

Attachment F1
Existing Data

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Acronyms and Abbreviations

CDEC	California Data Exchange Center
cfs	cubic feet per second
CVRWQCB	Central Valley Regional Water Quality Control Board
Delta	Sacramento-San Joaquin River Delta
DWR	California Department of Water Resources
EC	electrical conductivity
GDA	Grassland Drainage Area
SJR	San Joaquin River
SWRCB	State Water Resources Control Board
WDL	Water Data Library

Attachment F

Existing Data

F.1 Delta

Continuous electrical conductivity (EC), flow, and stage data for various locations in the Sacramento-San Joaquin River Delta (Delta) are reported by the California Department of Water Resources (DWR) via the California Data Exchange Center (CDEC 2008) and the Water Data Library (WDL, DWR 2008). The WDL also reports water quality for grab samples for locations in the southern Delta.

Measured EC, flow, and stage for southern Delta locations are presented in **Sections 2.2.1 and 2.2.3** of the Plan Formulation Report. Plots of measured EC in southern Delta compliance stations (the San Joaquin River [SJR] at Brandt Bridge, Old River at Tracy Road Bridge, and Union Island which is assumed to be equivalent to Old River near Middle River) are found in **Section 2.2.3**. Measured flow in the head of Old River as well as measure stage in the SJR at Brandt Bridge and Old River near Tracy are found in **Section 2.2.1**.

Flow and stage data for additional sites along the lower SJR (Rough & Ready Island, Rindge Pump, Mandeville Island, Antioch), Old River at Bacon Island, and Middle River east of Bacon Island are provided below. Negative flows are measured at several tidally influenced Delta sites. Flows are presented as mean daily flows in this report; however, **Figure F1-1** shows how flow fluctuates with tidal cycles. The sign of the mean daily flow (positive or negative) is indicative of the net flow direction at a given site over the course of one day. Negative mean daily flow indicates that more water flowed upstream than downstream, which may be due to southern Delta exports. Additional flow and stage data are provided on **Figures F1-2 through F1-7** for various Delta locations. Furthermore, average monthly flows by water year are presented in **Tables F1-1 through F1-4** following the graphs of mean daily flows.

Water quality data for southern Delta exports can be characterized by the water quality of Clifton Court Forebay and Banks Pumping Plant. **Tables F1-5 and F1-6** summarize WDL data for these locations.

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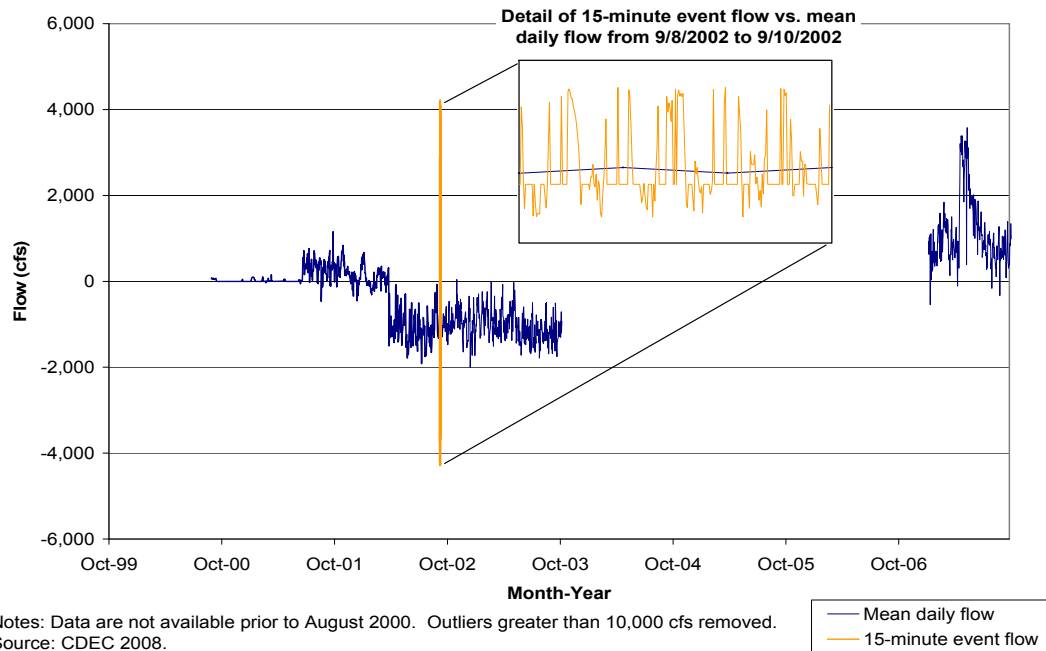


Figure F1-1. Mean Daily Flow at Rough & Ready Island (CDEC Station RRI)

Table F1-1. Average Flow (cfs) at Rough & Ready Island Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN											64	24
2001	D	0	0	3	31	11	17	20	0	143	369	245	313
2002	D	392	182	55	89	33	-82	-963	-1079	-1136	-1225	-1016	-1085
2003	BN	-973	-821	-1110	-845	-865	-937	-968	-1015	-1146	-1283	-1194	-1212
2004	D	-1062						36					
2005	W										4514		
2006	W					-4163							

Source: CDEC 2008

Key:

AN = above normal

BN = below normal

D = dry

W = wet

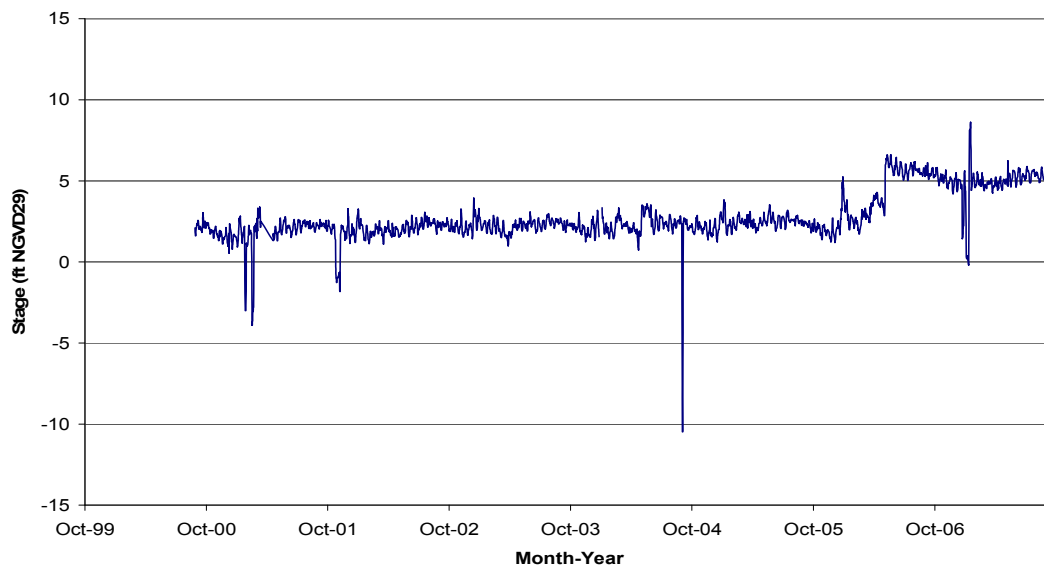
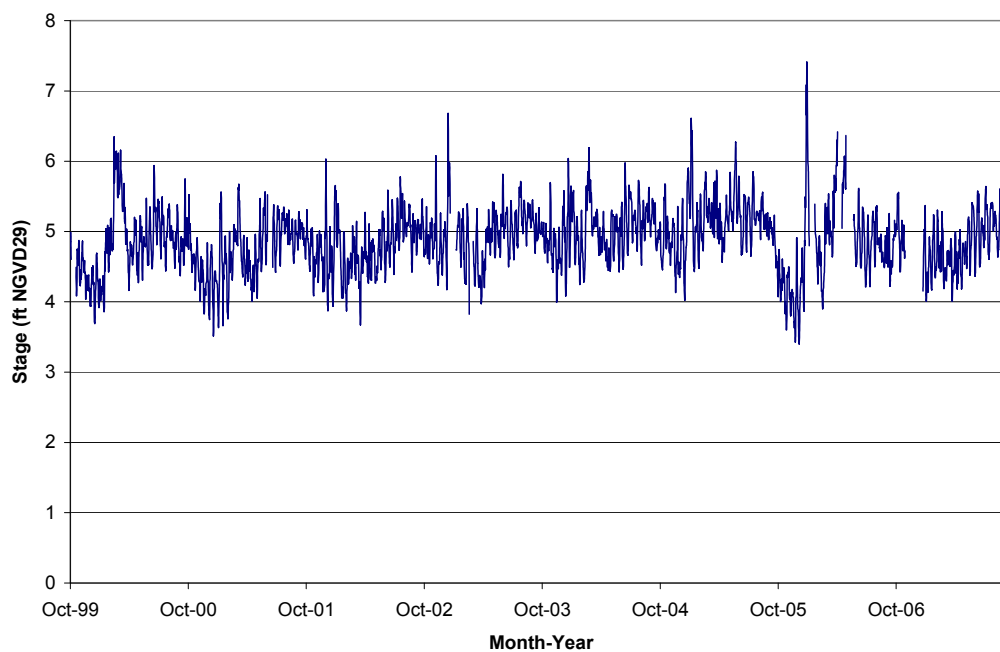


Figure F1-2. Mean Daily Stage at Rough & Ready Island (CDEC Station RRI)

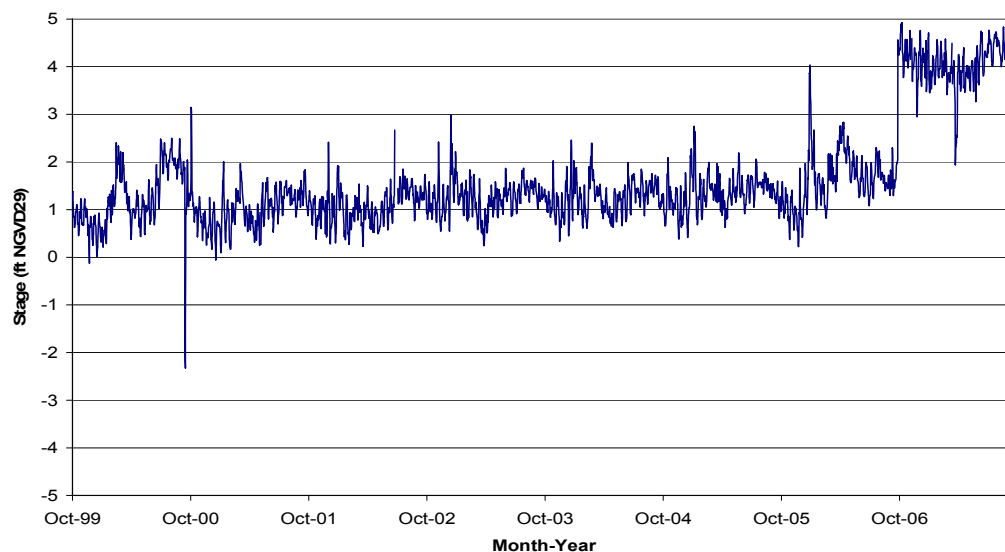


Source: DWR 2008.

Figure F1-3. Mean Daily Stage in the San Joaquin River at Rindge Pump

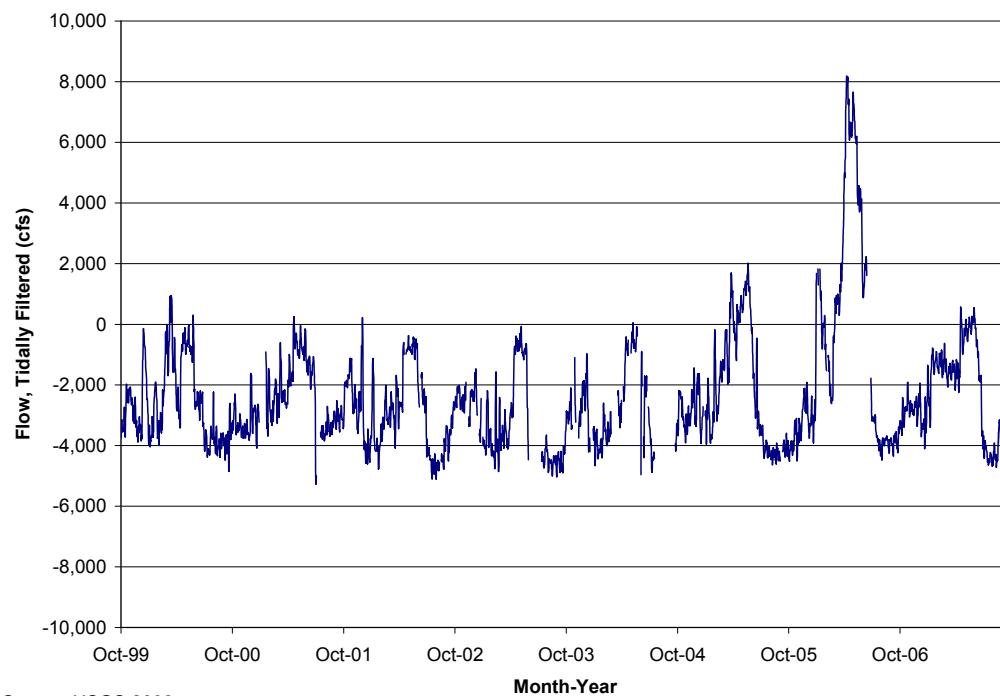
Figure F1-4. Reserved.

Table F1-2. Reserved.



Note: Values above an assumed threshold of 8 ft were considered outliers and removed from the dataset.
Source: CDEC 2008.

Figure F1-5. Mean Daily Stage in the San Joaquin River at Antioch (CDEC Station ANH)



Source: USGS 2008.

Figure F1-6. Mean Daily Flow in Old River at Bacon Island (CDEC Station OBI)

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Table F1-3. Average Flow (cfs) in Old River at Bacon Island Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	-2877	-2986	-2190	-3094	-2398	-654	-1650	-804	-2702	-3845	-3884	-3789
2001	D	-3222	-3496	-2919	-2258	-2661	-2257	-1216	-716	-1482	-3778	-3351	-3062
2002	D	-1934	-2673	-3548	-3565	-3109	-2799	-1919	-751	-2214	-4426	-4548	-3506
2003	BN	-2474	-2544	-2570	-3615	-3909	-3685	-1739	-1020	-4275	-4330	-4529	-4519
2004	D	-3084	-2670	-2646	-3979	-3476	-2749	-1501	-509	-2572	-4013		-4003
2005	W	-2978	-2829	-2742	-3171	-1963	-620	145	1106	-1762	-3905	-4289	-4159
2006	W	-3920	-3183	-3055	325	-1689	848	6246	5514	1828	-3352	-3951	-3918

Source: USGS 2008

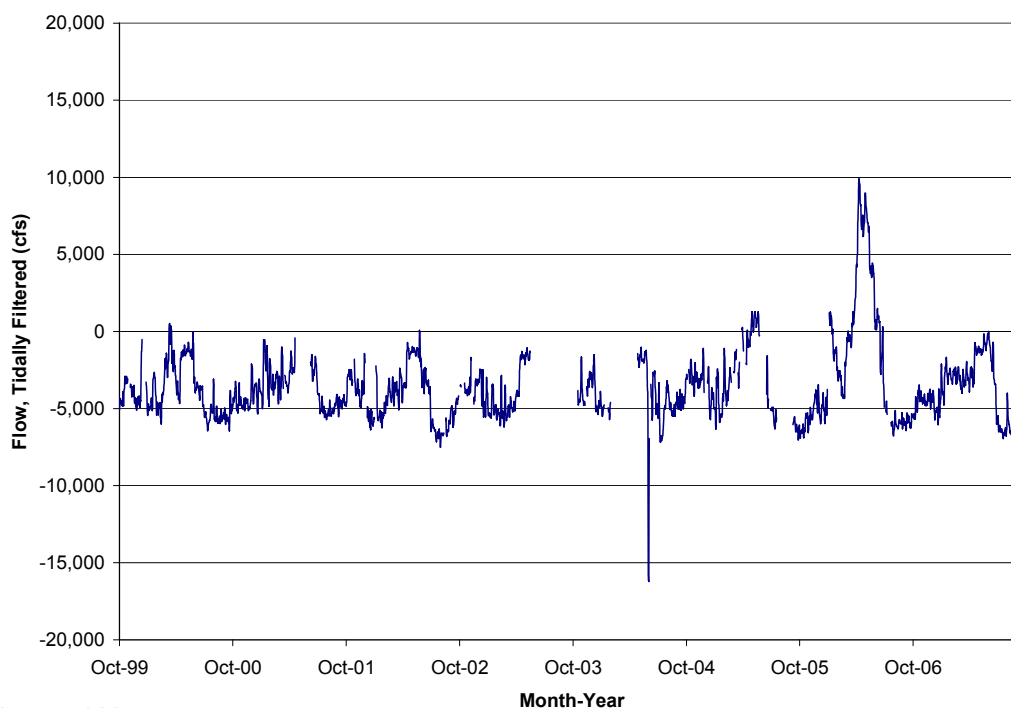
Key:

AN = above normal

BN = below normal

D = dry

W = wet



Source: USGS 2008.

