APPENDIX

ENVIRONMENTAL CHECKLIST FORM

(To Be Completed By Lead Agency)

I. Background

1. Name of Proponent State Water Resources Control Board
2. Address and Phone Number of Proponent Division of Water Rights
   P.O. Box 2000, Sacramento, CA 95810
   (916) 324-5751
3. Date of Checklist Submitted
4. Agency Requiring Checklist Resources Agency
5. Name of Proposal, if applicable Pollutant Policy Document for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

II. Environmental Impacts

(Explanations of all "yes" and "maybe" answers are required on attached sheets.)

	Yes	Maybe	No
1. Earth. Will the proposal result in:			
a. Unstable earth conditions or in changes in geologic substructures?			X
b. Disruptions, displacements, compaction or overcovering of the soil?			X
c. Change in topography or ground surface relief features?			X
d. The destruction, covering or modification of any unique geologic or physical features?			X
e. Any increase in wind or water erosion of soils, either on or off the site?			X
f. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?			X

	Yes	Maybe	No
g. Exposure of people or property to geologic hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards?			X
2. Air. Will the proposal result in:			
a. Substantial air emissions or deterioration of ambient air quality?			X
b. The creation of objectionable odors?			X
c. Alteration of air movement, moisture, or temperature, or any change in climate, either locally or regionally?			X
3. Water. Will the proposal result in:			
a. Changes in currents, or the course of direction of water movements, in either marine or fresh waters?			X
b. Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff?			X
c. Alterations to the course or flow of flood waters?			X
d. Change in the amount of surface water in any water body?			X
e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity?		X	
f. Alteration of the direction or rate of flow of ground waters?			X
g. Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?			X
h. Substantial reduction in the amount of water otherwise available for public water supplies?			X
i. Exposure of people or property to water related hazards such as flooding or tidal waves?			X

		Yes	Maybe	No
4.	**Plant Life.** Will the proposal result in:			
	a. Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, and aquatic plants)?	____	____	X
	b. Reduction of the numbers of any unique, rare or endangered species of plants?	____	____	X
	c. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?	____	____	X
	d. Reduction in acreage of any agricultural crop?	____	____	X
5.	**Animal Life.** Will the proposal result in:			
	a. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms or insects)?	____	____	X
	b. Reduction of the numbers of any unique, rare or endangered species of animals?	____	____	X
	c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?	____	____	X
	d. Deterioration to existing fish or wildlife habitat?	____	____	X
6.	**Noise.** Will the proposal result in:			
	a. Increases in existing noise levels?	____	____	X
	b. Exposure of people to severe noise levels?	____	____	X
7.	**Light and Glare.** Will the proposal produce new light or glare?	____	____	X
8.	**Land Use.** Will the proposal result in a substantial alteration of the present or planned land use of an area?	____	____	X
9.	**Natural Resources.** Will the proposal result in:			
	a. Increase in the rate of use of any natural resources?	____	____	X

	Yes	Maybe	No
b. Substantial depletion of any nonrenewable natural resource?	____	____	X
10. **Risk of Upset. Will the proposal involve:**			
a. A risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?	____	____	X
b. Possible interference with an emergency response plan or an emergency evacuation plan?	____	____	X
11. **Population.** Will the proposal alter the location, distribution, density, or growth rate of the human population of an area?	____	____	X
12. **Housing.** Will the proposal affect existing housing, or create a demand for additional housing?	____	____	X
13. Transportation/Circulation. Will the proposal result in:			
a. Generation of substantial additional vehicular movement?	____	____	X
b. Effects on existing parking facilities, or demand for new parking?	____	____	X
c. Substantial impact upon existing transportation systems?	____	____	X
d. Alterations to present patterns of circulation or movement of people and/or goods?	____	____	X
e. Alterations to waterborne, rail or air traffic?	____	____	X
f. Increase in traffic hazards to motor vehicles, bicyclists or pedestrians?	____	____	X
14. **Public Services.** Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas:	____	____	X
a. Fire protection?	____	____	X
b. Police protection?	____	____	X
c. Schools?	____	____	X

	Yes	Maybe	No
d. Parks or other recreational facilities?	____	____	X
e. Maintenance of public facilities, including roads?	____	____	X
f. Other governmental services?	____	____	X
15. Energy. Will the proposal result in:			
a. Use of substantial amounts of fuel or energy?	____	____	X
b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?	____	____	X
16. Utilities. Will the proposal result in a need for new systems, or substantial alterations to the following utilities:			
a. Power or natural gas?	____	____	X
b. Communications systems?	____	____	X
c. Water?	____	____	X
d. Sewer or septic tanks?	____	____	X
e. Storm water drainage?	____	____	X
f. Solid waste and disposal?	____	____	X
17. Human Health. Will the proposal result in:			
a. Creation of any health hazard or potential health hazard (excluding mental health)?	____	____	X
b. Exposure of people to potential health hazards?	____	____	X
18. Aesthetics. Will the proposal result in the obstruction of any scenic vista or view open to the public, or will the proposal result in the creation of an aesthetically offensive site open to public view?	____	____	X
19. Recreation. Will the proposal result in an impact upon the quality or quantity of existing recreational opportunities?	____	____	X
20. Cultural Resources.			
a. Will the proposal result in the alteration of or the destruction of a prehistoric or historic archaeological site?	____	____	X

	Yes	Maybe	No
b. Will the proposal result in adverse physical or aesthetic effects to a prehistoric or historic building, structure, or object?	____	____	X
c. Does the proposal have the potential to cause a physical change which would affect unique ethnic cultural values?	____	____	X
d. Will the proposal restrict existing religious or sacred uses within the potential impact area?	____	____	X

21. Mandatory Findings of Significance.

a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	____	____	X
b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.)	____	____	X
c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)	____	____	X
d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	____	____	X

III. Discussion of Environmental Evaluation

3.e: The Pollutant Policy Document recommends the establishment of an Ocean disposal site in lieu of Bay disposal. Ocean site selection, environmental impacts and mitigation measures are the subject of an EIR/EIS currently being prepared for this project.

IV. Determination
(To be completed by the Lead Agency)

On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a FUNCTIONAL EQUIVALENT DOCUMENT equivalent to a NEGATIVE DECLARATION will be prepared. [X]

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A NEGATIVE DECLARATION WILL BE PREPARED. [ ]

I find the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required. [ ]

May 4, 1990
Date

Gerald E. Johns
Signature

For _____

APPENDIX A

Problem Assessment Matrix

A-1 Trace Elements
A-2 Organochlorines and Hydrocarbons

POLLUTANT TYPE	PROBLEM ASSESSMENT MATRIX			
TRACE ELEMENTS	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	LOCATION	TISSUE RESIDUE LEVEL	REFERENCE
		C. Bay=Central Bay S. Bay=South Bay S.P. Bay=San Pablo Bay	ww=wet weight dw=dry weight	TSM=Toxic Substance Monitoring MW=Mussel Watch
Arsenic (As)	Shellfish			
	Macoma baltica	long-term San Pablo Bay	1.2 to 1.9 ppm ww	Anatec (1985)
	Mussels	Central Bay	1.28-2.02 ppm ww	MW '87 10yr sum.
		South Bay	1.16-2.16 ppm ww	MW '87 10yr sum.
		San Pablo Bay	1.58 ppm ww	MW '87 10yr sum.
	shellfish (unspec)	long-term	9.9 ppm ww	Girvin et al ('75)
	Mytilus	Central Bay; Islais	8.9 ppm ww	Girvin et al ('75)
Cadmium (Cd)	Shellfish	South Bay, MW	1.2-1.7 ppm	Hayes ('85)
	Mytilus sp.	S. Bay, Redwood Cr.	7.7-13.5 ppm ww	DFG ('82)
	Pacific oyster	C. Bay, San Leandro	4.74-27 ppm ww	Hayes ('86)
	shellfish sp.	San Pablo Bay MW	0.76-1.1 ppm ww	MW '87 10yr sum.
	Mussel	South Central Bay MW	0.58-1.4 ppm ww	
		South Bay	1.21 ppm	
			1.12 ppm ww	MW '87 10yr sum.
	shellfish sp.	Mare Island	1.8-5.0 ppm ww	Bradford & Luoma(80)
	Mytilus edulis	South Bay, Dunbarton Bridge	37.7 ppm kidneys	Ohlendorf ('85)
	Birds-diving ducks - ducks	South Bay, Redwood Creek	29.2 ppm kidneys	Ohlendorf ('85)
Chromium (Cr)	Shellfish			
	Mytilus spp.	San Pablo Bay MW	0.38-1.0 ppm ww	MW '87 10yr sum.
	Corbicula sp.	Central Bay	0.2-0.54 ppm ww	MW '87 10yr sum.
	Mytilus sp.	South Central Bay	0.15-3.92 ppm ww	MW '87 10yr sum.
		South Bay	0.29-0.32 ppm ww	MW '87 10yr sum.
		Suisun Bay long-term	1.8 ppm ww	Luoma et al in press
		Bay generally	0.4-.77 ppm ww	Hayes & Phillips(86)

POLLUTANT TYPE	PROBLEM ASSESSMENT MATRIX			
TRACE ELEMENTS	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESIDUE LEVEL wet weight=ww dry weight=dw	REFERENCE TSM=Toxic Substance Monitoring SWRCB=State Water Resources Control Board
Arsenic (As)	Fin Fish	Suisun Bay	0.76-1.2 ppm ww	TSM Station sum.
		Sacto R.; Hood	N.D.	TSM Station sum.
		San Joaq; Old River	0.6 ppm ww	TSM Station sum.
		White Sl.; Lodi	0.08 ppm ww	TSM Station sum.
		San Joaq.; Vernalis	0.13 ppm ww	TSM Station sum.
Cadmium (Cd)	Fin Fish	Suisun Bay	0.2-0.27 ppm ww	TSM Station sum.
		Sac. R.; Hood	0.11-0.48 ppm ww	TSM Station sum.
		San Joaq.; Old River	0.03-0.16 ppm ww	TSM Station sum.
		White Sl.; Lodi	0.05 ppm ww	TSM Station sum.
		San Joaq.; Vernalis	0.03-0.12 ppm ww	TSM Station sum.
Chromium (Cr)	Fin fish	Sacto R.; Hood	0.03-0.16 ppm ww	TSM Station sum.
		Bay-Delta tribs	0.03 ppm ww	SWRCB ('86)
		Bay-Delta tribs	0.1 ppm ww	SWRCB ('86)
	Fish sp.	San Joaq.; Vernalis	0.02-0.03 ppm ww	TSM Station sum.

POLLUTANT TYPE					
TRACE ELEMENTS	REGULATORY AGENCY GUIDANCE				
POLLUTANT	EPA 1986 CRITERIA (except as noted)				
	freshwater exposure	marine exposure	human health	bio. conc. factor	half-life
	[H]=hardness ln=natural log H=50, 100, 200 for sample calculation	"a"=acute;"f"=96 hr "c"=chronic;"h"=1-hr "d"=24-hour average "m"=max. allowable	10**(-6)risk level + = water + organism o = organisms only ppt=parts/trillion	Reported Range of bio. conc. factor (BFC) low to high or Acute: Chronic Ratio (A/C)	Used "C" for conservative substances
Arsenic (As)	c=40 ppb a=440 ppb (EPA,1980;84 update) Arsenic III: f=190 ppb once/3yrs h=360 ppb once/3yrs Arsenic V: a=850 ppb	c=insufficient data a=508 ppb Arsenic III f=36 ppb once/3yrs h=69 ppb once/3yrs a=234 ppm Arsenic V a=2319 ppb sw	+ = 22 ppt o = 17.5 ppt	Arsenic III: A/C 4.7-4.8 Arsenic V: A/C=28.7 Arsenic III: A/C=1.945 sw Inorganic Arsenic III: BFC=350	Arsenic C
Cadmium (Cd)	f=e**.7852ln[H]-3.49 f=0.66 f=1.1 f=2.0 all in ppb h=e**1.128ln[H] - 3.828 h=1.8 h=3.9 h=8.6 all in ppb	f=9.3 ppb once/3 yrs h=43 ppb once/3 yrs m=59 ppb	+ = 10 ppb	Cadmium 164-4190 (invert) fw 3-2213 (fish) fw 5-3160 (inverts) sw	Cadmium C
Chromium (Cr)	Cr III: f=e**.819ln[H]+1.561 f=120 f=210 f=370 all ppb h=e**.819ln[H]+3.688 Once per 3 years: h=980 h=1700 h=3100 all in ppb Cr VI: f=11 ppb, h=16 ppb once/3yrs	Cr III no criteria for sw Cr VI: f=50 ppb, h=1100 ppb	Cr III: + = 170 ppm o = 3433 ppm Cr VI: + = 50 ppb	Chromium 86 to 153 sw Cr VI: BCF=125-236	Chromium C

POLLUTANT TYPE					
TRACE ELEMENTS	REGULATORY AGENCY GUIDANCE				ALERT LEVELS
POLLUTANT	FDA ACTION LEVEL	CALIFORNIA AGENCY			MIS=Median Int'l Std EDL=Elevated Data Level (85% or 95%) LEL=Lowest Alert Level, fw=freshwater sw=salt water
		Prop 65 toxic effect C=Carcinogenic M=Mutagenic T=Teratogenic O=Other	WQ objectives relevant to water "Med"=6 Month Median "Max"=Daily Maximum "I"=Instant. max. H=Hardness CaCO3	Dept. Health Service Maximum contaminant level; Title 22	
Arsenic (As)	0.5 muscle meat 1.0 ppm organ meat 0.5 ppm eggs all in livestock	C/M	Ocean Plan: I=80ppb, Med=8.0 ppb, Max 32 ppb Region 2 fw: f=190, h=360 Region 2 sw: f=36, h=69 ppb Region 5: Max=10 ppb	0.05 ppm	MIS: 1.5 ppm fish, 1.4 ppm shellfish TSM: EDL 85=0.20 ppm ww EDL 95=0.61 ppm ww MW: EDL 85=4.46 ppm ww 31.26 ppm dw EDL 95=45.41 ppm dw, 6.49 ppm ww

Cadmium (Cd)	None	C/M/T	Ocean Plan: I=30,
			Med=3, Max=12 ppb
			Region 2 fw:
			f=1.1ppb, h=3.9 ppb;
			H=100
			Region 2 San Pablo:
			f=9.3 ppb, h=43 ppb;
			H=100
			Effluent limit;
			10 ppb shallow
			30 ppb deep
			Region 5: 0.2 ppm
				0.010 ppm	MIS: 0.3 ppm fish
					1.0 ppm shellfish
					TSM: EDL85=0.5 ppmww
					EDL 95=2.23 ppm ww
					MW:
					EDL 85=1.23 ppm ww
					8.62 ppm dw
					EDL 95=1.57 ppm ww,
					10.98 ppm dw
					LEL=0.15 ppb fw
					LEL=5.5 ppb sw

Chromium (Cr)	None	C/T	Med=2.0 ppb, Max=8.0 ppb, I=20 ppb Ocean Plan (CrVI): Med=2.0 ppm, Max=8.0 ppm, I=20 ppb Basin 2 fw: f=11, h=16 ppb Region 2 San Pablo: f=50, h=1100 ppb	0.05 ppm	MIS: Cr VI 1.0 ppm fish & shellfish TSM: EDL85=0.03ppmww EDL 95=0.11 ppm ww MW: EDL 85=0.45 ppm ww, 3.28 ppm dw EDL 95=0.64 ppm ww, 4.50 ppm dw LEL=2.5 ppb fw LEL=12.5 ppb sw

POLLUTANT TYPE					
TRACE ELEMENTS	PHYSICAL FACTORS				
POLLUTANT	SITES	WATER CONC/REFERENCE	SALINITY/CONC.	SEDIMENT & CONC	SOURCE & EST. LOAD
	General locations Delta, San Pablo Bay South Bay, Central Bay, Tributaries, Suisun Marsh. Name given for high sites	Water DS=San Joaquin River Drainage Study AHI=Aquatic Habitat Institute		S=Sediment	Point, Urban Runoff, Non-urban Runoff, Riverine, Atmosphere, Spills, D/D=Dredge/ Dump Metric tons, unless otherwise indicated
Arsenic (As)	Islais Ck			S=13-66 ppm 172 ppm NOAA(87)	Point 1.5-5.7 Riverine 32-37 Dredge/Dump 0.2-2 Urban runoff 1-9 Non-urban runoff 10.3-119 Total 45.0-172.7
Cadmium (Cd)	South Bay San Joaq.; Vernalis San Joaquin; F. F.	Water 0.1-0.25 ppb Particulates 1.2-5.0 (AHI; 304) DS =<.01-1.0ppb DS = <1-4 ppb		S=0.78-1.66 ppm dw (Bradford & Luoma '80)	Point 1.9-4.0 Urban runoff 0.3-3 Non-urb 0.52-6 River 5.5-27 Dredge/Dump 0.02-0.2 Atmosphere 0.14-0.35 Total 8.38-40.55
Chromium (Cr)	San Joaq.; Vernalis Mud Slough; South San Francisco Bay San Pablo Bay Oakland Islais Ck	4-30 ppb DS 6-55 ppb DS		200-649 ppm dw (NOAA '87) 72-93 ppm dw 85-95 ppm dw 110-145 ppm dw (Chapman, et al '86, AHI, 304)	Point 12-14 Urban 3-15 Non-urb 134-1537 River 77-92 D/D 5.0-50 Total 231-1708

POLLUTANT TYPE				
TRACE ELEMENTS	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESIDUE LEVEL	REFERENCE
			ww=wet weight dw=dry weight	TSM=Toxic Subs. Monitoring Prog. MW=Mussel Watch Program
Copper (Cu)	Shellfish			
	Crassostrea gigas	Long-term South Bay	1240+/-206 to 1680+/-570 ppm dw	Girvin et al ('75)
	Mya arenaria	Bay generally	2.1-6.4 ppm ww	Girvin et al ('75)
	Mussels	San Pablo Bay	1.1-2.2 ppm ww	MW '87 10yr sum.
		Central Bay	0.86-2.5 ppm ww	MW '87 10yr sum.
		South Central Bay	0.62-14.4 ppm ww	MW '87 10yr sum.
		South Bay	0.90-1.4 ppm ww	MW '87 10yr sum.
	Mytilus spp.	Short-term Bay generally	7.4-29.1 ppm dw	Hayes&Phillips ('86)
	Macoma balthica	Palo Alto- South Bay	10-100 ppm ww	Luoma et al ('85)
	Corbicula fluminea	Trib. American River	25-80 ppm	Woodward ('79)
	Birds			
	Scaup	Long-term South Bay	96.8+-7.6 ppm dw	Ohlendorf et al('86)
	Scoter	Long-term South Bay	49.8+-3.6 ppm dw	Ohlendorf et al('86)
Lead (Pb)	Shellfish			
	Mytilus spp.	Bay generally	0.3-5.7 ppm ww	Risebrough etal('78)
	Mytilus spp.	Bay generally	0.32-2.0 ppm ww	Hayes&Phillips('86)
	Mussels	San Pablo Bay	0.26-0.51 ppm ww	MW '87 10yr sum.
		Central Bay	0.25-0.92 ppm ww	MW '87 10yr sum.
		South Central Bay	0.12-4.98 ppm ww	MW '87 10yr sum.
		South Bay	0.16-0.39 ppm ww	MW '87 10yr sum.
	Mammals		"unremarkable"	(AHI, 304, 160)
	Harbor seals	Bay generally		Risebrough etal('78)
	Birds		451-711 ppm dw	Ohlendorf etal ('86)
	Diving ducks	South Bay	"unremarkable"	(AHI, 304, 160)
Mercury (Hg)	Shellfish	Redwood Ck	0.14-0.5 ppm ww 1-3.49 ppm dw	Risebrough etal (78)
	Mytilus spp.	Bay generally		Stephenson etal('86)
	Mussels	San Pablo Bay	0.03-0.05 ppm ww	MW '87 10yr sum.
		Central Bay	0.02-0.09 ppm ww	MW '87 10yr sum.
		South Central Bay	0.03-0.6 ppm ww	MW '87 10yr sum.
		South Bay	0.5 ppm ww	MW '87 10yr sum.
	Birds			
	Diving Ducks	San Joaq R. Vernalis	0.16-0.6 ppm ww	TSM Station sum.

