Stillwater Sciences

2855 Telegraph Avenue, Suite 400 Berkeley, CA 94704 Phone (510) 848-8098 Fax (510) 848-8398

DRAFT TECHNICAL MEMORANDUM

DATE: July 1, 2004

TO: Tim Ford

FROM: Noah Hume and Shawn White

SUBJECT: Lower Tuolumne River water quality monitoring results May/June 2004

INTRODUCTION

In the lower Tuolumne River, temperature conditions for over-summering salmonids relate directly to ambient air temperatures and instream flows (Aceituno 1990; USFWS 1995) and formed part of the basis of the present day flow allocation (FERC 1996). Dissolved oxygen (DO) and other water quality (WQ) data are limited for much of the lower Tuolumne River above the Dry Creek confluence in Modesto (Kratzner et. al. 2004; Kratzner and Shelton 1998). The TRTAC participants have discussed the need to obtain additional DO and other WQ data within the uppermost portions of the river that support over-summering salmonids. A study request made by the NOAA Fisheries in April 2004 included specific DO and WQ sampling. In their letter NOAA requests: 1) continued water temperature monitoring, 2) dissolved oxygen monitoring at a minimum of 15-day intervals, and 3) water quality sampling for potential contaminants.

In response to the first data request related to ongoing temperature monitoring, continuous data collection using in-situ thermographs has been carried out by the Districts since 1987, reported as daily min, max and averages (TID/MID 1992, 1998, 2002, 2003). Hourly data collected since 1998 was distributed in a series of Excel files (TID/MID 2004a). In addition, the Districts reported that the water temperature responses to the adaptive summer flow schedule based on Modesto air temperatures in the summer of 2003 met the objectives of increased downstream cool water habitat within the available water allocation (TID/MID 2004b).

In response to the second and third data requests related to dissolved oxygen and other water quality conditions during the summer flow period, the Districts have conducted data collection to provide this information to the TRTAC participants. This memorandum summarizes the approach, methods and results to date of water quality conditions sampled between RM 52 and RM 36 of the lower Tuolumne River.

APPROACH

The results of this monitoring study is intended to provide an initial record of water quality encountered by over-summering Chinook salmon (*Oncorhynchus tshawytscha*) and trout (*O. mykiss*). To provide representative data, synoptic (*i.e.,* multiple locations at or near the same time) water quality surveys were conducted downstream of La Grange Dam (RM 52) at multiple sites (Table 1 and Figure 1). These data were supplemented by spot checks of water quality parameters (Table 2) across the river cross section and vertically. In addition to these surveys, a single round

of upstream and downstream water chemistry sampling was conducted to include nutrients, and a screening analysis for common pesticides and herbicides (Table 2). Due to the considerable cost of conducting each survey, the Districts do not choose to conduct the surveys every two weeks. The initial surveys were conducted before and after the transition from the spring flow schedule to a lower summer flow period in early June, 2004. Additional surveys during hot weather conditions and/or in late summer will be discussed after review of the results to date.

METHODS

Wherever possible, standard methods were used during the course of these surveys (APHA 1998, USEPA 1999, Wagner et. al. 2000). Two calibrated water quality meters (Sondes) were placed in pool tails at RM 51 and RM 43 (Table 1) on the morning of Friday May 28th and retrieved Saturday June 5th 2004. Survey sites (Table 1 and Figure 1) were located by river mile and by hand-held GPS unit. In situ spot checks of physical water quality parameters (Table 2) were performed at additional locations shown in Table 1 along the channel margins and at various depths as site access permitted. Water chemistry sampling for the constituents in Table 2 was performed by the Districts on Monday, June 7, 2004 at the conclusion of the second synoptic survey, with samples collected in approved containers and stored according to recommended preservation and hold times until analysis.

RESULTS AND DISCUSSION

Stillwater Sciences and TID staff participated in two field efforts on 5/28-5/29 and 6/4-6/5, with water chemistry samples collected by TID at RM 43 on 6/7. Flows at La Grange (USGS 11289650) ranged from near 180 cfs on 5/28 to near 100 cfs on 6/7 with air temperatures at Modesto ranging between 60–70 ^{o}F at night to near 90^{o}F during the day. Due to changes in the USGS rating curve at the La Grange gage after the surveys were completed, the flow levels were apparently not as low as first indicated. The revised values are used in this report.