Figure F1-7. Mean Daily Flow in Middle River East of Bacon Island (CDEC Station MDM)

Table F1-4. Average Flow (cfs) in Middle River East of Bacon Island Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	-3985	-4179	-3744	-4296	-4139	-1486	-2603	-1406	-3920	-5439	-5526	-5367
2001	D	-4442	-4639	-3776	-2657	-3420	-3090	-2221		-2366	-4908	-5060	-4620
2002	D	-3155	-3833	-5363	-5117	-4293	-3693	-2429	-1280	-3195	-6393	-6526	-5101
2003	BN	-3769	-3498	-3857	-4886	-5178	-5053	-2775	-1591				
2004	D	-3957	-3742	-3889	-5081	-4735		-1440	-1789	-5320	-5675	-4668	-4506
2005	W	-2984	-2906	-4135	-4731	-3356	-2283	-587	669	-3697	-5437		-6127
2006	W	-6205	-5134	-5002	-646	-3271	-296	6591	5973	204	-4923	-6007	-5912

Source: USGS 2008

Key:

AN = above normal

BN = below normal

D = dry

W = wet

Table F1-5. Water Quality at Clifton Court Forebay

Analyte	Units	Fraction Detected	Count	Min	Max	Average
Temperature	°C	1	100	6.4	26.9	16.2
Electrical Conductivity (EC)	µmhos/cm	1	75	121	906	419
Field Conductance (EC)	µmhos/cm	1	100	120	1080	420
pH	Std. Unit	1	70	5.8	8.2	7.3
Field pH	Std. Unit	1	97	5.9	9.1	7.6
Dissolved Oxygen	mg/L	1	65	6.4	10.1	8.2
Boron, dissolved	mg/L	0.57	70	0.05	0.5	0.1
Selenium, dissolved	µg/L	0.75	12	0.5	2	1
Total Suspended Solids	mg/L	0.97	73	0.5	100	13
Volatile Suspended Solids	mg/L	0.85	73	0.5	8	2
Turbidity	NTU	1	126	1	150	15
Field Turbidity	NTU	1	101	5.1	102	17
Total Organic Carbon	mg/L	1	179	1.2	22.5	4.2
Dissolved Organic Carbon	mg/L	1	131	1.1	13	3.8
Total Dissolved Solids	mg/L	1	74	75	524	227
Bromide, dissolved	mg/L	1	56	0.03	0.46	0.19
Chloride, dissolved	mg/L	1	72	9	141	63
Fluoride, dissolved	mg/L	0.03	37	0.05	0.1	0.05
Sulfate, dissolved	mg/L	1	70	10	120	30
Calcium, dissolved	mg/L	1	70	9	40	17
Magnesium, dissolved	mg/L	1	70	3	21	11
Sodium, dissolved	mg/L	1	70	10	104	43
Potassium, dissolved	mg/L	1	58	1	4	2
Total Alkalinity	mg/L as CaCO ₃	1	70	29	127	66

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Table F1-5. Water Quality at Clifton Court Forebay

Analyte	Units	Fraction Detected	Count	Min	Max	Average
Hardness	mg/L as CaCO ₃	1	16	65	186	103
Hardness, dissolved	mg/L as CaCO ₃	1	54	35	154	84
Ammonia, dissolved	mg/L as N	1	12	0.02	0.13	0.05
Total Kjeldahl Nitrogen	mg/L as N	1	12	0.3	0.8	0.4
Nitrate, dissolved	mg/L	1	70	0.6	7.6	2.7
Nitrite + Nitrate, dissolved	mg/L as N	1	12	0.21	1.55	0.73
Orthophosphate, dissolved	mg/L as P	1	12	0.04	0.08	0.05
Total Phosphorus	mg/L	1	12	0.06	0.13	0.09
Aluminum, dissolved	µg/L	0.08	12	5	11	6
Arsenic, dissolved	µg/L	1	12	2	3	2
Chromium, dissolved	µg/L	0.67	12	0.5	3	1.5
Copper, dissolved	µg/L	1	12	1	3	2
Iron, dissolved	µg/L	1	12	8	55	21
Manganese, dissolved	µg/L	0.75	12	2.5	17	9
Nickel, dissolved	µg/L	0.83	12	0.5	2	1

Source: DWR 2008.

Notes:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

CaCO₃ = calcium carbonate

mg/L = milligram(s) per liter

NTU = nephelometric turbidity unit(s)

Table F1-6. Water Quality at Banks Pumping Plant

Analyte	Units	Fraction Detected	Count	Min	Max	Average
Temperature	°C	1	99	5.8	26.7	17.0
Electrical Conductivity (EC)	µmhos/cm	1	102	125	725	399
Field Conductance (EC)	µmhos/cm	1	100	8	798	384
pH	Std. Unit	1	114	5.9	8.2	7.3
Field pH	Std. Unit	1	99	7	8.4	7.7
Dissolved Oxygen	mg/L	1	97	2	836	17
Boron, dissolved	mg/L	0.71	101	0.05	0.5	0.1
Selenium, dissolved	µg/L	0.50	101	0.5	2	1
Total Suspended Solids	mg/L	0.97	118	0.5	44	12
Volatile Suspended Solids	mg/L	0.81	118	0.5	9	2
Turbidity	NTU	1	138	3	71	12
Field Turbidity	NTU	1	97	2.9	89	13

Table F1-6. Water Quality at Banks Pumping Plant

Analyte	Units	Fraction Detected	Count	Min	Max	Average
Total Organic Carbon	mg/L	1	235	1.6	16.3	4
Dissolved Organic Carbon	mg/L	1	133	1.9	8.3	3.3
Total Dissolved Solids	mg/L	1	104	74	409	229
Bromide, dissolved	mg/L	1	101	0.03	0.52	0.19
Chloride, dissolved	mg/L	1	101	11	151	61
Fluoride, dissolved	mg/L	0.10	96	0.05	0.3	0.1
Sulfate, dissolved	mg/L	1	101	10	77	30
Calcium, dissolved	mg/L	1	101	8	30	17
Magnesium, dissolved	mg/L	1	101	4	17	11
Sodium, dissolved	mg/L	1	101	12	91	42
Total Alkalinity	mg/L as CaCO ₃	1	101	28	92	68
Hardness	mg/L as CaCO ₃	1	41	64	127	94
Hardness, dissolved	mg/L as CaCO ₃	1	60	36	141	83
Ammonia, dissolved	mg/L as N	0.98	104	0.005	0.15	0.06
Total Kjeldahl Nitrogen	mg/L as N	0.99	104	0.05	1	0.4
Nitrate, dissolved	mg/L	1	101	0.4	7	2
Nitrite + Nitrate, dissolved	mg/L as N	1	104	0.08	1.74	0.58
Orthophosphate	mg/L as P	1	53	0.04	0.15	0.07
Orthophosphate, dissolved	mg/L as P	1	51	0.03	0.16	0.06
Total Phosphorus	mg/L	1	104	0.06	0.28	0.10
Aluminum, dissolved	µg/L	0.03	96	5	40	6
Arsenic, dissolved	µg/L	0.99	101	0.5	3	2
Chromium, dissolved	µg/L	0.82	101	0.5	8	3
Chromium, hexavalent (Cr ⁶⁺), dissolved	µg/L	0.36	22	0.1	0.7	0.3
Copper, dissolved	µg/L	0.99	101	0.5	9	2
Iron, dissolved	µg/L	0.77	101	2.5	85	20
Lead, dissolved	µg/L	0.01	101	0.5	7	0.6
Manganese, dissolved	µg/L	0.86	101	2.5	36	12
Nickel	µg/L	1	1	1	1	1
Nickel, dissolved	µg/L	0.93	98	0.5	2	1
Zinc, dissolved	µg/L	0.03	101	2.5	15	3
2,4-D	µg/L	0.22	23	0.05	0.3	0.1
Chlorpyrifos	µg/L	0.04	45	0.005	0.03	0.01
Dacthal (DCPA)	µg/L	0.02	46	0.005	0.05	0.03
Diazinon	µg/L	0.05	22	0.005	0.01	0.01
Diuron	µg/L	0.30	23	0.125	1.1	0.29
Methyl tert-butyl ether (MTBE)	µg/L	0.08	98	0.5	1.9	0.6
Metolachlor	µg/L	0.09	23	0.025	0.2	0.1
Molinate	µg/L	0.14	14	0.01	0.04	0.01
Simazine	µg/L	0.32	22	0.01	0.12	0.03
Styrene	µg/L	0.01	90	0.25	0.8	0.3

Table F1-6. Water Quality at Banks Pumping Plant

Analyte	Units	Fraction Detected	Count	Min	Max	Average
Toluene	µg/L	0.06	90	0.25	3.1	0.35
Trifluralin	µg/L	0.05	22	0.005	0.01	0.01

Source: DWR 2008.

Note:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

CaCO₃ = calcium carbonate

mg/L = milligram(s) per liter

NTU = nephelometric turbidity unit(s)

F.1.1 Mainstem San Joaquin River

San Joaquin River at Airport Way (Vernalis)

Major tributaries including the Merced, Tuolumne, and Stanislaus rivers as well as westside inputs contribute to water quality and flow at this site. Water quality at Vernalis is often better than at other mainstem locations because it is just downstream of the SJR confluence with the Stanislaus River.

Vernalis is a State Water Resources Control Board (SWRCB) Water Rights Decision 1641 compliance site for EC. The SWRCB under Clean Water Act Section 303(d) has also listed this stretch of the SJR as an impaired water body for EC, boron, mercury, and pesticides. **Table F1-7** summarizes water quality data collected by the Central Valley Regional Water Quality Control Board (CVRWQCB) during Water Years 2000–2007.

Table F1-7. Water Quality Summary – San Joaquin River at Vernalis, Station SJC501

Analyte	Range (WY)	Units	Count	Min	Max	Average
Temperature	2000–2007	°C	419	6.6	28.5	17.3
Field Conductivity (EC)	2000–2007	µmhos/cm	420	97	1200	617
Electrical Conductivity (EC)	2000–2002	µmhos/cm	95	210	1070	612
pH	2000–2007	Std. Unit	416	6.1	9.1	7.9
Dissolved Oxygen	2001–2007	mg/L	319	1.3	19.3	10.9
Boron	2000–2007	mg/L	404	0.025	0.9	0.3
Selenium	2000–2007	µg/L	413	0.2	2.8	0.9
Total Suspended Solids	2001–2003, 2005–2007	mg/L	242	7	160	40
Turbidity	2002–2004	NTU	54	12.3	86.6	35.2
Total Organic Carbon	2001–2007	mg/L	233	0.5	18	4.1
Total Coliforms	2002–2007	MPN/100 mL	86	457	>2420	2230
<i>E. coli</i>	2002–2007	MPN/100 mL	86	16	>2420	210
Chloride	2000–2003	mg/L	33	18	400	93
Sulfate	2000–2003	mg/L	36	19	470	94
Hardness	2000–2003	mg/L	35	77	250	155
Calcium	2000–2003	mg/L	36	17	52	34
Magnesium	2000–2003	mg/L	36	8	29	18
Total Dissolved Solids	2000–2003	mg/L	30	160	630	400
Carbonate	2000–2003	mg/L	32	0.5	4	0.6
Bicarbonate	2000–2003	mg/L	31	50	150	120
Total Alkalinity	2000–2003	mg/L	30	52	130	100
Sodium	2000–2003	mg/L	32	28	130	78
Nitrate	2000–2003	mg/L	27	3.8	12	8.4
Total Kjeldahl Nitrogen	2000–2003	mg/L as N	34	0.2	1.9	0.9
Ammonia	2000–2001	mg/L as N	3	0.5	0.5	0.5
Phosphorus	2000–2003	mg/L	36	0.025	0.4	0.2
Orthophosphate	2000–2003	mg/L as P	39	0.015	0.5	0.4
Potassium	2000–2003	mg/L	41	2.1	8.1	4.5
BOD, 5-Day	2002–2003	mg/L	41	0.7	5.1	1.7
BOD, 10-Day	2002–2003	mg/L	41	1.3	8.5	3.0
Arsenic	2001–2003	µg/L	22	1.0	4.9	2.2
Cadmium	2001–2003	µg/L	21	0.05	0.5	0.2
Chromium	2000–2003	µg/L	50	0.5	3.2	1.7
Copper	2000–2003	µg/L	48	0.5	9.4	3.0
Lead	2000–2003	µg/L	50	2.5	2.5	2.5
Nickel	2000–2003	µg/L	50	2.5	12	2.9
Zinc	2000–2003	µg/L	48	1	22	4.5
Mercury	2001–2003	µg/L	21	0.1	0.1	0.1
Arsenic, dissolved	2001–2003	µg/L	18	1	3	2
Cadmium, dissolved	2001–2003	µg/L	18	0.05	0.5	0.2
Chromium, dissolved	2001–2003	µg/L	28	0.5	0.5	0.5
Copper, dissolved	2001–2003	µg/L	27	0.5	3.4	1.0
Lead, dissolved	2001–2003	µg/L	28	2.5	2.5	2.5

Table F1-7. Water Quality Summary – San Joaquin River at Vernalis, Station SJC501

Analyte	Range (WY)	Units	Count	Min	Max	Average
Nickel, dissolved	2001–2003	µg/L	28	2.5	12	2.8
Zinc, dissolved	2001–2003	µg/L	27	1	21	2.2
Mercury, dissolved	2001–2003	µg/L	17	0.1	0.1	0.1

Source: CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets comprised entirely of nondetect data are in bold. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

mg/L = milligram(s) per liter

mL = milliliter(s)

MPN = most probable number

NTU = nephelometric turbidity unit(s)

OD = biological oxygen demand

WY = Water Year

San Joaquin River at Highway 132 (Maze Boulevard)

This site is just upstream of the SJR confluence with the Stanislaus River, and downstream of the confluence with the Tuolumne River. Water quality and water quantity at this site is poor and lower, respectively, than that found just downstream at Vernalis. The SWRCB, acting under Clean Water Act Section 303(d), has listed this stretch of the SJR as an impaired water body for EC, boron, mercury, and pesticides. **Table F1-8** summarizes water quality data collected by the Central Valley Regional Water Quality Control Board (CVRWQCB) during Water Years 2000–2007.