POLLUTANT TYPE				
TRACE ELEMENTS	TISSUE RESIDUE LEVEL IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESIDUE LEVEL	REFERENCE
			ww=wet weight dw=dry weight	TSM=Toxic Subs. Monitoring Prog. MW=Mussel Watch Program
Copper (Cu)	Fin fish			
		Delta and Tribs	66-275 ppm San Joaq.	SWRCB ('86)
		Suisun Bay	13-30 ppm ww	TSM Station sum.
		Sacto R; Hood	2-3.6 ppm ww	TSM Station sum.
		San Joaq R. Vernalis	1.3-4.7 ppm ww	TSM Station sum.
		San Joaq R. @ Old R.	2.2-6.4 ppm ww	TSM Station sum.
		White Slough; Lodi	3.3 ppm ww	TSM Station sum.
		Paradise Wt; Tracy	2.4 ppm ww	TSM Station sum.
Lead (Pb)	Fin Fish			
		Suisun Bay	0.1 ppm ww	TSM Station sum.
		Sacto R; Hood	0.1-0.2 ppm ww	TSM Station sum.
		San Joaquin Vernalis	0.02 ppm ww	TSM Station sum.
	Fish liver	Sac'to/San Joaquin	"detected"	SWRCB ('86)
Mercury (Hg)	Fish			
	Largemouth Bass	Trib. chronic	0.57-1.62 ppm ww	Rasmussen et al('87)
	Channel catfish	Trib. chronic	0.8-1.5 ppm ww	SWRCB (86)
	White catfish	Trib. chronic	0.52-0.94 ppm ww	SWRCB (86)
	Fin Fish	Suisun Bay	0.13-0.22 ppm ww	TSM Station sum.
		Sacto R.; Hood	0.19-0.94 ppm ww	TSM Station sum.
		San Joaq. R.; Old R.	0.13-0.19 ppm ww	TSM Station sum.
		Paradise WT; Tracy	0.16-0.2 ppm ww	TSM Station sum.
		San Joaq R. Vernalis	0.16-0.6 ppm ww	TSM Station sum.

POLLUTANT TYPE	REGULATORY AGENCY GUIDANCE				
TRACE ELEMENTS	EPA 1986 CRITERIA (Unless otherwise indicated)				
POLLUTANT	freshwater	marine exposure	human health	bio. conc. factor	half-life
	[H]=hardness, using H=50, 100, 200 for sample calculation	"a"=acute; "f"=96-hr "c"=chronic;"h"=1-hr "d"=24-hour average	10**(-5)risk level + = water + organism o = organisms only	fw=freshwater sw=salt water	8760 hrs (=1yr) Used "C" for conservative substances
Copper (Cu)	f=e**0.8545 ln[H] -1.465 Once per 3 years f=6.5 f=12 f=21 ppb h=e**0.9422 ln[H] -1.464 Once per 3 years h=9.2 h=18 h=34 ppb c=3.87-60.4 ppb a=16.7-10240 ppb	h=2.9 ppb Once per 3 years a=5.8-600 ppb c=5-100 ppb	1 ppm organoleptic Drinking water stds	Copper up to 28,200	Copper C
Lead (Pb)	f=e**1.273 ln [H] -4.705 Once per 3 years f=1.3 f=3.2 f=7.7 all ppb h=e**1.273 ln[H] -1.460 Once per 3 years h=34 h=82 h=200 ppb a=142.5-235,900 ppb c=12.3-128.1 ppb	f=5.6 ppb h=140 ppb Once per 3 years a=315-2700 ppn c=17-37 ppb	+ = 50 ppb drinking water stds o = 312 ppm	42-1700 fw 125-2570 sw	Lead C
Mercury (Hg)	f=0.012 ppb h=2.4 ppb Once per 3 years Inorganic=0.2 ppb a=2.2-2000 ppb insects a=30-1000 ppb fish c<0.26 ppb Methyl mercury a<0.07 ppb	f=0.025 ppb h=2.40 ppb Inorganic=0.1 ppb a=3.5-1678 ppb c(HgIII)=10-160 ppb c(HgII)=1.6	ppt=parts/trillion + = 144 ppt o = 146 ppt	Mercury II 4994 BCF 10,000-40,000 sw Methyl mercury BCF =4000-85000 fw	Mercury C

POLLUTANT TYPE					
TRACE ELEMENTS	REGULATORY AGENCY GUIDANCE				ALERT LEVELS
POLLUTANT		FDA ACTION LEVEL	CALIFORNIA AGENCY		MIS=Median Int'l Std EDL=Elevated Data Level(85% or 95%) LEL=Lowest Effect Level; fw=fresh-water, sw=salt water
	toxic effects C=Carcinogen T=Tetratogenic M=Mutagenic;O=Other		Relevant Basin Plan "Med"=6 Month median "Max"=Daily maximum "I"=Instant. max.	Dept Health Services Maximum contaminant (Title 22)	
Copper (Cu)			Ocean Plan (old) Med=5 ppb Max=20 ppb I=50 ppb Ocean Plan (new) Med=3 ppb Max=12 ppb I=30 ppb Basin 2 Upstream f=6.5, h=9.2 Basin 2 San Pablo EPA 2.9 ppb;f'tnote Reg. 5 Delta Max =10 ppb; Reg. 5 Upstream 5.6 ppb	None	LEL=1.0 ppb fw LEL=4.0 ppb sw MW EDL 85=8.50 ppm dw 1.21 ppm ww EDL 95=13.39 ppm dw 1.91 ppm ww TSM (other than trout) EDL 85=7.45 ppm ww EDL 95=32.75 ppm ww MIS (fish & shellfish) 20 ppm ww
Lead (Pb)	Lead C/T		Ocean Plan Med=8 ppb Max=32 ppb I=80 ppb Basin 2 Upstream f=3.2 ppb h=83 ppb Basin 2 San Pablo f=5.6; h=140 ppb	0.05 ppm MCL	MIS (fish & shellfish) 2.0 ppm ww MW EDL 85=8.23 ppm dw 1.17 ppm ww EDL 95=21.09 ppm dw 3.01 ppm ww TSM EDL 85=0.2 ppm ww EDL 95=0.2 ppm ww MIS (fish & shellfish) 2.0 ppm ww
Mercury (Hg)	Mercury T	1.0 ppm ww	Ocean Plan Med=0.14 ppb Max=0.56 ppb I=1.4 ppb Basin 2 Upstream f=0.025; h=2.4 ppb Basin 2 San Pablo f=0.025; h-2.1 ppb	0.5 ppb Tissue (Informational) 2.0 ppb MCL	MIS (fish & shellfish) 0.5 ppm ww FDA Action Level (fish & muscles) 1.0 ppm ww Depart. of Health Services Advisory Level (protection of human health) 0.5 ppm ww Nat'l Acadamy of Sci Guidelines (predator protection) 0.5 ppm ww MW EDL 85=0.42 ppm dw 0.06 ppm ww EDL 95=0.79 ppm dw 0.11 ppm ww TSM EDL 85=0.64 ppm ww EDL 95=1.0 ppm ww

POLLUTANT TYPE					
TRACE ELEMENTS	PHYSICAL FACTORS				
POLLUTANT	Sites	Water Conc/Ref	Salinity/Conc.	Sediment	Source of Est. Load
	Delta, South Central Bay, Farallon Island San Pablo Bay, Tribs	AHI=Aquatic Habitat Institute San Joaq R. Drainage Study Cu SBDA Exhibit			Point, Urban Runoff, Non-urban Runoff, Riverine, Atmosphere, Spills, Dredge/Dump Metric tons(else Kg)
Copper (Cu)	South Central Bay South Bay (60%in dissolved form) Farallon Island South Bay Ambient San Joaquin R. @ Vernalis Islais Ck. Central Bay	0.5-4.0 ppb 2.5 & 4.0 ppb AHI; 304,42 to 100 ppb 3-18 ppb	Conc. vs Salinity gradient across Bay to Farallones 0% sal 1.98-5.2 ppb 16% sal 2.00 ppb 26%sal 2.00-2.9 ppb 34% sal 2.5-0.6 ppb	S=24-1500 ppb ww AHI; 304, fig. 16 S=68-184 ppm dw AHI; 304, 49 (Hoffman & Meighan, '84; Chapman, et al '86)	Point = 18-31 Urban= 7-59 Nonurban=51-581 Riverine=203 Dredge/dump=1-10 Atmosphere=1.9-3. Total 281.9-887.1
Lead (Pb)	South Central Bay Average in C. Bay Farallones(offshore) South Bay Islais Ck Mission Ck Suisun Bay Lower San Joaquin	0.03-0.39 ppb-Garvin et al. ('78) 0.018-0.033 ppb-Gordon ('80) 0.012-0.015 ppb Max to 200 ppb (South Bay Dischargers)		S=10-10000 ppm dw 50-882 ppm dw max (Hoffman & Meighan, '84) 2.580 ppm dw max (Hoffman & Meighan, '84) 13-62 ppm dw (Luoma, et al; '84) 30-38 ppm dw (Luoma, et al; '84)	Point=11-17 Urban=30-250 Nonurban=31-358 Riverine=30-66 Dredge/dump=1-10 Atmosphere=6-21 Total 109.0-722.0
Mercury (Hg)	Central Bay San Pablo Bay total levels San Pablo Bay dissolved levels Central Bay Islais Ck Mission Ck Mare Island Stait to Dumbarton Bridge Albany Hill Foster City	ppt=parts/trillion 9.4-27.7 ppt 5.9-11.2 ppt		S=0.08-0.46 ppm dw S=1.2 ppm dw max S=2.5 ppm dw max S=0.24-0.87 ppm dw S=1.3 ppm dw S=0.35 ppm dw	Point=0.1?-0.8 Urban=0.026-0.15 Nonurban=0.15-1.7 Riverine=1.2-3 Dredge/dump=0.01-0.1 Total 1.57-5.75

POLLUTANT TYPE				
TRACE ELEMENTS	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESIDUE LEVEL	REFERENCE
		Vernalis=Vern. Old River=Old R.	Wet weight=ww dry weight=dw part/trillion=ppt parts/billion=ppb parts/million=ppm	TSM=Toxic Substance Monitoring MW=Mussel Watch AHI=Aquatic Habitat Institute
Nickel (Ni)	Shellfish	San Pablo Bay	0.8 ppm ww	MW '87 10yr sum.
		Central Bay	0.5-0.6 ppm ww	MW '87 10yr sum.
		South Central Bay	0.6-0.9 ppm ww	MW '87 10yr sum.
	Tapes japonica	South Bay long-term	12-20 ppm dw approx 1.7-2.8ppm ww	(AHI,304,F67)
	Other shellfish	South Bay	2.0-8.0 ppm dw approx 0.3-1.1ppm ww	(AHI,304,193)
	Mytilus edulis	Mare Island Strait/ Carquinez Strait	10-16.9 ppm dw approx 1.4-2.4ppm ww	Riesbrough et al ('78)
		Islais Creek	5.0-9.9 ppm dw approx 0.7-1.4ppm ww	Riesbrough et al ('78)
	Fin Fish	Suisun Bay	0.8 ppm	TSM Sation sum.
	Diving ducks	South Bay migrants	0.1 ppm ww liver	Ohlendorf et al('86)
Selenium (Se)	Shellfish Mussels	San Pablo Bay	0.43-0.54 ppm ww	MW '87 10yr sum.
		Central Bay	0.49-1.0 ppm ww	MW '87 10yr sum.
		South Central Bay	0.19-0.66 ppm ww	MW '87 10yr sum.
	Mytilus edulis	Bay, long-term	2.4-11.4 ppm dw approx 0.3-1.6ppm ww	(AHI,304,f39)
	Mya arenaria	San Pablo Bay	0.9-1.2 ppm ww	Girvin et al ('75)
		Central Bay	0.3-0.5 ppm ww	Girvin et al ('75)
		South Bay	1.0-1.3 ppm ww	Girvin et al ('75)
	Fin Fish	Suisun Bay	0.4-1.0 ppm ww	TSM Station sum.
		White Slough; Lodi	0.07 ppm ww	(AHI,304,f39)
		Paradise Cut; Tracy	0.16-0.59 ppm ww	
	Largemouth bass	Alameda Ck & Lake Herman	1.2-1.6 ppm ww	TSM Station sum. TSM Station sum.
		Sacto R.; Hood	0.14-0.39 ppm ww	TSM Station sum.
		San Joaquin; Vern.	0.16-0.2 ppm ww	TSM Station sum.
	White sturgeon	Suisun Bay	0.69 ppm ww	TSM Station sum.
	Starry flounder	Suisun Bay	1.10 ppm ww	TSM Station sum.
	Striped bass	Suisun Bay	0.48 ppm ww	TSM Station sum.
	Birds			
	Surf scoter	South Bay migrants	34.4+/-2.58 ppm dw	(AHI,304,105)
	Scaup	South Bay migrants	19.3+/-1.55 ppm dw	(AHI,304,105)
	Surf scoter	Suisun Bay migrants	10-35 ppm liver ww	Ohlendorf et al('86)
	Scaup	Suisun Bay migrants	3.6-19 ppm liver ww	Ohlendorf et al('86)

POLLUTANT TYPE				
TRACE ELEMENTS	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESIDUE LEVEL	REFERENCE
		Vernalis=Vern. Old River=Old R.	Wet weight=ww dry weight=dw part/trillion=ppt parts/billion=ppb parts/million=ppm	TSM=Toxic Substance Monitoring MW=Mussel Watch AHI=Aquatic Habitat Institute
Silver (Ag)	Shellfish			
	Mytilus edulis	N. Bay, long-term	0.3-0.6 ppm ww	Goldberg et al('75)
	Mytilus edulis	S. Bay, long-term	2.3-2.4 ppm ww	Goldberg et al('75)
	Mussel	San Pablo Bay	0.004-0.017 ppm ww	MW '87 10yr sum.
	Mussel	Central Bay	0.014-0.24 ppm ww	MW '87 10yr sum.
	Mussel	South Central Bay	0.016-2.97 ppm ww	MW '87 10yr sum.
	Crassostrea gigas	Redwood Ck. short-term	196+/-12.6 ppm dw	Girvin et al('75)
	Fin Fish			
		Suisun Bay	0.3-0.44 ppm ww	TSM Station sum.
		Sacto R.; Hood	0.19-0.94 ppm ww	TSM Station sum.
		San Joaquin; Old R.	0.13-0.19 ppm ww	TSM Station sum.
		Paradise Cut; Tracy	0.16-0.2 ppm ww	TSM Station sum.
		San Joaquin; Vern.	0.16-0.6 ppm ww	TSM Station sum.
	Birds			
	Scaup	South Bay migrants	0.33-3.7 ppm dw	Ohlendorf et al('86)
			(liver)	Ohlendorf et al('86)
	Scoter	South Bay migrants	0.39-3.1 ppm dw	
Tributyltin	Shellfish			
	Mussel	Alameda harbor	2110 ppt	(CBE,1,34)
	Mussel	San Pablo Bay	120-176 ppb ww	MW '87 10yr sum.
	Mussel	Central Bay	975-2960 ppb ww	MW '87 10yr sum.
	Mussel	South Central Bay	664-1180 ppb ww	MW '87 10yr sum.
Zinc (Zn)	Shellfish			
	Mytilus sp.	San Pablo Bay	11.0-25.0 ppm ww	MW '87 10yr sum.
		Central Bay	21.5-37.0 ppm ww	MW '87 10yr sum.
		South Central Bay	15.0-45.8 ppm ww	MW '87 10yr sum.
		South Bay	15.0-33.0 ppm ww	MW '87 10yr sum.
	Fin Fish	San Joaquin R; Vern.	16.0-25.0 ppm ww	TSM Station sum.
		San Joaquin R; Old R	20.0-22.0 ppm ww	TSM Station sum.
		Suisun Bay	22.0-43.0 ppm ww	TSM Station sum.
		Sacto R.; Hood	16.0-26.0 ppm ww	TSM Station sum.
	Birds			
	Scaup	South Bay migrants	151+/-5.94 ppm dw	Ohlendorf et al('86)

