

Appendix 8N
Trace Metals

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8N.1 Trace Metals Methodology

Trace metals were assessed mostly qualitatively. Section 8.3.1.3 and the trace metals discussion under section 8.3.1.7 provide more detailed information regarding the assessment methodology for trace metals. Tables and figures below support the trace metals assessment.

Table 1. Concentration of Dissolved Copper in Primary Source Waters to Delta

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	1.7	2.4	1.7
75 th Percentile (µg/L)	2.0	3.0	1.9
95 th Percentile (µg/L)	3.4	4.5	2.4
Maximum (µg/L)	9.5	8.0	2.6
Data Source	SRCS, DWR, CVRWQCB	DWR, CVRWQCB	SFEI
Station(s)	Sac River at Freeport, Greene's Landing, Hood, and River Mile 44	SJR at Vernalis	BD40
Date Range	1992–2010	1993–1994, 1997–1998	1993–2001
ND Replaced with RL	Yes	Yes	No
Data Omitted	None	None	None
No. of Data Points	414	51	25

Table 2. Concentration of Dissolved Cadmium in Primary Source Waters to Delta

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	0.026	0.007	0.055
75 th Percentile (µg/L)	0.030	0.009	0.070
95 th Percentile (µg/L)	0.10	0.010	0.12
Maximum (µg/L)	0.18	0.010	0.16
Data Source	SRCS, CVRWQCB	CVRWQCB	SFEI
Station(s)	Sac River at Freeport, Greene's Landing, and River Mile 44	SJR at Vernalis	BD40
Date Range	1992–2010	1993–1994	1993–2001
ND Replaced with RL	Yes	No	No
Data Omitted	None	None	None
No. of Data Points	378	3	25

1 **Table 3. Concentration of Dissolved Chromium in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	1.0	0.57	0.52
75 th Percentile (µg/L)	1.0	0.64	0.37
95 th Percentile (µg/L)	2.8	1.1	1.4
Maximum (µg/L)	4.8	1.2	4.7
Data Source	SRCS, CVRWQCB	CVRWQCB	SFEI
Station(s)	Sac River at Freeport, Greene's Landing, and River Mile 44	SJR at Vernalis	BD40
Date Range	1992–2010	1993–1994	1993–2001
ND Replaced with RL	Yes	No	No
Data Omitted	None	None	Yes
No. of Data Points	252	6	20

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3 **Table 4. Concentration of Dissolved Lead in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	0.13	0.065	0.040
75 th Percentile (µg/L)	0.10	0.075	0.029
95 th Percentile (µg/L)	0.48	0.087	0.17
Maximum (µg/L)	1.2	0.090	0.42
Data Source	SRCS, CVRWQCB	CVRWQCB	SFEI
Station(s)	Sac River at Freeport, Greene's Landing, and River Mile 44	SJR at Vernalis	BD40
Date Range	1992–2010	1993–1994	1993–2001
ND Replaced with RL	Yes	No	No
Data Omitted	None	None	None
No. of Data Points	373	4	25

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5 **Table 5. Concentration of Dissolved Nickel in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	1.3	1.5	1.8
75 th Percentile (µg/L)	1.3	1.9	1.8
95 th Percentile (µg/L)	4.0	2.2	3.4
Maximum (µg/L)	26	2.2	3.8
Data Source	SRCS, CVRWQCB	CVRWQCB	SFEI
Station(s)	Sac River at Freeport, Greene's Landing, and River Mile 44	SJR at Vernalis	BD40
Date Range	1992–2010	1993–1994	1993–2001
ND Replaced with RL	Yes	No	No
Data Omitted	None	None	None
No. of Data Points	358	6	25

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1 **Table 6. Concentration of Dissolved Silver in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	0.011	–	0.0040
75 th Percentile (µg/L)	0.015	–	0.0039
95 th Percentile (µg/L)	0.020	–	0.0066
Maximum (µg/L)	0.020	–	0.034
Data Source	SRCS D, CVRWQCB	–	SFEI
Station(s)	Sac River at Freeport, Greene’s Landing, and River Mile 44	–	BD40
Date Range	2001–2010	–	1993–2001
ND Replaced with RL	Yes	–	No
Data Omitted	None	–	Yes
No. of Data Points	72	0	22