Table F1-8. Water Quality Summary – San Joaquin River at Maze, Station STC510

Analyte	Range (WY)	Units	Count	Min	Max	Average
Temperature	2000–2007	°C	416	7	28.7	17.7
Field Conductivity (EC)	2000–2007	µmhos/cm	416	100	1410	777
Electrical Conductivity (EC)	2000–2002	µmhos/cm	93	238	1300	752
pH	2000–2007	Std. Unit	412	6.7	9	7.9
Dissolved Oxygen	2001–2007	mg/L	317	4.1	25.7	10.8
Boron	2000–2007	mg/L	401	0.025	1.1	0.5
Selenium	2000–2007	µg/L	411	0.2	3.6	1.2
Total Suspended Solids	2000–2003, 2005–2007	mg/L	232	8	160	43
Turbidity	2002–2004	NTU	54	12.4	82	39.9
Total Organic Carbon	2001–2007	mg/L	226	0.5	16	4.6
Total Coliforms	2002–2007	MPN/100 mL	86	517	>2420	2310
<i>E. coli</i>	2002–2007	MPN/100 mL	86	3	>2420	222

Table F1-8. Water Quality Summary – San Joaquin River at Maze, Station STC510

Analyte	Range (WY)	Units	Count	Min	Max	Average
Chloride	2000–2003	mg/L	22	19	180	99
Sulfate	2000–2003	mg/L	24	21	200	100
Hardness	2000–2003	mg/L	27	95	280	180
Calcium	2000–2003	mg/L	24	21	59	39
Magnesium	2000–2003	mg/L	24	10	33	21
Total Dissolved Solids	2000–2002	mg/L	15	220	690	490
Carbonate	2000–2002	mg/L	15	0.5	0.5	0.5
Bicarbonate	2000–2002	mg/L	14	68	290	150
Total Alkalinity	2000–2002	mg/L	13	70	240	130
Sodium	2000–2002	mg/L	15	38	140	100
Nitrate	2000–2002	mg/L	23	5.8	15	10
Total Kjeldahl Nitrogen	2000–2001	mg/L as N	22	0.5	1.2	1.0
Ammonia	2000–2001	mg/L as N	3	0.5	0.5	0.5
Phosphorus	2000–2002	mg/L	24	0.05	0.4	0.2
Orthophosphate	2000–2002	mg/L as P	25	0.1	0.5	0.5
Potassium	2000–2002	mg/L	26	2.5	7.2	5.3
BOD, 5-Day	2001–2003	mg/L	39	0.9	6.3	2.1
BOD, 10-Day	2001–2003	mg/L	39	1.7	12.6	3.7
Arsenic	2001–2003	µg/L	21	2	4.8	2.5
Cadmium	2001–2003	µg/L	20	0.05	0.5	0.2
Chromium	2000–2003	µg/L	31	0.5	4.8	2.2
Copper	2000–2003	µg/L	29	0.5	4.6	3.0
Lead	2000–2003	µg/L	31	2.5	2.5	2.5
Nickel	2000–2003	µg/L	31	2.5	8.8	3.5
Zinc	2000–2003	µg/L	30	1	10	4.6
Mercury	2001–2003	µg/L	20	0.1	0.1	0.1
Arsenic, dissolved	2001–2003	µg/L	17	2	3.3	2.1
Cadmium, dissolved	2001–2003	µg/L	17	0.05	0.5	0.2
Chromium, dissolved	2001–2003	µg/L	25	0.5	1.9	0.6
Copper, dissolved	2001–2003	µg/L	24	0.5	3.2	1.0
Lead, dissolved	2001–2003	µg/L	25	2.5	2.5	2.5
Nickel, dissolved	2001–2003	µg/L	25	2.5	2.5	2.5
Zinc, dissolved	2001–2003	µg/L	24	1	6.5	1.4
Mercury, dissolved	2001–2003	µg/L	16	0.1	0.1	0.1

Source: CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets comprised entirely of nondetect data are in bold. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

BOD = biological oxygen demand

mg/L = milligram(s) per liter mL = milliliter(s) per liter

MPN = most probable number

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NTU = nephelometric turbidity unit(s) WY = Water Year

San Joaquin River at Patterson Fishing Access

Water quality at this site is similar to that at Crows Landing Bridge, with the additional influence of a few agricultural discharges to the river. The SWRCB under Clean Water Act Section 303(d) has listed this stretch of the SJR as an impaired water body for EC, boron, mercury, and pesticides. **Table F1-9** summarizes water quality data collected by the CVRWQCB during Water Years 2000–2007.

Table F1-9. Water Quality Summary – San Joaquin River at Patterson, Station STC507

Analyte	Range (WY)	Units	Count	Min	Max	Average
Temperature	2001–2007	°C	369	6.8	28.5	18.1
Field Conductivity (EC)	2000–2007	µmhos/cm	370	118	1820	1080
Electrical Conductivity (EC)	2000–2002	µmhos/cm	93	330	1800	1110
pH	2000–2007	Std. Unit	366	6.6	8.6	7.8
Dissolved Oxygen	2001–2007	mg/L	272	7	18.6	10.2
Boron	2000–2007	mg/L	361	0.025	1.5	0.7
Selenium	2000–2007	µg/L	365	0.2	5.5	2.1
Total Suspended Solids	2001–2003, 2005–2007	mg/L	221	9	170	44
Turbidity	2002–2004	NTU	56	4.6	170	45.3
Total Organic Carbon	2001–2007	mg/L	212	0.5	22	6.1
Total Coliforms	2002–2007	MPN/100 mL	70	1011	>2420	2384
<i>E. coli</i>	2002–2007	MPN/100 mL	70	24	>2420	276
Chloride	2000–2003	mg/L	23	57	240	150
Sulfate	2000–2003	mg/L	25	78	280	180
Hardness	2000–2003	mg/L	28	130	350	250
Calcium	2000–2003	mg/L	25	29	74	55
Magnesium	2000–2003	mg/L	25	14	41	28
Total Dissolved Solids	2000–2002	mg/L	16	330	1100	710
Carbonate	2000–2002	mg/L	16	0.5	0.5	0.5
Bicarbonate	2000–2002	mg/L	15	80	220	160
Total Alkalinity	2000–2002	mg/L	14	72	180	140
Sodium	2000–2002	mg/L	16	60	200	150
Nitrate	2000–2002	mg/L	24	5	18	13
Total Kjeldahl Nitrogen	2000–2002	mg/L as N	23	0.5	2.1	1.0
Ammonia	2000–2001	mg/L as N	3	0.5	0.5	0.5
Phosphorus	2000–2002	mg/L	25	0.2	0.5	0.3
Orthophosphate	2000–2002	mg/L as P	27	0.1	0.5	0.5

Table F1-9. Water Quality Summary – San Joaquin River at Patterson, Station STC507

Analyte	Range (WY)	Units	Count	Min	Max	Average
Potassium	2000–2002	mg/L	28	3.2	9.3	6.9
BOD, 5-Day	2001–2003	mg/L	40	1.1	5.8	2.5
BOD, 10-Day	2001–2003	mg/L	40	2.1	11.2	4.7
Arsenic	2001–2003	µg/L	22	2	6.6	3.1
Cadmium	2001–2003	µg/L	21	0.05	0.5	0.2
Chromium	2000–2003	µg/L	32	0.5	4.8	2.3
Copper	2000–2003	µg/L	30	0.5	4.8	3.0
Lead	2000–2003	µg/L	32	2.5	2.5	2.5
Nickel	2000–2003	µg/L	32	2.5	7.1	3.2
Zinc	2000–2003	µg/L	31	1	10	4.9
Mercury	2001–2003	µg/L	21	0.1	0.1	0.1
Arsenic, dissolved	2001–2003	µg/L	18	2	5.4	2.6
Cadmium, dissolved	2001–2003	µg/L	18	0.05	0.5	0.2
Chromium, dissolved	2001–2003	µg/L	26	0.5	0.5	0.5
Copper, dissolved	2001–2003	µg/L	25	0.5	4.6	1.3
Lead, dissolved	2001–2003	µg/L	26	2.5	2.5	2.5
Nickel, dissolved	2001–2003	µg/L	26	2.5	8.2	2.7
Zinc, dissolved	2001–2003	µg/L	25	1	4.2	1.6
Mercury, dissolved	2001–2003	µg/L	17	0.1	0.1	0.1

Source: CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets comprised entirely of nondetect data are in bold. Total coliform and E. coli samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

°C = degrees Celsius

µg/L = microgram(s) per liter

µmhos/cm = micromhos per centimeter

BOD = biological oxygen demand

mg/L = milligram(s) per liter

mL = milliliter(s)

MPN = most probable number \

NTU = nephelometric turbidity unit(s)

WY = Water Year

San Joaquin River at Crows Landing (Turlock Sports Club)

Downstream of the Merced River confluence, the SJR at Crows Landing is a CVRWQCB compliance point for selenium. This site represents the SJR as influenced by the Grassland Drainage Area (GDA) discharges and diluted by the Merced River flow. Water quality at this site is better than upstream stations, because the Merced River and Orestimba Creek drain to

the SJR upstream of this station. **Table F1-10** summarizes water quality data collected by the CVRWQCB during Water Years 2000–2007.

Table F1-10. Water Quality Summary – San Joaquin River at Crows Landing, Station STC504

Analyte	Range (WY)	Units	Count	Min	Max	Average
Conductivity (EC), autosampler	2000–2007	µmhos/cm	2502	124	1970	1110
Boron, autosampler	2000–2007	mg/L	2422	0.06	1.6	0.8
Selenium, autosampler	2000–2007	µg/L	2496	0.2	6.8	2.4
Temperature	2000–2007	°C	416	5.9	28.4	17.5
Field Conductivity (EC)	2000–2007	µmhos/cm	416	100	1900	1080
Electrical Conductivity (EC)	2000	µmhos/cm	94	320	1830	1090
pH	2000–2007	Std.Unit	412	5.8	9.5	7.8
Dissolved Oxygen	2001–2007	mg/L	320	5.1	16.8	9.8
Boron	2000–2007	mg/L	396	0.025	1.7	0.8
Selenium	2000–2007	µg/L	406	0.2	6	2.3
Total Suspended Solids	2000–2003, 2005–2007	mg/L	236	5	120	45
Turbidity	2002–2004	NTU	56	0.8	273	53.0
Total Organic Carbon	2001–2007	mg/L	232	0.5	15	5.9
Total Coliforms	2002–2007	MPN/100 mL	86	665	>2420	2340
<i>E. coli</i>	2002–2007	MPN/100 mL	86	22	>2420	192
Chloride	2000–2003	mg/L	32	49	250	150
Sulfate	2000–2003	mg/L	35	49	310	200
Hardness	2000–2003	mg/L	35	91	380	250
Calcium	2000–2003	mg/L	35	20	78	55
Magnesium	2000–2003	mg/L	35	10	45	29
Total Dissolved Solids	2000–2003	mg/L	29	220	1100	680
Carbonate	2000–2003	mg/L	31	0.5	0.5	0.5
Bicarbonate	2000–2003	mg/L	30	72	230	160
Total Alkalinity	2000–2003	mg/L	29	60	190	140
Sodium	2000–2003	mg/L	31	41	250	150
Nitrate	2000–2004	mg/L	43	4.2	23	13
Nitrate–N	2004–2007	mg/L as N	55	0.1	4.5	1.9
Total Kjeldahl Nitrogen	2000–2007	mg/L as N	103	0.1	3	0.9
Ammonia	2000–2007	mg/L as N	38	0.1	0.6	0.2
Phosphorus	2000–2007	mg/L	97	0.05	0.4	0.2
Orthophosphate	2000–2007	mg/L as P	113	0.015	11	0.4
Potassium	2000–2004	mg/L	61	2.6	10	6.4
BOD, 5-Day	2001–2003	mg/L	40	0.7	4.1	1.9
BOD, 10-Day	2001–2003	mg/L	40	1.4	6.6	3.4
Arsenic	2001–2003	µg/L	24	2	7	3.1
Cadmium	2001–2003	µg/L	23	0.05	0.5	0.2
Chromium	2000–2003	µg/L	52	0.5	43	3.4
Copper	2000–2003	µg/L	50	0.5	6.4	3.4
Lead	2000–2003	µg/L	52	2.5	2.5	2.5
Nickel	2000–2003	µg/L	52	2.5	7.5	3.2

Table F1-10. Water Quality Summary – San Joaquin River at Crows Landing, Station STC504

Analyte	Range (WY)	Units	Count	Min	Max	Average
Zinc	2000–2003	µg/L	51	1	14	5.0
Mercury	2001–2003	µg/L	23	0.1	0.1	0.1
Arsenic, dissolved	2001–2003	µg/L	18	1	4.6	2.4
Cadmium, dissolved	2001–2003	µg/L	18	0.05	0.5	0.2
Chromium, dissolved	2001–2003	µg/L	26	0.5	0.5	0.5
Copper, dissolved	2001–2003	µg/L	25	0.5	2.2	1.0
Lead, dissolved	2001–2003	µg/L	26	2.5	2.5	2.5
Nickel, dissolved	2001–2003	µg/L	26	2.5	2.5	2.5
Zinc, dissolved	2001–2003	µg/L	25	1	4.8	1.5
Mercury, dissolved	2001–2003	µg/L	17	0.1	0.1	0.1

Source: CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets comprised entirely of nondetect data are in bold. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter
°C = degrees Celsius
µg/L = microgram(s) per liter
BOD = biological oxygen demand
mg/L = milligram(s) per liter
mL = milliliter(s)
MPN = most probable number
NTU = nephelometric turbidity unit(s)
WY = Water Year

San Joaquin River South of Merced River Confluence (Hills Ferry Bridge)

The agricultural drainage that discharges into the SJR at the confluence of Mud Slough travels about 3 miles before it is diluted by the incoming Merced River. Flows in this region are composed of subsurface agricultural drainage, wetland drainage, and some surface runoff from the Grassland area, as well as wet season inflows from Merced River flood channels. Water at this site is often elevated with respect to salt, selenium, and boron. **Table F1-11** summarizes water quality data collected by the CVRWQCB during Water Years 2000–2007.

