G. Fred Lee & Associates

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June 5, 1999

Via Email

Chris Foe, Val Connor
Central Valley Regional Control Board
Sacramento, CA

Bill Jennings
DeltaKeeper
Stockton, CA

Dear Chris, Val, and Bill:

At the June 3, 1999 Water Resources Control Board (WRCB) Bay Protection and Toxic Cleanup Program (BPTCP) Consolidated Toxic Hot Spot Cleanup Plan hearing, a statement was made by a pesticide registrant representative that implied that urban stormwater runoff in Stockton, CA is only infrequently toxic due to OP pesticides. The implication was that the Central Valley Regional Water Quality Control Board (CVRWQCB) had inappropriately determined that the Stockton sloughs, rivers, and creeks should be listed as a Toxic Hot Spot which requires remediation to control OP pesticides in stormwater runoff to these waterbodies. As you know, over the past few months at the request of DeltaKeeper Bill Jennings, my wife, Dr. Anne Jones-Lee, and I have been compiling and reviewing the data available on urban stormwater runoff aquatic life toxicity in the city of Stockton stormwater runoff. This database is one of the more comprehensive, if not the most comprehensive database that I'm aware of, on aquatic life toxicity in urban stormwater runoff and the OP pesticides responsible for this toxicity. The database spans from 1994 through the present. It shows that, associated with rainfall runoff events, the stormwater runoff in Stockton is toxic to *Ceriodaphnia*.

In order that the State WRCB members reliably understand the frequency of stormwater runoff toxicity in Stockton, I decided to accelerate the development of a data report that we had been working on covering city of Stockton stormwater runoff aquatic life toxicity studies. With the assistance of Karen Larsen at the University of California, Davis Aquatic Toxicology Laboratory, I developed the attached report that I submitted to the State Water Resources Control Board on June 4, 1999 for inclusion into the BPTCP Consolidated Plan hearing record. While there is still some additional data on aquatic life toxicity in the city of Stockton stormwater runoff that is not in the Summary Report, since it has not yet been made available to me by the City of Stockton, the summaries of that data which are available show the same pattern as the other monitoring data collected by the CVRWQCB, the DeltaKeeper, and the City of Stockton. I have marked this report as "preliminary," based on a revision that I plan to make in it, which would include a map to show

sampling locations. All sampling locations were within the city of Stockton. When the rainfall data are made available to me, I will be incorporating this information into the final report. I can indicate that, with few exceptions, the data presented in this report are based on samples collected during rainfall runoff events. There are a couple of sampling dates, however, when samples were collected at other times, which did not show *Ceriodaphnia* toxicity.

As discussed in the cover letter to the State Board, the frequency of toxicity is determined by the frequency of rainfall. Over the period since 1994 to date, monitored stormwater runoff has been found to be toxic and this toxicity can be attributed, to a considerable extent, to diazinon and chlorpyrifos.

The attached Summary Report is a referencable document as

Lee, G.F, and Jones-Lee, A., "Conclusions from Review of the City of Stockton Urban Stormwater Runoff Aquatic Life Toxicity Studies Conducted by the CVRWQCB, DeltaKeeper, City of Stockton, and the University of California, Davis Aquatic Toxicology Laboratory between 1994 and 1999, Preliminary Report to the State Water Resources Control Board, Sacramento, CA, submitted by G. Fred Lee & Associates, El Macero, CA, June 1999.

If there are questions about this report, or if you or others know of additional information I should incorporate into it, as part of an update that I plan to conduct when I receive the additional City of Stockton stormwater runoff data and other information I have requested, please contact me.

