

**STUDY REPORT W&AR-01
WATER QUALITY ASSESSMENT**

ATTACHMENT C

WATER QUALITY ELEMENT DATA

Table C-1. Water Quality Data--Summer 2012

		River Name			Tuolumne River		Woods Creek		Sullivan Creek		Don Pedro Reservoir		Don Pedro Reservoir		Don Pedro Reservoir		Don Pedro Reservoir		Tuolumne River		Tuolumne River		Tuolumne River	
		Sample Location			Above Don Pedro Reservoir		Above Don Pedro Reservoir		Above Don Pedro Reservoir		Between Upper and Middle Bays		Between Upper and Middle Bays		Near Don Pedro Dam		Near Don Pedro Dam		Below Don Pedro Dam		Below Don Pedro Dam		Below La Grange Dam	
		Sample ID			177261-3		177261-1		177261-2		177261-4		177261-5		177261-6		177261-7		177261-8		177261-8		177261-9	
		Sample Depth	Method		Surface		Surface		Surface		Surface		Bottom		Surface		Bottom		Surface		Surface		Surface	
Analyte	Benchmark	Date	Detection	Reporting	8/21/2012						8/22/2012		8/22/2012		8/23/2012		8/23/2012		8/23/2012		8/23/2012		8/22/2012	
		Sample Type	Limit	Limit	Original		Original		Original		Original		Original		Original		Original		Original		Duplicate		Original	
		Units	--	--	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes
In Situ Measurements																								
Temperature	--	°C	--	± 1	21.35		--	--	--	--	27.13		9.91		26.12		9.67		11.1		--	--	13.75	
Specific Conductance	150	µmhos	--	0.001	20		--	--	--	--	34		40		32		44		33		--	--	33	
pH	6.5-8.5	std units	--	0.1	6.4		--	--	--	--	7.95		6.47		7.81		6.42		6.7		--	--	6.84	
Dissolved Oxygen	< 7	mg/L	--	0.1	9.0		--	--	--	--	8.0		3.2		8.1		4.8		9.3		--	--	12.6	
Turbidity	--	NTU	--	0.1	8.6		--	--	--	--	283		0		0		0		0.0		--	--	--	
Basic Water Quality, Inorganic Ions, and Nutrients																								
Alkalinity, Total (as CaCO ₃)	< 20 or > 500	mg/L	0.85	1.0	3.5		--	--	--	--	13.8		15.5		12.6		15		12.5		12.5		12.2	
Ammonia (as N)	Temp & pH Dep't	mg/L	0.094	0.10	0.10	ND	--	--	--	--	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
Calcium	--	mg/L	0.0118	0.10	2.12		--	--	--	--	2.9		3.95		2.73		3.77		2.83		2.74		2.79	
Carbon, Dissolved Organic	--	mg/L	0.021	0.50	3.1	B	--	--	--	--	3.3	B	4.7		3.7		4.6		3.6		3.6		3.4	
Carbon, Total Organic	--	mg/L	0.026	0.50	2.6	B	--	--	--	--	3.3	B	4.6		3.4		4		3.4		3.4		3.2	
Chloride	230	mg/L	0.24	1.0	0.58	J	--	--	--	--	0.64	J	0.72	J	0.75	J	0.83	J	0.74	J	0.71	J	0.6	J
Hardness, Total	--	mg/L	0.99	2.0	6		--	--	--	--	11		15		12		15		11		11		11	
Magnesium	--	mg/L	0.00336	0.10	0.443		--	--	--	--	1.52		1.46		1.38		1.55		1.25		1.25		1.25	
Nitrate (as N)	45	mg/L	0.037	0.10	0.10	ND	--	--	--	--	0.10	ND	0.10	ND	0.10	ND	0.11		0.047	J	0.063	J	0.037	J
Nitrite (as N)	1	mg/L	0.016	0.10	0.10	ND	--	--	--	--	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND
o-Phosphate (as P)	--	mg/L	0.031	0.10	0.10	ND	--	--	--	--	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.051	J
Phosphorus, Total	--	mg/L	0.022	0.10	0.055	J	--	--	--	--	0.057	J	0.076	J	0.025	J	0.034	J	0.1	ND	0.1	ND	0.046	J
Potassium	--	mg/L	0.103	0.50	0.647		--	--	--	--	0.547		0.662		0.61		0.693		0.535		0.534		0.546	
Sodium	> 20	mg/L	0.103	0.50	1.2		--	--	--	--	1.96		1.86		2.3		2.31		1.93		1.81		1.49	
Solids, Total Dissolved	500	mg/L	0.82	1.0	20		--	--	--	--	27		30		27		47		30		27		23	
