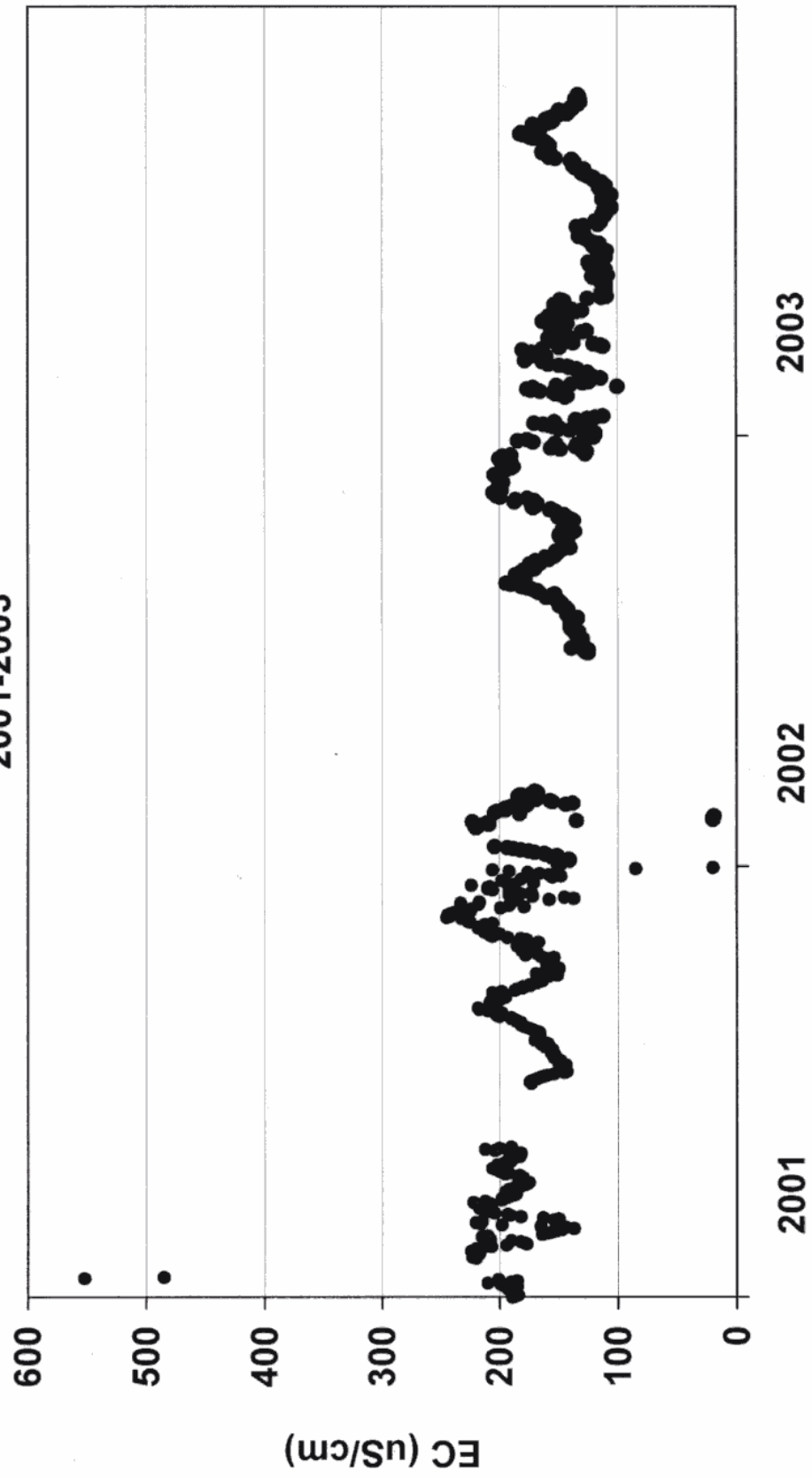
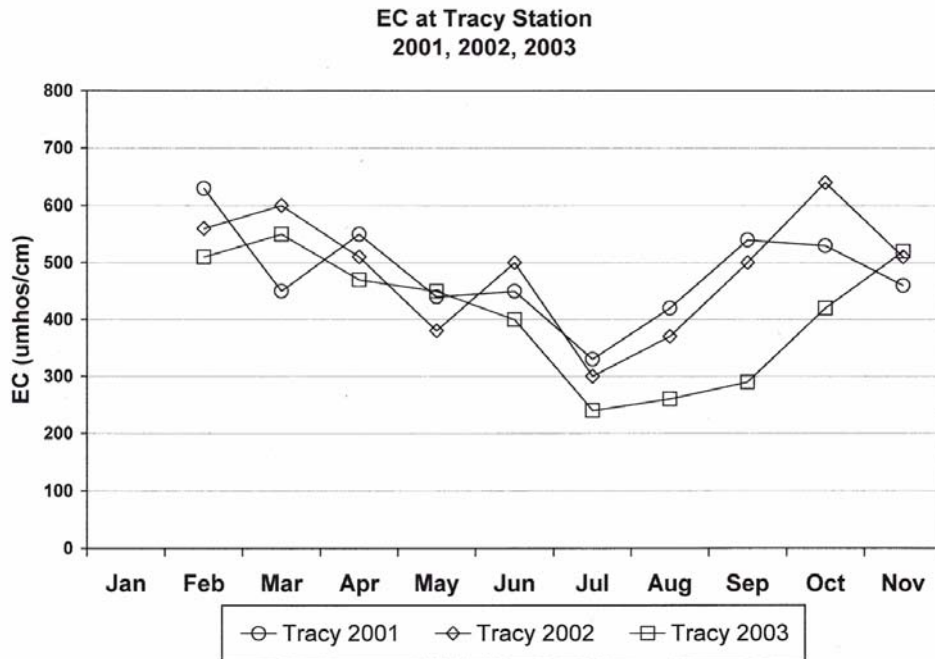
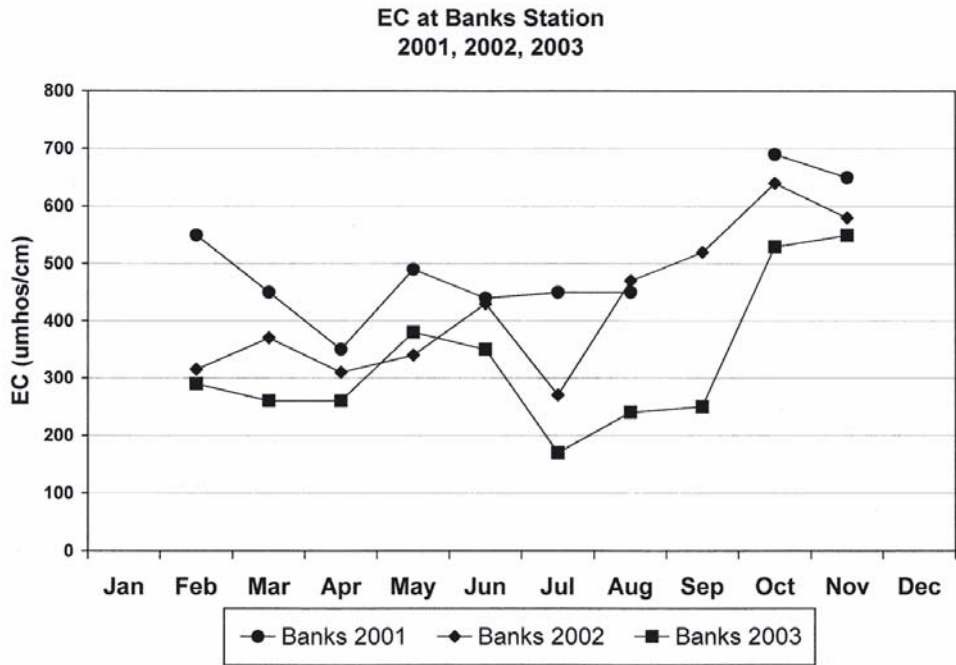


Figure 10



of water in the Delta and how pollutants present in Delta waters impact beneficial uses of the Delta.

In the late 1990s CALFED developed substantial information on the approach that was to be used to provide the information needed to better understand the impacts of pollutants on Delta water quality and how the State and federal export projects' exporting of Delta water affects pollutants' impacts on Delta water quality. The late 1990s Water Quality Program Plan and the associated Comprehensive Monitoring, Assessment and Research Program (CMARP) were not implemented by CALFED or other agencies, with the result that at this time it is not possible to reliably assess the potential water quality impacts of the DIP proposed increase in Banks pumping of South Delta water.

There is urgent need for CALFED and those supporting the DIP to immediately organize and fund a large-scale monitoring and assessment program that will provide the information needed to determine how further increasing Delta water exports to central and Southern California impacts the water quality-beneficial uses of the Delta. This information should be available before the interim implementation of the DIP occurs. Without this information it will not be possible to develop credible environmental documentation in support of the DIP.

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