Fred

Preliminary Report

Conclusions from Review of the City of Stockton Urban Stormwater Runoff Aquatic Life Toxicity Studies Conducted by the CVRWQCB, DeltaKeeper, City of Stockton and the University of California, Davis Aquatic Toxicology Laboratory between 1994 and 1999

Prepared by

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June 4, 1999

Beginning in 1994, the Central Valley Regional Water Quality Control Board under Dr. Val Connor's leadership with support of a US EPA grant and with the assistance of the University of California, Davis Aquatic Toxicology Laboratory (UCD-ATL), initiated a study of aquatic life toxicity in the City of Stockton's urban stormwater runoff. Samples of stormwater runoff were obtained from Mosher Slough, 5 Mile Slough, Calaveras River, Walker Slough and the Smith Canal. Smith Canal and 5 Mile Slough receive stormwater runoff only from the City of Stockton. Mosher Slough, Calaveras River and Walker Slough also receive stormwater runoff from agricultural areas and agricultural return (drain waters) upstream of the City of Stockton. All of these waterbodies are tidal freshwater within the City of Stockton with a one- to three-foot tide. The City of Stockton pumps dry weather flow from the City's storm sewer system and stormwater runoff into the waterbody which has also recently been found by the DeltaKeeper to be toxic.

An extensive set of samples and detailed analyses were conducted in 1994. Additional samples and analyses were conducted on samples collected in 1995, 1996 and 1997. A total of about 160 toxicity tests have been conducted on these samples over this time. The 1996, 1997, 1998 and 1999 samples were collected by the DeltaKeeper. In general, the samples of each waterbody were taken at the location where it crosses I-5.

All samples were analyzed for aquatic life toxicity by the University of California, Davis Aquatic Toxicology Laboratory using the US EPA standard three species toxicity test (Lewis, *et al.*, 1994) with *Ceriodaphnia dubia* (freshwater zooplankton), *Pimephales promelas* (fathead minnow larvae) and *Selenastrum capricornutum* (freshwater alga) as the test organisms. Some of the samples were processed through a toxicity testing dilution series in order to estimate the total amount of toxicity present in the sample. Some of the original and dilutions were treated with piperonyl butoxide (PBO). PBO interacts with organophosphate pesticides such as diazinon and chlorpyrifos to eliminate and/or reduce their toxicity (Bailey *et al.*, 1996).

Some of the samples were analyzed for the OP pesticides diazinon and chlorpyrifos using the enzyme linked immuno sorbent assay (ELISA) procedure. Details of the sampling and analytical procedures are provided by the UCD-ATL QAPP.

While not involved in the original studies, the authors, Drs. G. Fred Lee and Anne Jones-Lee, were asked to assist the DeltaKeeper in developing a report summarizing the data obtained in these studies. In addition to the CVRWQCB/DeltaKeeper/UCD ATL data, the City of Stockton holds an NPDES stormwater permit that requires monitoring of stormwater runoff. Stormwater monitoring data was available for 1997–1998 (Stockton 1998, San Joaquin County 1997). Additional aquatic life toxicity and/or OP pesticide data has been collected by Stockton that has not yet been made available. Summaries of that data indicate that the results are similar to the 1997-1998 data. This report presents an overview assessment of the information available from the 1994-1999 City of Stockton urban stormwater runoff aquatic life toxicity studies.

SUMMARY OF RESULTS

A summary of the data obtained in these studies is presented in Tables 1-9. The original data tables with some minor modifications from that developed by the UCD-ATL are available upon request.

Tables 1-9 provide information on the toxicity test results and chemical analyses obtained in these studies for each of the dates for which samples were collected. The *Ceriodaphnia* data set "% Sample" column indicates whether there was any dilution of the sample or any additions such as PBO or EDTA. The "Toxic Response" column provides the percent kill information on the day indicated in parentheses. The "Comments" column provides a brief summary of the most outstanding feature of that particular data set. The "Diazinon" and "Chlorpyrifos" concentrations are based on the ELISA testing where the < value was the indicated detection limit of the test. The "Calculated TUa" column represents a value obtained by dividing the concentration of diazinon or chlorpyrifos by the LC_{50} value and summing the two quotients. For diazinon a *Ceriodaphnia* LC_{50} value of 450 ng/L was used. For chlorpyrifos, the LC_{50} value that was used was 80 ng/L.