POLLUTANT TYPE					
TRACE ELEMENTS	REGULATORY AGENCY GUIDANCE				
POLLUTANT	EPA 1986 CRITERIA				
	freshwater exposure	marine exposure	human health	bio conc. factor	half-life
	[H]=hardness, using H= 50, 100, 200 for sample calculation	"a"=acute "f"=96-hr "c"=chronic "h"=1-hr "d"=24-hour average "m"=max. allowable	10**(-5)risk level + = water + organism o = organisms only	DS=San Joaquin Drainage Study	Used C for conservative substances.
Nickel (Ni)	d=e**0.76ln[H]+1.06 m=e**0.76ln[H]+4.02 d=56 d=96 d=160 m=1100 m=1800 m=3100 all in ppb	d=7.1 ppb m=140 ppb	+ = 13.4 ppb o = 100 ppb	nickel 261-675 0.8-193	C
Selenium (Se)	c(Se IV)=27.6 ppb c(Se VI)=9.67 ppb Se (IV) f=5.0 ppb once/3yr h=20.0 ppb once/3yr a(SeIV)=371.8 ppb a(Se VI)=25.65 ppb	c(Se IV)=70.69ppb f=71 ppb once/3yrs h=300 ppb once/3yrs a=587.7 ppb	+ = 10 ppb	selenium BCF=2-452 EPA Bioaccumulation= 267-6000 Impounded water 18-535 flowing water DS	C

POLLUTANT TYPE	REGULATORY AGENCY GUIDANCE				
TRACE ELEMENTS	EPA 1986 CRITERIA				
POLLUTANT	freshwater exposure	marine exposure	human health	bio conc. factor	half-life
	[H]=hardness, using H= 50, 100, 200 for sample calculation	"a"=acute "f"=96-hr "c"=chronic "h"=1-hr "d"=24-hour average "m"=max. allowable	10**(-5)risk level + = water + organism o = organisms only	DS=San Joaquin Drainage Study	Used C for conservative substances.
Silver (Ag)	a=e**1.72ln[H]-6.52 a=1.2 a=4.1 a=13 c=0.12 ppb	a=2.3 ppb	+ = 50 ppb	Ag 3,080	C
Tributyltin	Provisional Aquatic Life Advisory 26 ppt	Provisional Aquatic Life Advisory 10 ppt	Relative reference Dose 3*10(-5)mg/kg/day 2.1ug/day for 70 kg man	Tin Marine inverts 1000-45000 Fish 2600 Algae 5500	Marine water -- 6 days Marine organisms 7-60 days freshwater organisms 6-140 days
Zinc (Zn)	EPA 1987 d=59 ppb @ H=50 d=110 @ H=100 m=e**0.83ln[H]+1.95 m=180 ppb m=320 ppb m=570 ppb	d=58 ppb m=170 ppb	+ = 5 ppm	zinc 432	C

POLLUTANT TYPE					
TRACE ELEMENTS	REGULATORY AGENCY GUIDANCE				ALERT LEVEL
POLLUTANT		FDA ACTION LEVEL	CALIFORNIA AGENCY		MARL=Max. Allow. Residue Level, DHS=Dept. of Health Services Advisory Level MIS=Median Intl. Standard EDL=Elevated Data Level LEL=Lowest Effect Level, fw=freshwater sw=salt water EDL=Elevated Data Level 85% or 95% (MW or TSM)
	effects		RWQCB Basin Plan	Dept Health Services	
	C=Carcinogenic M=Mutagenic T=Teratogenic O=Other		6 Month Median="Med" Daily Maximum="Max" Instant. max.="I"	Maximum contaminant level	
Nickel (Ni)	nickel C/M	none	Ocean Plan Med=20.0 ppb Max=80 ppb I=200 ppb Basin Plan 2 Upstream d=56 ppb I=1100 ppb Basin Plan 2 San Pablo d=7.1 ppb I=140 ppb	none	LEL=20 ppb sw LEL=4.1 ppb fw MW: EDL 85=4.06 ppm dw, 0.6 ppm ww EDL 95=5.01 ppm dw, 0.7ppm ww TSM: EDL 85=0.1 ppm ww EDL 95=0.3 ppm ww
Selenium (Se)	T	none	none		DHS Advisory Level= 2.0 ppm LEL=320 ppb sw LEL=10 ppb fw MARL=1.0 ppm ww (sportfish & aquatic birds) TSM: EDL 85=3.88 ppm ww EDL 95=6.16 ppm ww MW: EDL 85=4.10 ppm dw, 0.6 ppm ww EDL 95=5.73 ppm dw, 0.8 ppm ww MIS: 2.0 ppm ww fish 0.3 ppm ww shellfish

TRACE ELEMENTS (3) (page 3b)

POLLUTANT TYPE					
TRACE ELEMENTS	REGULATORY AGENCY GUIDANCE				ALERT LEVEL
POLLUTANT		FDA ACTION LEVEL	CALIFORNIA AGENCY		MARL=Max. Allow. Residue Level, DHS=Dept. of Health Services Advisory Level MIS=Median Intl. Standard EDL=Elevated Data Level LEL=Lowest Effect Level, fw=freshwater sw=salt water EDL=Elevated Data Level 85% or 95% (MW or TSM)
	effects		RWQCB Basin Plan	Dept Health Services	
	C=Carcinogenic M=Mutagenic T=Teratogenic O=Other		6 Month Median="Med" Daily Maximum="Max" Instant. max.="I"	Maximum contaminant level	
Silver (Ag)		none	Ocean Plan Med=0.45 ppb Max=1.8 ppb I=4.5 ppb Basin 2 Upstream I=12 ppb Basin 2 San Pablo	0.05 ppm	TSM: EDL 85=0.18 ppm ww EDL 95=0.63 ppm ww MW: EDL 85=4.01 ppm dw, 0.6 ppm ww EDL 95=16.07 ppm dw, 2.3 ppm ww LEL=2.6 ppb sw LEL=0.12 ppb fw (chronic)
Tributyltin	C - Not indicated M - Possible Weak T - in vitro strohg in vivo not indicated	none	2 ppt Guidance Level SWRCB Fresh=6 ppt Salt=20 ppt	none	LEL=0.08 ppb fw (80ppt) 0.047 ppb sw (47 ppt)
Zinc (Zn)		none	Ocean Plan Med=20.0 ppb Max=80.0 ppb I=20.0 ppb Basin 2 San Pablo d=58 I=170 ppb Basin 2 Upstream d=58 I=170 ppb Basin 5 Max=100 ppb	none	TSM: EDL 85=30.0 ppm ww EDL 95=38.0 ppm ww MIS: 45 ppm ww fish; 70 ppm ww shellfish Alert=8.6 DS MW: EDL 85=231.49 ppm dw 33.07 ppm ww EDL 95=269.78 dw 38.54 ppm ww LEL=30 ppb fw, 45 ppb sw

POLLUTANT TYPE					
TRACE ELEMENTS	PHYSICAL FACTORS				
POLLUTANT	Site	Water	Salinity Conc./Ref	Sediment Conc./Ref	Source of Est. Load
	Delta, Farallones South and Central Bay, Mare Island Straits, San Fransico Bay YC=Yacht Club	Max Concentrations Influent waters Total levels ppt=parts per trillion	Sources: AHI 304 Ni p. 185-186; Ag p. 12; Se p. 81; TBT Goldburg, 1987; AHI 304, 197 Zn p. 165 San Joaquin River Drainage Study=DS	Sed = Sediment	Point, Urban Runoff, Non-urban Runoff, Riverine, Atmosphere, Spills, Dredge/Dump Metric tons, unless otherwise indicated
Nickel (Ni)	San Joaquin R. Central Bay Influent waters Gulf of Farallones Southern extremity of South Bay	3-50 ppb 1.0 ppb, mean conc. 2.0 ppb, mean conc. 0.2-0.4 ppb 8.0 ppb, max		S=84-189 ppm dw Carquiez Strait to Oakland Inner Harbor	Pt. Sources 21-29 Riverine 74-82 Dredge/dump 2-20 Total 97-131
Selenium (Se)	South Central Bay conc. along salinity gradient measured in part/thousand (o/oo)	total selenium 18 o/oo=320 ppt 24 o/oo=160 ppt 26 o/oo=170 ppt 27 o/oo=150 ppt selenate 18 o/oo=110 ppt 24 o/oo=64 ppt 27 o/oo=80 ppt	selenide + organics 18 o/oo=200 ppt 26 o/oo=96 ppt 27 o/oo=48 ppt selenite 18 o/oo=26 ppt 21 o/oo=17 ppt 27 o/oo=20 ppt	S=1.2-34.6ppb	Pt. Sources 1.9-2.5 Riverine 4.3-7.4 Dredge/dump 0.04-0.4 Total 6.2-10.3
	San Joaquin @ Vern. 10/60-3/87	1.1 ppb, mean conc. 1.0 ppb, median 5.0 ppb, max conc.	DS		
	Suisun Bay 7/82-6/83	3.0 ppb, mean conc. 3.0 ppb, median 5.0, max conc.			
	North San Francisco Bay	45-240 ppt			

TRACE ELEMENTS (3) (page 4b)

POLLUTANT TYPE	PHYSICAL FACTORS				
TRACE ELEMENTS					
POLLUTANT	Site	Water	Salinity Conc./Ref	Sediment Conc./Ref	Source of Est. Load
	Delta, Farallones South and Central Bay, Mare Island Straits, San Fransico Bay YC=Yacht Club	Max Concentrations Influent waters Total levels ppt=parts per trillion	Sources: AHI 304 Ni p. 185-186; Ag p. 12; Se p. 81; TBT Goldburg, 1987; AHI 304, 197 Zn p. 165 San Joaquin River Drainage Study=DS	Sed = Sediment	Point, Urban Runoff, Non-urban Runoff, Riverine, Atmosphere, Spills, Dredge/Dump Metric tons, unless otherwise indicated
Silver (Ag)	South & Central Bay Farallones South Bay Palo Alto area Central Bay Islais Creek Mission Creek (AHI 304, 14-15) Islais Creek Oakland San Pablo Bay Suisun Bay & Delta (AHI 304, 16)	0.004-0.310 ppb 0.005-0.044 ppb 0.042+/-0.61 ppb		"Average/Background" values=0.01-0.5 ppm dw (AHI 304, 13) S=2.5-4.0 ppm S=0.4-1.8 ppm dw 3.0 ppm dw 9.5 & 16 ppm dw 6.9+/-2.1 ppm dw 2.0+/-0.3 ppm dw 1.2+/-0.3 ppm dw 0.028-0.389 ppm dw	Pt. Sources 3.3-7.5 Riverine 2.6-26 Dredge/dump 0.04-0.2 Total 5.92..33.7
Tributyltin	Oxbow Marina Antioch YC Stockton, Paradise Pt St. Francis YC Berkeley Marina Peir 39, S. F. Petes Harbor Peninsula Marina Oakland, Alameda & London Marina Rio Vista Delta Marina Vallejo; Mare Island Martinez Marina Richardson Bay, Sausalito Other Marinas	210 & 250 ppt; 230 ppt mean 130 & 570 ppt 350 ppt, mean 11 ppt, mean 58 ppt, mean 62 ppt, mean 6 ppt, mean 180 ppt, mean 105 ppt, mean 82 ppt, mean 90 ppt, mean 2.0 ppt, mean 140 ppt, mean 59 ppt, mean 51-150 ppt		S=2800-93000 ppt	Pt. Sources (boats)
Zinc (Zn)	Mission Ck Islais Ck Islais Ck Albany Hill San Joaquin @ Vernalis Delta (Region 5) Golden Gate South Central Bay Lower South Bay Islais, Mission Ck	<10-80 ppb 5-12 ppb 0.4-2.4 ppb 1.1-7.5 ppb Eaton'79 0.4-2.0 ppb <1.0-90 ppb SBDA'87 0.5-2.0 ppb	DS	1255 ppm dw 984 ppm dw 321 ppt NOAA '87 222+/-51 ppm dw Total Bay Sediment =100 ppm dw	Pt. Source 70-74; D/D 3-30; Urban 34-268; Nonurb 126-1453; Atm. 16-32; River 272-288 Total 521-2145

POLLUTANT TYPE				
ORGANOCHLORINES	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESIDUE LEVEL	REFERENCE
Polychlorinated Biphenyls (PCB's)			ww=wet weight dw=dry weight	MW=Mussel Watch TSM=Toxic Substances Minitoring
PCBs	Bivalve Molluscs	Same locations used	Range of locations	
	Mya arenaria	for all four species	39.2-55.1 ppb ww	Girvin et al. ('75)
	Tapes japonica	Albany Hill; Coyote	29.1-38.1 ppb ww	Id.
	Mytilus edulis	Point North; Foster	108-152 ppb ww	
	Ostrea lurida	City	118-201 ppb ww	
	Mussels	San Pablo Bay	11.4-29.9 ppb ww	MW '87 10yr sum.
		Central Bay	33.2-242ppb ww	MW '87 10yr sum.
		South Central Bay	14-235.8 ppb ww	MW '87 10yr sum.
	M. edulis	South Bay	590-990 ppb dw approx 843- 141.4 ppb ww	Goldberg et al ('78)
	Fish sp.			
	Striped bass	long-term/Bay	0.51-5.49 ppm ww	Stevens ('80)
	Starry flounder	long-term/Bay	1191-6990 ppb ww	NOAA ('87)
	Fin Fish			
		Sacto R; Hood	50-480 ppb ww	TSM Station sum.
		San Joaquin; Vernalis	50-314 ppb ww	TSM Station sum.
PCB's		San Joaquin R; Old R	130 ppb ww	TSM Station sum.
	Marine Mammals			
	Harbor seal	Richardson Bay	100-31000 ppm lipid	Risebrough et al. ('78)
	Birds			
	Black-crowned night heron, Caspian tern Great blue heron	long-term/South Bay	"comparable to level causing effect elsewhere"	Hoffman et al. ('86)
DDT and metabolites	Bivalve Molluscs			
	Crassostrea gigas	year-round in Bay	157+/-60 ppm ww('66) 186+/-54 ppm ww ('67) (mean values +/- Std. Dev.)	Butler ('66,'69, & '73)
DDT	Corbicula fluminia	year-round in Delta; W. Island & False R.	897+/-525:1350+/-389 ppm ww (mean values +/- Std. Dev.)	Modin ('69)
	Mussels	San Pablo Bay	10.7-30.9 ppb ww	MW ('87) 10yr sum.
		Central Bay	11.41-12025.8ppb ww	MW ('87) 10yr sum.
		So. Central Bay	3.2-37.2 ppb ww	MW ('87) 10yr sum.
	Mya arenaria	long-term C., S.Bay	10.1-12.8 ppb ww	Girvin et al. ('75)
	Tapes japonica		6.56-14.9 ppb ww	Girvin et al. ('75)
	Mytilus edulis		24.3-34.3 ppb ww	Girvin et al. ('75)
	Ostrea lurida		20.6-29.2 ppb ww	Girvin et al. ('75)
	Fin Fish	Suisun Bay	20 ppb ww	TSM Station sum.
		Sacto R; Hood	103-1078 ppb ww	TSM Station sum.
		San Joaquin Vernalis	440-5180 ppb ww	TSM Station sum.
		San Joaquin; Old R.	21-219 ppb ww	TSM Station sum.