Solids, Total Suspended	--	mg/L	0.95	1.0	16		--	--	--	--	1.1		1.0	ND	1.0		1.0	ND	1.0	ND	1.0	ND	1.7	
Total Kjeldahl Nitrogen	--	mg/L	0.46	0.50	0.50	ND	--	--	--	--	0.50	ND	0.50	ND	0.50	ND	0.50	ND	0.50	ND	0.50	ND	0.50	ND
Pesticides																								
Aldrin	3.0	µg/L	0.0016	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Alpha-BHC	0.08	µg/L	0.0017	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Beta-BHC	0.08	µg/L	0.0039	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Chlordane	0.0043	µg/L	0.0052	0.025	0.025	ND	--	--	--	--	0.025	ND	0.025	ND	0.025	ND	0.025	ND	0.025	ND	0.025	ND	0.025	ND
Chlorpyrifos	0.014	µg/L	0.0024	0.005	0.0050	ND	--	--	--	--	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Delta-BHC	0.08	µg/L	0.0016	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Diazinon	0.05	µg/L	0.0029	0.0050	0.0050	ND	--	--	--	--	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND	0.0050	ND
Dieldrin	0.056	µg/L	0.0016	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Endosulfan I	0.056	µg/L	0.0015	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Endosulfan II	0.056	µg/L	0.0016	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Endrin	0.036	µg/L	0.0016	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Gamma-BHC	0.08	µg/L	0.0023	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Heptachlor	0.0038	µg/L	0.0018	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Heptachlor Epoxide	0.0038	µg/L	0.0017	0.010	0.010	ND	--	--	--	--	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND	0.010	ND
Toxaphene	0.0002	µg/L	0.023	0.12	0.12	ND	--	--	--	--	0.12	ND	0.12	ND	0.12	ND	0.12	ND	0.12	ND	0.12	ND	0.12	ND
Total Metals Concentrations																								
Arsenic	10	µg/L	0.04	0.15	0.28		--	--	--	--	0.25		0.32		0.28		0.33		0.26		0.27		0.3	
Cadmium	5	µg/L	0.003	0.02	0.006	J	--	--	--	--	0.004	J	0.003		0.004	J	0.004	J	0.004	J	0.003	J	0.003	J
Copper	1000	µg/L	0.01	0.1	0.69		--	--	--	--	0.98		0.65		0.62		1.18		0.49		0.48		0.58	
Iron	300	µg/L	0.6	10	314		--	--	--	--	105		38		32		33		19		18		21	
Lead	15	µg/L	0.003	0.04	0.142		--	--	--	--	0.008	J	0.007	J	0.008	J	0.008	J	0.005	J	0.006	J	0.008	J
Mercury	50	ng/L	0.08	0.5	1.08		--	--	--	--	0.62		4.07		0.08	J	4.57		0.34	J	0.28	J	0.43	J
Methyl Mercury	--	ng/L	0.026	0.05	0.029	J	--	--	--	--	0.05	ND	0.042	J	0.05	ND	0.053		0.05	ND	0.05	ND	0.05	ND
Selenium	50	µg/L	0.31	0.6	0.6	ND	--	--	--	--	0.6	ND	0.6	ND	0.6	ND	0.6	ND	0.6	ND	0.6	ND	0.6	ND
Silver	100	µg/L	0.002	0.02	0.002	J	--	--	--	--	0.002	J	0.003	J	0.002	ND	0.002	ND	0.002	J	0.002	ND	0.02	ND
Zinc	5000	µg/L	0.03	0.2	1.03		--	--	--	--	0.2		6.35		0.14	J	0.3		0.19	J	0.18	J	0.18	J
Dissolved Metals Concentrations																								
Arsenic	--	µg/L	0.04	0.15	0.23		--	--	--	--	0.28		0.29		0.29		0.34		0.27		0.24		0.27	
Cadmium	Hardness Dep't	µg/L	0.003	0.02	0.003	J	--	--	--	--	0.02	ND	0.004	J	0.003	J	0.02	ND	0.02	ND	0.02	ND	0.02	ND
Copper	Hardness Dep't	µg/L	0.01	0.1	0.4		--	--	--	--	0.96		6.25		0.7		8.16		0.47		0.46		0.63	
Iron	Hardness Dep't	µg/L	0.6	10	18		--	--	--	--	96		8	J	1	J	7	J	4	J	3	J	5	J
Lead	Hardness Dep't	µg/L	0.003	0.04	0.01	J	--	--	--	--	0.008	J	0.01	J	0.04	ND	0.008	J	0.04	ND	0.04	ND	0.009	J
Methyl Mercury	--	ng/L	0.026	0.05	0.05	ND	--	--	--	--	0.05	ND	0.293		0.05	ND	0.349		0.05	ND	0.05	ND	0.05	ND