For the fathead minnow larvae tests, the "% Mortality" is provided with a comment as to whether it was statistically significant. The *Selenastrum* tests were summarized in terms of whether there was a toxic response based on a decrease in the number of *Selanastrum* cells in the test samples compared to the control. The "Comment" section indicates whether the algae in the test samples grew to a greater degree than the reference, indicating a "stimulation" of growth by nutrients in the samples.

CONCLUSIONS

The overall conclusions from the City of Stockton urban stormwater runoff aquatic life toxicity studies of Mosher Slough, 5 Mile Slough, Calaveras River, Walker Slough, and Smith Canal (waterbodies) are presented below.

- Stormwater runoff to the investigated waterbodies causes the waterbody to be toxic to *Ceriodaphnia*.

- Typically, one to two acute toxic units (TUa's) were present in the waterbodies during a stormwater runoff event.
- Stormwater runoff to these waterbodies did not cause toxicity to fathead minnow larvae or the alga *Selenastrum*. Typically, samples of the waterbodies during stormwater runoff stimulated the growth of the test alga.
- Based on toxicity investigation evaluations (TIE), PBO and ELISA testing, diazinon is the chemical primarily responsible for the observed toxicity. Some samples had sufficient chlorpyrifos concentrations to contribute to the toxicity found.
- Based on limited TIE studies, heavy metals do not appear to be a contributor to the aquatic life toxicity found.
- There is some indication of possible pyrethrin toxicity as indicated by PBO enhanced toxicity.
- Urban stormwater runoff monitoring conducted by the City of Stockton over the past three years (1995-1998) shows *Ceriodaphnia* toxicity
- Studies conducted by the DeltaKeeper and UCD-ATL during the fall and winter of 1998-1999 of Mosher Slough show that stormwater runoff was toxic to *Ceriodaphnia* due to OP pesticides.
- The aquatic life toxicity found in City of Stockton stormwater runoff is similar to what has been found in urban stormwater runoff in the San Francisco Bay region, Sacramento area, Orange County, Los Angeles and San Diego.

RECOMMENDATIONS FOR FUTURE WORK

Presented below are recommendations for future studies and programs that need to be evaluated and, if appropriate, implemented.

- There is need to evaluate the contribution of agricultural stormwater runoff to the aquatic life toxicity present in the City of Stockton waterbodies that receive agricultural runoff/drainage from upstream sources.
- There is need to evaluate the potential for enhanced toxicity due to OP pesticides associated with low dissolved oxygen concentrations in the waterbodies and downstream.
- There is need to understand the dry weather flow toxicity to young fathead minnows (not larvae) that the DeltaKeeper is finding in caged fathead minnows placed in the waterbodies near City of Stockton stormwater sewer discharges.
- There is need to evaluate the water quality/ecological significance of periodic toxic pulses associated with stormwater runoff events within the City of Stockton on the sloughs' aquatic resources and the nearby Delta aquatic resources. The slough backwater areas could be important nursery grounds for Delta fish that are being adversely impacted by current OP pesticide-caused aquatic life toxicity.
- There is need to evaluate the possible control of OP pesticide-caused aquatic life toxicity in Stockton stormwater runoff. Consideration should be given to public education as a means of controlling both residential and agriculturally-derived OP pesticide-caused aquatic life toxicity.
- There is need to evaluate the effectiveness of education programs in reducing the amounts of OP pesticides diazinon and chlorpyrifos and aquatic life toxicity in City of Stockton waterbodies. Also, consideration must be given to assessing the improvements in the aquatic life-related beneficial uses that could result from controlling the use of OP pesticides within

the City of Stockton that causes aquatic life toxicity in the City's waterbodies and nearshore regions of the Delta.

- There is need to understand how the use of OP pesticides in residential areas for termite and ant control and lawn and garden pest control leads to stormwater runoff that is toxic to *Ceriodaphnia*.