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Table F1-11. Water Quality Summary – San Joaquin River at Hills Ferry, Station STC512

Analyte	Range (WY)	Units	Count	Min	Max	Average
Temperature	2000–2007	°C	117	5.6	29	18.4
Field Conductivity (EC)	2000–2007	µmhos/cm	117	220	3080	1690
Electrical Conductivity (EC)	2000–2002	µmhos/cm	26	695	2450	1740
pH	2000–2007	Std. Unit	114	6.6	8.3	7.8
Dissolved Oxygen	2001–2007	mg/L	92	3.9	24.4	9.7
Boron	2000–2007	mg/L	76	0.2	2.6	1.3
Selenium	2000–2002, 2004–2007	µg/L	56	0.5	9.6	3.9
Total Suspended Solids	2001	mg/L	6	34	150	76
Turbidity	2002–2004	NTU	18	27.5	194	91
Total Organic Carbon	2001–2007	mg/L	44	0.5	16	8
Total Coliforms	2002–2006	MPN/100 mL	32	1986	>2420	2410
<i>E. coli</i>	2002–2006	MPN/100 mL	32	27	>2420	324
Chloride	2000–2003	mg/L	26	160	460	290
Sulfate	2000–2003	mg/L	25	180	550	370
Hardness	2000–2003	mg/L	26	270	600	420
Calcium	2000–2003	mg/L	26	56	130	89
Magnesium	2000–2003	mg/L	26	31	68	49
Total Dissolved Solids	2001–2003	mg/L	15	150	1700	1100
Carbonate	2000–2003	mg/L	23	0.5	4	0.7
Bicarbonate	2000–2003	mg/L	23	150	290	230
Total Alkalinity	2000–2003	mg/L	23	150	240	200
Sodium	2000–2003	mg/L	23	160	370	280
Nitrate	2001–2002	mg/L	11	3.4	19	9.3
Total Kjeldahl Nitrogen	2001–2003	mg/L as N	21	0.2	2.6	1.1
Phosphorus	2001–2003	mg/L	19	0.1	0.4	0.3
Orthophosphate	2001–2003	mg/L as P	23	0.015	0.5	0.3
Potassium	2000–2003	mg/L	22	1.4	13	9.0
BOD, 5-Day	2001–2003	mg/L	22	1.7	5.4	3.1
BOD, 10-Day	2001–2003	mg/L	22	2.7	10.1	5.6
Arsenic	2001–2003	µg/L	16	2	9.4	4.9
Cadmium	2001–2003	µg/L	16	0.05	0.5	0.1
Chromium	2000–2003	µg/L	25	0.5	10	3.8
Copper	2000–2003	µg/L	24	0.5	7.5	3.6
Lead	2000–2003	µg/L	26	2.5	2.5	2.5
Nickel	2000–2003	µg/L	25	2.5	13	6.1
Zinc	2000–2003	µg/L	25	1	19	7.5
Mercury	2001–2003	µg/L	14	0.1	0.1	0.1
Arsenic, dissolved	2001–2003	µg/L	12	2	5.3	3.4
Cadmium, dissolved	2001–2003	µg/L	12	0.05	0.5	0.1
Chromium, dissolved	2001–2003	µg/L	19	0.5	3.2	0.6
Copper, dissolved	2001–2003	µg/L	19	0.5	4	1.3
Lead, dissolved	2001–2003	µg/L	20	2.5	2.5	2.5
Nickel, dissolved	2001–2003	µg/L	20	2.5	2.5	2.5

Table F1-11. Water Quality Summary – San Joaquin River at Hills Ferry, Station STC512

Analyte	Range (WY)	Units	Count	Min	Max	Average
Zinc, dissolved	2001–2003	µg/L	19	1	6.1	1.5
Mercury, dissolved	2001–2003	µg/L	11	0.1	0.1	0.1

Source: CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets comprised entirely of nondetect data are in bold. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

BOD = biological oxygen demand

mg/L = milligram(s) per liter

mL = milliliter(s)

MPN = most probable number

NTU = nephelometric turbidity unit(s)

WY = Water Year

San Joaquin River at Fremont Ford (Highway 140)

This portion of the SJR is located between the confluences of Mud Slough and Salt Slough with the SJR. Drainage discharges to this section of the SJR originate from Salt Slough, i.e., drainage from non-GDA farmland and wetlands. Water quality at this site usually has elevated salinity levels. **Table F1-12** summarizes water quality data collected by the CVRWQCB during Water Years 2000–2007.

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Table F1-12. Water Quality Summary – San Joaquin River at Fremont Ford, Station MER538

Analyte	Range (WY)	Units	Count	Min	Max	Average
Temperature	2000–2007	°C	402	5	29.3	17.4
Field Conductivity (EC)	2000–2007	µmhos/cm	401	75	3830	1390
Electrical Conductivity (EC)	2000–2002	µmhos/cm	93	295	2560	1390
pH	2000–2007	Std. Unit	397	6.3	8.5	7.6
Dissolved Oxygen	2001–2007	mg/L	307	1.6	50.2	9.8
Boron	2000–2007	mg/L	387	0.025	1.4	0.6
Selenium	2000–2007	µg/L	398	0.2	1.6	0.5
Total Suspended Solids	2001–2003, 2005–2007	mg/L	214	1	180	71
Turbidity	2002–2004	NTU	58	12.3	1410	99
Total Organic Carbon	2001–2007	mg/L	220	0.5	22	7
Total Coliforms	2002–2007	MPN/100 mL	82	0.5	>2420	2260
<i>E. coli</i>	2002–2007	MPN/100 mL	82	0.5	>2420	195
Chloride	2000–2003	mg/L	32	94	440	240
Sulfate	2000–2003	mg/L	33	97	330	190
Hardness	2000–2003	mg/L	33	180	460	310
Calcium	2000–2003	mg/L	34	38	96	65
Magnesium	2000–2003	mg/L	34	4	53	35
Total Dissolved Solids	2000–2003	mg/L	22	590	1400	950
Carbonate	2000–2003	mg/L	25	0.5	0.5	0.5
Bicarbonate	2000–2003	mg/L	24	140	270	210
Total Alkalinity	2000–2003	mg/L	23	140	220	180
Sodium	2000–2003	mg/L	25	120	310	210
Nitrate	2000–2004	mg/L	41	1	16	5.8
Nitrate as N	2004–2007	mg/L	47	0.1	3.7	1.1
Total Kjeldahl Nitrogen	2000–2007	mg/L as N	97	0.1	3	1.1
Ammonia	2000, 2004–2007	mg/L as N	34	0.1	0.8	0.2
Phosphorus	2000–2007	mg/L	93	0.1	0.7	0.3
Orthophosphate	2000–2007	mg/L as P	107	0.015	0.5	0.3
Potassium	2000–2004	mg/L	60	3.3	12	8.2
BOD, 5-Day	2001–2003	mg/L	41	1.3	4.6	2.6
BOD, 10-Day	2001–2003	mg/L	41	2.5	6.8	4.5
Arsenic	2001–2003	µg/L	22	2	8.6	5.4
Cadmium	2001–2003	µg/L	22	0.05	1	0.2
Chromium	2000–2003	µg/L	33	0.5	6.8	2.8
Copper	2000–2003	µg/L	32	0.5	7	3.9
Lead	2000–2003	µg/L	33	2.5	2.5	2.5
Nickel	2000–2003	µg/L	32	2.5	9.5	4.6
Zinc	2000–2003	µg/L	33	1	22	8.8
Mercury	2001–2003	µg/L	21	0.1	0.1	0.1
Arsenic, dissolved	2001–2003	µg/L	18	2	4.9	3.2
Cadmium, dissolved	2001–2003	µg/L	18	0.05	0.5	0.2
Chromium, dissolved	2001–2003	µg/L	26	0.5	1.5	0.5
Copper, dissolved	2001–2003	µg/L	25	0.5	3.2	1.3

Table F1-12. Water Quality Summary – San Joaquin River at Fremont Ford, Station MER538

Analyte	Range (WY)	Units	Count	Min	Max	Average
Lead, dissolved	2001–2003	µg/L	26	2.5	2.5	2.5
Nickel, dissolved	2001–2003	µg/L	26	2.5	2.5	2.5
Zinc, dissolved	2001–2003	µg/L	25	1	8.2	1.7
Mercury, dissolved	2001–2003	µg/L	17	0.1	0.1	0.1

Source: CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets comprised entirely of nondetect data are in bold. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter
 °C = degrees Celsius
 µg/L = microgram(s) per liter
 BOD = biological oxygen demand
 mg/L = milligram(s) per liter
 mL = milliliter(s)
 MPN = most probable number
 NTU = nephelometric turbidity unit(s)
 WY = Water Year

San Joaquin River at Lander Avenue

Upstream of Salt Slough the SJR receives drainage from eastside tributaries including Fresno River and Bear Creek, as well as return flows from agricultural districts including San Luis Canal Company, and Central California Irrigation District. Also included are occasional releases of floodwater from Friant. In low-flow periods, a significant portion of the river flow will consist of surface runoff from irrigated areas. Water quality at this site shows natural background levels or good quality surface runoff from irrigated agriculture. **Table F1-13** summarizes water quality data collected by the CVRWQCB during Water Years 2000–2007.

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Table F1-13. Water Quality Summary – San Joaquin River at Lander Avenue, Station MER522

Analyte	Range (WY)	Units	Count	Min	Max	Average
Temperature	2000–2007	°C	421	6.2	32.1	17.9
Field Conductivity (EC)	2000–2007	µmhos/cm	421	47	2260	1130
Electrical Conductivity (EC)	2000–2007	µmhos/cm	96	160	2030	1120
pH	2000–2007	Std. Unit	414	6.3	9	7.9
Dissolved Oxygen	2001–2007	mg/L	321	3.4	23.3	10.2
Boron	2000–2007	mg/L	392	0.025	0.8	0.2
Selenium	2000–2007	µg/L	403	0.025	0.9	0.2
Total Suspended Solids	2001–2003, 2005–2007	mg/L	232	14	130	32
Turbidity	2002–2004	NTU	61	12.9	114	30.0
Total Organic Carbon	2001–2007	mg/L	232	0.5	27	7.6
Total Coliforms	2002–2007	MPN/100 mL	87	192	>2420	2210
<i>E. coli</i>	2003–2007	MPN/100 mL	86	5	>2420	204
Chloride	2000–2003	mg/L	26	10	390	230
Sulfate	2000–2003	mg/L	26	12	210	100
Hardness	2000–2003	mg/L	30	72	430	240
Calcium	2000–2003	mg/L	27	15	96	54
Magnesium	2000–2003	mg/L	27	8	46	25
Total Dissolved Solids	2000–2002	mg/L	17	200	1200	790
Carbonate	2000–2002	mg/L	18	0.5	13	1.2
Bicarbonate	2000–2002	mg/L	18	120	300	230
Total Alkalinity	2000–2002	mg/L	18	99	260	190
Sodium	2000–2002	mg/L	18	35	320	200
Nitrate	2000–2002	mg/L	26	1	17	4.2
Total Kjeldahl Nitrogen	2000–2002	mg/L as N	25	0.5	6.7	1.8
Phosphorus	2000–2002	mg/L	27	0.2	0.5	0.3
Orthophosphate	2000–2002	mg/L as P	28	0.015	0.5	0.5
Potassium	2000–2002	mg/L	30	3.7	10	7.7
BOD, 5-Day	2001–2003	mg/L	42	1.6	9.2	5.6
BOD, 10-Day	2001–2003	mg/L	42	3.1	17.2	9.9
Arsenic	2001–2003	µg/L	21	2	13	8.4
Cadmium	2001–2003	µg/L	21	0.05	0.5	0.2
Chromium	2000–2003	µg/L	51	0.5	5.8	1.0
Copper	2000–2003	µg/L	51	0.5	9.2	2.5
Lead	2000–2003	µg/L	51	2.5	2.5	2.5
Nickel	2000–2003	µg/L	50	2.5	7.5	2.7
Zinc	2000–2003	µg/L	48	1	16	3.7
Mercury	2001–2003	µg/L	19	0.1	0.1	0.1
Arsenic, dissolved	2001–2003	µg/L	17	2	11	6.4
Cadmium, dissolved	2001–2003	µg/L	17	0.05	0.5	0.2
Chromium, dissolved	2001–2003	µg/L	27	0.5	0.5	0.5
Copper, dissolved	2001–2003	µg/L	27	0.5	3	1
Lead, dissolved	2001–2003	µg/L	27	2.5	2.5	2.5

Table F1-13. Water Quality Summary – San Joaquin River at Lander Avenue, Station MER522

Analyte	Range (WY)	Units	Count	Min	Max	Average
Nickel, dissolved	2001–2003	µg/L	27	2.5	2.5	2.5
Zinc, dissolved	2001–2003	µg/L	27	1	7.8	1.6
Mercury, dissolved	2001–2003	µg/L	15	0.1	0.1	0.1

Source: CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets comprised entirely of nondetect data are in bold. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

BOD = biological oxygen demand

mg/L = milligram(s) per liter

mL = milliliter(s)

MPN = most probable number

NTU = nephelometric turbidity unit(s)

WY = Water Year

F.1.2 Eastside and Westside Tributaries

Merced River

The southern-most major eastside tributary is the Merced River. Recent flow and stage data for the Merced River near Stevenson (CDEC station ID MST) are shown on **Figures F1-8 and F1-9**. Average monthly flows are shown in **Table F1-14**. Water quality data collected by the CVRWQCB during water years 2000 to 2007 are summarized in **Table F1-15**. Samples that were not detected are represented as one-half of the reporting limit. Water quality parameters that were not detected since Water Year 2000 are not included in the tables.

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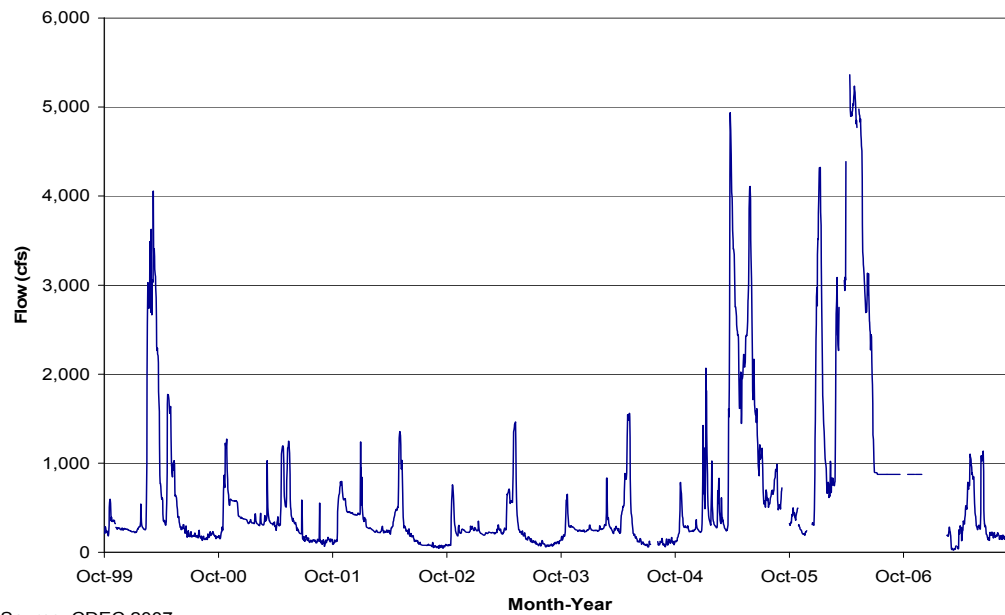


Figure F1-8. Mean Daily Flow in the Merced River Near Stevinson (CDEC Station MST)

Table F1-14. Average Flow (cfs) in the Merced River Near Stevinson Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	328	278	250	275	1646	2368	904	711	243	189	161	192
2001	D	575	580	392	344	331	383	584	682	265	136	137	128
2002	D	376	524	471	383	238	237	364	647	171	88	74	65
2003	BN	288	233	246	233	217	235	479	667	170	102	85	98
2004	D	292	267	242	253	326	278	459	724	117	83	102	112
2005	W	311	260	283	793	402	1098	2887	2425	1958	774	707	575
2006	W	401	246	1077	2619	758	2495	4675	4569	2595	906	874	874

Source: CDEC 2008

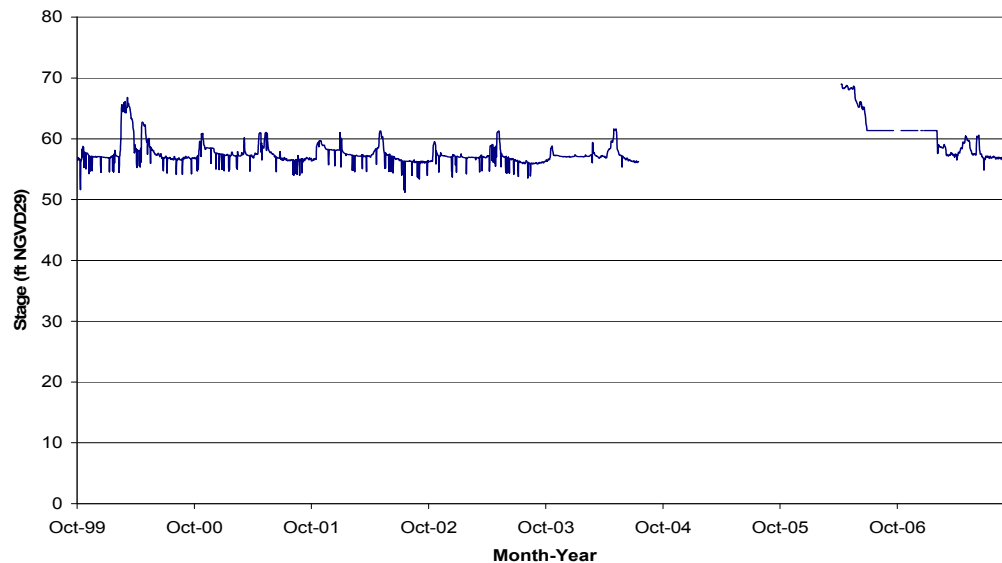
Key:

AN = above normal

BN = below normal

D = dry

W = wet



Note: Values above the peak stage of record (73.8 ft) were considered outliers and removed from the dataset.
Source: CDEC 2008.