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3 **Table 7. Concentration of Dissolved Zinc in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	2.7	1.2	0.80
75 th Percentile (µg/L)	4.0	1.4	0.84
95 th Percentile (µg/L)	6.6	3.0	2.3
Maximum (µg/L)	27	3.5	2.6
Data Source	SRCS D, CVRWQCB	CVRWQCB	SFEI
Station(s)	Sac River at Freeport, Greene’s Landing, and River Mile 44	SJR at Vernalis	BD40
Date Range	1992–2010	1993–1994	1993–2001
ND Replaced with RL	Yes	No	No
Data Omitted	None	None	None
No. of Data Points	393	6	25

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5 **Table 8. Concentration of Dissolved Arsenic in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	1.3	1.8	1.9
75 th Percentile (µg/L)	1.5	2.0	2.2
95 th Percentile (µg/L)	2.0	3.0	3.1
Maximum (µg/L)	4.0	3.0	3.2
Data Source	SRCS D, DWR, CVRWQCB	DWR	SFEI
Station(s)	Sac River at Freeport, Greene’s Landing, Hood, and River Mile 44	SJR at Vernalis	BD40
Date Range	1992–2010	1996–1998	1993–2001
ND Replaced with RL	Yes	Yes	No
Data Omitted	None	None	None
No. of Data Points	226	59	25

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1 **Table 9. Concentration of Dissolved Aluminum in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	39	7	No Data
75 th Percentile (µg/L)	32	5	No Data
95 th Percentile (µg/L)	145	13	No Data
Maximum (µg/L)	157	27	No Data
Data Source	DWR	DWR	No Data
Station(s)	Sac River at Hood	SJR at Vernalis	No Data
Date Range	2013–2014	2013–2014	No Data
ND Replaced with RL	Yes	Yes	No Data
Data Omitted	None	None	No Data
No. of Data Points	22	22	No Data

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3 **Table 10. Concentration of Dissolved Iron in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	30	32	21
75 th Percentile (µg/L)	43	30	20
95 th Percentile (µg/L)	81	75	85
Maximum (µg/L)	120	360	100
Data Source	SRCS, BDAT, USGS	USGS	SFEI, BDAT
Station(s)	Sac River at Freeport, Greene's Landing, Hood, and River Mile 44	SJR at Vernalis	BD40, Suisun at Bulls Head
Date Range	1992–2010	1992–2001	1975–1978, 1983–1993, 2000–2001
ND Replaced with RL	Yes	Yes	No
Data Omitted	None	None	None
No. of Data Points	117	92	41

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5 **Table 11. Concentration of Dissolved Manganese in Primary Source Waters to Delta**

Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (µg/L)	7.4	31	9.3
75 th Percentile (µg/L)	10	41	10
95 th Percentile (µg/L)	17	71	20
Maximum (µg/L)	29	130	32
Data Source	BDAT, USGS	USGS	SFEI, BDAT
Station(s)	Sac River at Freeport and Greene's Landing	SJR at Vernalis	BD40, Suisun at Bulls Head
Date Range	1975–1992, 1996–1998	1992–2001	1977, 1984–1993, 2000–2001
ND Replaced with RL	Yes	Yes	No
Data Omitted	None	None	None
No. of Data Points	55	119	29