ORGANOCHLORINES (page 2)

POLLUTANT TYPE					
ORGANOCHLORINES	REGULATORY AGENCY GUIDANCE				
POLLUTANT	EPA 1986 CRITERIA				
	freshwater exposure	marine exposure	human health	bio conc. factor	half-life
Polychlorinated Biphenyls (PCB's)	[H]=Hardness, using H=50,100, 200 for sample calculation	"c"=chronic; "h"=1-hr;"a"=acute;"f"=96-hr;"d"=24-hour average;"m"=max. allowable	10**(-6)risk level + = water + organism o = organisms only ppt=parts per trillion		
PCBs	d=0.014 ppb m=2.0 ppb	d=0.030 ppb m=10.0 ppb		PCBs (all) 31,000	PCBs (all) 7.1
PCB's					
DDT and metabolites	d=0.0010 ppb m=1.1 ppb	d=0.0010 ppb m=0.13 ppb	+ = 0.024 ppt o = 0.024 ppt	DDT 540,000	
DDT	a=1050 ppb a=0.6 ppb	a=14 ppb a=3.6 ppb	no data no data		

POLLUTANT TYPE					
ORGANOCHLORINES	REGULATORY AGENCY GUIDANCE				ALERT LEVELS
POLLUTANT		FDA ACTION LEVEL	CALIFORNIA AGENCY		EDL=Elevated Data Level (85% or 95%) FDA=Food & Drug Administration NAS=National Academy of Science Recommended Guideline
Polychlorinated Biphenyls (PCB's)	Toxic Effects C=Carcinogen M=Mutagenic T=Teratogenic O=Other		RWQCB Basin Plan "Med"=6 Month median "Max"=Daily maximum "I"=Instant maximum	Dept Health Services Maximum contaminant level	
PCBs PCB's	PCBs (all): C	2.0 ppm ww (FDA Tolerance Level)	Ocean Plan Med=3 ppt Max=2 ppt I=9 ppt		MW=1400 ppb dw EDL 85=200 ppb ww EDL 95=1980 ppb dw 283 ppb ww TSM (Fish fillets) EDL 85=160 ppb ww EDL 95=475 ppb ww NAS Max=0.5 ppm ww (500 ppb) Tollerance FDA Level=2.0 ppm ww (2000 ppb)
DDT and metabolites DDT	DDT C/T	5.0 ppm alone or in combination	Ocean Plan Med.=1 ppt Max=2ppt I=3 ppt		EDL 85=2954 ppb dw 422 ppb ww EDL 95=5.444 ppb dw 778 ppb ww TSM (fish fillets): EDL 85=160 ppb ww EDL 95=220 ppb ww NAS Max=1.0 ppb ww FDA Level=5000 ppb (5.0 ppm)

ORGANOCHLORINES (page 4)

POLLUTANT TYPE	PHYSICAL FACTORS				
ORGANOCHLORINES					
POLLUTANT	Site	Water Conc/Reference	Salinity/Conc.	Sediments	Source of Est. Load
Polychlorinated Biphenyls (PCB's)	Delta San Pablo Bay South Bay, Central Bay, Tributaries, Suisun Marsh			Source: PCBs-AHI 304 T27; F69 DDT-AHI 304 T31; F74	Point, Urban Runoff, Non-urban Runoff, Riverine, Atmosphere, Spills, Dredge/Dump Metric tons, unless otherwise indicated
PCBs	Islais Ck			Mean +/-Std. Dev. 164+/-81.57 ppb dw Chapman et al ('86)	Urban: 0.006-0.4 Dredge/Dump:0.00067-0.0067 Atmos: 0.12-0.75
	Oakland San Pablo Bay			30.12+/-4.75 ppb dw 11.43 +/-4.80 ppb dw	Total 0.127- 1.157
	Bodega Bay (Reference site)			4.0 ppb dw	
	San Pablo Bay Southampton Shoal Oakland Hunters Point			9.0 ppb dw 12.0ppb dw 61.0 ppb dw 40.0 ppb dw NOAA ('87) (total PCB's)	
PCB's					
DDT and metabolites	N,C,S Bay San Pablo Bay Oakland Islais Ck			Sediments 0.42-0.80 ppb dw 0.87-1.53 ppb dw 2.24-3.60 ppb dw After Chapman et al ('86)	Urban Runoff 4-70 kg Non-urban Runoff 56 kg Riverine 442 kg Total 498 kg (AHI,302,T53)
DDT	Bodega Bay (Reference site) Southampton Shoal Oakland Hunters Point San Pablo Bay			N.D. 0.3 ppb dw 5.4 ppb dw 2.7 ppb dw 0.5 ppb dw After NOAA ('87)	

Chlorinated Hydrocarbon Pesticides & Hydrocarbons (page 1a)

POLLUTANT TYPE				
ORGANOCHLORINES	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESID. LEVEL	REFERENCE
			dw=dry weight ww=wet weight	TSM=Toxic Substance Monitoring Program MW=Mussel Watch
endrin	Shellfish			
	Corbicula fluminea	West Island (Delta)	10 ppb	Linn et al ('87)
	Mussels	Central Bay	0-61.2 ppb ww	MW '87 10yr sum.
chlordane	Shellfish	San Pablo Bay	4.8-8.5 ppb ww	MW '87 10yr sum.
		South Central Bay	2.6-31.2 ppb dw	MW '87 10yr sum.
	Fish species	Central Bay	4.7-158 ppb	MW '87 10yr sum.
		San Joaquin River	>300 ppb	SWRCB ('86)
		Sacto R.; Hood	21-129 ppb ww	TSM Station sum.
		Suisun Bay	11.7 ppb ww	TSM Station sum.
		San Joaq; Vernalis	21-540 ppb ww	TSM Station sum.
		San Joaquin; Old R.	6.4 ppb ww	TSM Station sum.
"Group A" heptachlor aldrin, dieldrin, endrin, chlordane lindane, etc.	Fish species	Sacto R.; Hood	21-436.8 ppb ww	TSM Station sum.
		Suisun Bay	14.6 ppb ww	TSM Station sum.
		San Joaq; Vernalis	248-15180 ppb	TSM Station sum.
		San Joaquin; Old R.	6.4 ppb ww	TSM Station sum.
dieldrin	Shellfish			
	Crassostrea gigas	San Francisco Bay	10-23 ppb ww	Modin ('69)
	Corbicula fluminea	Delta	<10-28 ppb ww	Linn et al ('87)
	C. fluminea	San Joaquin River	6.7 ppb ww	Linn et al ('87)
	Shellfish			
	Mytilus calif.	San Pablo Bay	1.6-3.6 ppb ww	MW '87 10yr sum.
	Mussels	Central Bay	2.9-810 ppb ww	MW '87 10yr sum.
		So Central Bay	1.8-16.8 ppb ww	MW '87 10yr sum.
	Fin Fish	Sacto R; Hood	6.4-15 ppb ww	TSM Station sum.
		San Joaq.; Vernalis	5-53 ppb ww	TSM Station sum.

Chlorinated Hydrocarbon Pesticides & Hydrocarbons (page 1b)

POLLUTANT TYPE	TISSUE RESIDUE LEVELS IN THE BAY-DELTA ESTUARY			
ORGANOCHLORINES/ HYDROCARBONS POLLUTANT	SPECIES DESIGNATION	DURATION/LOCATION	TISSUE RESID. LEVEL dw=dry weight ww=wet weight	REFERENCE TSM=Toxic Substance Monitoring Program MW=Mussel Watch
toxaphene	Fin Fish	San Joaq.; Vernalis	190-14000 ppb	TSM Station sum.
		14 other Bay tribs	>100 ppb	SWRCB ('86)
		Sacto R.; Hood	100-300 ppb ww	TSM Station sum.
		South Central Bay	0-2220 ppb ww	MW '87 10yr sum.
endosulfan	Mussels	South Central Bay	0-0.5 ppb ww	MW '87 10yr sum.
		Central Bay	0-0.42 ppb ww	MW '87 10yr sum.
	Fin Fish	San Joaquin River	>100 ppb	TSM Station sum.
		Tuolumne River	>100 ppb	TSM Station sum.
		Sacto. R. at Hood	6.8-11 ppb ww	TSM Station sum.
		S Joaq. R; Vernalis	8.0-596 ppb ww	TSM Station sum.
Monoaromatic Hydrocarbons (MAH's)	Fin fish Striped bass Striper bass	San Joaquin River Sacramento River	N.D.-1.997 ppm ww N.D.-3.588 ppm ww	Whipple et al('83)
Polyaromatic Hydrocarbons (PAH's) Aromatics generally	Fin Fish Starry flounder	San Pablo Bay	140 ppb ww liver	Spies et al ('85)
		Berkeley, Oakland,	2600 ppb ww	Spies et al ('85)
			1400 ppb ww	
	Shellfish	Alameda	14000 ppb ww liver	Report to R-2
	Cancer antennarius	Oakland Harbor	81 ppm dw (hep-pan)	
	Cancer antennarius	North Bay	43-57 ppm dw (hep-pan)	Guard et al ('83) Guard et al ('83)

POLLUTANT TYPE					
ORGANOCHLORINES	REGULATORY AGENCY GUIDANCE				
POLLUTANT	EPA 1986 CRITERIA				
	freshwater exposure	marine exposure	human health	bio. conc. factor	half-life
	[H]=Hardness, using H=50, 100, 200 for sample calculation	"a"=acute; "f"=96-hr "c"=chronic; "h"=1-hr "d"=24-hour average "m"=max. allowable	10**(-6) risk level + = water + organism o = organisms only		
endrin	d=0.0023 ppb m=0.18 ppb	d=0.0023 ppb m=0.037 ppb	(added 86) + = 1.0 ppb	3,970	6,846
chlordane	d=0.0043 ppb m=2.4 ppb	d=0.0040 ppb m=0.09 ppb	+ = 0.46 ppt o = 0.48 ppt		49.7
"Group A" heptachlor aldrin, dieldrin, endrin, chlordane lindane, etc.	d=0.0038 ppb m=0.52 ppb d=0.080, m=2 ppb m=3.0 ppb	d=0.0036 ppb m=0.53 ppb d=0.16 ppb m=1.3 ppb	+ = 0.278 ppt o = 0.285 ppt + = 18.6 ppt o = 62.5 ppt + = 0.074 ppt o = 0.079 ppt		
dieldrin	d=0.0019 ppb m=2.5 ppb	d=0.0019 ppb m=0.71 ppb	+ = 0.074 ppt o = 0.079 ppt	dieldrin 4,760	dieldrin 1,231

Chlorinated Hydrocarbon Pesticides & Hydrocarbons (page 2b)

POLLUTANT TYPE	REGULATORY AGENCY GUIDANCE				
ORGANOCHLORINES/ HYDROCARBONS	EPA 1986 CRITERIA				
POLLUTANT	freshwater exposure	marine exposure	human health	bio. conc. factor	half-life
	[H]=Hardness, using H=50, 100, 200 for sample calculation	"a"=acute; "f"=96-hr "c"=chronic; "h"=1-hr "d"=24-hour average "m"=max. allowable	10**(-6) risk level + = water + organism o = organisms only		
toxaphene	f=2.0 ppt d=13 ppt m=1.6 ppb a=0.8-500 ppb c=0.039-0.1964 ppb	f = 0.2 ppt d=insufficient data m=0.070ppb; h=21 ppb a=0.5-460,000 ppb c=0.3-1.658 ppb	+ = 5.0 ppm	3100-90000	20.9 days
endosulfan	d=0.056 ppt m=0.22 ppt	d=0.087 ppt m=0.034 ppt	+ = 74 ppb o = 159 ppb	endosulfan alpha 270 beta 270 sulfate 324	endosulfan alpha 127 days beta 127 days sulfate 127 days
Monoaromatic Hydrocarbons (MAH's)	a=5300 ppb (EPA '80)	a=5100 ppb c=700 ppb	(Benzene) + 0.66 ppb o 40 ppb	2-25	<24 hrs
Polyaromatic Hydrocarbons (PAH's) Aromatics generally	Insufficient data c=620 ppb a=2300 ppb c=520 ppb a=1700 ppb	Insufficient data a=300 ppb c=15 ppb a=970 ppb c=710 ppb	+ 2.80 ppt 0 31.1 ppt	eg Anthracene 1800-9096 in amphipods 47-132 midge larvae	Variable

Chlorinated Hydrocarbon Pesticides & Hydrocarbons (page 3a)

POLLUTANT TYPE					
ORGANOCHLORINES	REGULATORY GUIDANCE				ALERT LEVELS
POLLUTANT		FDA ACTION LEVEL	CALIFORNIA AGENCY		EDL=Elevated Data Level (85% or 95%)
	toxic effect		RWQCB Basin Plan	Dept Health Services	NAS=National Academy of Science
	C=Carcinogenic M=Mutagenic T=Teraogenic O=Other		"Med=6 Month Median "Max"=Daily Maximum "I"=Instant. max. ppt=parts/trillion	MCL=Maximum Contaminant Level	FDA=Food & Drug Administration Action Levels
endrin		0.3 ppm fish, shellfish	Ocean Plan Med=2.0 ppt Max=4.0 ppt I=6.0 ppt	1.0 ppb	EDL 95=14.8 ppb dw Calif. Mussels Transplant EDL 85=28.3 ppm dw Resident Bay Mussel EDL 95=95.4 Resident Mussels
chlordane		0.3 ppm fish	Ocean Plan Med=3.0 ppt Max=6.0 ppt I=9.0 ppt	3.0 ppb	FDA=300 ppb NAS=100 ppb ww
"Group A" heptachlor aldrin, dieldrin, endrin, chlordane lindane, etc.	heptachlor -- aldrin C	0.3 ppm fish	Ocean Plan Aldrin & Dieldrin Med=2.0 ppt Max=4.0 ppt I=6.0 ppt	aldrin 17.0 ppt heptachlor 18.0 ppb lindane 56 ppt	NAS=100 ppb EDL 85=4.82 ppb dw EDL 95=9.0 ppb dw freshwater clams, lindane: EDL 85=2.79 ppb dw EDL 95=5.71 ppb dw resident bay mussel
dieldrin	dieldrin C	0.3 ppm fish		17.0 ppb	EDL 85=102 ppb EDL 95=265 ppb in resident bay mussel, EDL 85=1865 ppb EDL 95=2755 ppb freshwater clams NAS=100 ppb ww

Chlorinated Hydrocarbon Pesticides & Hydrocarbons (page 3b)

POLLUTANT TYPE	REGULATORY GUIDANCE				ALERT LEVELS
ORGANOCHLORINES/ HYDROCARBONS		FDA ACTION LEVEL	CALIFORNIA AGENCY		EDL=Elevated Data Level (85% or 95%)
POLLUTANT	toxic effect C=Carcinogenic M=Mutagenic T=Teraogenic O=Other		RWQCB Basin Plan "Med=6 Month Median "Max"=Daily Maximum "I"=Instant. max. ppt=parts/trillion	Dept Health Services MCL=Maximum Contaminant Level	NAS=National Academy of Science FDA=Food & Drug Administration Action Levels
toxaphene	toxaphene C/M	5.0 ppm fish	Ocean Plan Med=7.0 ppt Max=14.0 ppt I=21.0 ppt	5.0 ppb	FDA=5000 ppb NAS=100 ppb ww EDL 85=8465 ppb EDL 95=22550 ppb in freshwater clams EDL 85=1200 ppb EDL 95=3350 ppb in resident bay mussel
endosulfan	alpha -- beta -- sulfate --	NA			NAS=100 ppb EDL 85 1490 ppb dw EDL 95=2192 ppb in resident mussels EDL 85=2571 ppb dw EDL 95=13976 ppb dw in freshwater clams
Monoaromatic Hydrocarbons (MAH's)	C	None	None	MCL Anticipated =0.7 ppm	
Polyaromatic Hydrocarbons (PAH's) Aromatics generally	C/M/T/O	None	Reg 2 San Pablo 15 ppb=Max Reg 2 upstream 15 ppb=Max	DOHS Applied Action Levels in ppb for 5 PAHs Naphthalene=18 Fluorene=19 Acenaphthylene=19 Acenaphthene=19 Phenanthrene=19	

Chlorinated Hydrocarbon Pesticides & Hydrocarbons (page 4a)

POLLUTANT TYPE					
ORGANOCHLORINES	PHYSICAL FACTORS				
POLLUTANT	Sites	Water Conc/Reference	Salinity Conc.	Sediment	Source of Est. Load
	Delta, San Pablo Bay Central Bay, South Bay, Tributaries, Suisun Marsh, etc				Point, Urban Runoff, Non-urban Runoff, Riverine, Atmosphere, Spills, Dredge/Dump Metric tons, unless otherwise indicated
endrin	Delta	N.D.		N.D.	Urban plus local Non-urban runoff
chlordane	Tribs Richmond Harbor	N.D.		Sediment-to 800 ppb	
"Group A" heptachlor aldrin, dieldrin, endrin, chlordane lindane, etc.	Delta & Tribs, Oakland Harbor Sediment	N.D.		Sediments-57 ppb	
dieldrin	Bay, Delta Tribs Richmond Harbor	N.D.		N.D.	

Chlorinated Hydrocarbon Pesticides & Hydrocarbons (page 4b)

POLLUTANT TYPE					
ORGANOCHLORINES/ HYDROCARBONS	PHYSICAL FACTORS				
POLLUTANT	Sites	Water Conc/Reference	Salinity Conc.	Sediment	Source of Est. Load
	Delta, San Pablo Bay Central Bay, South Bay, Tributaries, Suisun Marsh, etc				Point, Urban Runoff, Non-urban Runoff, Riverine, Atmosphere, Spills, Dredge/Dump Metric tons, unless otherwise indicated
toxaphene	Bay Tribs-San Joaquin	N.D.		N.D.	
endosulfan	Bay Tribs	N.D.		N.D.	
Monoaromatic Hydrocarbons (MAH's)	Bay	Not detected with limit < 0.5 ppb	Board report forthcoming		Tested effluents below detection
Polyaromatic Hydrocarbons (PAH's) Aromatics generally	Central Bay Islais Ck Oakland Berkeley San Pablo Bay San Pablo Bay		12.06 ppm dw est. 2.4 ppm dw est. 4.6 ppm dw 2.6 ppm dw 0.93 ppm dw est.		Urban runoff 0.5-9 Dredge/Dump .05-2. Atmosphere 0.8-. Total 1.35-10.27

POLLUTANT POLICY DOCUMENT
APPENDIX B - GLOSSARY

WORD/PHRASE	DEFINITION
2,3,7,8-TCDD	See Dioxin.
2,4-D	A selective herbicide registered for use on grasses, wheat, barley, oats, sorghum, corn, sugar cane, rice and noncrop areas for postemergent control of weeds such as Canada thistle, dandelion, annual mustard, ragweed, and lambsquarters. CHEMICAL NAME: 2-4(Dichlorophenoxy) acetic acid. [Farm Chemical Handbook, 1987]
Acaricide (Miticide)	A material used primarily in the control of plant-feeding mites (acarids) especially spider mites. Typical acaricides with little insect-killing efficiency are chlorobenzilate, Kelthane, and Omite. Some insecticides, especially phosphorous compounds, are effective also against mites. [Farm Chemicals Handbook, 1987]
Acclimation	The physiological and behavioral adjustment of an organism to changes in environment.
Acre-foot (AF)	The quantity of water which will cover an acre of land to a depth of one foot (i.e. 43,560 cubic feet or 325,900 gallons).
Action levels, FDA	See Regulatory levels.
Activator	A substance that accelerates the effect or increases the total effect of a pesticide. [Farm Chemicals Handbook, 1987]
Acute	Occurring over a short period of time; used to describe brief exposures and effects which appear promptly after exposure. [Environmental Glossary 4th ed.]
Acute toxicity	Any poisonous effect produced within a short period of time following exposure, usually up to 24-96 hours, resulting in severe biological harm and often death.
Additive effect	The effect of a mixture which is equal to the sum of the effects of its individual components.
Adjuvant	An adjuvant is used in a formulation to aid the operation or improve the effectiveness of the pesticide. The term includes such materials as wetting agents, speaders, emulsifiers, dispersing agents, foam adjuvants, foam suppressants, penetrants, and correctives. A spray adjuvant may contain one or more surfactants, solvents, solubilizers, buffering agents, and stickers needed to formulate a specific type adjuvant. By using the proper adjuvant it is often possible to use certain