Diel Studies. Attachment A provides a record of the continuous water quality data recorded at RM 51 (upstream) and RM 43 (downstream) over a seven day period (5/28-6/4). Figures 2 and 3 show the hourly variations of temperature and dissolved oxygen at the upstream and downstream locations.

Although instream temperatures are more accurately assessed using the Districts thermographs deployed throughout the river, recorded temperatures in the first few days ranged from 10.7–13.5 ^{o}C upstream and 13–17 ^{o}C at the downstream location. Variations in temperature reached minimum and maximum values just after dawn (5–6 am) and early evening (6 pm) with average values near mid-afternoon (2 pm to 3 pm). The decrease in flow combined with increased air temperatures after 6/1 served to increase the water temperature at the downstream location to a range of 15.6–20 ^{o}C) at the downstream location (Figure 2). These conditions were associated with only minor changes in upstream water temperatures due to the short travel time of the water from Don Pedro Dam (Figure 2).

Although the slightly larger diel variation in DO at the downstream site suggests that aquatic vegetation may exert an influence, DO was at or near saturation throughout the sampling period, ranging from 9.5–11 mg/L upstream and 9.2–11.3 mg/L at the downstream location (Figure 3).

Variations in DO reached minimum and maximum values before dawn (5 am) and late afternoon (5 pm) with average values near mid-afternoon (1 pm to 3 pm).

Spot checks. In addition to recording diel variations in water quality at Riffles A7 and 21, spot checks of water quality were conducted at ten sites (Table 1) from RM 51.8 to RM 36.7. Within each site, samples were taken at several locations characterized by meso-habitat (e.g., backwater, pool, run, riffle), sample depth (e.g., surface, mid-depth, and bottom) and cross section (e.g., mid-channel, edge). Vertical profile data was recorded in pool habitats and above the Sonde locations at the time of recovery.

Attachment B provides a record of all sample data recorded, which were analyzed by using linear fitting and analysis of variance. For temperature, DO and conductivity, date and site effects are much larger than within site effects by meso-habitat, sample depth or cross section location. Water temperatures generally varied with distance downstream (i.e. downstream > upstream), by meso-habitat (i.e., backwater > riffle > run > pool), as well as by cross section (i.e. backwater > margin > mid-channel). A slight decrease in temperature was apparent with depth; the relatively shallow water (approx. 4-8 ft) appeared to be well mixed at the observed flows.

Dissolved oxygen decreases slightly, but significantly in the downstream direction, with DO remaining at or near saturation in all locations. There were apparent differences in DO by meso-habitat conditions (e.g., Riffle > Run > Pool > Backwater), with mid-riffle locations having the highest levels, perhaps due to the greatest amount of turbulence. In exploratory analyses, no significant variations in DO were found with depth or meso-habitat with the combination of distance downstream and date accounting for 18% of the variability in DO. However, after separating out the site and date effects from DO levels in individual locations, the variation by cross section (i.e. mid-channel > margin).was found highly significant ($p < 0.0001$), whereas variations with depth or meso-habitat were at best marginally significant ($p=0.07$ and $p=0.13$, respectively).

pH increased only slightly in the downstream direction. However, specific conductivity increased significantly by distance (i.e., downstream > upstream) and by cross section (i.e., edge > mid-channel). The combination of distance downstream and date accounts for 77% of the variability in conductivity. Although conversion of the conductivity values to dissolved solids would require a correlation between laboratory and instrument testing, the increases in conductivity in the downstream direction are on the order of 10–30 mg/L, suggesting that groundwater may have an influence on salinity, temperature and other water quality conditions in the lower Tuolumne River.

Water Chemistry. Samples for nutrients, herbicides, pesticides and algae (Table 2) were collected below Riffle A7 (RM 50.8) and above Riffle 21 (RM 43) by TID staff at 1 pm and 2 pm, respectively on 6/7/04. Contaminant samples were sent to Environmental Micro Analysis, Inc., Woodland CA, whereas the nutrient samples were sent to A & L Western Agricultural Laboratories, Inc., Modesto CA.