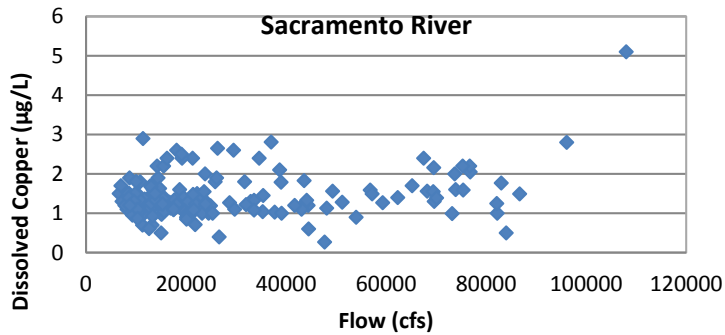
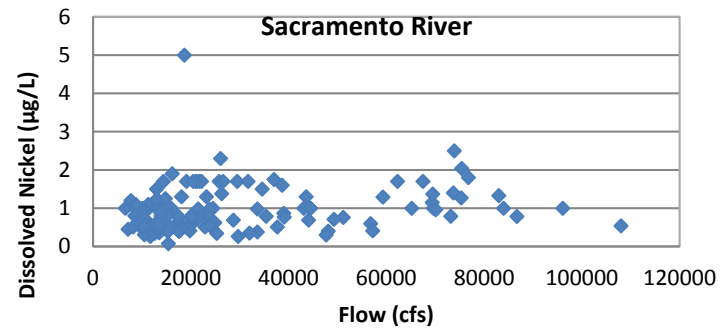
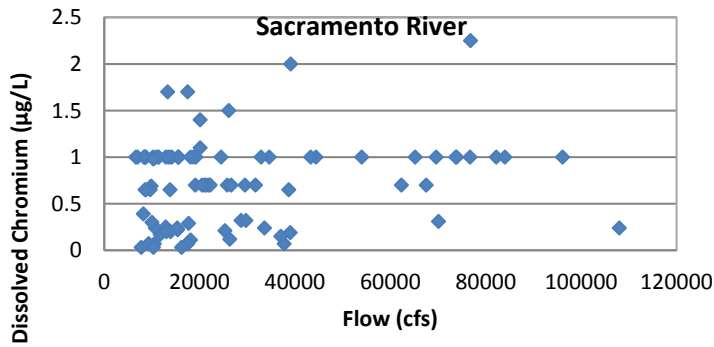
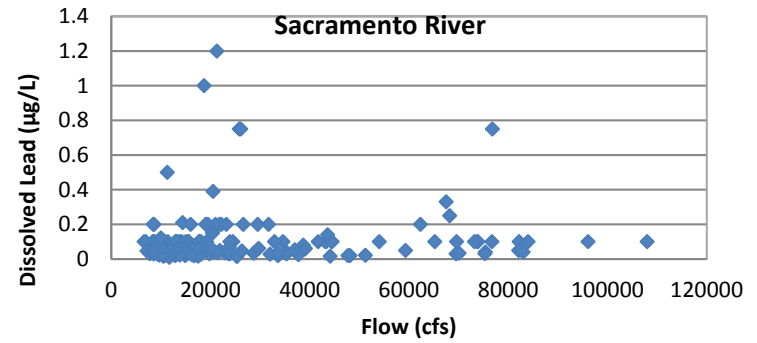
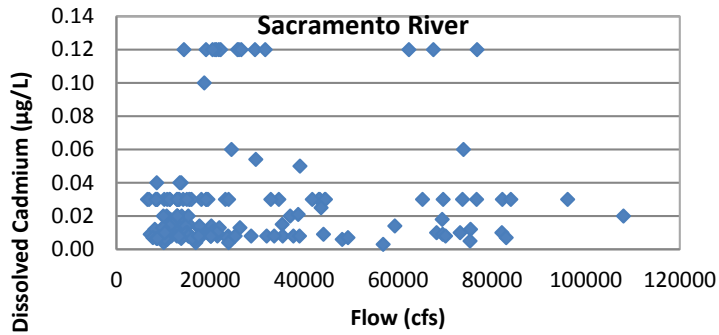
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1 **Table 12. Concentration of Total Hardness in Primary Source Waters to Delta**