Figure F1-9. Mean Daily Stage in the Merced River Near Stevinson (CDEC Station MST)

Table F1-15. Existing Water Quality in the Merced River (Station MER546)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Electrical Conductivity (EC)	2000–2006	µmhos/cm	96	37	454	186
pH	2000–2006	Std. Units	95	6.8	9.2	7.8
Dissolved Oxygen	2001–2006	mg/L	73	6.7	13	9.5
Boron	2000–2006	mg/L	57	0.025	0.1	0.03
Selenium	2000–2006	µg/L	62	0.2	0.5	0.2
Total Suspended Solids	2001–2003	mg/L	17	2.5	17	9.6
Turbidity	2002–2004	NTU	30	2.7	53.2	11.3
Total Organic Carbon	2001–2003, 2005–2006	mg/L	35	1.4	9.3	2.8
Total Coliforms	2002–2006	MPN/100 mL	49	344	>2420	1960
<i>E. coli</i>	2002–2006	MPN/100 mL	49	19	1990	201
Chloride	2000–2003	mg/L	21	3	35	13
Sulfate	2000–2003	mg/L	20	3	23	10
Hardness	2000–2003	mg/L	24	15	100	49
Calcium	2000–2003	mg/L	21	4	26	12
Magnesium	2000–2003	mg/L	21	1	9	4
Total Dissolved Solids	2000–2002	mg/L	12	39	220	92
Bicarbonate	2000–2002	mg/L	14	18	120	50
Total Alkalinity	2000–2002	mg/L	14	10	96	42
Sodium	2000–2002	mg/L	14	2	35	12
Nitrate	2000–2002	mg/L	15	1	15	8
Total Kjeldhal Nitrogen	2000–2002	mg/L as N	14	1	2.4	1.1
Potassium	2000–2002	mg/L	17	0.5	2.9	1.5

Table F1-15. Existing Water Quality in the Merced River (Station MER546)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
BOD, 5-Day	2001–2003	mg/L	23	0.1	3.3	0.6
BOD, 10-Day	2001–2003	mg/L	23	0.3	7.3	1.1
Total Copper	2001–2003	µg/L	24	0.5	5	1.3
Dissolved Copper	2001–2003	µg/L	17	0.5	2	0.8
Total Zinc	2001–2003	µg/L	26	1	10	2
Dissolved Zinc	2001–2003	µg/L	20	1	5.5	1.8

Source: CVRWQCB 2007.

Notes:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter
°C = degrees Celsius
µg/L = microgram(s) per liter
BOD = biological oxygen demand
mg/L = milligram(s) per liter
mL = milliliter(s)
MPN = most probable number
NTU = nephelometric turbidity unit(s)
WY = Water Year

Tuolumne River

The next major eastside tributary north of the Merced River is the Tuolumne River. Recent flow and stage data for the Tuolumne River near La Grange (CDEC Station ID LGN) are shown on **Figures F1-10 and F1-11**. Average monthly flows are shown in **Table F1-16**. Water quality data collected by the CVRWQCB during Water Years 2000–2007 are summarized in **Table F1-17**.

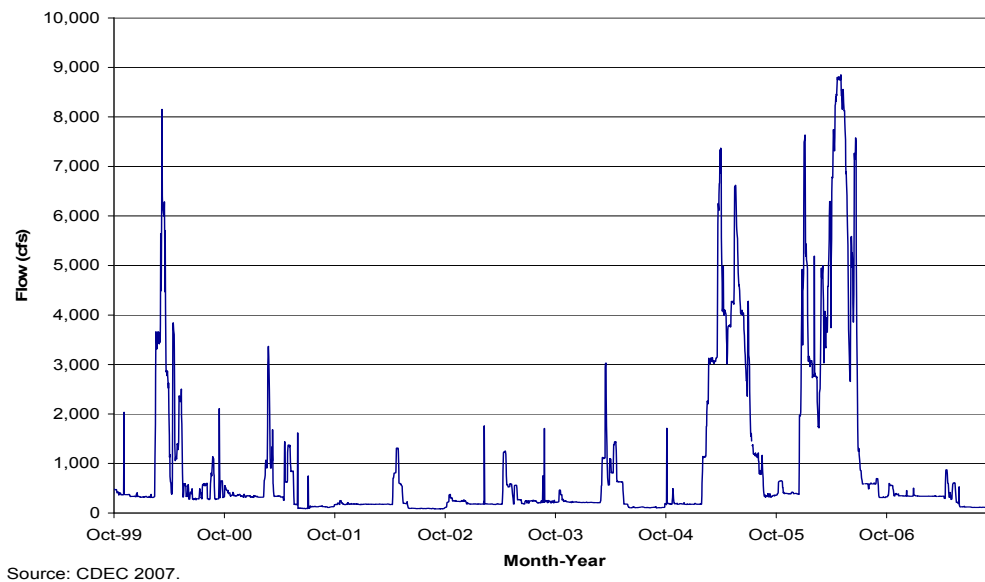


Figure F1-10. Mean Daily Flow in the Tuolumne River Near La Grange (CDEC Station LGN)

Table F1-16. Average Flow (cfs) in the Tuolumne River Near La Grange Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	424	338	336	324	2284	4602	1548	1164	340	421	603	473
2001	D	411	347	334	325	1273	615	558	706	54	89	110	112
2002	D	189	184	177	176	171	165	665	419	97	88	86	68
2003	BN	201	191	187	184	185	182	685	477	234	243	236	250
2004	D	297	231	226	223	220	1098	1010	412	127	108	106	110
2005	W	209	186	178	187	1823	3875	4524	4868	3809	1913	773	328
2006	W	464	369	1285	4456	2373	4234	7436	7847	4657	834	584	412

Source: CDEC 2008.

Key:

AN = above normal

BN = below normal

D = dry

W = wet

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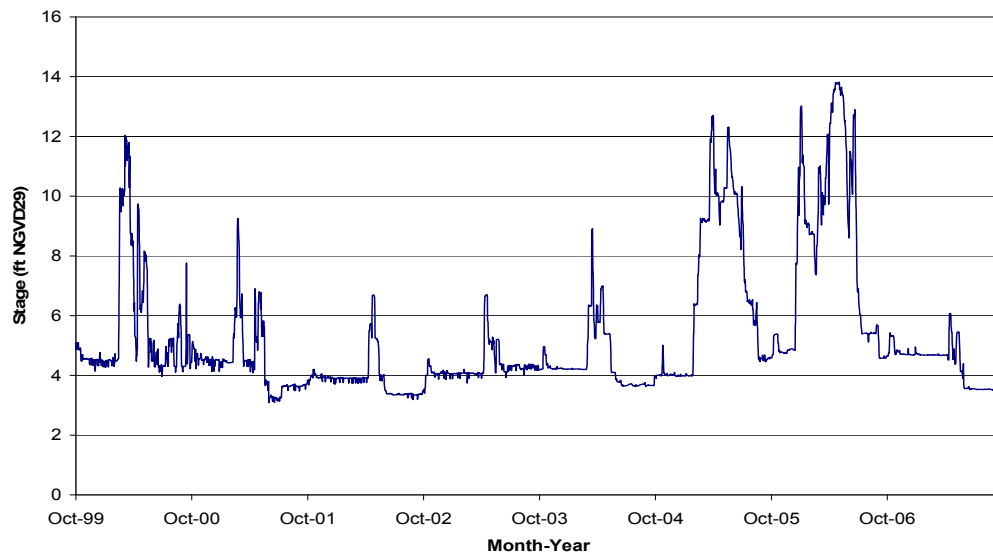


Figure F1-11. Mean Daily Stage in the Tuolumne River Below La Grange Dam Near La Grange (CDEC Station LGN)

Table F1-17. Existing Water Quality in the Tuolumne River (Station STC513)

Analyte	Time Range (WY)	Unit	Count	Min	Max	Average
Electrical Conductivity (EC)	2000–2006	µmhos/cm	96	45	396	189
pH	2000–2006	Std. Units	95	6.7	9	7.9
Dissolved Oxygen	2001–2006	mg/L	71	6.8	12.5	9.7
Boron	2000–2006	mg/L	53	0.025	0.08	0.03
Selenium	2000–2006	µg/L	57	0.2	0.5	0.2
Total Suspended Solids	2001–2003	mg/L	21	2.5	32	10
Turbidity	2002–2004	NTU	30	2.1	94.5	12.4
Total Organic Carbon	2001–2003, 2005–2006	mg/L	36	0.5	8.7	2.7
Total Coliforms	2002–2006	MPN/100 mL	48	179	>2420	2080
<i>E. coli</i>	2002–2006	MPN/100 mL	48	8	>2420	187
Chloride	2000–2003	mg/L	24	3	28	14
Sulfate	2000–2003	mg/L	23	3	14	8
Hardness	2000–2003	mg/L	28	5	94	58
Calcium	2000–2003	mg/L	25	5	22	13
Magnesium	2000–2003	mg/L	25	2	9	6
TDS	2000–2002	mg/L	12	64	190	120
Bicarbonate	2000–2002	mg/L	15	37	110	72
Total Alkalinity	2000–2002	mg/L	15	30	93	61
Sodium	2000–2002	mg/L	15	5	25	15
Nitrate	2000–2002	mg/L	18	2.5	9.3	6.4
Total Kjeldhal Nitrogen	2000–2002	mg/L as N	18	0.3	2.2	1.0

Table F1-17. Existing Water Quality in the Tuolumne River (Station STC513)

Analyte	Time Range (WY)	Unit	Count	Min	Max	Average
Phosphorus	2000–2002	mg/L	19	0.05	0.4	0.1
Orthophosphate-P	2000–2002	mg/L as P	20	0.1	0.5	0.5
Potassium	2000–2002	mg/L	20	1.1	6.2	2.2
BOD, 5-Day	2001–2003	mg/L	24	0.05	5.6	0.7
BOD, 10-Day	2001–2003	mg/L	24	0.2	8.4	1.2
Total Arsenic	2001–2003	µg/L	18	2	2.1	2.0
Dissolved Arsenic	2001–2003	µg/L	13	2	2	2
Total Chromium	2001–2003	µg/L	36	0.5	1.1	0.5
Total Copper	2001–2003	µg/L	34	0.5	2.5	1.4
Dissolved Copper	2001–2003	µg/L	22	0.5	1.6	0.7
Total Zinc	2000–2003	µg/L	35	1	6.9	2.1
Dissolved Zinc	2001–2003	µg/L	22	1	4.7	1.3

Source: CVRWQCB 2007

Note:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

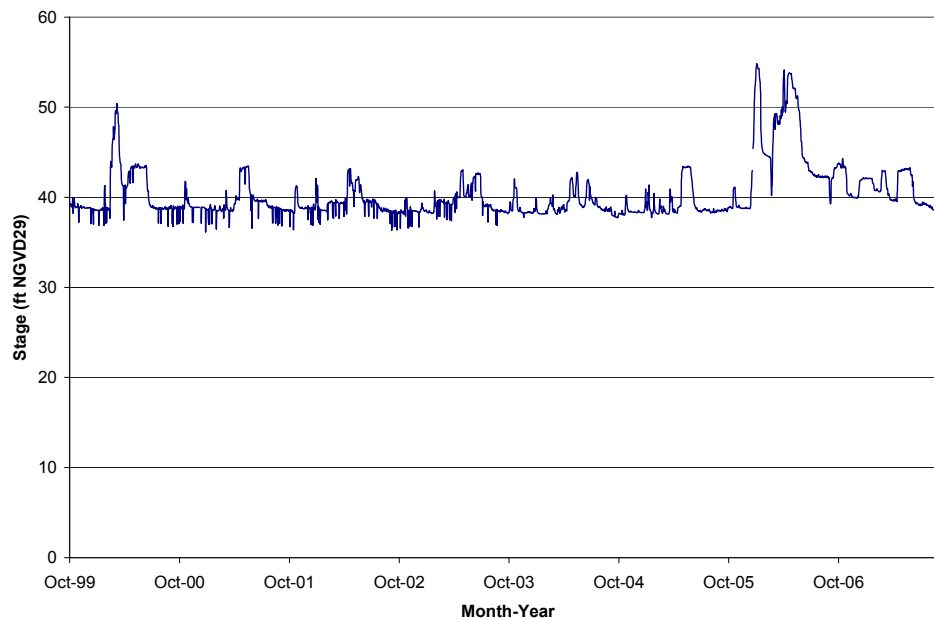
Key:

µmhos/cm = micromhos per centimeter
 °C = degrees Celsius
 µg/L = microgram(s) per liter
 BOD = biological oxygen demand
 mg/L = milligram(s) per liter
 mL = milliliter(s)
 MPN = most probable number
 NTU = nephelometric turbidity unit(s)
 WY = Water Year

Stanislaus River

The Stanislaus River is the northern-most eastside SJR tributary. Recent stage and flow data for the Stanislaus River at Ripon (CDEC Station ID RIP) are shown on **Figures F1-12 and F1-13**. Average monthly flows are shown in **Table F1-18**. Stage at this site generally ranges from 35 to 45 feet, and reached a peak of about 54 feet in mid-January 2006 and again in early May 2006. Water quality data collected by the CVRWQCB during Water Years 2000–2007 are summarized in **Table F1-19**.

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Note: Values above the peak stage of record (64.4 ft) were considered outliers and removed from the dataset.
Source: CDEC 2008.

Figure F1-12. Mean Daily Stage at Stanislaus River at Ripon (Station RIP)

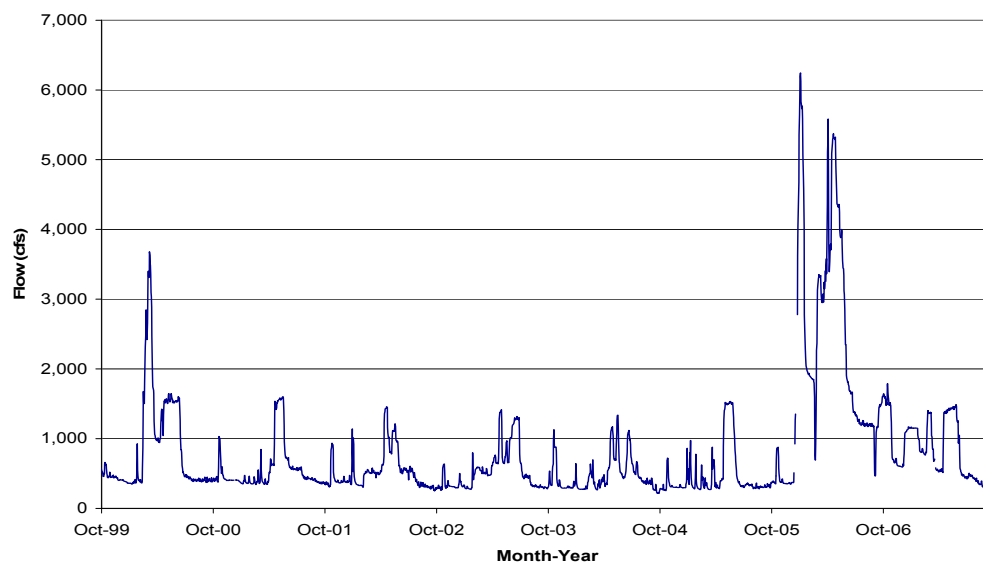


Figure F1-13. Mean Daily Flow at Stanislaus River at Ripon (Station RIP)

Near Ripon, average monthly flows ranged from about 280 to over 4,500 cubic feet per second (cfs) between 2000 and 2006. In drier years (2001–2004) average flows exceeded 600 cfs only during spring runoff. This was true of 2005 as well, although it was classified as a wet year.