ACKNOWLEGEMENTS

Dr. Val Connor of the Central Valley Regional Water Quality Control Board planned many of these studies. Her assistance in obtaining this data and in this project is appreciated.

All samples except those collected by the Stockton Stormwater monitoring program were processed by the University of California, Davis Aquatic Toxicology Laboratory. The assistance of Linda Deanovic and Karen Larsen of the UCD ATL is greatly appreciated. The DeltaKeeper (Bill Jennings) and its staff were responsible for sample collection during 1996–1999. The assistance of Bill Jennings is appreciated.

REFERENCES

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Table 1. Summary of Aquatic Toxicity Test Data
Mosher Slough, Stockton, CA (1994-1999)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-pyrifos (ng/L)	Calculated TUa
2/6/94	100	100 (1)		900	--	2
2/6/94	100	100 (1)		--	--	
2/6/94	100+200µg/L PBO	20 (2)	PBO reduced toxicity	--	--	
2/7/94	100	100 (1)		630	--	1.2
2/7/94	100	100 (1)		--	--	
2/7/94	100+200µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
10/5/94	100	100 (2)		459	<80	1
10/5/94	100	100 (3)		--	--	
10/5/94	100	50 (2)		--	--	1 to 2
10/5/94	50	0 (4)		--	--	
10/5/94	100+200µg/L PBO	10 (4)	PBO reduced toxicity	--	--	
11/6/94	100	100 (2)		--	--	
11/6/94	100	100 (3)		499	<80	1
11/6/94	100+200µg/L PBO	0 (4)	PBO reduced toxicity	--	--	
5/3/95	100	100 (2)	At Don Ave.	417	120	2
5/3/95	100+200µg/L PBO	0 (4)	PBO reduced toxicity	--	--	
10/29/96	100	100 (7)	No information on kill rate	486	103	2
10/29/96	100+200µg/L PBO	100 (7)		--	--	
10/29/96	100	100 (1)	(H36)	--	--	
10/29/96	50	80 (4)		--	--	
10/29/96	50+100µg/L PBO	0 (4)	PBO reduced toxicity	--	--	
10/29/96	50+200µg/L PBO	13 (4)	PBO activated toxicity	--	--	
10/29/96	25	0 (4)		--	--	2 to 4
10/29/96	25+100µg/L PBO	0 (4)		--	--	
10/29/96	25+200µg/L PBO	77 (3)	PBO activated toxicity	--	--	
10/29/96	12.5	7 (4)		--	--	
10/29/96	100+15mg/L EDTA	93 (4)	Not metal toxicity	--	--	
10/29/96	100+30mg/L EDTA	100 (1)		--	--	
11/16/96*	100		At Kelley Drive	640 830	80 120	2 2.5
11/16/96*	100		At Thornton Road	760	70	2
11/10/97*			At Thornton Road	1,500	100	3
11/10/97*	100	6.0 TUa	At Kelley Drive	2,300	150	6

(continues)

Table 1. Summary of Aquatic Toxicity Test Data
Mosher Slough, Stockton, CA (1994-1999) (continued)