POLLUTANT POLICY DOCUMENT
APPENDIX B - GLOSSARY

WORD/PHRASE	DEFINITION
	chemical pesticides in a tank mixture that otherwise would present compatibility problems. [Farm Chemical Handbook, 1987]
Adsorption	Adherence of gas molecules, ions, or molecules in solution to the surface of solids. [USGS, Federal Glossary of Selected Terms: Subsurface-Water Flow and Solute Transport, August 1989]
Alert level	See Median International Standard.
Ambient	The prevailing condition in the vicinity, usually relating to some physical measurement such as temperature. Sometimes used as a synonym for background. [SWRCB Order No. WQ 85-1]
Ambient water quality criterion	That concentration of a toxic pollutant in a navigable water that, based upon available data, will not result in adverse impact on important aquatic life, or on consumers of such aquatic life, after exposure of that aquatic life for periods of time exceeding 96 hours and continuing at least through one reproductive cycle; and will not result in significant risk of adverse health effects in a large human population based on available information such as mammalian laboratory toxicity data, epidemiological studies of human occupational exposures, or human exposure data, or any other relevant data. [40 CFR]
Antagonism	(1) The interaction of two substances, e.g. [chemicals, pesticides,] drugs, or hormones, acting in the same system in such a way that one partially or completely inhibits the effects of the other. (2) The interaction of two types of organism existing in close association in such a way that the growth of one is inhibited by the other. [Dictionary of Life Sciences, 2nd ed., 1983]
Apparent effects threshold (AET) method	A statistically based empirical approach to establish quantitative relationships between sediment pollutants and biological effects. This approach involves the analysis of paired chemical and biological data from numerous sites in a specific waterbody. Statistical analysis of the paired data allows the ranking of observed effects. AETs allow the ranking of relative degradation of aquatic sites, but do not provide a safe level for the protection of aquatic species or human health.
Aquatic species (organisms)	Organisms, plants and animals, that live in water or whose habitat needs (spawning, nesting, feeding resting) include the water medium.
Argyria	A bluish skin discoloration: an effect produced by the continued use of silver preparations [or consumption of foods with elevated silver concentrations]. [Webster's New Universal

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APPENDIX B - GLOSSARY

WORD/PHRASE	DEFINITION
	Unabridged Dictionary, 2nd Ed. 1983]
Aromatic	(1) Fragrant; spicy; strong-scented; odoriferous; having an agreeable odor. (2) In chemistry, of or designating any of a series of benzene ring compounds, many of which have an odor or are derived from materials having an odor. [Webster's New Universal Unabridged Dictionary, 2nd ed., 1979]
Arsenic (As)	A highly poisonous metallic element. Arsenic and its compounds are used in insecticides, weed killers and industrial processes. [SWRCB Order No. WQ 85-1] Arsenic occurs in two environmentally significant valence states, As +3 or As III (trivalent) and As +5 or As V (pentavalent), with different toxic properties. The various organic forms of arsenic include: methylated forms, arseno-lipids, arseno-sugars, arseno-betaine, and arseno-choline.
Atrazine	A selective herbicide used for season-long weed control in corn, sorghum, and certain other crops. At highest rates it is used for non-selective weed control in noncropped areas. CHEMICAL NAME: 2-chloro-4-ethylamino-6-isopropylamino-S-triazine. [Farm Chemicals Handbook, 1987]
Banks Pumping Plant, Harvey O.	The Department of Water Resources' State Water Project main deltapumping plant located West of Tracy. The source of the water in the California Aquaduct.
Basagran	A herbicide for selective postemergence control of many troublesome broadleaf weeds in soybeans, rice, corn, peanuts, dry beans, dry peas, snap beans for seed, green lima beans, and mint. CHEMICAL NAME: 3-(1-Methylethyl)-IH-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide. [Farm Chemicals Handbook, 1987]
Basin Plan	A plan for the protection of water quality prepared by a Regional Water Quality Control Board in response to the Porter Cologne Water Quality Control Act also contains Water Quality Standards for the federal Clean Water Act.
Bay-Delta Estuary (the Estuary)	San Francisco Bay, the Sacramento-San Joaquin Delta and Suisun Marsh, as defined in Sec. 6610 and 6611 of the Cal. Government Code, Sec. 12220 of the Cal. Water Code, and Sec. 29101 and 29101.5 of the Cal. Public Resources Code, respectively.

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WORD/PHRASE	DEFINITION
Beneficial uses	"Beneficial uses" of the waters of the state that may be protected against quality degradation include but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; esthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. [CWC Sec. 13050(f)] Equivalent to "designated uses" under federal law.
Bentazon	See Basagran
Benthos	The whole assemblage of plants or animals living on the bottom of a water body: distinguished from plankton.
Benzo-a-anthracene	A specific isomer of the benzoanthracenes which are polynuclear aromatic hydrocarbons and are listed by the EPA as a priority pollutant under Section 307(a) of the Clean Water Act.
Benzo-a-pyrene	A polynuclear aromatic hydrocarbon which is one of the 126 priority pollutants listed by the EPA under Section 307(a) of the Clean Water Act. CHEMICAL NAME: 3,4-benzopyrene
Benzopyrene(s)	The class of polynuclear aromatic hydrocarbons which contain five joined benzene rings. CHEMICAL FORMULA: C20H12
Best management practices (BMPs)	A practice, or combination of practices, that is determined after ...problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. [40 CFR]
Bioaccumulative	A characteristic of a chemical species when the rate of intake into a living organism is greater than the rate of excretion or metabolism. This results in an increase in tissue concentration relative to the exposure concentration.
Bioassay	The employment of living organisms to determine the biological effects of a substance, factor, or condition. [40 CFR]
Bioassessment	Assessment of the condition of a waterbody using any available biological methods. Biosurvey and bioassay are common bioassessment methods. [EPA, Report of the National Workshop on Instream Biological Monitoring and Criteria, Lincolnwood, IL, 12/2-4/87]

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WORD/PHRASE	DEFINITION
Bioavailability potential	A measure of the relative bioavailability of different elements, ions, radicals, molecules, etc. (e.g., the bioavailability potential of the methylated forms of mercury are higher than that for elemental mercury).
Bioconcentration	The positive difference in concentration of a chemical between water and that in an organism living in that body of water due to direct uptake of the chemical from the water. [SWRCB Order No. WQ 85-1]
Biomagnification	The net accumulation and increase of a substance in an organism as a result of consuming organisms from lower trophic levels, e.g., the consumption of algae by fish or water plants by ducks. [SWRCB Order No. WQ 85-1]
Biota	All living organisms that exist in an area.
Boron (B)	A nonmetallic, chemical element occurring only in combination, as with sodium and oxygen in borax, and produced in the form either of a brown amorphous powder or very hard, brilliant crystals: its compounds are used in the preparation of boric acid, water softeners, soaps, enamels, glass, pottery, etc.. [Webster's New Universal Unabridged Dictionary, 1979] Boron is an essential element in the nutrition of higher plants, yet concentrations of boron in irrigation waters in excess of 0.5 mg/l may be deleterious for certain crops. [McKee, J.E. and Wolf, H.W., 2nd ed., 1963]
Bromoform	See Trihalomethane.
Cadmium (Cd)	A soft, bluish-white metallic element known to cause cancer in animals. Though not a confirmed human carcinogen. It is also a toxicant for a variety of species. [SWRCB Order No. WQ 85-1]
Cancer	Any disorder of cell growth that results in invasion and destruction of surrounding healthy tissue by the abnormal cells.
Carcinogen	Any agent that produces cancer, e.g. tobacco smoke, silica and asbestos particles, certain industrial chemicals, and ionizing radiation (such as X-rays and ultraviolet rays).
Carquinez Strait	The narrow strait between Suisun and San Pablo bays. It has a mean surface area of 12 sq. mi., mean depth of 29 ft., and mean volume of 223,000 AF.
Central Bay	Central San Francisco Bay. That portion of San Francisco Bay bounded by the Golden Gate, San Francisco-Oakland Bay and Richmond-San Rafael bridges. Surface area = 103 sq. mi. at MLLW, mean depth = 35 ft, and mean volume = 2.307 MAF.

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WORD/PHRASE	DEFINITION
Chemical oxygen demand (COD)	The results of a laboratory chemical analytical technique which is used to measure the amount of oxygen required to oxidize all compounds in a sample of water, organic and inorganic. [Environmental Glossary 4th ed.]
Chlordane, chlordane congers and related compounds	A stomach and contact insecticide. The emulsifiable formulation concentrate of chlordane alone or in combination with heptachlor is used exclusively in the U.S. for subterranean termite control applications. It has a tolerance of 0.3 ppm on about 50 raw agricultural commodities. CHEMICAL NAME: 1,2,4,5,6,7,8,8-Octachlor-2,3,3a,4,7,7a-hexahydro-4,7-methanoind ane. [Farm Chemicals Handbook, 1987] Chlordane congers include; Trans-chlordane, Cis-chlordane, and Trans-nonachlor. Additional related compounds include; oxyclordane, heptachlor, and heptachlor epoxide.
Chlorinated dibenzodioxins (CDDs) and dibenzofurans (CDFs)	The unchlorinated forms of these classes of compounds consist of two benzene rings joined together by two oxygen atoms, in the case the dibenzodioxin, or one oxygen atom and a single bond between two adjacent carbons, in the case of the dibenzofuran. The chlorinated dibenzodioxin and dibenzofuran molecules each can contain from one to eight chlorine atoms. Since these can be arranged in a variety of ways, up to 75 CDDs and 135 CDFs are possible. A mixture having both CDDs and CDFs theoretically could contain 210 individual compounds. The CDDs and CDFs having four, five, six, or seven chlorine atoms, four of which are in the 2,3,7, and 8 positions, are considered to be significantly toxic to mammals. (Dioxin is 2,3,7,8-tetrachlorodibenzodioxin.) CDDs and CDFs are not produced intentionally, except as reference standards for chemical analysis. They appear, for example, as by-products of chemical synthesis, electrical equipment fires, and municipal incineration of solid wastes. They are contaminants of chlorophenol wood preservatives. [SWRCB, Report No. 88-5WQ, 1988]
Chlorinated dibenzofurans (CDFs)	

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Chlorinated hydrocarbons	A class of pesticides which contain chlorine, carbon, and hydrogen. See Chlorinated organic insecticides and acaricides. [Farm Chemical Handbook, 1987] They include solvents (e.g., TCE, TCA), heat exchangers (e.g., PCBs), contaminants (e.g., TCDD, TCDF), herbicides (e.g., ZAP), and wood preservatives (e.g., Pentachlorphenol).
Chlorinated organic insecticides and acaricides	The organic-chlorine chemicals form one of three principal pesticide families. This class in the insecticides and acaricides has related pharmacological effects, and EPA has limited the total amount of these related chemicals for residue purposes. Included are the following chemicals and their metabolites: Aldrin BHC (benzene hexachloride) Chlorbenside Chlordane Chlorobenzilate DDT Dicofol Dieldrin Endosulfan Endrin Heptachlor Lindane Methoxychlor Mirex Ovex TDE Tetradifon Toxaphene [Farm Chemicals Handbook, 1987]
Chlorination	The application of chlorine to drinking water, sewage, or industrial waste to disinfect or oxidize undesirable compounds.
Chlorine (Cl)	A greenish yellow, poisonous, readily liquified gaseous element of the halogen group, with a suffocating odor, obtained principally from common salt, and widely used in industry, medicine, etc. [Funk & Wagnalls Standard College Dictionary, 1973] Commonly used to disinfect drinking water and to bleach paper pulp.
Chloroform	See Trihalomethane.
Chlorpyrifos	A broadly applicable insecticide available in the following primary formulations: (a) Dursban: Used for control of fire ants, turf and ornamental plant insects, mosquitoes, cockroaches, and other household insects, stored product insects, termites and lice, and hornflies on cattle. (b) Lorsban): Used on corn as a soil insecticide for

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	control of corn rootworms, cutworms, billbugs, wireworm, seed corn maggot and beetle, lesser cornstalk borer, etc.. Also used as a foliar insecticide on corn, alfalfa, peanuts, sorghum, sugarbeets, and sunflowers. other crops on which Lorsban is used include fruit, nut and vegetable crops. (c) Stipend: For use in mushrooms at spawning to protect developing mushrooms from injury by various fly larvae. CHEMICAL NAME: O,O-Diethyl O-(3,5,6-trichloro-2-pyridyl)-phosphorothioate. [Farm Chemicals Handbook, 1987]
Chromium (Cr)	A lustrous, hard, steel-gray metallic element which is a known human carcinogen. It occurs in two environmentally significant valence states Cr +3 or Cr III (trivalent) and Cr +6 or Cr VI (hexavalent), with different toxic properties. [SWRCB Order No. WQ 85-1]
Chronic toxicity	The property of a substance or mixture of substances to cause adverse effects in an organism upon repeated or continuous exposures over a long period of time (specified as at least 1/2 the lifetime of that organism in regulations promulgated by the EPA).
Chrysene	A polynuclear aromatic hydrocarbon which is one of the 126 priority pollutants listed by the EPA under Section 307(a) of the Clean Water Act.
Coliform organisms	All of the aerobic and faculative anaerobic, gram-negative, nonspore-forming, rodshaped bacteria that ferment lactose with gas formation within 48 hr at 35 degrees C. [Standard Methods ..., 14th ed., 1975] Large numbers of these organisms are found in the intestinal tracts of humans and warm-blooded animals, their presence in water is often used as an indicator of pollution or potentially pathogenic bacterial contamination.
Congener	A compound which is figured as a by product of a chemical reaction, having different properties from the desired end product.
Contaminant	Federal definition: Any physical, chemical, biological, or radioactive substance or matter in water. [40 CFR 141.2]
Contaminate	[To] introduce a substance that would cause: (1) the concentration of that substance in the ground water

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	to exceed the maximum contaminant levels, or (2) an increase in the concentration of that substance in the ground water where the existing concentration of that substance exceeds the maximum contaminant levels. [40 CFR 257.3-4]
Contamination	State definition: An impairment of the quality of the waters of the state by waste to a degree which creates a hazard to the public health through poisoning or through the spread of disease...includ[ing] any equivalent effect resulting from the disposal of waste, whether or not waters of the state are affected. [CWC Sec. 13050(k)] Federal definition: The addition to water of any substance or property preventing the use or reducing the usability of water. Sometimes considered synonymous with pollution. [USGS, Federal Glossary of Selected Terms: Subsurface-Water Flow and Solute Transport, August 1989]
Copper (Cu)	A ductile, malleable reddish-brown metallic element, toxic to aquatic organisms from algae and plants to fish. [SWRCB Order No. WQ 85-1]
Cubic meter (cu. m.)	35.3 cubic feet = 1.308 cubic yards.
Cumulative objective	A numerical water quality objective limiting the total concentration of a group of constitutents regardless of the characteristics of the individual members of the group, e.g., the water quality objective for pesticides in the 1975 Basin Plan for the Central Valley.
DDA	A degradation product of DDT. CHEMICAL NAME: Bis(chlorophenyl) acetic acid. [Farm Chemicals Handbook, 1987]
DDE	A product of degradation of DDT by loss of one molecule of hydrochloric acid (dehydrohalogenation). DDE further degrades to DDA by loss of two more molecules of (HCl) hydrochloric acid. CHEMICAL NAME: Dichlorodiphenyldichloroethylene. [Farm Chemicals Handbook, 1987]
DDT	The first chlorinated hydrocarbon insecticide It has a half-life of 15 years and can collect in fatty tissues of

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	certain animals. EPA banned registration and interstate sale of DDT for virtually all but emergency uses in the U.S. in 1972 because of its persistence in the environment and accumulation in the food chain. CHEMICAL NAME: Dichloro diphenyl trichloroethane. The principal isomer present (not less than 70%) is 1, 1,1-trichloro-2, 2-bis (p-chlorophenyl)-ethane. [Farm Chemicals Handbook, 1987]
Dabbling duck	A duck which feeds in shallow water, usually from the surface or by "tipping-up." Generally a species in the family Anatidae.
Dacthal	A selective preemergence herbicide [which is] effective against smooth and hairy crabgrass, witchgrass, green and yellow foxtails, fall panicum, and other annual grasses. Also useful against certain broadleaf weeds... Presently approved for use on turf, ornamentals, strawberries, and agronomic crops including cotton, soybeans, and field beans. Vegetable crops include onions, garlic, cole crops, radish, horseradish, potatoes, ...tomatoes, eggplant, and peppers. CHEMICAL NAME: Dimethyl 1 tetrachloroterphthalate. [Farm Chemicals Handbook, 1987]
Deflocculator	A dispersing agent used to retard settling of solid particles in a suspension, especially when the particles tend to clump together and settle out rapidly. Emulsifiers are often effective deflocculators. [Farm Chemicals Handbook, 1987]
Delta	The Sacramento-San Joaquin rivers delta as defined in the CWC Sec. 12220.
Depurate	To make or become free of impurities; purify; cleanse.
Depuration	Purification; cleansing.
Depurative	(1) Purifying or cleansing. (2) A depurative agent or substance.
Diazinon	A insecticide (nematicide) [used] for control of soil insects, such as cutworms, wireworms, and maggots. Also effective against many pests of fruits, vegetables, tobacco, forage, field crops, range, pasture, grasslands and ornamentals. It is used extensively in controlling cockroaches and many other household insects; grub and nematodes in turf; seed treatment and fly control. CHEMICAL NAME: O,O-Diethyl O-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothiote. [Farm Chemicals Handbook, 1987]