Table FI-18. Average Flow (cfs) at Stanislaus River near Ripon Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	497	416	388	419	1437	2201	1239	1572	1046	414	396	398
2001	D	558	421	404	383	371	391	902	1240	585	500	370	324
2002	D	478	375	422	404	484	520	994	961	550	486	318	293
2003	BN	376	319	332	328	548	497	797	836	1208	513	355	315
2004	D	591	322	308	309	435	337	607	834	712	554	360	278
2005	W	335	308	307	448	321	392	366	1472	591	325	304	326
2006	W	516	381	1154	4178	1696	3115	4537	4130	1839	1267	1199	1158

Source: USGS 11303000 STANISLAUS R A RIPON CA

Key:

AN = above normal

BN = below normal

D = dry

W = wet

Table F1-19. Existing Water Quality in the Stanislaus River at Caswell Park (Station STC514)

Analyte	Range (WY)	Units	Fraction Detected	Count	Min	Max	Average
Temperature	2000–2006	°C	1	94	7.3	25.3	16.0
Field Conductivity (EC)	2000–2006	µmhos/cm	1	94	60	183	103
Electrical Conductivity (EC)	2000–2002	µmhos/cm	1	25	68	181	108
pH	2000–2006	Std. Unit	1	93	6.5	9	7.8
Dissolved Oxygen	2001–2006	mg/L	1	70	7.6	15.1	9.9
Boron	2000–2006	mg/L	0	51	0.025	0.025	0.025
Selenium	2000–2006	µg/L	0.02	56	0.2	0.5	0.2
Total Suspended Solids	2001–2003	mg/L	0.8	20	2	22	9
Turbidity	2002–2004	NTU	1	32	0.8	52.3	9.2
Total Organic Carbon	2001–2003, 2005–2006	mg/L	0.94	33	0.5	7	2.5
Total Coliforms	2002–2006	MPN/100 mL	1	48	122	>2420	1940
<i>E. coli</i>	2002–2006	MPN/100 mL	1	48	21	1120	112
Chloride	2000–2003	mg/L	1	22	2	7	4
Sulfate	2000–2003	mg/L	1	20	3	7	5
Hardness	2000–2003	mg/L	1	25	26	55	38
Calcium	2000–2003	mg/L	1	22	7	13	9
Magnesium	2000–2003	mg/L	1	22	2	6	4
Total Dissolved Solids	2000–2002	mg/L	1	10	42	120	71
Carbonate	2000–2002	mg/L	0	13	0.5	0.5	0.5
Bicarbonate	2000–2002	mg/L	1	13	30	110	54
Total Alkalinity	2000–2002	mg/L	1	13	27	86	44
Sodium	2000–2002	mg/L	1	13	3	8	5

Table F1-19. Existing Water Quality in the Stanislaus River at Caswell Park (Station STC514)

Analyte	Range (WY)	Units	Fraction Detected	Count	Min	Max	Average
Nitrate	2000–2002	mg/L	0.56	16	1	3.7	2.1
Total Kjeldhal Nitrogen	2000–2002	mg/L	0.13	16	0.1	3	1
Ammonia-N	2000	mg/L as N	0	2	0.5	0.5	0.5
Phosphorus	2000–2002	mg/L	0.29	17	0.05	0.1	0.06
Orthophosphate-P	2000–2002	mg/L as P	0	18	0.015	0.5	0.5
Potassium	2000–2002	mg/L	0.89	18	0.5	2.3	1.5
BOD, 5-Day	2001–2003	mg/L	1	22	0.2	6.2	0.8
BOD, 10-Day	2001–2003	mg/L	1	22	0.4	8.8	1.3
Total Arsenic	2001–2003	µg/L	0	18	1	2	1.9
Total Cadmium	2001–2003	µg/L	0	18	0.05	0.5	0.1
Total Chromium	2000–2003	µg/L	0	34	0.5	0.5	0.5
Total Copper	2000–2003	µg/L	0.75	32	0.5	3	1.5
Total Lead	2000–2003	µg/L	0	35	2.5	2.5	2.5
Total Nickel	2000–2003	µg/L	0	34	2.5	2.5	2.5
Total Zinc	2000–2003	µg/L	0.48	33	1	7.7	2.3
Total Mercury	2001–2003	µg/L	0	17	0.1	0.1	0.1
Dissolved Arsenic	2001–2003	µg/L	0	13	1	2	1.9
Dissolved Cadmium	2001–2003	µg/L	0	12	0.05	0.05	0.05
Dissolved Chromium	2001–2003	µg/L	0	20	0.5	0.5	0.5
Dissolved Copper	2001–2003	µg/L	0.25	20	0.5	2.1	0.7
Dissolved Lead	2001–2003	µg/L	0	21	2.5	2.5	2.5
Dissolved Nickel	2001–2003	µg/L	0	21	2.5	2.5	2.5
Dissolved Zinc	2001–2003	µg/L	0.35	20	1	6.1	2.0
Dissolved Mercury	2001–2003	µg/L	0	12	0.1	0.1	0.1

Source CVRWQCB 2008.

Note:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Analytes with datasets composed entirely of nondetect data are in bold. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

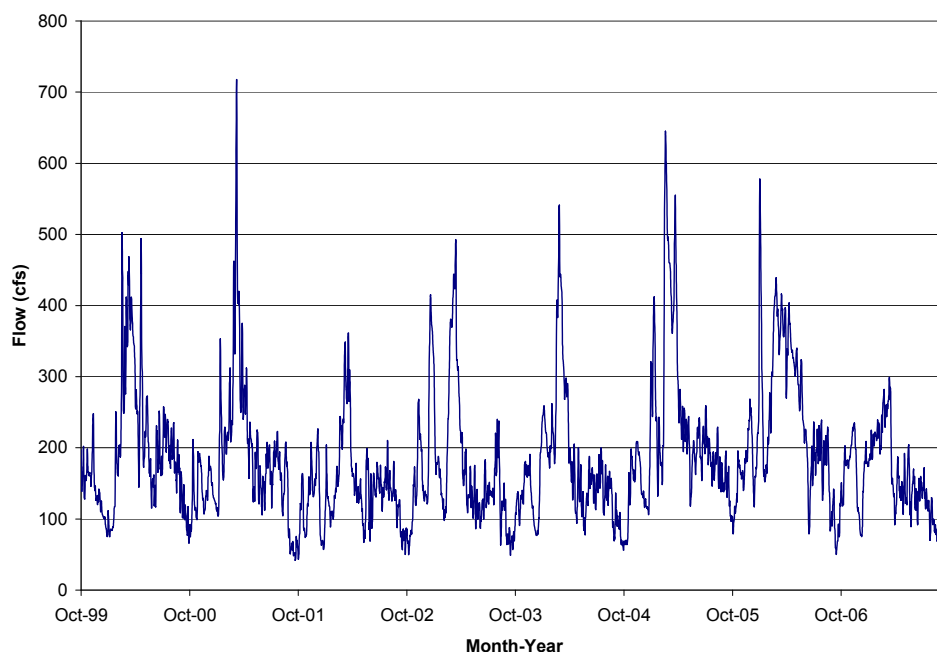
µmhos/cm = micromhos per centimeter
°C = degrees Celsius
µg/L = microgram(s) per liter
BOD = biological oxygen demand
mg/L = milligram(s) per liter
mL = milliliter(s)
MPN = most probable number
NTU = nephelometric turbidity unit(s)
WY = Water Year

Salt Slough

As one of the two major westside tributaries of the SJR, Salt Slough is located on the easterly side of the Kesterson National Wildlife Refuge.

Since 1996, water in this channel comes only from wetland discharges, runoff from non-GDA farmland, and occasional flood flows, and is a blend of surface tail water, operational spills, and wetland drainage from the surrounding area.

Recent flow and stage data for the Salt Slough near Stevinson (CDEC Station ID SSH) are shown on **Figures F1-14 and F1-15**. Average monthly flows are shown in **Table F1-20**. Water quality data collected by the CVRWQCB during Water Years 2000–2007 are summarized in **Table F1-21**.



Source: USGS 2008.

Figure F1-14. Mean Daily Flow in Salt Slough Near Stevinson (CDEC Station SSH)

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Table F1-20. Average Flow (cfs) in Salt Slough Near Stevinson Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	163	158	104	118	272	381	265	193	178	215	179	109
2001	D	128	144	146	195	263	394	236	162	161	181	150	60
2002	D	98	147	120	121	178	277	147	122	140	151	137	87
2003	BN	96	183	250	186	197	369	169	129	123	146	146	74
2004	D	117	159	114	217	296	337	155	128	149	151	135	88
2005	W	105	182	130	276	355	443	253	191	201	199	175	145
2006	W	130	179	196	278	307	380	346	295	176	195	176	90

Source: USGS 2008

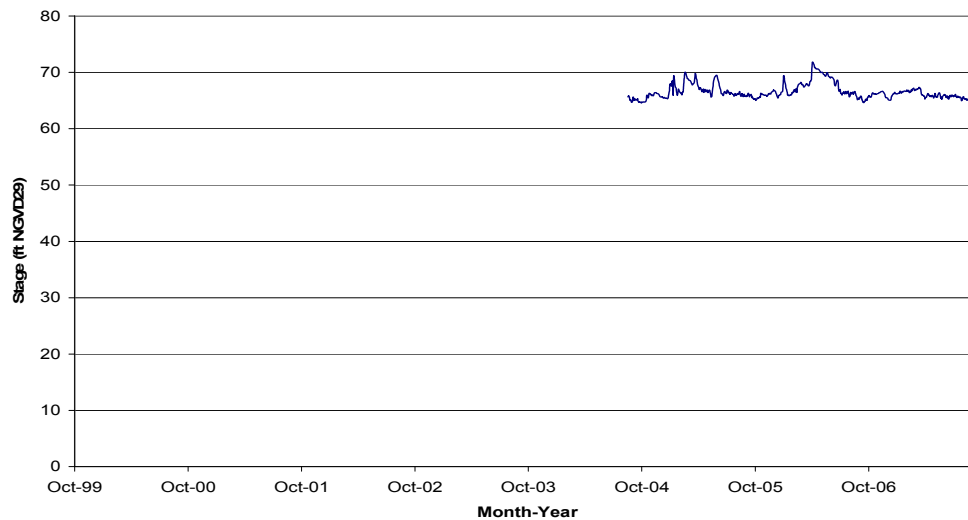
Key:

AN = above normal

BN = below normal

D = dry

W = wet



Note: Data not available prior to August 2004.
Source: CDEC 2008.

Figure F1-15. Mean Daily Stage in Salt Slough at Highway 165 Near Stevinson (CDEC Station SSH)

Table F1-21. Existing Water Quality in Salt Slough (Station MER531)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Electrical Conductivity (EC)	2000–2007	µmhos/cm	370	200	2470	1380
pH	2000–2007	Std. Units	365	6.3	8.7	7.7
Dissolved Oxygen	2001–2007	mg/L	273	1.2	98.2	9.0
Boron	2000–2007	mg/L	356	0.3	2.4	0.8
Selenium	2000–2007	µg/L	366	0.2	2.1	0.7
Total Suspended Solids	2001, 2006–2007	mg/L	57	15	170	77
Turbidity	2002–2004	NTU	62	18.8	874	106
Total Organic Carbon	2002–2003, 2005–2007	mg/L	84	0.5	21	7.0
Total Coliforms	2002–2007	MPN/100 mL	52	613	>2420	2330
<i>E. coli</i>	2002–2007	MPN/100 mL	52	42	>2420	211
Chloride	2000–2003	mg/L	24	92	310	220
Sulfate	2000–2003	mg/L	25	78	370	200
Hardness	2000–2003	mg/L	28	120	380	290
Calcium	2000–2003	mg/L	25	34	79	63
Magnesium	2000–2003	mg/L	25	23	44	35
Total Dissolved Solids	2000–2002	mg/L	16	550	1100	880
Bicarbonate	2000–2002	mg/L	17	150	250	210
Total Alkalinity	2000–2002	mg/L	17	130	210	180
Sodium	2000–2002	mg/L	16	130	250	200
Nitrate	2000–2002	mg/L	18	1.0	15	6.1
Total Kjeldhal Nitrogen	2000–2002	mg/L as N	17	0.5	2.8	1.1
Phosphorus	2000–2002	mg/L	18	0.1	0.4	0.3
Orthophosphate-P	2000–2002	mg/L as P	21	0.1	0.5	0.5
Potassium	2000–2002	mg/L	21	6.9	10	8.6
BOD, 5-Day	2001–2003	mg/L	27	1.0	4.2	2.1
BOD, 10-Day	2001–2003	mg/L	27	2.0	7.1	3.6
Total Arsenic	2001–2003	µg/L	21	2.0	8.4	5.9
Dissolved Arsenic	2001–2003	µg/L	9	3.4	4.9	4.3
Total Chromium	2000–2003	µg/L	49	0.5	6.2	3.3
Total Copper	2000–2003	µg/L	49	0.5	7.2	4.5
Dissolved Copper	2001–2003	µg/L	25	0.5	2.4	1.2
Total Nickel	2000–2003	µg/L	48	2.5	8.9	5.8
Total Zinc	2000–2003	µg/L	47	1.0	27	11
Dissolved Zinc	2001–2003	µg/L	25	1.0	7.0	1.6

Source: CVRWQCB 2007.

Note:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter
 °C = degrees Celsius
 µg/L = microgram(s) per liter
 BOD = biological oxygen demand
 mg/L = milligram(s) per liter

mL = milliliter(s)
 MPN = most probable number
 NTU = nephelometric turbidity unit(s)
 WY = Water Year

Mud Slough

The other major westside tributary of the SJR, Mud Slough, is currently the major carrier of agricultural drainage from the GDA to the SJR. Drainage originates from the GDA, travels via the San Luis Drain, and is discharged directly into Mud Slough. Flow in Mud Slough (North) upstream of the discharge point consists of wetland releases from the north and south Grassland Water Districts and additionally from Volta Wildlife Management Area, as well as operational spills from the Delta-Mendota Canal and Central California Irrigation District's Main Canal and flood flows from Los Banos Creek. Water quality in Mud Slough (North) downstream of the discharge point is often dominated by water originating from GDA via the San Luis Drain, but also carries a blend of subsurface tile drainage water and discharges from surrounding duck clubs.

Recent flow and stage data for the Mud Slough near Gustine (CDEC Station ID MSG) are shown on **Figures F1-16 and F1-17**. Average monthly flows are shown in **Table F1-22**. Water quality data collected by the CVRWQCB during water years 2000 to 2007 are summarized in **Tables F1-23 and F1-24**.