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-pyrifos (ng/L)	Calculated TUa
11/10/97*	100+125µg/L PBO	1.6 TUa	At Thornton Road PBO reduced toxicity	--	--	
11/13/97	100	100 (3)		461	59	2
11/13/97	100+ 100 µg/L PBO	90 (3)		--	--	
1/14/98*			at Kelley Drive	830	<500	--
1/14/98*			at Thornton Road	360J	<500	--
2/19/98*			at Kelley Drive	430J	<500	--
2/19/98*			at Thornton Road	320J	<500	--
9/9/98	100	0 (7)		--	--	
10/24/98	100	100 (3)	At Mariner	310	--	
10/24/98	100+ 100 µg/L PBO	20 (7)		--	--	
12/7/98	100	60 (7)		--	--	
12/7/98	100	90 (7)		--	--	
12/7/98	100+ 100 µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
1/20/99	100	100 (1)		--	--	
1/20/99	100+100 µg/L PBO	100 (6)	PBO slowed kill rate	--	--	
1/20/99	100	100 (1)	At I-5	1,200	50	3
1/20/99	100	100 (1)	At Don Ave	--	--	
2/8/99	100	100 (1)	At I-5	820	40	
2/8/99	100+ 100 µg/L PBO	0 (4)	At I-5	--	--	
2/8/99	50	100 (2)	At I-5	--	--	
2/8/99	25	0 (4)	At I-5	--	--	
2/8/99	25+ 100 µg/L PBO	0 (4)	At I-5	--	--	
2/8/99	12.5	0 (4)	At I-5	--	--	
2/8/99	100	100 (1)	At Don Ave	860	30	
2/8/99	100+ 100 µg/L PBO	5 (3)	At Don Ave; PBO reduced toxicity	--	--	
2/8/99	50	100 (1)		--	--	
2/8/99	25	0 (4)		--	--	
2/8/99	25+ 100 µg/L PBO	0 (4)		--	--	

* – City of Stockton data
J – Estimated < detection limit
-- – Not measured

(table continues)

Table 1. Summary of Aquatic Toxicity Test Data
Mosher Slough, Stockton, CA (1994-1999) (continued)

Fathead Minnow Larvae

Date	% Mortality	Comment
10/5/96	0	
10/29/96	5	Not statistically significant
11/13/97	22	Not statistically significant
9/9/98	0	
10/24/98	2.5	Not statistically significant
12/7/98	0	
2/8/99	5	at I-5; Not statistically significant
2/8/99	10	at Don Ave; Not statistically significant

Selenastrum capricornutum

Date	Toxic Response	Comment
10/5/94	No	Stimulation
11/6/94	No	
10/29/96	No	Stimulation
11/13/97	No	
9/9/98	No	Stimulation
10/24/98	No	Stimulation
12/7/98	No	
1/20/99	No	
2/8/99	Yes	At I-5
2/8/99	Yes	At Don Ave

Table 2. Summary of Aquatic Toxicity Test Data
5-mile Slough, Stockton, CA (1994-1998)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-pyrifos (ng/L)	Calculated TUa
2/6/94	100	100 (2)		1,000	--	2
2/6/94	100	100 (1)		--	--	
2/6/94	100+200µg/L PBO	80 (4)	PBO reduced toxicity	--	--	
2/7/94	100	100 (1)		>1,000	--	> 2
2/7/94	100	100 (1)		1,200	--	2.5
2/7/94	100+200µg/L PBO	20 (4)	PBO reduced toxicity	--	--	
10/5/94	100	100 (2)		278	<80	0.5
10/5/94	100	100 (3)		--	--	
10/5/94	50	0 (4)	Between 1 and 2 TUa	--	--	
10/5/94	100+200µg/L PBO	60 (7)	PBO reduced toxicity	--	--	
11/6/94	100	0 (4)		80	<80	1
10/29/96	100	100 (7)	No information on rate of kill	304	84	1.5
10/29/96	100+100µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
11/13/97	100	100 (5)		359	52	2
11/13/97	100+100µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
10/24/98	100	0 (7)		--	--	
10/24/98	100+100µg/L PBO	10 (7)		--	--	

-- – Not measured

Fathead Minnow Larvae

Date	% Mortality	Comment
10/5/94	7	Not statistically significant
10/29/96	42	Not statistically significant
11/13/97	75	Statistically significant
10/24/98	0	

Selenastrum capricornutum

Date	Toxic Response	Comment
10/5/94	No	Stimulation
11/6/94	No	
10/29/96	No	Stimulation
11/13/97	No	Stimulation
10/24/98	No	Stimulation