Table C-2. Ammonia Criteria

USEPA National Recommended Water Quality Criteria to Protect Freshwater Aquatic Life													
Total Ammonia Nitrogen											Maximum Concentration		
Continuous Concentration, 30-day Average (mg N/L)											1-hour Average (mg N/L)		
pH	Fish Early Life Stages Present											Salmonids	
	Temperature, degrees C											Present	Absent
	6.5 -14	15.8	16.6 -16.8	17.1	17.6	17.9	20.0	20.7	20.9	21.3			
6.6	6.6	6.0	5.7	5.6	5.4	5.3	4.6	4.4	4.3	4.2	31.3	46.8	
6.7	6.4	5.9	5.6	5.5	5.3	5.2	4.5	4.3	4.3	4.2	29.8	44.6	
6.8	6.3	5.8	5.5	5.3	5.1	5.1	4.4	4.2	4.2	4.1	28.0	42.0	
6.9	6.1	5.6	5.3	5.2	5.0	4.9	4.3	4.1	4.0	4.0	26.2	39.2	
7.0	5.9	5.4	5.2	5.0	4.8	4.8	4.1	4.0	3.9	3.8	24.1	36.1	
7.1	5.7	5.2	5.0	4.8	4.6	4.6	4.0	3.8	3.7	3.7	21.9	32.9	
7.2	5.4	5.0	4.7	4.6	4.4	4.3	3.8	3.6	3.6	3.5	19.7	29.5	
7.3	5.1	4.7	4.4	4.3	4.2	4.1	3.6	3.4	3.4	3.3	17.5	26.2	
7.4	4.7	4.4	4.1	4.0	3.9	3.8	3.3	3.2	3.1	3.1	15.3	23.0	
7.5	4.4	4.0	3.8	3.7	3.6	3.5	3.1	2.9	2.9	2.8	13.3	19.9	
7.6	4.0	3.7	3.5	3.4	3.3	3.2	2.8	2.7	2.6	2.6	11.4	17.0	
7.7	3.6	3.3	3.1	3.0	2.9	2.9	2.5	2.4	2.4	2.3	9.6	14.4	
7.8	3.2	2.9	2.8	2.7	2.6	2.6	2.2	2.1	2.1	2.1	8.1	12.1	
7.9	2.8	2.6	2.4	2.4	2.3	2.3	2.0	1.9	1.8	1.8	6.8	10.1	
8.0	2.4	2.2	2.1	2.1	2.0	2.0	1.7	1.6	1.6	1.6	5.6	8.4	
8.1	2.1	1.9	1.8	1.8	1.7	1.7	1.5	1.4	1.4	1.4	4.6	6.9	
8.2	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.2	1.2	1.2	3.8	5.7	
8.3	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.0	1.0	1.0	3.1	4.7	

Source: Marshack 2008

Notes:

mg N/L = milligrams Nitrogen per Liter

Table C-3. Hardness-dependent Metals (dissolved) Criteria

	California Toxics Rule				
	Continuous Concentration, 4 day average (dissolved)				
Hardness	Cadmium	Copper	Lead	Silver	Zinc
mg/L as CaCO ₃	µg/L	µg/L	µg/L	µg/L	µg/L
5	0.24	0.7	0.09	0.020	9
6	0.28	0.8	0.11	0.027	11
7	0.31	0.9	0.13	0.036	12
8	0.34	1.0	0.15	0.045	14
9	0.38	1.1	0.17	0.055	15
10	0.41	1.3	0.19	0.066	17
11	0.44	1.4	0.21	0.077	18
12	0.46	1.5	0.24	0.090	20
13	0.49	1.6	0.26	0.103	21
14	0.52	1.7	0.28	0.117	22
15	0.55	1.8	0.30	0.132	24