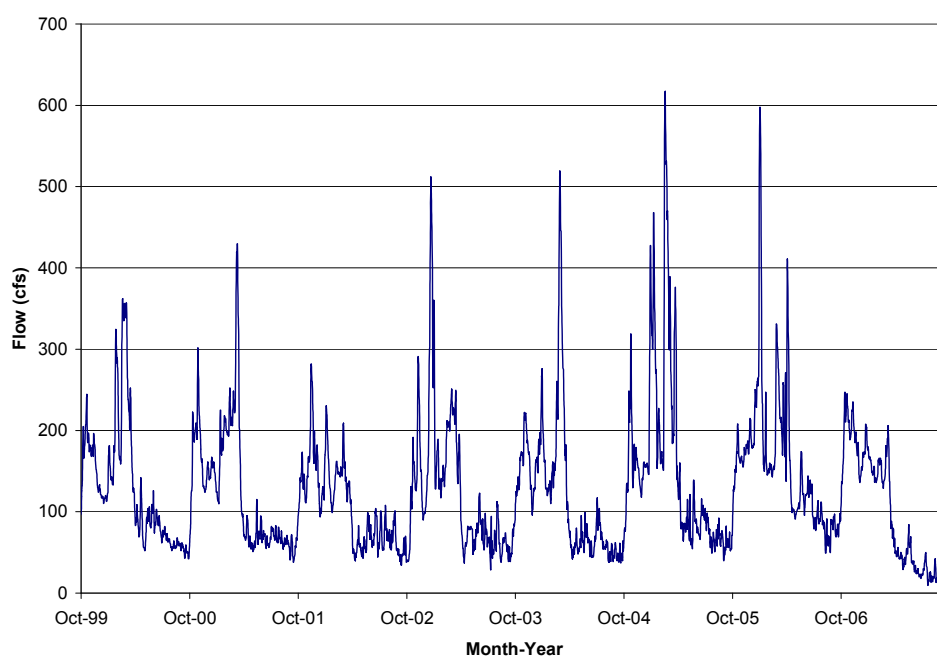


Figure F1-16. Mean Daily Flow in Mud Slough near Gustine (CDEC Station MSG)

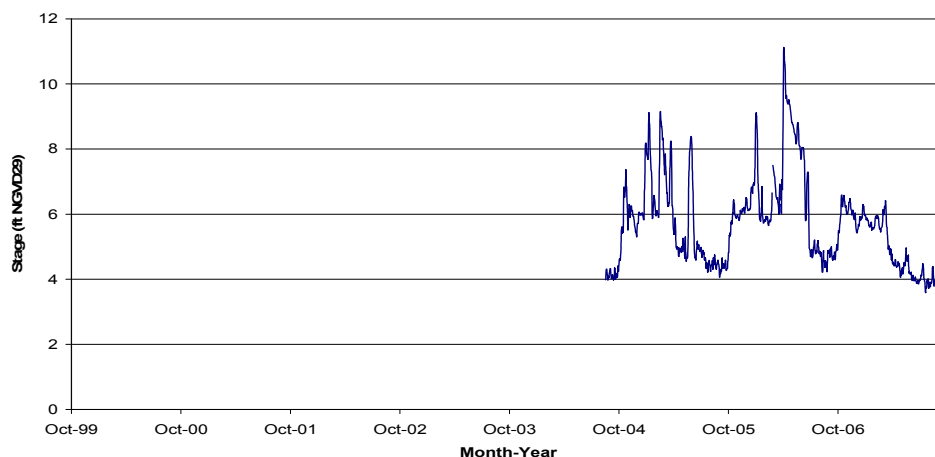
Table F1-22. Average Flow (cfs) in Mud Slough near Gustine from 2000 through 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	181	162	120	192	271	201	88	87	85	68	59	52
2001	D	183	157	149	174	215	233	69	72	65	72	64	56
2002	D	130	195	131	149	149	140	57	65	74	75	71	50
2003	BN	96	164	252	172	182	204	69	72	83	58	67	56
2004	D	140	174	161	157	199	260	61	65	58	77	51	47
2005	W	155	156	167	301	327	288	102	89	86	78	69	59
2006	W	143	171	215	285	158	238	197	117	123	93	73	82

Source: USGS 2008.

Key:

AN = above normal
BN = below normal
D = dry
W = wet



Notes: Data not available prior to August 2004. Values above an assumed threshold of 20 ft were considered outliers and removed from the dataset.
Source: CDEC 2008.

Figure F1-17. Mean Daily Stage in Mud Slough near Gustine (CDEC Station MSG)

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Table F1-23. Existing Water Quality in Mud Slough Upstream of San Luis Drain (Station MER536)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Electrical Conductivity (EC)	2000–2007	µmhos/cm	366	463	3820	1580
pH	2000–2007	Std. Units	361	6.5	8.8	7.9
Dissolved Oxygen	2001–2007	mg/L	265	2.1	19.7	9.5
Boron	2000–2007	mg/L	357	0.3	4.1	1.4
Selenium	2000–2007	µg/L	364	0.2	2.4	0.6
Total Suspended Solids	2001, 2006–2007	mg/L	58	9	150	54
Turbidity	2002–2004	NTU	55	2.5	142	53
Total Organic Carbon	2002–2003, 2005–2007	mg/L	89	0.5	27	11
Total Coliforms	2002–2007	MPN/100 mL	52	691	>2420	2310
<i>E. coli</i>	2002–2007	MPN/100 mL	52	33	2420	273
Chloride	2000–2003	mg/L	32	32	490	230
Sulfate	2000–2003	mg/L	35	40	910	300
Hardness	2000–2003	mg/L	34	200	740	340
Calcium	2000–2003	mg/L	35	36	160	60
Magnesium	2000–2003	mg/L	35	25	90	47
Total Dissolved Solids	2000–2003	mg/L	25	160	2700	1100
Carbonate	2000–2003	mg/L	26	0.5	10	1.2
Bicarbonate	2000–2003	mg/L	25	180	400	280
Total Alkalinity	2000–2003	mg/L	24	150	330	230
Sodium	2000–2003	mg/L	26	100	630	280
Nitrate	2000–2004	mg/L	34	1	5.1	1.8
Nitrate-N	2004–2007	mg/L as N	41	0.025	2.9	0.4
Total Kjeldhal Nitrogen	2000–2007	mg/L as N	80	0.1	4.3	1.2
Ammonia-N	2000–2001, 2004–2004	mg/L as N	27	0.1	1	0.3
Phosphorus	2000–2007	mg/L	72	0.1	0.8	0.3
Orthophosphate-P	2000–2007	mg/L as P	84	0.015	0.6	0.3
Potassium	2000–2004	mg/L	47	5.7	15	9.2
BOD, 5-Day	2001–2003	mg/L	26	1.2	5.7	2.8
BOD, 10-Day	2001–2003	mg/L	26	2.4	10.2	5.0
Total Arsenic	2001–2003	µg/L	22	2	7.6	4.7
Dissolved Arsenic	2001–2003	µg/L	18	2	6.2	4.1
Total Chromium	2000–2003	µg/L	50	0.5	14	3.4
Dissolved Chromium	2000–2003	µg/L	26	0.5	2.4	0.6
Total Copper	2000–2003	µg/L	48	0.5	7	3.3
Dissolved Copper	2001–2003	µg/L	25	0.5	2.6	1.1
Total Nickel	2000–2003	µg/L	50	2.5	20	6.8
Dissolved Nickel	2001–2003	µg/L	26	2.5	6	2.6

Table F1-23. Existing Water Quality in Mud Slough Upstream of San Luis Drain (Station MER536)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Total Zinc	2000–2003	µg/L	49	1	14	4
Dissolved Zinc	2001–2003	µg/L	25	1	4.7	1.4

Source: CVRWQCB 2007.

Notes:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter
 °C = degrees Celsius
 µg/L = microgram(s) per liter
 BOD = biological oxygen demand
 mg/L = milligram(s) per liter
 mL = milliliter(s)
 MPN = most probable number
 NTU = nephelometric turbidity unit(s)
 WY = Water Year

Table F1-24. Existing Water Quality in Mud Slough Downstream of San Luis Drain (Station MER542)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Electrical Conductivity (EC)	2000–2007	µmhos/cm	371	1120	5140	2750
pH	2000–2007	Std. Units	366	6.6	8.7	8.0
Dissolved Oxygen	2001–2007	mg/L	274	2.6	27.6	10.0
Boron	2000–2007	mg/L	361	1.1	8.4	3.7
Selenium	2000–2007	µg/L	368	2.9	66	19
Total Suspended Solids	2001, 2006–2007	mg/L	59	14	140	56
Turbidity	2002–2004	NTU	56	13.3	218	45.3
Total Organic Carbon	2002–2003, 2005–2007	mg/L	85	0.5	32	10
Total Coliforms	2002–2007	MPN/100 mL	51	914	>2420	2270
<i>E. coli</i>	2002–2007	MPN/100 mL	51	6	2420	169
Chloride	2000–2003	mg/L	24	140	600	370
Sulfate	2000–2003	mg/L	26	200	1700	920
Hardness	2000–2003	mg/L	29	280	1200	670
Calcium	2000–2003	mg/L	26	61	310	170
Magnesium	2000–2003	mg/L	26	31	110	70
Total Dissolved Solids	2000–2002	mg/L	17	800	3900	2400
Carbonate	2000–2002	mg/L	17	0.5	20	2.1
Bicarbonate	2000–2002	mg/L	16	140	290	220
Total Alkalinity	2000–2002	mg/L	15	120	240	180

Table F1-24. Existing Water Quality in Mud Slough Downstream of San Luis Drain (Station MER542)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Sodium	2000–2002	mg/L	17	150	740	490
Nitrate	2000–2004	mg/L	23	4.2	84	65
Nitrate-N	2004–2007	mg/L as N	43	0.7	13	5.1
Total Kjeldhal Nitrogen	2000–2007	mg/L	65	0.1	4.5	1.5
Ammonia-N	2000–2001, 2004–2004	mg/L as N	30	0.1	1.2	0.3
Phosphorus	2000–2007	mg/L	56	0.05	2.1	0.3
Orthophosphate-P	2000–2007	mg/L as P	63	0.005	0.5	0.3
Potassium	2000–2004	mg/L	27	7.9	12	10
BOD, 5-Day	2001–2003	mg/L	26	1.2	7.3	3.4
BOD, 10-Day	2001–2003	mg/L	26	2.3	11.8	5.9
Total Arsenic	2001–2003	µg/L	22	1	9.4	3.7
Dissolved Arsenic	2001–2003	µg/L	18	1	6.6	3.0
Total Chromium	2000–2003	µg/L	50	0.5	8.6	4.2
Dissolved Chromium	2000–2003	µg/L	26	0.5	4.3	1.3
Total Copper	2000–2003	µg/L	48	0.5	7.7	3.2
Dissolved Copper	2001–2003	µg/L	18	1.1	3.2	1.5
Total Nickel	2000–2003	µg/L	50	2.5	13	5.4
Dissolved Nickel	2001–2003	µg/L	26	2.5	8.1	2.7
Total Zinc	2000–2003	µg/L	35	1	70	5.3
Dissolved Zinc	2001–2003	µg/L	25	1	52	3

Source: CVRWQCB 2007.

Notes:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Key:

µmhos/cm = micromhos per centimeter
°C = degrees Celsius
µg/L = microgram(s) per liter
BOD = biological oxygen demand
mg/L = milligram(s) per liter
mL = milliliter(s)
MPN = most probable number
NTU = nephelometric turbidity unit(s)
WY = Water Year

Orestimba Creek

Another westside tributary of the SJR, Orestimba Creek joins the SJR downstream of Salt and Mud Sloughs. It is situated between Newman and Westley Wasteways. Orestimba Creek carries both natural runoff and agricultural return flows. It is also likely that the deep entrenchment of the creek in its lower reaches near the SJR causes seepage of groundwater into the creek in several reaches.

Recent flow and stage data for the Orestimba Creek at River Road (CDEC Station ID OCL) are shown on **Figures F1-18 and F1-19**. Average monthly flows are shown in **Table F1-25**. Water quality data collected by the CVRWQCB during water years 2000 to 2007 are summarized in **Table F1-26**.

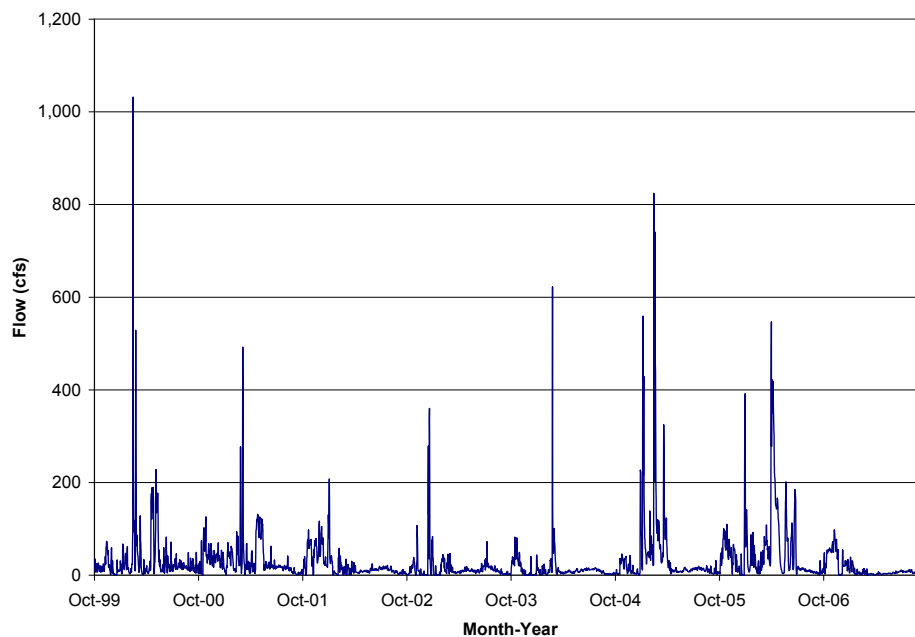


Figure F1-18. Mean Daily Flow in Orestimba Creek at River Road Near Crows Landing (CDEC Station OCL)

Table F1-25. Average Flow (cfs) in Orestimba Creek at River Road Near Crows Landing Between 2000 and 2006

Water Year	Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000	AN	15	31	9	27	117	23	60	67	26	20	18	19
2001	D	43	40	33	35	41	49	52	59	22	17	13	5
2002	D	41	50	51	29	16	12	8	9	13	15	9	5
2003	BN	12	13	52	9	24	10	9	11	11	21	10	3
2004	D	35	11	3	10	42	21	6	7	11	13	8	3
2005	W	15	20	12	114	173	84	23	8	11	14	12	7
2006	W	52	45	10	75	23	52	232	54	68	13	9	6

Source: USGS 2008.