Table 3. Summary of Aquatic Toxicity Test Data
Calaveras River, Stockton, CA (1994-1998)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-pyrifos (ng/L)	Calculated TUa
2/6/94	100	100 (2)		380	--	0.8
2/6/94	100	100 (2)		--	--	
2/6/94	100+200µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
2/7/94	100	100 (2)		450	--	1
2/7/94	100	100 (2)		--	--	
2/7/94	100+200µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
10/5/94	100	100 (4)		299	<80	0.5
10/5/94	100	100 (4)		--	--	
10/5/94	100+100µg/L PBO	5 (6)	PBO reduced toxicity	--	--	
11/6/94	100	0 (4)		199	88	1.5
10/29/96	100	0 (7)	TUa could not be calculated	36	<50	
10/29/96	100+100µg/L PBO	0 (7)			--	
11/16/96*			At Sutter Street	640	<50	
11/16/96*			At West Lane	170	<50	
1/22/97*			At Sutter Street	130	70	
1/22/97*			At West Lane	210 200	100 90	
11/10/97*			At Sutter Street	480	<50	
11/10/97*	100	<1.0TUa	At West Lane	380	<50	
11/10/97*	100+125µg/L PBO		At West Lane	--	--	
1/14/98*			At Sutter Street	320J	<500	
1/14/98*			At West Lane	310J	<500	
2/19/98*			At Sutter Street	<500	<500	
2/19/98*			At West Lane	<500	<500	
10/24/98	100	10 (7)	At Pershing	--	--	
10/24/98	100+100µg/L PBO	0 (7)		--	--	

* - City of Stockton data
J – Estimated < detection limit
-- – Not measured

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Table 3. Summary of Aquatic Toxicity Test Data
Calaveras River, Stockton, CA (1994-1998) (continued)

Fathead Minnow Larvae

Date	% Mortality	Comment
10/5/94	0	
10/29/96	2	Not statistically significant
10/24/98	2	Not statistically significant

Selenastrum capricornutum

Date	Toxic Response	Comment
10/5/94	No	
11/6/94	No	Stimulation
10/29/96	No	Stimulation
10/24/98	No	Stimulation

Table 4. Summary of Aquatic Toxicity Test Data
Walker Slough, Stockton, CA (1994-1998)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-Pyrifos (ng/L)	Calculated TUa
10/5/94	100	100 (7)	No information on rate of kill	273	<80	0.5
11/6/94	100	0 (4)	TUa could not be calculated	<30	<80	
12/11/95	100	100 (2)	White light	--	--	
12/11/95	100	100 (2)	UV light	--	--	
12/11/95	80	100 (3)		--	--	
12/11/95	60	100 (4)		--	--	
12/11/95	40	64 (7)		--	--	
12/11/95	20	0 (7)		--	--	4 to 5
10/29/96	100	0 (7)		96	65	1
10/29/96	100+100µg/L PBO	0 (7)		--	--	
11/16/96*			At Western Pacific Industrial Park	470	<50	
1/22/97*			At Western Pacific Industrial Park	150	90	
11/10/97*	100	<1.0 TUa	At Western Pacific Industrial Park	<50	<50	
11/10/97*	100+125µg/L PBO	<1.0 TUa	At Western Pacific Industrial Park	--	--	
1/4/98*			At Western Pacific Industrial Park	<320J	<500	
2/19/98*			At Western Pacific Industrial Park	<500	<500	
9/9/98	100	0 (7)			--	
10/24/98	100	100 (2)		170	--	
10/24/98	100+100µg/L PBO	0 (7)		--	--	
12/7/98	100	0 (7)		--	--	

* – City of Stockton data
J – Estimated < detection limit
-- – Not measured

(continues)

Table 4. Summary of Aquatic Toxicity Test Data
Walker Slough, Stockton, CA (1994-1998) (continued)