Table 3 shows the physical and water quality conditions at the time of sampling along with values of the analytes tested. All parameters sampled were below the method reporting limits (MRLs),

which are set by the laboratory to ensure a reporting accuracy with less than a 0.3% probability that replicate samples reported in Table 3 as non-detect (ND) would exceed the Table 2 MRLs. With the possible exception of legacy contamination from historic gold mining debris (Churchill 1999), contaminants responsible for lower water quality are generally associated with agricultural activities that primarily occur downstream of the Dry Creek confluence in Modesto (Kratzner and Shelton 1998). To provide some basis of comparison, a 2000–2001 water resources investigation report by USGS (Kratzner et. al 2004) reported relatively low summertime nutrients levels downstream of the study area at Shiloh Rd. (RM 3.5). Because average reported ammonia, nitrate and organic nitrogen concentrations were 0.03, 1.59 and 0.23 mg-N/L, respectively, it is likely that actual concentrations are well below the reported MRLs in Table 2. Historical grab sample data available for pesticides from the USGS (http://waterdata.usgs.gov/nwis/qw) are also generally consistent with the results found in this sampling event.

CONCLUSIONS AND RECOMMENDATIONS

Like many other rivers of the Sierra Nevada, the Tuolumne River is regarded as producing surface water of excellent quality. Minimum DO levels during pre-dawn hours found in these surveys were near 8 mg/L at the downstream location; above the applicable standards (i.e. DO > 85% saturation or 7.0 mg/L at all times). Water chemistry sampling resulted in non-detects for nutrients and contaminants. Comparisons with independent studies of water quality conditions in downstream locations below Modesto suggest that the lower Tuolumne River approaches natural background levels for nutrients. The combinations of non-detect values for nutrients and relatively high nighttime DO levels (8–10 mg/L) suggest that water quality conditions are suitable for all aquatic beneficial uses. Although it is unlikely that chemical water quality conditions will be substantially degraded under hotter conditions during mid- to late-summer, it is unknown to what degree the increase in algal and macrophyte biomass later in the summer will increase the nighttime oxygen demand in the river. For this reason, the Districts may elect to perform one or more additional diel surveys and paired water chemistry sampling event for nutrients to confirm the results of these initial surveys, pending further discussion by the TRTAC participants.

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Table 1. Water quality sampling locations on the lower Tuolumne River

Location	River mile	Sampling Type			Site Description
		Diel	Spot Check	Chem.	
La Grange Gage	51.8		X		Pool habitat below gage house access road.
SRP 1 (pool above RA7)	51	X	X		Pool habitat upstream of Riffle A7.
Riffle A7	50.8		X	X	Riffle habitat off of OLGB access road.
Riffle 5B (New Basso Br.)	47.9		X		Riffle, pool and backwater habitat.
Riffle 13B (Zanker)	45.5		X		Riffle, pool and backwater habitat.
Riffle 21 (TRR/BobCat Flat)	43	X	X	X	Pool habitat with dense aquatic vegetation.
Riffle 24B (TLSRA)	41.6		X		Riffle habitat below TLSRA Campground.
Roberts Ferry Bridge	39.4		X		Riffle and pool habitat.
Riffle 36A/35B (Santa Fe Aggr.)	36.7		X		Riffle, pool and backwater habitat above Santa Fe Aggregates. bridge