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Dieldrin	A contact and stomach poison insecticide used for control of soil insects, public health insects, termites, and other pests. NOTE: Except for termite control, use of dieldrin has been canceled in the U.S. CHEMICAL COMPOSITION: (1R, 4S, 5S, 8R)-1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4:5,8-dim ethanonaphthalene (principal constituent, known as HEOD), with not over 15% related compounds. [Farm Chemicals Handbook, 1987]
Dioxin	A chlorinated dibenzodioxin (CDD) and one of the most toxic substances known. It occurs as a byproduct of chemical synthesis, from electrical fires, from combustion of wood preservaties, and from municipal solid waste incinerators. One of the 126 priority pollutants listed by the EPA under Section 307(a) of the Clean Water Act. CHEMICAL NAME: 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)
Dissolved oxygen (DO)	A measure of the amount of oxygen available for biochemical activity in a given amount of water. Adequate levels of DO are needed to support aquatic life. Low dissolved oxygen concentrations can result from inadequate waste treatment. [Environmental Glossary 4th ed.]
Diving duck	A duck which feeds on bottom organisms while swimming, usually fully submerged. Generally in the family Aythyidae.
Dredge sediment (spoil)	The material removed from the bottom of a water body by the process of dredging which must be disposed of.
Dredging	The removal of material from the bottom of water bodies using a scooping or suction machine.
Economic poisons	Chemicals used to control pests, disinfect, preserve wood, and other agricultural products; anti-foulant paints, and defoliants for cash crops such as cotton (see pesticide).
Ecosystem	A natural unit consisting of living and nonliving parts interacting to produce a stable system. Examples are a lake or a grassland. Four components of an ecosystem can be recognized: (1) the abiotic (nonliving) components; (2) the producers (autotrophs, mostly green plants); (3) the consumers (heterotrophs, chiefly animals feeding on plants or other animals); (4) decomposers (heterotrophs, chiefly bacteria, that bring about decay of dead organic matter).... [Dictionary of Life Sciences, 2nd ed., rev., 1983
Effluent	(1) Solid, liquid, or gaseous wastes that enter the

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	environment as a by-product of man-oriented processes. (2) The discharge or overflow of fluid from ground or subsurface storage.
Elevated data level (EDL or ETPL)	That concentration of a toxic substance in a fish tissue that equals or exceeds a specific percentile (85 or 95 percent) of all Toxic Substances Monitoring Program measurements of the toxic substance in the same tissue type between 1978 and 1985. EDLs are based on the relative ranking of each element. When exceeded, EDLs can give early warning of elevated toxicant levels in California waters. EDLs do not assess adverse impacts, nor do they provide information on the concentrations that are detrimental to fish or human health. Formerly referred to as Elevated Toxic Pollutant Level. The concept was introduced in 1983 by the SWRCB Staff working on the Toxic Substances Monitoring Program as an internal comparative measure.
Emulsifier	A surface active substance which stabilizes (reduces the tendency to separate) a suspension of droplets of one liquid in another liquid which otherwise would not mix with the first. Some or all applications may be classified by the U.S. EPA as Restricted Use Pesticides (RUP). [Farm Chemicals Handbook, 1987]
Endosulfan	An insecticide (acaricide) [which] controls aphids, bollworms, bugs, whiteflies, leafhoppers, and slugs on deciduous, citrus, and small fruits, vegetables, forage crops, nut crops, oil crops, fiber crops, grains, tobacco, coffee, tea, forest, and ornamentals. CHEMICAL NAME: 6,7,8,9,10,10-Hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin-3-oxide. [Farm Chemicals Handbook, 1987]
Estuary	The mouth of a stream which serves as a mixing zone for fresh and ocean water. Mouths of streams which are temporarily separated from the ocean by sandbars are considered as estuaries by the SWRCB. Estuarine waters are generally considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and seawater. Estuarine waters are considered to extend seaward if significant mixing of fresh and seawater occurs in the open coastal waters. [SWRCB, Water Quality Control Policy for the Enclosed Bays and Estuaries of California, May 1974] In this document Estuary is used when referring to the San Francisco Bay and Sacramento-San Joaquin Delta Estuary.

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Fetotoxic	Poisonous to fetuses.
Flow-weighted sampling	Samples taken in a manner that allows determination of mass emissions, i.e., samples taken in proportion to the rate of flow of a river or stream.
Fluoranthene	One of the 126 priority pollutants listed by the EPA under Section 307(a) of the Clean Water Act.
Flushing	The process by which contaminant concentrations in a body of water are diluted by river inflow and, where applicable, tidal exchange of "new" uncontaminated water combined with the net advection of the contaminants away from their source by residual currents.
Foam suppressant	A spray adjuvant useful for suppressing both surface foam and entrained air. [Farm Chemicals Handbook, 1987]
Foaming adjuvant	A surface active substance that forms a fast-draining foam to provide maximum contact of the spray with a plant surface, to insulate the surface, and to reduce [the] rate of evaporation. Used to enhance herbicide action and to reduce drift of sprays. [Farm Chemicals Handbook, 1987]
Food chain	The pyramidal relationship of producers (plants) and consumers (animals) by which solar energy is converted through photosynthesis to plant tissue which is consumed by animals which are in turn consumed. At each step up the food chain consumers are usually larger but fewer in number.
Food web	The sum of the interacting food chains in an ecological community. [SWRCB Order No. W.Q. 85-1]
Guidelines, NAS	See Regulatory levels.
Hardness	A waters content of metallic (i.e., positive) polyvalent ions, principally calcium and magnesium, that react with sodium soaps to produce solid soaps and that react with negative ions, when the water is evaporated in boilers, to produce solid boiler scale. Hardness is usually expressed as mg/l of equivalent calcium carbonate ($CaCO_3$). [Camp, T.R. and Meserve, R.L., Water And Its Impurities, 1974]
Health advisory levels, DHS	See Regulatory levels.
Heavy metals	Metallic elements like mercury (Hg), chromium (Cr), cadmium (Cd), arsenic (As), and lead (Pb), with high molecular weights. They can damage living things at low concentrations and tend to accumulate in the food chain.

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Hepatic mixed-function oxidase enzyme activity	Exposure of fish to environmental contaminants such as polynuclear aromatic hydrocarbons (PAHs) and chlorinated hydrocarbons can induce increased activity in enzyme systems capable of detoxifying the contaminants. Hepatic mixed function oxidase activity is measured as an index of the exposure of fish to contaminants which may harm their reproduction or development.
Hepatopancreas	In zoology, a glandular organ of many invertebrates, usually called the liver. [Webster's New Universal Unabridged Dictionary, 2nd Ed., 1983]
Herbicides	All substances or mixtures of substances used to control or destroy undesirable plants.
Hexachlorobenzene	A seed protectant used to control common bunt on wheat. CHEMICAL NAME: Perchlorobenzene. [Farm Chemicals Handbook, 1987]
Hexavalent chromium (Cr VI)	See Chromium.
Homologous	In Biology: Anatomical features of different organisms (species) which correspond in structure and evolutionary origin, as the flipper of a seal and the arms of a human being. [American Heritage Dictionary 2nd ed.] In Chemistry: The members of a series of organic compounds having the same structure, but in which each differs from the preceding one by a constant increment, as the methane series. [Funk & Wagnalls Standard College Dictionary, 1973]
Hot-spots, toxic	Locations in the Bay-Delta Estuary where toxic chemicals have reached threatening levels in the sediments, shellfish, ducks and waters. [CBE,1,1]
Hydrocarbons	A large and important group of organic compounds that contain only hydrogen and carbon. There are two types, saturated and unsaturated. Saturated hydrocarbons are those in which adjacent carbon atoms are joined by a single valence bond and all other valences are satisfied by hydrogen. Unsaturated hydrocarbons have at least two carbon atoms that are joined by more than one valence bond and all remaining valences are satisfied by hydrogen. The saturated hydrocarbons form a whole series of compounds starting with one carbon atom and increasing one carbon atom, stepwise. These compounds are also known as the paraffin series, the methane series, and as the alkanes. The principal source is

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	petroleum. Gasoline is a mixture containing several of them; diesel fuel is another such mixture. The unsaturated hydrocarbons are usually seperated into four classes: (i) the ethylene series of compounds all contain one double valence bond between two adjacent carbon atoms; (ii) the diolefin series of compounds all contain two double bonds in their molecules; (iii) the polyenes contain more than two double bonds, these compounds occur in the wastewaters produced by the canning industry (the chlorine demand of wastewaters containing polyenes is extremely high); (iv) the acetylene series of unsaturated hydrocarbons have a triple bond between adjacent carbon atoms, these compounds are found in some industrial wastewater (particularly those from the manufacture of some types of synthetic rubber).
Hydrodynamics	The motion and action of water and other liquids, i.e., the dynamics of liquids, and the study thereof.
Hydrogen peroxide	Pure hydrogen peroxide (H2O2) is a syrupy, colorless liquid with a specific gravity of 1.443. A dilute solution has a harsh, astringent taste. Hydrogen peroxide in solution yields small concentrations of hydronium ion (H_3O^+) and peroxide ($O_2^=$) ions and is slightly acidic. Hydrogen peroxide is used extensively in bleaching cotton, wool, silk, rayon, linen, paper pulp and other fibrous materials. As an oxidizing agent it is employed in the manufacture of niacin, dyes, drugs, and pharmaceuticals. Dilute solutions of hydrogen peroxide have long been used in the treatment of open wounds.
Impairment	A change in quality of water which makes it less suitable for beneficial use. [DWR Bulletin 74-81]
Inorganic matter	Chemical substances of mineral origin, not containing carbon-to-carbon bonding. Generally structured through ionic bonding. [Environmental Glossary 4th ed.]
Insecticides	All substances or mixtures of substances intended for preventing or inhibiting the establishment, reproduction, development, or growth of, destroying or repelling any member of the Class Insecta or other allied Classes in the Phylum Arthropoda considered to be a pest.
Isomer	A compound having the same chemical formula as another, but a slightly different molecular arrangement.
Kesterson National Wildlife Refuge (Kesterson NWR)	A waterfowl management area adjacent to Kesterson Reservoir in Merced county California which was originally planned to utilize San Luis Drain water. When first established, Kesterson National Wildlife Refuge (NWR) used a mixture of fresh CVP water

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	and local tailwater to develop wetland habitat. As the use of San Luis Drain water, including an increasing proportion of tile drain waters, was phased in, deformities and reproductive abnormalities began to affect the birds nesting there. [SWRCB Order No. WQ 85-1]
Kesterson Reservoir	A water storage facility adapted as an interim evaporation basin for the Central Valley Project San Luis Drain. [SWRCB Order No. WQ 85-1]
LC 50	The concentration of a chemical inhaled, drink or absorbed by the skin which is expected to cause death in 50 percent of the test animals so exposed.
LD 50	The dose of a chemical taken by mouth or absorbed by the skin which is expected to cause death in 50 percent of the test animals so treated.
Lead (Pb)	A soft, malleable, ductile, bluish white dense metallic element, with a variety of toxic salts. [SWRCB Order No. WQ 85-1]
Lethal endpoint	The endpoint of a test is the death of the test organism. This does not address other adverse effects which may occur short of death. [SWRCB Order No. WQ 85-1]
Levels of concern, DHS	Mercury and selenium levels in excess of those for which DHS health advisories were previously issued, 0.5 and 2.0 ppm, respectively. [SWRCB, TSM Program: 1986, 1988, p. 25]
Lindane	An insecticide with many uses of which seed treatments are prominent (soil treatment, foliage applications on fruit and nut trees, vegetables, ornamentals, timber, and wood protection). It possesses more vapor activity than most of the organochlorine insecticides. Some applications have been classified by EPA as Restricted Use. CHEMICAL NAME: Gamma isomer of 1,2,3,4,5,6-hexaclorocyclohexane. [Farm Chemicals Handbook, 1987]
Lipid	Any of a diverse group of organic compounds, occurring in living organisms, that are insoluble in water but soluble in organic solvents, such as chloroform, benzene, etc. Lipids are broadly classified into two categories: complex lipids, which are esters of long-chain fatty acids and include the glycerides (which constitute the fats an oils of animals and plants), glycolipids, phospholipids, and waxes; and simple lipids, which do not contain fatty acids and include the steroids and terpenes. Lipids have a variety of functions in living organisms. Fats and oils are a convenient and concentrated means of storing food

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	energy in plants and animals. Phospholipids and sterols, such as cholesterol, are major components of cell membranes. Waxes provide vital waterproofing for body surfaces. Terpenes include vitamins A, E, and K, and phytol (a component of chlorophyll) and occur in essential oils, such as menthol and camphor. Steroids include the adrenal hormones, sex hormones and bile acids. Lipids can combine with proteins to form lipoproteins, e.g. in cell membranes. In bacterial cell walls, lipids may associate with polysaccharides to form lipopolysaccharides.
Logarithm (Log)	The exponent expressing the power to which a fixed number (the base) must be raised in order to produce a given number (the antilogarithm). The most common logarithms are for the base 10. For example, 3 is the base 10 logarithm of 1,000 -- 100 is the base 10 antilogarithm of 2. See Natural logarithum
Lowest effects level (LEL)	The lowest effect levels listed are the lowest acceptable effect levels for North American aquatic species reported in the toxicological literature. Acceptability of effect level data is based upon a critical review of the reference and comparison with established guidelines for toxicity testing.
Lowest observed effect level (LOEL)	The lowest concentration of a toxicant in a bioassay test in which an adverse effect was seen on the test organism. [SWRCB Order no. WQ 85-1]
Marine	Of or belonging to the sea.
Mass emission strategy (MES)	A program to be developed by the San Francisco Bay and Central Valley Regional Water Quality Control Boards to regulate mass emissions of specified pollutants to the Estuary.
Maximum allowable residue level (MARL)	The maximum concentration of a contaminant (in mg/kg on a wet weight, edible portion bases) which will ensure that a consumer of the specified fish or wildlife species does not exceed the permissible intake level (PI) of the contaminant specified by the California Department of Health Services.
Maximum contaminant level (MCL)	The maximum permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system, except in the case of turbidity where the maximum permissible level is measured at the point of entry to the distribution system. Contaminants added to the water under circumstances controlled by the user, except those resulting from corrosion of piping and plumbing caused by water quality, are excluded from this definition. [40 CFR 141.2]
Median International Standard (MIS)	Developed in the Surveillance and Monitoring Program of the SWRCB, the Median International Standard (MIS) for trace

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	elements is the median value of worldwide health protection criteria surveyed by the Food and Agriculture Organization (FAO) of the United Nations. (The survey results were published by FAO in the 1983 report entitled "compilation of Legal Limits for Hazardous Substances in Fish and Fishery Products".) The criteria are not standardized by tissue analysis or by the level of protection required by each nation; however, quantitative comparisons can be made. The MIS gives an indication of what other nations consider to be elevated contamination levels; it can only be used to provide general guidelines on other nations findings. MIS apply to "flesh weight, edible portions" of freshwater fish and marine shellfish in parts per million (ppm) wet weight (ww), unless specifically noted otherwise. In this report the term "Alert Level" is synonymous to Median International Standard
Mercury (Hg)	A silvery metal, liquid at ordinary temperatures, which is toxic itself or in most compounds. [SWRCB Order No. WQ 85-1]
Molinate	A selective herbicide which is particularly effective for control of watergrass in rice. CHEMICAL NAME: S-Ethyl hexahydro-1 H-azepine-1-carbothioate. [Farm Chemicals Handbook, 1987]
Monocyclic aromatic hydrocarbons (MAHs)	The class of aromatic hydrocarbons which contain a single benzene ring (C6H6).
Mutagenic	An agent that causes an increase in the number of mutants (see mutation) in a population. Mutagens operate either by causing changes in the DNA of the genes, so interfering with the coding system, or by causing chromosome damage.
National Pollutant Discharge Elimination System (NPDES)	The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 318, 402, and 405 of the Clean Water Act. The term includes appoved state programs. [40 CFR]
Natural logarithum	logarithms to the base e. The number e is an irrational number that can only be approximated: e = 2.7182818284.... The value of e can be approximated by substituting large numbers for n in the formula e = (1 + 1/n) ** n This formula shows up in problems dealing with natural growth or

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	decay, such as in population growth of bacteria or the decay of uranium. [The Prentice-Hall Encyclopedia of Mathematics, 1982]
Nematicides	All substances or mixtures of substances used to control or destroy nematodes.
Nickel (Ni)	A hard, ductile, mallable, silver-white metallic element of the iron-cobalt group.
Nitrogen dioxide	A poisonous reddish-brown gas with the formula NO2 (a.k.a. nitrogen peroxide). When cooled, the gas changes to a light yellow liquid, nitrogen tetroxide (N2O4), and becomes a crystalline solid without color at - 15.3 degrees F. It is used to bleach paper pulp.
No observed effect level (NOEL)	The highest concentration of a toxicant in a bioassay test for which no adverse effect was found on the test organism. [SWRCB Order No. WQ 85-1]
No significant risk levels, calculated (NSRLs)	Calculated from DHS NSRLs using EPA assumptions of average consumption of water of 2 liters per day and average ingestion of fish of 6.5 grams per day.
Non-point source	Causes of water pollution that are not associated with point sources, such as agricultural fertilizer runoff, or sediment from construction. Examples include (i) Agriculturally related non-point sources of pollution including runoff from manure disposal areas, and from land used for livestock and crop production; (ii) Siviculturally related non-point sources of pollution; (iii) Mine-related sources of pollution including new, current and abandoned surface and underground mine runoff; (iv) Construction activity related sources of pollution; (v) Sources of pollution from disposal on land, in wells or in subsurface excavations that affect ground and surface water quality; (vi) Salt water intrusion into rivers, lakes, estuaries and ground water resulting from reduction of fresh water flow from any cause, including irrigation, obstruction, ground water extraction, and diversion; and (vii) Sources of pollution related to hydrologic modifications, including those caused by changes in the movement, flow, or circulation of any navigable waters or ground waters due to construction and operation of dams, levees, channels, or flow diversion facilities. [40 CFR]
Nutrients	Any substance which nourishes; anything nutritious. [Webster's New Universal Unabridged Dictionary, 1983] Common macro-nutrients: C, H, O, P, K, N, S, Ca, Fe, Na, and Mg. Common micro-nutrients: B, Co, Cu, Mn, Mo, Se, and Zn.