Fathead Minnow Larvae

Date	% Mortality	Comment
10/5/94	0	Impaired growth
10/29/96	0	
9/9/98	5	Not statistically significant
10/24/98	10	Not statistically significant
12/7/98	0	

Selenastrum capricornutum

Date	Toxic Response	Comment
10/5/94	No	
11/6/94	No	Stimulation
10/29/96	No	Stimulation
9/9/98	No	Stimulation
10/24/98	No	Stimulation
12/7/98	No	
12/7/98	Yes	
12/7/98	No	
12/14/98	No	

Table 5. Summary of Aquatic Toxicity Test Data
Smith Canal, Stockton, CA (1994-1998)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-Pyrifos (ng/L)	Calculated TUa
11/6/94	100	100 (7)	No information on rate of kill	186	122	1.5
11/8/96	100	0 (7)	TUa could not be calculated	<30	<80	
11/6/94	100	100 (6)		--	--	
11/6/94	100+100µg/L PBO	87 (7)	PBO caused delayed mortality	--	--	
11/9/94	100	100 (7)		166	<80	0.25
11/9/94	100	??		--	--	
11/9/94	100+200µg/L PBO	0 (7)		--	--	
11/25/94	100	20 (7)		106	<80	0.25
12/4/94	100	0 (7)	TUa could not be calculated	<30	<80	
3/11/95	100	100 (7)		--	--	
3/11/95	100+200µg/L PBO	20 (3)	PBO reduced toxicity	--	--	
10/29/96	100	100 (7)		129	<30	0.25
10/29/96	100+100µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
10/24/98	100	0 (7)-?	At Pershing	--	--	
10/24/98	100+100µg/L PBO	0 (7)		--	--	

-- – Not measured

Fathead Minnow Larvae

Date	% Mortality	Comment
11/6/94	7	Not statically significant
1/25/94	7	Not statically significant
12/4/94	0	
10/29/96	2	Not statistically significant
10/24/98	0	

Selenastrum capricornutum

Date	Toxic Response	Comment
11/6/94	No	
11/8/94	No	Stimulation
11/19/94	No	Stimulation
11/25/94	No	Stimulation
12/4/94	No	Stimulation
10/24/98	No	Stimulation

Table 6 Summary of Aquatic Toxicity Test Data
Mormon Slough, Stockton, CA (1994)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-pyrifos (ng/L)	Calculated TUa
2/6/94	100	100 (6)		320	--	0.8
2/6/94	100	100 (7)		--	--	
2/6/94	100+200µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
2/7/94	100	100 (1)		900	--	2
2/7/94	100	100 (1)		--	--	
2/7/94	100+200µg/L PBO	100 (2)	PBO reduced toxicity	--	--	

-- – Not measured

Table 7. Summary of Aquatic Toxicity Test Data
Lake McLeod, Stockton, CA (1994)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-pyrifos (ng/L)	Calculated TUa
2/6/94	100	100 (6)		200	--	< 0.5
2/6/94	100	100 (6)		--	--	
2/6/94	100+200µg/L PBO	0 (7)	PBO reduced toxicity	--	--	
2/7/94	100	100 (2)		500	--	1
2/7/94	100	100 (2)		--	--	
2/7/94	100+200µg/L PBO	0 (7)	PBO reduced toxicity	--	--	

-- – Not measured

Table 8. Summary of Aquatic Toxicity Test Data
Turning Basin, Stockton, CA (1994)

Ceriodaphnia

Date	% Sample	Toxicity Response %kill in (days)	Comments	Diazinon (ng/L)	Chlor-pyrifos (ng/L)	Calculated TUa
2/6/94	100	0 (7)		190	--	< 0.5
2/6/94	100	0 (7)		--	--	
2/6/94	100+200µg/L PBO	0 (7)		--	--	
2/7/94	100	100 (1)		600	--	1
2/7/94	100	100 (1)		--	--	
2/7/94	100+200µg/L PBO	0 (7)	PBO reduced toxicity	--	--	

-- – Not measured