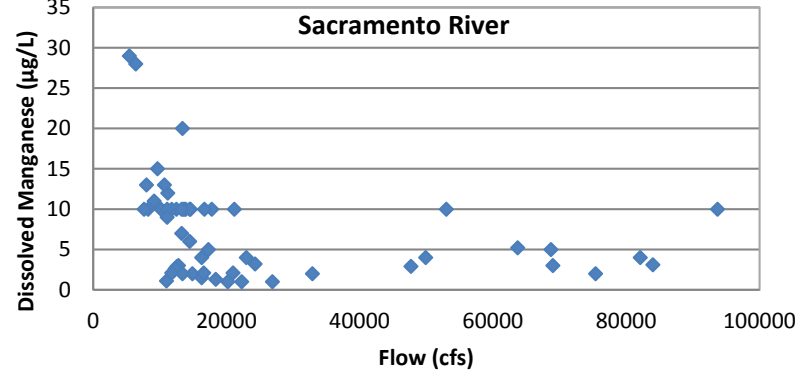
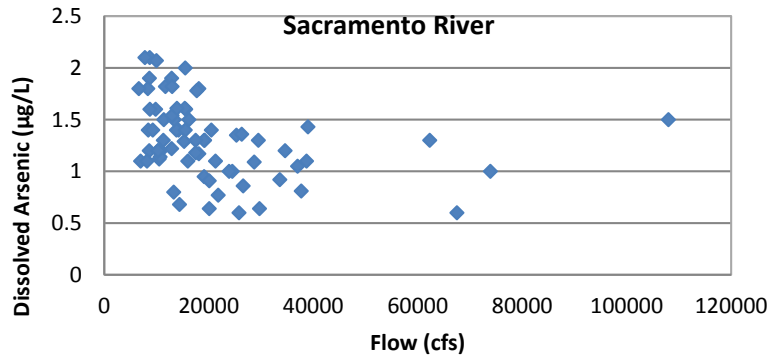
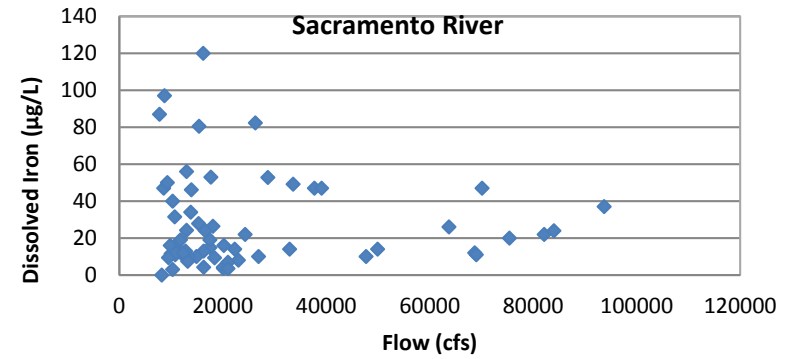
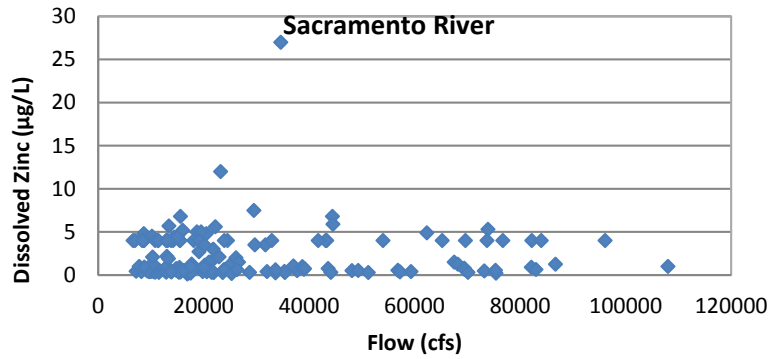
Source Water	Sacramento River	San Joaquin River	San Francisco Bay
Mean (mg/L)	58	147	737
25 th Percentile (mg/L)	48	93	154
5 th Percentile (mg/L)	39	55	54
Maximum (mg/L)	16	32	36
Data Source	SRCS, DWR, CVRWQCB	DWR, CVRWQCB	SFEI, DWR
Station(s)	Sac River at Freeport, Greene's Landing, Hood, and River Mile 44	SJR at Vernalis	BD40, Mallard Island
Date Range	1986–2010	1986–2003	1986–2003
ND Replaced with RL	No	No	No
Data Omitted	None	None	None
No. of Data Points	630	378	267

^a Central Valley Regional Water Quality Control Board (CVRWQCB). 1998. Metals concentrations, loads, and toxicity assessment in the Sacramento-San Joaquin Delta: 1993-1995. Staff report of the Central Valley Regional Water Quality Control Board. December 1998.