Table 2. Water quality analytical methods

Parameter Type	Parameter	Reporting Limit	Method
Physical Water Quality Parameters	Temperature	0.1 C	EPA 170.1
	Dissolved Oxygen (DO)	0.0 mg/L	SM 4500-O
	Conductivity (Total Dissolved Solids)	1.0 umhos/cm	SM 2510-B
	pH	0.1 s.u.	SM 4500-H
	Turbidity	0.1 NTU	SM 2130 B
Nutrients	Nitrate-Nitrite (NO_3 + NO_2 as N)	2 mg/L	SM-4500-NO3-F
	Ammonia (NH_3 as N)	0.3 mg/L	SM 4500-NH3-B
	Kjeldahl Nitrogen (TKN as N)	0.3 mg/L	SM 4500-NH3-B
	Total Phosphorous (TP as P)	0.1 mg/L	SM 4500-P-F
	Orthophosphate (PO_4 as P)	0.01 mg/L	SM 4500-P-F
Biological	Algae (chlorophyll-*a*)	0.5 ug/L	SM 10200-H
Organophosphorus Pesticides	Azinphos-methyl (Guthion)	0.5 ug/L	EPA 8141A
	Bolstar (Sulprofos)	0.5 ug/L	
	Bensulide	0.5 ug/L	
	Carbofenthion (Trithion)	2 ug/L	
	Chlorfenvinphos (Supona)	0.5 ug/L	
	Chlorpyrifos (Dursban)	0.3 ug/L	
	Chlorpyrifos-methyl	0.3 ug/L	
	Ciodrin (Crotophos)	0.5 ug/L	
	Coumaphos (Co-Ral)	1.5 ug/L	
	DEF	0.5 ug/L	
	Demeton (Systox) O/S Analogues	0.5 ug/L	
	Diazinon	0.5 ug/L	
	Dibrom (Naled)	0.5 ug/L	
	Dicrotophos (Didrin)	0.5 ug/L	
	Dimethoate (Cygon)	0.5 ug/L	
	Disulfoton (Disyston)	0.3 ug/L	
	EPN	1.0 ug/L	
	Ethion	0.5 ug/L	
	Ethoprop (Modap)	0.5 ug/L	
	Fenamiphos (Nemacur)	0.5 ug/L	
	Fenitrothion (Sumithion)	0.5 ug/L	
	Fenthion (Baytex)	0.5 ug/L	
	Fonofos (Dyfonate)	0.5 ug/L	
	Imidan (Phosmet)	0.5 ug/L	
	Isofenphos (Oftanol)	0.5 ug/L	
	Malathion	0.5 ug/L	
	Methidathion (Supracide)	0.5 ug/L	
	Methyl Parathion	0.5 ug/L	
	Mevinphos (Phosdrin)	0.5 ug/L	
	Parathion	0.5 ug/L	
	Phorate (Thimet)	0.5 ug/L	
	Phosalone (Zolone)	1.5 ug/L	
	Phosphamidon (Dimecron)	1.0 ug/L	
	Primiphos-methyl	0.5 ug/L	
	Profenofos (Curacron)	1.0 ug/L	
	Propetamiphos (Safrotin)	0.5 ug/L	
	Ronnel (Fenchlorfos)	0.5 ug/L	
	Tetrachlorvinphos (Gardona)	0.5 ug/L	
	Thionazin (Zinophos)	0.5 ug/L	
Chlorinated Herbicides	2, 4 - D	0.25 ug/L	EPA 8161A
	2, 4 -DB	0.25 ug/L	
	2, 4, 5 - T	0.13 ug?l	
	2, 4, 5 -TP	0.13 ug/L	
	Dicamba	0.13 ug?L	
	Dichloroprop	0.13 ug/L	
	Dinoseb	0.13 ug/L	

Table 3. Water chemistry results of 6/7/04 sampling on the lower Tuolumne River

Parameter	Method	Riffle A7 (RM 50.8)	Riffle 21 (RM 43)
Sampling Conditions			
Time		12:55	14:05
Depth		1.4 ft	2.0 ft
Flow at La Grange		106 cfs	106 cfs
Air Temp at Modesto		75°F (24.4°C)	78°F (25.6°C)
Barometric Pressure		753 mm Hg	753 m Hg
Physical Water Quality			
Temperature	EPA 170.1	12.96	19.92
Dissolved Oxygen (DO)	SM 4500-O	10.41	10.10
Conductivity (Total Dissolved Solids)	SM 2510-B	32	41
pH	SM 4500-H	7.01	7.74
Turbidity	SM 2130 B	0.33	0.77
Nutrients			
Nitrate-Nitrite (NO_3 + NO_2 as N)	EPA 300.0	ND	ND
Ammonia (NH_3 as N)	EPA 350.2		
Kjeldahl Nitrogen (TKN as N)	EPA 351.3		
Total Phosphorous (TP as P)	EPA 365.3		
Orthophosphate (PO_4 as P)	EPA 365.2		
Algae (Chlorophyll-*a*)	SM 10200-H	ND	ND
Organophosphorus Pesticides	EPA 8141A	ND	ND
Chlorinated Herbicides	EPA 8161A	ND	ND

Note: See Table 2 for the method reporting limits associated with non-detect (ND) results.