Key:

AN = above normal

BN = below normal

D = dry

W = wet

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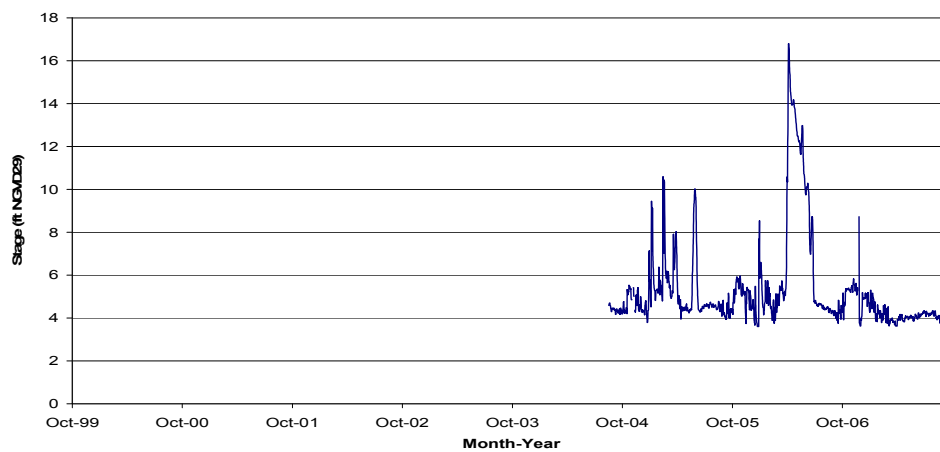


Figure F1-19. Mean Daily Stage in Orestimba Creek at River Road Near Crows Landing (CDEC Station OCL)

Table F1-26. Existing Water Quality in Orestimba Creek (Station STC019)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Electrical Conductivity (EC)	2001–2007	µmhos/cm	211	196	1290	706
pH	2001–2007	Std. Units	212	7.3	8.9	8.0
Dissolved Oxygen	2001–2007	mg/L	191	6	17.2	10.0
Boron	2001–2007	mg/L	131	0.1	0.5	0.3
Selenium	2001–2007	µg/L	178	0.2	5.2	1.0
Total Suspended Solids	2001–2002, 2005–2007	mg/L	34	10	780	130
Turbidity	2002–2004	NTU	53	1.6	810	187
Total Organic Carbon	2001–2003, 2005–2006	mg/L	35	0.5	14	4.8
Total Coliforms	2002–2006	MPN/100 mL	43	1011	>2420	2330
<i>E. coli</i>	2002–2006	MPN/100 mL	43	40	2420	616
Chloride	2001–2003	mg/L	15	53	120	88
Sulfate	2001–2003	mg/L	17	46	150	93
Hardness	2001–2003	mg/L	21	130	310	220
Calcium	2001–2003	mg/L	17	24	66	44
Magnesium	2001–2003	mg/L	17	16	35	25
Total Dissolved Solids	2001–2002	mg/L	13	320	550	430
Bicarbonate	2001–2002	mg/L	12	110	210	140
Total Alkalinity	2001–2002	mg/L	11	90	170	120
Sodium	2001–2002	mg/L	13	56	94	74
Nitrate	2001–2002	mg/L	10	4.3	20	11
Phosphorus	2001–2002	mg/L	10	0.05	0.4	0.2
Orthophosphate-P	2001–2002	mg/L as P	11	0.1	0.5	0.5

Table F1-26. Existing Water Quality in Orestimba Creek (Station STC019)

Analyte	Range (WY)	Unit	Count	Min	Max	Average
Potassium	2001–2002	mg/L	11	5.2	9.4	7.1
BOD, 5-Day	2001–2003	mg/L	23	0.5	4	1.6
BOD, 10-Day	2001–2003	mg/L	23	0.9	8.4	2.9
Total Arsenic	2001–2003	µg/L	18	2	5	2.4
Dissolved Arsenic	2001–2003	µg/L	14	2	4.1	2.2
Total Cadmium	2001–2003	µg/L	18	0.05	0.5	0.1
Total Chromium	2001–2003	µg/L	28	0.5	49	10
Dissolved Chromium	2001–2003	µg/L	23	0.5	4.2	1.3
Total Copper	2001–2003	µg/L	26	2.5	31	8.7
Dissolved Copper	2001–2003	µg/L	22	0.5	4.9	2.4
Total Lead	2001–2003	µg/L	28	2.5	12	3.2
Total Nickel	2001–2003	µg/L	28	2.5	91	14
Dissolved Nickel	2001–2003	µg/L	23	2.5	53	4.7
Total Zinc	2001–2003	µg/L	28	1	65	15
Dissolved Zinc	2001–2003	µg/L	22	1	16	2.3

Source: CVRWQCB 2007.

Notes:

Analytes with at least one sample detected during Water Years 2000–2007 are shown above. For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

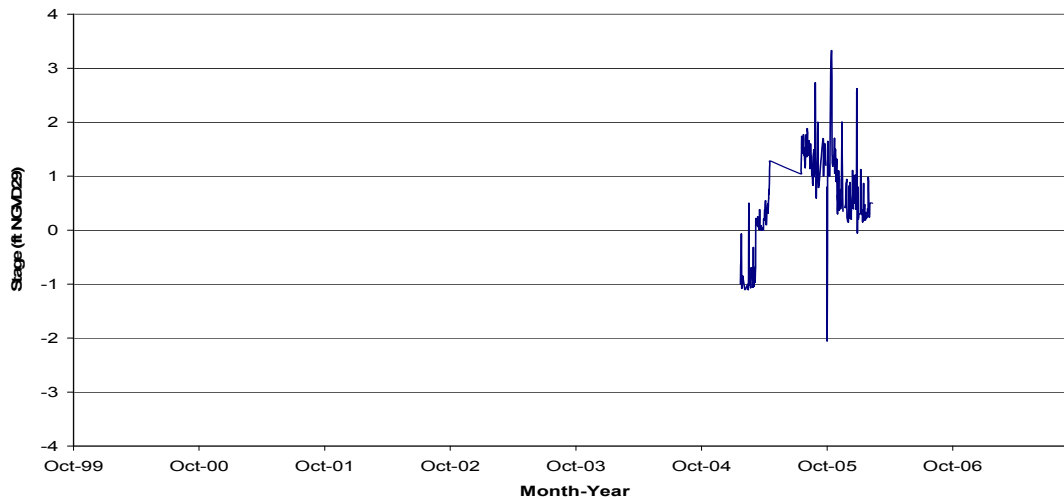
Key:

µmhos/cm = micromhos per centimeter
°C = degrees Celsius
µg/L = microgram(s) per liter
BOD = biological oxygen demand
mg/L = milligram(s) per liter
mL = milliliter(s)
MPN = most probable number
NTU = nephelometric turbidity unit(s)
WY = Water Year

F.1.3 Wasteways

Stage in Westley Wasteway is reported by CDEC (2008) and is shown on **Figure F1-20**. Westley Wasteway water quality data collected by both the DWR and westside SJR Watershed Coalition are summarized in **Table F1-27**.

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Note: Values above an assumed threshold of 5 ft were considered outliers and removed from the dataset.
Source: CDEC 2008.

Figure F1-20. Mean Daily Stage in Westley Wasteway (CDEC Station WSW)

Table F1-27. Water Quality in Westley Wasteway

Analyte	Time Range	Unit	Fraction Detected	Count	Min	Max	Average
Electrical Conductivity (EC)	2005–2007	µmhos/cm	1	32	122	828	449
Dissolved Oxygen	2004–2007	mg/L	1	32	5.6	12.7	9.2
pH	2004–2007	Std. Unit	1	32	5.6	9.3	7.9
Temperature	2005–2006	°C	1	32	4.8	22.2	14.9
Selenium	2006–2007	µg/L	0.8	5	0.5	5	2
Boron	2006–2007	mg/L	1	5	0.12	0.55	0.24
Bromide	2004–2007	mg/L	0.83	24	0.032	0.67	0.31
Total Dissolved Solids	2004–2007	mg/L	1	24	140	710	350
Dissolved Organic Carbon	2004–2007	mg/L	1	24	1.8	7.9	4.3
Total Organic Carbon	2004–2007	mg/L	1	24	2.4	11	5.1
Total Suspended Solids	2004–2007	mg/L	1	24	6	1400	230
Turbidity	2004–2007	NTU	1	24	4	830	130
<i>E. coli</i>	2004–2007	MPN/100 mL	1	24	22	1600	430
Hardness	2006–2007	mg/L as CaCO ₃	1	5	94	270	180
Ammonia	2006–2007	mg/L as N	0.4	5	0.05	0.23	0.10
Nitrate	2006–2007	mg/L as N	1	4	0.54	2.6	1.6
Nitrate + Nitrite	2006	mg/L as N	1	1	0.86	0.86	0.86
Nitrite	2006–2007	mg/L as N	1	5	0.013	0.037	0.03
Orthophosphate	2006–2007	mg/L as P	1	5	0.012	0.22	0.14
Total Kjeldahl Nitrogen	2006–2007	mg/L as N	1	5	0.59	1.8	1.4
Phosphate	2006	mg/L as P	1	3	0.068	0.71	0.36
Arsenic	2006–2007	µg/L	1	5	1.6	9.9	6.3
Cadmium	2006–2007	µg/L	1	5	0.05	0.2	0.1

Table F1-27. Water Quality in Westley Wasteway

Analyte	Time Range	Unit	Fraction Detected	Count	Min	Max	Average
Copper	2006–2007	µg/L	1	5	3	28	18
Lead	2006–2007	µg/L	1	5	0.74	13	9.0
Nickel	2006–2007	µg/L	1	4	3.2	45	26
Zinc	2006–2007	µg/L	1	5	8	80	50
p,p'-DDE	2006–2007	µg/L	1	3	0.0092	0.06	0.038
p,p'-DDT	2006–2007	µg/L	1	3	0.0088	0.024	0.019
Chlorpyrifos	2004–2006	µg/L	1	3	0.032	0.056	0.041
Dimethoate	2004–2006	µg/L	1	6	0.1	1.4	0.5
Diuron	2007	µg/L	1	2	0.54	4	2.3
EPTC	2005	µg/L	1	1	0.26	0.26	0.26
Pendimethalin (Prowl)	2004–2006	µg/L	1	8	0.053	0.86	0.28
Trifluralin	2006	µg/L	1	2	0.064	0.895	0.48

Source: Westside San Joaquin River Water Coalition 2007.

Notes:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit.

Data were combined for sites at Westley Wasteway near Cox Road and Westley Wasteway at Refuge Ponds.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

BOD = biological oxygen demand

mg/L = milligram(s) per liter

mL = milliliter(s)

MPN = most probable number

NTU = nephelometric turbidity unit(s)

WY = Water Year

Water quality data within Newman Wasteway were collected by the U.S. Geological Survey in 2000–2001 and by the Westside SJR Water Coalition from 2004–2006, and are summarized in **Table F1-28**.

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Table F1-28. Water Quality in Newman Wasteway

Analyte	Time Range	Unit	Fraction Detected	Count	Min	Max	Average
Electrical Conductivity (EC)	2005–2007	µmhos/cm	1	51	283	1850	1080
Dissolved Oxygen	2004–2007	mg/L	1	42	1.57	16.93	7.36
pH	2004–2007	Std. Unit	1	42	6.4	8.5	7.6
Temperature	2004–2007	°C	1	42	5.5	25.9	16.3
Boron	2006–2007	mg/L	1	10	0.56	1.1	0.79
Selenium	2006–2007	µg/L	0.8	10	0.5	3	1.5
Total Organic Carbon	2004–2007	mg/L	1	35	1.5	56	7.9
Dissolved Organic Carbon	2000, 2004–2007	mg/L	1	34	2.1	51	6.7
Bromide	2004–2007	mg/L	0.91	35	0.065	0.88	0.46
Total Dissolved Solids	2004–2007	mg/L	1	36	190	1300	750
Total Suspended Solids	2004–2007	mg/L	1	36	15	360	88
Turbidity	2004–2007	NTU	1	36	13	430	67
<i>E. coli</i>	2004–2007	MPN/100 mL	1	36	4	>2400	590
Hardness	2006–2007	mg/L as CaCO ₃	1	10	260	540	390
Ammonia	2006–2007	mg/L as N	0.7	10	0.044	0.36	0.16
Ammonia, dissolved	2000	mg/L as N	1	1	0.32	0.32	0.32
Ammonia + Organic Nitrogen	2000	mg/L as N	1	1	0.86	0.86	0.86
Ammonia + Organic Nitrogen, dissolved	2000	mg/L as N	1	1	0.86	0.86	0.86
Nitrate	2006–2007	mg/L as N	1	9	2.4	6.4	3.8
Nitrate + Nitrite	2006	mg/L as N	1	1	3.2	3.2	3.2
Nitrate + Nitrite, dissolved	2000	mg/L as N	1	1	3.23	3.23	3.23
Nitrite	2006–2007	mg/L as N	1	10	0.0445	0.2	0.09
Nitrite, dissolved	2000	mg/L as N	1	1	0.062	0.062	0.06
Orthophosphate	2006–2007	mg/L as P	1	9	0.027	0.14	0.08
Orthophosphate, dissolved	2000	mg/L as P	1	2	0.1	0.16	0.13
Phosphorus	2000	mg/L	1	1	0.13	0.13	0.13
Phosphorus, dissolved	2000	mg/L	1	1	0.131	0.131	0.131
Total Kjeldahl Nitrogen	2006–2007	mg/L as N	1	10	0.59	2.6	1.5
Phosphate	2006	mg/L as P	1	4	0.26	0.51	0.43
Arsenic	2006–2007	µg/L	1	10	2.1	5.9	4.1
Cadmium	2006–2007	µg/L	0.9	10	0.02	0.1	0.05
Copper	2006–2007	µg/L	1	10	3.5	24	10.1
Lead	2006–2007	µg/L	1	10	0.49	7.1	2.8
Nickel	2006–2007	µg/L	1	9	7.35	46	21
Zinc	2006–2007	µg/L	1	10	3.5	46	19
2,4-D	2004	µg/L	1	1	0.45	0.45	0.45
2-Chloro-4-isopropylamino-6-amino-s-triazine, dissolved	2000	µg/L	0.55	11	0.001	0.005	0.003
p,p'-DDE	2006–2007	µg/L	1	3	0.004	0.0057	0.005
p,p'-DDE, dissolved	2000–2001	µg/L	0.91	11	0.002	0.007	0.004
Atrazine, dissolved	2000	µg/L	0.82	11	0.0005	0.016	0.007
Azinphos-methyl (Guthion),	2000	µg/L	0.45	11	0.0005	0.025	0.013

Table F1-28. Water Quality in Newman Wasteway

Analyte	Time Range	Unit	Fraction Detected	Count	Min	Max	Average
dissolved							
Butylate, dissolved	2000	µg/L	0.09	11	0.001	0.006	0.001
Carbaryl, dissolved	2000	µg/L	0.6	10	0.0015	0.014	0.005
Chlorpyrifos	2005–2007	µg/L	1	3	0.017	0.034	0.024
Chlorpyrifos, dissolved	2000–2001	µg/L	0.82	11	0.002	0.037	0.013
Cyanazine, dissolved	2000	µg/L	0.36	11	0.002	0.01	0.01
Dacthal (DCPA), dissolved	2000	µg/L	0.27	11	0.001	0.002	0.001
Diazinon, dissolved	2000	µg/L	0.91	11	0.001	0.154	0.046
Dichlorprop (2,4-DP)	2000	µg/L	1	1	0.34	0.34	0.34
Dieldrin, dissolved	2000	µg/L	0.09	11	0.0005	0.007	0.001
Dimethoate	2004–2006	µg/L	1	6	0.06	0.5	0.28
Diuron	2007	µg/L	1	3	0.56	13	4.8
EPTC, dissolved	2000–2001, 2005	µg/L	0.45	11	0.001	0.072	0.009
Glyphosate	2006	µg/L	0.50	2	2.5	48	25
Malathion, dissolved	2000	µg/L	0.64	11	0.0025	1.14	0.111
Metolachlor, dissolved	2000	µg/L	1	11	0.011	0.198	0.040
Metribuzin, dissolved	2000	µg/L	0.09	11	0.002	0.015	0.003
Molinate, dissolved	2000	µg/L	0.18	11	0.001	0.007	0.002
Napropamide, dissolved	2000	µg/L	0.73	11	0.0015	0.018	0.008
Oxamyl	2007	µg/L	1	1	0.23	0.23	0.23
Pendimethalin (Prowl), dissolved	2000	µg/L	0.18	11	0.002	0.021	0.006
Prometon, dissolved	2000	µg/L	0.75	8	0.005	0.01	0.009
Propargite, dissolved	2000	µg/L	0.1	10	0.005	0.075	0.017
Simazine	2006–2007	µg/L	1	5	0.13	2.2	0.97
Simazine, dissolved	2000–2001	µg/L	1	11	0.02	9.67	2.35
Trifluralin	2000–2001, 2006	µg/L	1	1	0.067	0.067	0.067
Trifluralin, dissolved	2000–2001	µg/L	0.82	11	0.001	0.163	0.021

Sources: U.S. Geological Survey 2007; Westside San Joaquin River Water Coalition 2007.

Notes:

For the purpose of data evaluation, nondetect data were assumed to equal half the reporting limit. Total coliform and *E. coli* samples greater than the upper limit of quantitation, 2419.6 MPN/100 mL, are represented as >2420 MPN/100 mL.

Data were combined for sites at Newman Wasteway at Highway 33 Near Gustine and Newman Wasteway near Hills Ferry Road.

Key:

µmhos/cm = micromhos per centimeter

°C = degrees Celsius

µg/L = microgram(s) per liter

BOD = biological oxygen demand

mg/L = milligram(s) per liter

mL = milliliter(s)

MPN = most probable number

NTU = nephelometric turbidity unit(s)

WY = Water Year

F.1.4 References

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