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O'Neill Forebay	The forebay of the San Luis Reservoir near Los Banos, California. It is located at mile post 66.74 on the Governor Edmund G. Brown California Aqueduct. [Data Handbook - State Water Project, DWR, 1987]
Octanol/water partition coefficient	This is a number which reflects the relative solubility of a chemical in octanol when compared to water. Substances with a high coefficient tend to be absorbed and stored in lipid-rich tissues, are readily bioavailable and/or have a high potential for bioaccumulation.
Oil and grease	In the determination of oil and grease, an absolute quantity of a specific substance is not measured. Rather, groups of substances with similar physical characteristics are determined quantitatively on the basis of their common solubility in freon. Oil and Grease may therefore be said to include hydrocarbons, fatty acids, soaps, fats, waxes, oils, and any other material that is extracted by the solvent from an acidified sample and that is not volatilized during the manipulations of the test. It is important that this limitation be clearly understood. Unlike some constituents--which represent distinct chemical elements, ions, compounds, or groups of compounds--oils and greases are defined by the method used for their determination. [Standard Methods..., 14th ed., 1975]
Organic	Referring to or derived from living organisms. In chemistry, any compound containing carbon. [Environmental Glossary 4th ed.]
Organism	Any living thing. [Environmental Glossary 4th ed.]
Organo-tin compounds	Organic compounds containing tin which are formulated to act as anti-fouling agents in paints used on the hulls of boats and ships.
Organochlorines	A range of compounds used mainly as pesticides, and the polychlorinated biphenyls (PCBs), which are of industrial origin. These compounds share a range of properties which set them apart from other types of pollutants. They are generally of relatively low water solubility, also known as chlorinated hydrocarbons. [AHI, 304]
Oxidation state	The degree to which an element is oxidized. This may involve the increase in oxygen content of a compound, such as the oxygen acids of the halogens. In such cases there is no evidence of a transfer of electrons; in fact the bonds between the oxygen and the halogens are coordinate covalent. In other cases, however, where a transfer of electrons occurs, a change in electrovalence is produced. [Basic College Chemistry, 2nd ed., 1956]

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WORD/PHRASE	DEFINITION
Ozone	An unstable allotropic form of oxygen, O3, with a pungent odor like that of chlorine, formed variously, as by the passage of electricity through the air. It is a powerful oxidizing agent, much more active than ordinary oxygen, and is used for bleaching oils, waxes, ivory, flour, [paper bulp] and starch, and for disinfecting drinking water. [Funk & Wagnalls Standard College Dictionary, 1973]
Pelagic	Describes open-water (or deep-water) habitat or those organisms which depend upon it.
Pentavalent Arsenic (As V)	See Arsenic.
Peroxide	See Hydrogen peroxide.
Pesticide	All chemical agents which are used for the control of some noxious insect, plant, or animal. Pesticide compounds, synthetic as well as substances which occur in nature, can be categorized into four groups as follows: (1) Chlorinated hydrocarbons containing carbon, hydrogen, and chlorine. Examples are DDT, toxaphene, lindane, chlordane, and endrin. (2) Organic phosphorus (thiophosphate) compounds of phosphorus, oxygen, carbon, and hydrogen. Examples are parathion and malathion. (3) Organic compounds including organic sulfur compounds, organic mercurials, dinitrophenols, carbamates, and natural products such as rotenone, nicotine, and strychnine. (4) Inorganic compounds of copper sulfate, arsenate of lead, zinc, chlorine, thallium, calcium arsenate, and sodium floroacetate. [ASCE SA 5, p. 28, October, 1967]
Phenanthrene	A polynuclear aromatic hydrocarbon composed of three joined benzene rings. CHEMICAL FORMULA: C14H10
Phyla	Plural of phylum.
Phylum	A unit used in the classification of animals. A phylum consists of a number of classes, or occasionally of only one class, with certain important characteristics in common, implying that all members are descended from a common ancestor. For example the phylum Protozoa consists of unicellular organisms; the phylum Arthropoda contains invertebrates with exoskeletons and jointed appendages. Large phyla are divided into subphyla; for example the phylum Chordata is divided into the subphyla

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WORD/PHRASE	DEFINITION
	Urochordata, Cephalochordata, and Vertebrata. Subphyla are then divided into classes. The corresponding unit in plant classification is the division (although the phylum is used in some plant classification schemes). [Dictionary of Life Science, 2nd ed., 1983]
Phytoplankton	Free-floating aquatic plants.
Point source	Any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture. [CWA, Sec. 502 (14)]
Pollutant	something that pollutes; especially, a harmful chemical or waste material discharged into the water or atmosphere. [Webster's New Universal Unabridged Dictionary, 2nd ed., 1983]
Pollutant loading	The mass emission rate of a pollutant generally expressed in pounds or kilograms per day.
Pollution	An alteration of the quality of the waters of the state by waste to a degree which unreasonably affects (1) such waters for beneficial uses, or (2) facilities which serve such beneficial uses. "Pollution" may include "contamination". [CWC Sec. 13050(l)]
	The introduction into the groundwater of the state of an active ingredient, other specific product, or degradation product of an active ingredient of an economic poison above a level, with an adequate margin of safety, that does not cause adverse health effects. [CFAC Sec. 13142]
Polychlorinated biphenyls (PCBs)	A mixture of compounds composed of the biphenyl molecule which has been chlorinated to varying degrees. [Environmental Glossary, 4th ed.]
	PCBs are considered an environmental problem because of their abundance, very great persistence, and considerable toxicity to aquatic biota. [AHI, 304]
Polychlorinated napthalenes	Polynuclear aromatic hydrocarbons composed of two fused benzene rings ($C_{10}H_8$) and one to eight chlorine atoms.
Polynuclear aromatic hydrocarbons (PAHs)	The class of compounds containing two or more fused benzene rings.
	In the 1990 SWRCB Draft FED for the Enclosed Bays and Estuaries Plan PAHs are defined as the sum of acenaphthylene; anthracene;

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WORD/PHRASE	DEFINITION
	1,2-benzanthracene; 3,4-benzofluoranthene; benzo[k]fluoranthene; 1,12-benzoperylene; benzo[a]pyrene; chrysene; dibenzo[ah]anthracene; fluorene; indeno[1,2,3-cd]pyrene; phenanthrene; and pyrene.
Pyrene	A polynuclear aromatic hydrocarbon composed of four joined benzene rings. CHEMICAL FORMULA: C16H10
Quality of water	The chemical, physical, biological, bacteriological, radiological, and other properties and characteristics of water which affect its use. [CWC Sec. 13050(h)]
Regulatory levels	NAS guidelines and FDA action levels: The National Academy of Sciences (NAS) in 1973 established recommended maximum concentrations of toxicants in tissues. The NAS guidelines apply to contaminant concentrations in the whole fish in parts per million (ppm). These recommendations were established not only to protect the organism containing the toxic compounds, but also to protect the species that consume these contaminated organisms. The U.S. Food and Drug Administration (FDA) established maximum concentration levels for some toxic substances for human foods in 1985. The FDA action levels are for edible portions and are measured in ppm by wet weight (ww). DHS health advisory levels: The DHS is responsible for issuing health advisory levels, particularly in cases where FDA action levels are not available for chemicals in food, for the protection of human health. DHS health advisory levels are for the edible portion and are measured in ppm ww. The interpretation of data available in the Toxic Substances Monitoring Program, 1985 (TSM Program, 1985) uses DHS sources where human health is concerned.
Reverse flow	In the context of this report, the term reverse flow refers to net flow being in the upstream direction in the Southern and Western Delta. This condition occurs between approximately the western end of Sherman Island (in the Delta) and the export pumps when Delta inflow is relatively, low and Delta consumptive uses and exports are high.
Riverine	Pertaining to or like a river; riparian. [Funk & Wagnalls Standard College Dictionary, 1973]
Riverine sources	The pollutant inputs into the major rivers flowing into the Bay-Delta Estuary from all point and non-point sources outside of the geographic boundary of the Estuary.

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WORD/PHRASE	DEFINITION
Runoff	That part of precipitation which is not absorbed by soil, evaporated, or transpired by plants, but finds its way into streams as surface flow. [Fundamentals of Ground Water Contamination Glossary, 1985] Any precipitation, leachate, or liquid that drains from any part of a waste management unit. [23 CCR 2601]
Salinity	The total concentration of dissolved ions in water, a conservative property. [T, XLV, 5:12-5:25] The salt content of a water. [SWRCB Order No. WQ 85-1] Usually expressed as ppt (g/l), or ppm (mg/l).
San Pablo Bay	The portion of San Francisco Bay encompassing the area from the Richmond-San Rafael Bay Bridge on the south side to the Petaluma River on the north and the Carquinez Strait on the east. It has a surface area of 105 sq. mi. at MLLW, mean depth of 9 ft., and mean surface area of 605,000 AF.
Sediment quality objective	Objectives to be developed for basin planning which shall be designed to protect the beneficial uses of the waters of the Bay-Delta Estuary from degradation due to sediment quality.
Selenate (Se +6)	Ionized selenium at a valence state of +6. [SWRCB Order No. WQ 85-1] See Selenium.
Selenide (Se -2)	Ionized selenium at a valence state of -2.
Seleniferous	High in selenium as in seleniferous soils.
Selenite (Se +4)	Ionized selenium at a valence state of +4. [SWRCB Order No. WQ 85-1] See Selenium.
Selenium (Se)	A non-metallic element chemically resembling sulfur. Essential for animals at trace concentrations, selenium is toxic to animals in deficient or excessive dietary exposure. [SWRCB Order No. WQ 85-1] Selenium occurs in three environmentally significant valence states Se -2 (selenide), Se +4 (selenite), and Se +6 (selenate), with different toxic properties.
Silver (Ag)	A white, ductile, and very malleable metallic element of high electric conductivity, crystallizing in the isometric system, found native as well as in combination: also called argentum.
Silviculture	The art of cultivating a forest; forestry. [Webster's New Universal Unabridged Dictionary, 2nd ed., 1979]

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WORD/PHRASE	DEFINITION
Simazine	A selective herbicide used for the control of most annual grasses and broadleaf weeds in corn, established alfalfa, established bermuda grass, cherries, peaches, citrus, caneberries, cranberries, grapes, apples, pears, certain nuts, asparagus, certain ornamentals and tree nursery stock, in turf grass sod production, fairways, lawns, and similar areas. CHEMICAL NAME: 2-chloro-4,6-bis(ethylamino)-s-triazine. [Farm Chemicals Handbook, 1987]
Soluble, e.g., soluble selenium	Any substance capable of passing through a membrane filter with a rated pore diameter of 0.45 microns. [Standard Methods..., 14th ed., 1975] Capable of entering into solution or of being dissolved; as, a soluble substance. [Webster's New Universal Unabridged Dictionary, 1979]
South Bay	The portion of the San Francisco Bay stretching from the San Francisco-Oakland Bay Bridge on the north to Mountain View in the south. It has a surface area of 214 sq. mi. at MLLW, mean depth of 11 ft. and mean volume of 1,507,000 AF
Spreader	Also termed "film extender". The American Association of Pesticide Control Officials, Inc. has adopted this definition: "A substance which increases the area that a given volume of liquid will cover on a solid, or on another liquid." [Farm Chemicals Handbook, 1987]
Standard	See Water Quality Standard.
Statewide plan	A water quality control plan adopted by the State Water Resources Control Board in accordance with the provisions of Cal.Water Code Sec. 13240 to 13244, for waters where water quality standards are required by the Federal Water Pollution Control Act. Such plans supersede regional water quality control plans for the same waters to the extent of a conflict. [CWC Sec. 13170]
Subsurface agricultural drainage	The effluent from a subsurface agricultural drainage system.
Subsurface agricultural drainage system	A set of tile drains, collectors and, in most cases, one or more sump pumps which are installed in a field to remove water from the root zone of any crops which may be planted. Generally installed in areas with shallow perched water tables.
Suisun Bay	The portion of San Francisco Bay between the entrance to the

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WORD/PHRASE	DEFINITION
	Carquinez Strait and Chipps Island, including Grizzly and Honker bays. It has a surface area of 36 sq. mi. at MLLW, mean depth of 14 ft. and mean volume of 323,000 AF.
Suisun Marsh	The marshlands generally located in southern Solano County, south of the cities of Fairfield and Suisun City. It is bordered on the south by Suisun Bay including Grizzly and Honker bays, and the confluence of the Sacramento and San Joaquin rivers; on the east from Denverton along Shiloh Road to Collinsville. Suisun Marsh occupies an area of 116,000 acres, including about 88,000 acres below the five-foot contour It is the largest contiguous brackish water marsh in the United States. Suisun Marsh's boundaries are legally defined in CPRC Sec. 29101 and 29101.5.
Sulfur dioxide	A gas with a pungent and irritating odor. Eighty volumes of the gas dissolve in one volume of water at 0 degrees Celsius (centigrade) and 1 atmosphere pressure (14.7 pounds per inch). Liquid sulfur dioxide boils at -10 degrees Celsius. Because of its low boiling point and high heat of vaporization, sulfur dioxide has been used as a refrigerant, although has been largely replaced by Freon. In the canning and paper industries sulfur dioxide is employed as a bleaching agent for certain fruits and paper pulp. Sliced fruits are exposed to sulfur dioxide before drying to prevent fermentation, the growth of molds, and blackening of the product. It is also used in the manufacture of sulfuric acid, sulfurous acid, and its salts.
Surface active agent	A substance that reduces the interfacial tension of two boundary lines. Most pesticide adjuvants may be considered surface active agents. Also known as surfactants. These materials can be classed as nonionic, anionic and cationic. Most emulsifying agents are of the nonionic type; they do not ionize. Wetting agents and detergents are primarily anionic, becoming ionized in solution, the negative molecule exerting primary influence. Cationic forms which also become ionized in solution are not extensively used. The positive portion of the molecule is dominant when these materials are ionized. Factors involved in the selection of a surface active agent include the homogeneity of concentrate, storage stability of concentrate or powder, corrosion factors on storage or packaging of a concentrate, the ease of mixing with water, effect of water hardness on emulsion stability or dispersion, and use end cost of ingredients.

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WORD/PHRASE	DEFINITION
	When dealing with high gallonage spray equipment using considerable agitation, a minimum amount of emulsifier is needed. However, residual surface sprays require greater amounts to reduce the run-off. Many terms designate particular surface activities. These are often related. The following are are defined under these headings: Activator, Adjuvant, Deflocculator, Detergent, Dispersant, Emulsifier, Foaming adjuvant, Foam suppressant, Spreader, Sticker, Wetting agent [Farm Chemicals Handbook, 1987]
Suspended solids (SS)	Tiny particles of solids dispersed but undissolved in a solid, liquid, or gas. Suspended solids in sewage cloud the water and require special treatment to remove (Environmental Glossary 4th ed.). Generally considered those particles subject to Brownian diffusion.
Synergism	The joint action of different substances [or organisms] in producing an effect greater than the sum of the effects of all the substances [or organisms] acting separately. [Funk & Wagnalls Standard College Dictionary, 1973]
Synergistic	Of or pertaining to the action of two or more substances [or organisms] to achieve an effect of which neither alone is capable. [SWRCB Order No. WQ 85-1]
Synergistic effect	The effect of a mixture which is greater than the sum of the effects of its individual components.
TCDD equivalents	The dioxin toxic equivalent concentrations of a mixture of chlorinated dibenzodioxins and dibenzofurans.
Teratogen	An agent which causes fetal malformations or monstrosities.
Thiobencarb	A preemergent and early postemergent herbicide for the control of grasses and broadleaf weeds which infest rice fields, both when transplanting and during direct-seeding. The most common commercial formulations of thiobencard are; Bolero, Saturn, and Saturno. Some or all applications of Saturn may be classified by the U.S. EPA as Restricted Use Pesticides (RUP). CHEMICAL NAME: S-(4-chlorophenyl) methyl diethylcarbamothioate. [Farm Chemicals Handbook, 1987]

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WORD/PHRASE	DEFINITION
Tile drains	A System of clay pipes installed beneath irrigated lands to artificially remove water saturating the soil of the crop root zone by gravity flow.
Time-averaged	The averaging of a time series of (sequential) analytical results from a single sampling location in a manner which takes into account the length of time between sequential samples.
Tin (Sn)	A white, malleable, metallic element of low tensile strenght, found chiefly in combination; also called stannum.
Tissue alert levels	Maximum tissue residue levels which are protective of human health and preferably tissue residue levels which trigger State and Regional Board action to prevent levels from reaching maximum allowable concentrations for human consumption. Information concerning synergistic, antagonistic or additive effects when more than one contaminant is accumulated in an organism should be considered when developing tissue alert levels. Tissue residue levels protective of aquatic life must also be determined. These levels are to be used to establish priorities for State and Regional Board regulatory programs, including the mass emissions strategy.
Total hydrocarbons	Use to refer to an extensive and artificial group of compounds which include oil and grease, monocyclic aromatic hydrocarbons (MAHs), polynuclear aromatic hydrocarbons (PAHs), ant other hydrocarbons or organic compounds such as trihalomethane formation precursors (THMFPs).
Toxic pollutants (elements, metals or organics)	Those pollutants, or combinations of pollutants, [elements, metals,or organics] including disease-causing agents, which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, or physical deformations, in such organisms or their offspring. [Resource Conservation Glossary]
Toxicant	(1) A chemical that controls pests by killing rather than repelling them. (2) A harmful substance or agent that may injure an exposed organism. [Environmental Glossary 4th ed.]
Trace elements (metals or organics)	Those elements [metals or organics] generally present in natural water samples at concentrations of less than one milligram per liter. [SWRCB Order No. WQ 85-1]
Tracy Pumping Plant	The U.S. Bureau of Reclamation Central Valley Project pumping