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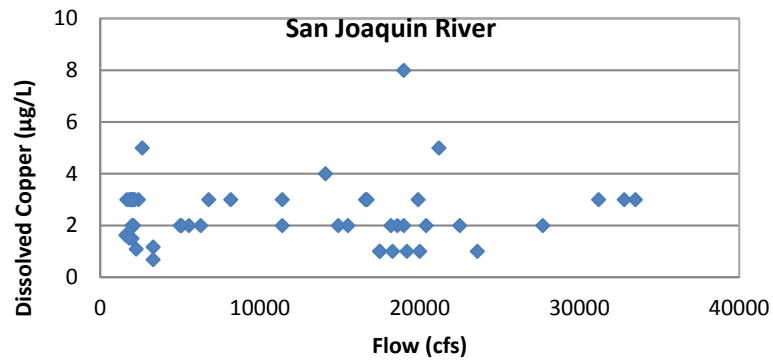


1 **Figure 1. Association of dissolved trace metals with Sacramento River flow at Freeport, 1992–2010**

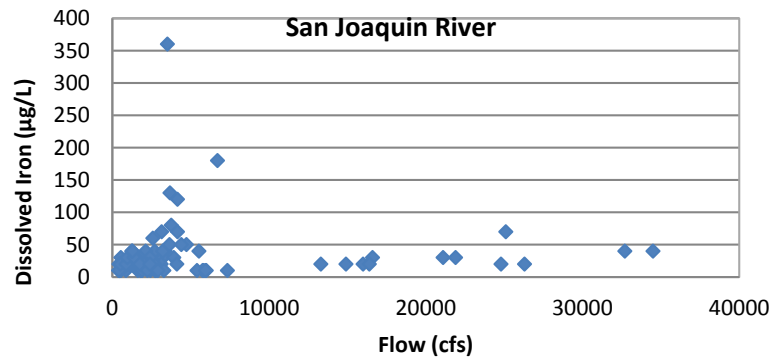


- 1 **Figure 2. Association of dissolved trace metals with Sacramento River flow at Freeport, 1992–2010 (continued).**
- 2 Freeport data obtained from SRCSD, CVRWQB, and USGS (see Appendix N, Tables 1-10).

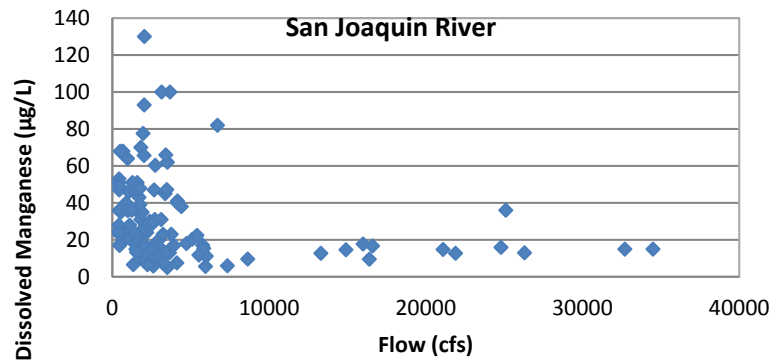
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6 **Figure 3. Association of dissolved trace metals with San Joaquin River flow at Vernalis, 1992-2001.**

7 Vernalis data obtained from DWR, CVRWQB, and USGS (see Appendix N, Tables 1-10).

1 8N.2 References

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- 4 CVRWQCB (Central Valley Regional Water Quality Control Board). 1998. Metals concentrations, loads,
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19 [http://nwis.waterdata.usgs.gov/nwis/qwdata?search_criteria=search_station_nm&submitted_form](http://nwis.waterdata.usgs.gov/nwis/qwdata?search_criteria=search_station_nm&submitted_form=Introduction)
20 [=Introduction](http://nwis.waterdata.usgs.gov/nwis/qwdata?search_criteria=search_station_nm&submitted_form=Introduction). Site accessed September 26, 2014.