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WORD/PHRASE	DEFINITION
	plant in the Delta west of Tracy. The source of the water in the Delta-Mendota Canal.
Tributyltin (TBT)	An antifouling agent used as an additive in hull paints for ships and boats. Tributyltin is the most common organo-tin. Di- and monobutyltin are also used as antifouling agents.
Trihalomenthane formation potential (THMFP)	The analytical results from a non-standard laboratory technique which is used on raw water supplies in an attempt to quantify the likelihood that trihalomethanes will be formed when the water is disinfected.
Trihalomethane formation precursors (THMFPs)	The organic materials (usually dissolved humic and fulvic acids) in a raw water supply which when disinfected result in the production of trihalomethanes.
Trihalomethane precursors (THMPs)	See Trihalomethane formation precursors (THMFPs).
Trihalomethanes (THMs) or Total trihalomethanes (TTHMs)	Singular; One of the family of organic compounds, named as derivatives of methane (CH4), wherein three of the four hydrogen atoms are each substituted by a halogen atom [e.g., chlorine, bromine] in the molecular structure. [40 CFR 141.2] Plural; (1) A subset of chemicals known as disinfection by-products (DBPs) which are formed when waters are disinfected. THMs are produced when dissolved organic substances, such as fulvic and humic acids produced by decaying crop residues or peat soil in fresh or saline waters, come in contact with the oxidizing agents used to disinfect drinking water. [T,VI,38:3-5; T,XLVI,99:11-19] (2) The sum of the concentration in mg/l of the trihalomethane compounds (trichloromethane [chloroform], dibromochloromethane, bromodichloromethane, and tribromomethane [bromoform]), rounded to two significant figures. [40 CFR 141.2]
Trivalent chromium (Cr III)	See Chromium.
Turbidity	Hazy air due to the presence of particles and pollutants; a similar cloudy condition in water due to suspended silt or organic matter. [Environmental Glossary 4th ed.]
Valence	The combining capacity of an atom of an element [or radical] for atoms [or radicals of other elements. It is often closely related to the number of electrons an atom [or radical] will lose, or in many cases will gain, during a chemical reaction. [Basic College Chemistry, 1956]

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WORD/PHRASE	DEFINITION
	Also spelled valance.
Vapor pressure	he pressure exerted when a solid or liquid is in equilibrium with its own vapor. The vapor pressure is a function of the substance and its temperature. [Handbook of Chemistry and Physics, 48th ed., 1967]
Volatile	Evaporating rapidly; diffusing more or less freely in theatmosphere.
Waste	Sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation of whatever nature, including such waste placed within containers of whatever nature prior to, and for purposes of, disposal. [CWC Sec. 13050(d)]
Water quality	See Quality of water.
Water quality control	The regulation of any activity or factor which may affect the quality of the water of the state and includes the prevention and correction of water pollution and nuisance. [CWC Sec. 13050(i)]
Water quality control plan	A designation or establishment for the waters within a specified area of (1) beneficial uses to be protected, (2) water quality objectives, and (3) a program of implementation needed for achieving water quality objectives. [CWC Sec. 13050(j)]
Water quality criteria, EPA	Scientifically derived constituent concentrations or levels which are thought to protect specific beneficial uses in a water body. Water quality criteria do not include the consideration of all the other factors necessary to develop water quality standards or objectives.
Water quality objective	The limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area and time frame. Water quality objectives may be either numerical or narrative. [CWC Sec. 13050] Factors to be considered in establishing water quality objectives shall include, but not be limited to all of the following: (a) past, present, and probable future beneficial uses of water, (b) environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto,

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WORD/PHRASE	DEFINITION
	(c) water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area, (d) economic considerations, and (e) the need for developing housing within the region. [CWC Sec. 13241]
Water quality standard	A term used in connection with the federal Clean Water Act which is roughly equivalent to water quality objectives and designated beneficial uses.
Zinc (Zn)	A bluish white, metallic element occurring mostly in combination.

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APPENDIX C
ABBREVIATIONS FOR CITATIONS

ABBREVIATION	ORGANIZATION NAME
AHI	AQUATIC HABITAT INSTITUTE
Agency	U.S. ENVIRONMENTAL PROTECTION AGENCY (also EPA)
BADA	BAY AREA DISCHARGERS ASSOCIATION
BISF	THE BAY INSTITUTE OF SAN FRANCISCO
Bureau	U.S. BUREAU OF RECLAMATION (also USBR)
CBE	CITIZENS FOR A BETTER ENVIRONMENT
CCWD	CONTRA COSTA WATER DISTRICT
COE	U. S. ARMY CORPS OF ENGINEERS (also U.S. Corps)
DFA	DEPARTMENT OF FOOD AND AGRICULTURE
DFG	CALIFORNIA DEPARTMENT OF FISH AND GAME
DHS	CALIFORNIA DEPARTMENT OF HEALTH SERVICES (also DOHS)
DWR	DEPARTMENT OF WATER RESOURCES
EBMUD	EAST BAY MUNICIPAL UTILITY DISTRICT
EPA	U.S. ENVIRONMENTAL PROTECTION AGENCY (also Agency)
FAO	FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS
FDA	U.S. FOOD AND DRUG ADMINISTRATION
NAS	NATIONAL ACADEMY OF SCIENCES
NOAA	U.S. NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION
RIC	RICE INDUSTRY COMMITTEE
RWQCB_2	SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD (REGION 2)
RWQCB_5	CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD (REGION 5)
Region 2	See RWQCB_2
Region 5	See RWQCB_5
SAVESF	SAVE THE SAN FRANCISCO BAY ASSOCIATION, THE
SBDA	SOUTH BAY DISCHARGERS ASSOCIATION
SWRCB	CALIFORNIA STATE WATER RESOURCES CONTROL BOARD (also State Board)
State Board	CALIFORNIA STATE WATER RESOURCES CONTROL BOARD (also SWRCB)
U.S. Corps	U.S. ARMY CORPS OF ENGINEERS (also COE)
USBR	U.S. BUREAU OF RECLAMATION (also Bureau)
USFDA	U.S. FOOD AND DRUG ADMINISTRATION (also FDA)
USFWS	U.S. FISH AND WILDLIFE SERVICE
USGS	U.S. GEOLOGICAL SURVEY

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ABBREVIATIONS/SYMBOLS

ABBREVIATION/ SYMBOL	DEFINITION
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin (See Dioxin in Glossary)
2,4-D	(2,4-Dichlorophenoxy) acetic acid
AEL	Adverse effects level
AET	Apparent effects threshold
AF	Acre-Foot = 43,560 cubic feet = 325,900 gallons
Ag	Silver
As	Arsenic
As III	Trivalent arsenic, valence = +3
As V	Pentavalent arsenic, valence = +5
B	Boron
BHC	Benzene hexachloride
BMP(s)	Best management practice(s)
BPTC	Bay Protection and Toxic Cleanup Program (also BPTCP)
CAC	California Administrative Code (OBSOLETE--Now Cal. Code of Regulations, CCR)
CCR	California Code of Regulations (formerly Cal. Administrative Code, CAC)
CDD(s)	Chlorinated dibenzodioxin(s) (dioxin equivalant(s))
CDF(s)	Chlorinated dibenzofuran(s) (dioxin equivalent(s))
CEQA	California Environmental Quality Act
CFR	U.S. Code of Federal Regulations
COD	Chemical oxygen demand
CPRC	California Public Resources Code
CVP	Central Valley Project
CWA	Federal Clean Water Act of 1977
CWC	California Water Code
CZMA	Coastal Zone Management Act
Cd	Cadmium
Cl	Chlorine
Cr	Chromium
Cr III	Trivalent chromium, valence = +3
Cr VI	Hexavalent chromium, valence = +6
Cu	Copper
D-1485	SWRCB Water Rights Decision 1485 (1978)
DDA	Bis(chlorophenyl) acetic acid
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DO	Dissolved oxygen
DS	San Joaquin River Drainage Study
Delta	Sacramento-San Joaquin Delta
Delta Plan	1978 SWRCB WQCP - Sacramento-San Jouquin Delta and Suisun Marsh
EDL	Elevated data level
Estuary	San Francisco Bay and Sacramento-San Joaquin Delta Estuary
FED	Functional Equivilant Document
H	Hardness (as CaCO3)
HCH(s)	Hexachlorocyclohexanel(s) (See BHCs)
Hg	Mercury

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ABBREVIATIONS/SYMBOLS

ABBREVIATION/ SYMBOL	DEFINITION
IDHAMP	Interagency Delta Health Aspects Monitoring Program
LC50	Median lethal concentration
LD50	Median lethal dose
LEL	Lowest effect level
LOEL	Local observable effects limit or lowest observed effects level
LTMS	Long term management strategy
MAF	Million acre feet
MAH(s)	Monocyclic aromatic hydrocarbon(s)
MARL	Maximum allowable residue level
MCL(s)	Maximum contaminant level(s) (associated with drinking water)
MES	Mass emission strategy
MIS	Median international standard
MLLW	Mean lower low water
MPRSA	Marine Protection Research and Sanctuaries Act
NOEL	No observed effect level
NPDES	National Pollutant Discharge Elimination System
NSRL	No significant risk level
NWR	National wildlife refuge
Ni	Nickel
PAH(s)	Polynuclear aromatic hydrocarbon(s)
PCB(s)	Polychlorinated biphenyl(s)
POTW(s)	Publicly owned treatment work(s)
PPD	Pollutant Policy Document
Pb	Lead
Plan	1988 or 1990 Draft Water Quality Control Plan (also WQCP)
RUP	Restricted use pesticide, EPA
Region 2	San Francisco Bay Basin (also Basin 2). See RWQCB_2
Region 5A	Sacramento River Basin (also Basin 5A)
Region 5B	Sacramento-San Joaquin Delta Basin (also Basin 5B)
Region 5C	San Joaquin River Basin (also Basin 5C)
SMW Program	State Mussel Watch Program
SS	Suspended solids
STORET	Storage and Retrieval system, the EPA's national computerized data
SWP	State Water Project
Se	Selenium
Se +4	Selenite, valence = +4 (also Se IV)
Se +6	Selenate, valence = +6 (also Se VI)
Se -2	Selenide, valence = -2 (also Se -II)
Sn	Tin
TBT	Tributyltin
THM(s)	Trihalomethane(s)
THMFP(s)	Trihalomethane formation precussers
THMP(s)	Trihalomethane precursor(s)
TSM Program	Toxic Substances Monitoring Program
TTHM	Total trihalomethane

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ABBREVIATIONS/SYMBOLS

ABBREVIATION/ SYMBOL	DEFINITION
USCA	U.S. Code Annotated
WQCP	1988 or 1990 Draft Water Quality Control Plan (also Plan)
Zn	Zinc
cu. m.	Cubic meter = 35.31 cu. ft. = 1.31 cu yd.
dw	Dry weight basis
ft	Foot or feet
fw	Freshwater
gm	Gram = 0.035 oz (avdp.)
kg	Kilogram = 2.2046 pounds
kg/d	Kilograms per day = 2.205 lbs/d
lb	Pound (avdp.) = 16 oz (avdp.) = 453.6 grams
lbs/d	Pounds (avdp.) per day = 0.4536 kg/d
ln	Natural logarithm (logarithum to the base e)
m	Meter or meters = 3.28 feet
mg	Milligram = 0.001 gm
mg/kg	Miiligrams per kilogram (egual to ppm)
mg/l	Milligrams per liter (approximately equal to ppm in aqueous solutions)
ng/l	Nanograms per liter (approximately equal to ppt in aqueous solutions)
o/oo	Parts per thousand (approximately equal to g/l in aqueous solutions)
ppb	Parts per billion (approximately equal to ug/l in aqueous solutions)
ppm	Parts per million (equal to mg/kg, approx. equal to mg/l in aqueous solutiions)
ppq	Parts per quadrillion (approx. one thousandth of a ng/l in aqueous solutions)
ppt	Parts per trillion (approximately equal to ng/l in aqueous solutions)
sq. mi.	Square mile = 640 acres = 259 hectares
sw	Salt water
tonne	metric ton = 1000 kilograms = 2205 pounds = 1.1025 U.S. (short) tons
ug/l	Micrograms per liter (approximately equal to ppb in aqueous solutions)
ww	Wet weight basis

STATE WATER RESOURCES CONTROL BOARD
P. O. Box 100, Sacramento, CA 95801

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARDS

NORTH COAST REGION (1)

1440 Guerneville Road
Santa Rosa, CA 95403
(707) 576-2220

SAN FRANCISCO BAY REGION (2)

1800 Harrison Street, Ste. 700
Oakland, CA 94612
(415) 464-1255

CENTRAL COAST REGION (3)

1102-A Laurel Lane
San Luis Obispo, CA 93401
(805) 549-3147

LOS ANGELES REGION (4)

101 Centre Plaza Drive
Monterey Park, CA 91754-2156
(213) 266-7500

CENTRAL VALLEY REGION (5)

3443 Routier Road, Suite A
Sacramento, CA 95827-3098
(916) 361-5600

Fresno Branch Office

3614 East Ashlan Ave.
Fresno, CA 93726
(209) 445-5116

Redding Branch Office

415 Knollcrest Drive
Redding, CA 96002
(916) 224-4845

LAHONTAN REGION (6)

2092 Lake Tahoe Boulevard
P. O. Box 9428
South Lake Tahoe, CA 95731-2428
(916) 544-3481

Victorville Branch Office

Civic Plaza
15428 Civic Drive, Suite 100
Victorville, CA 92392-2359
(619) 241-6583

COLORADO RIVER BASIN REGION (7)

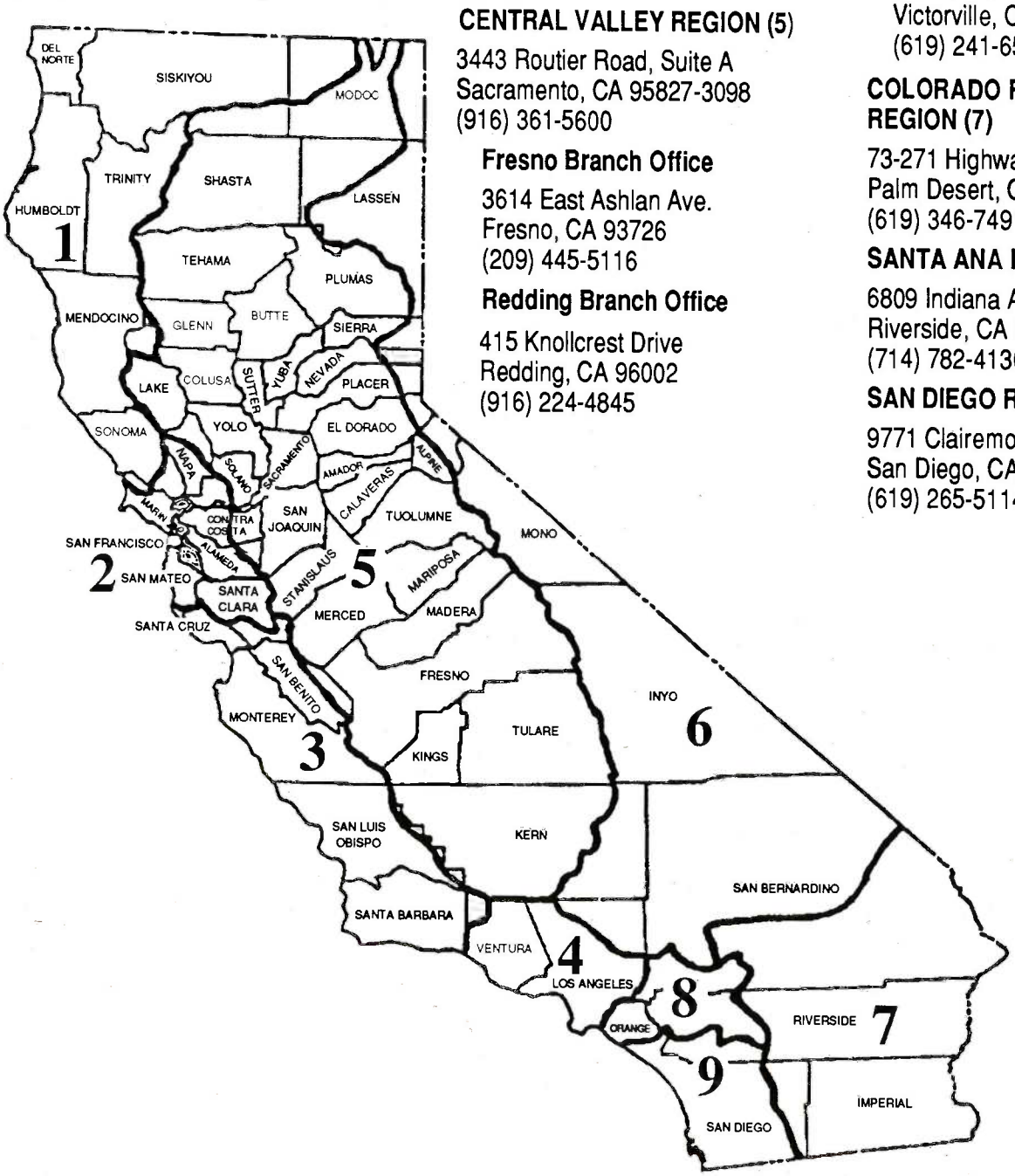
73-271 Highway 111, Ste. 21
Palm Desert, CA 92260
(619) 346-7491

SANTA ANA REGION (8)

6809 Indiana Avenue, Ste. 200
Riverside, CA 92506
(714) 782-4130

SAN DIEGO REGION (9)

9771 Clairemont Mesa Blvd. Ste. B
San Diego, CA 92124
(619) 265-5114



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