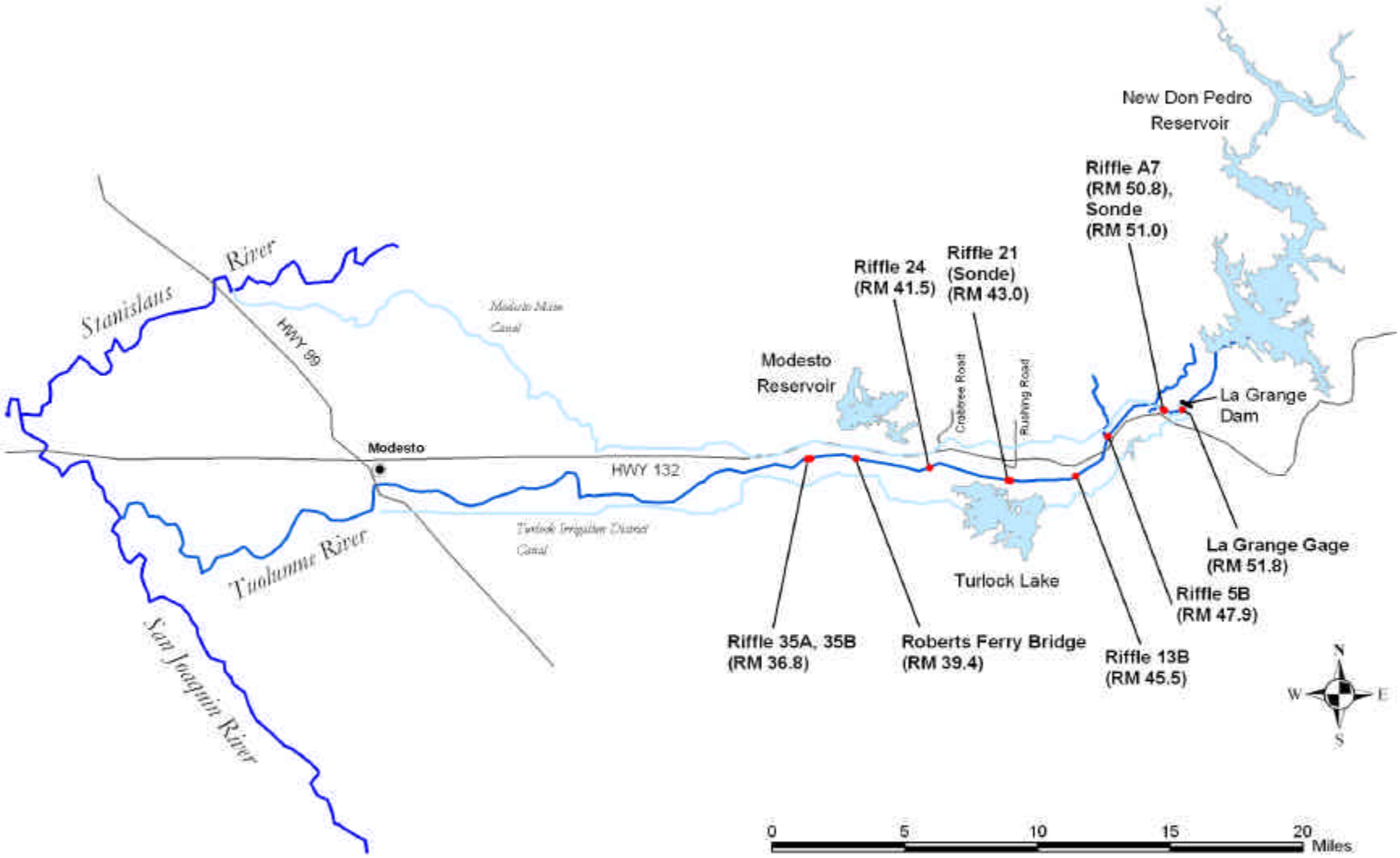

Figure 1. 2004 Water quality sampling locations on the lower Tuolumne River

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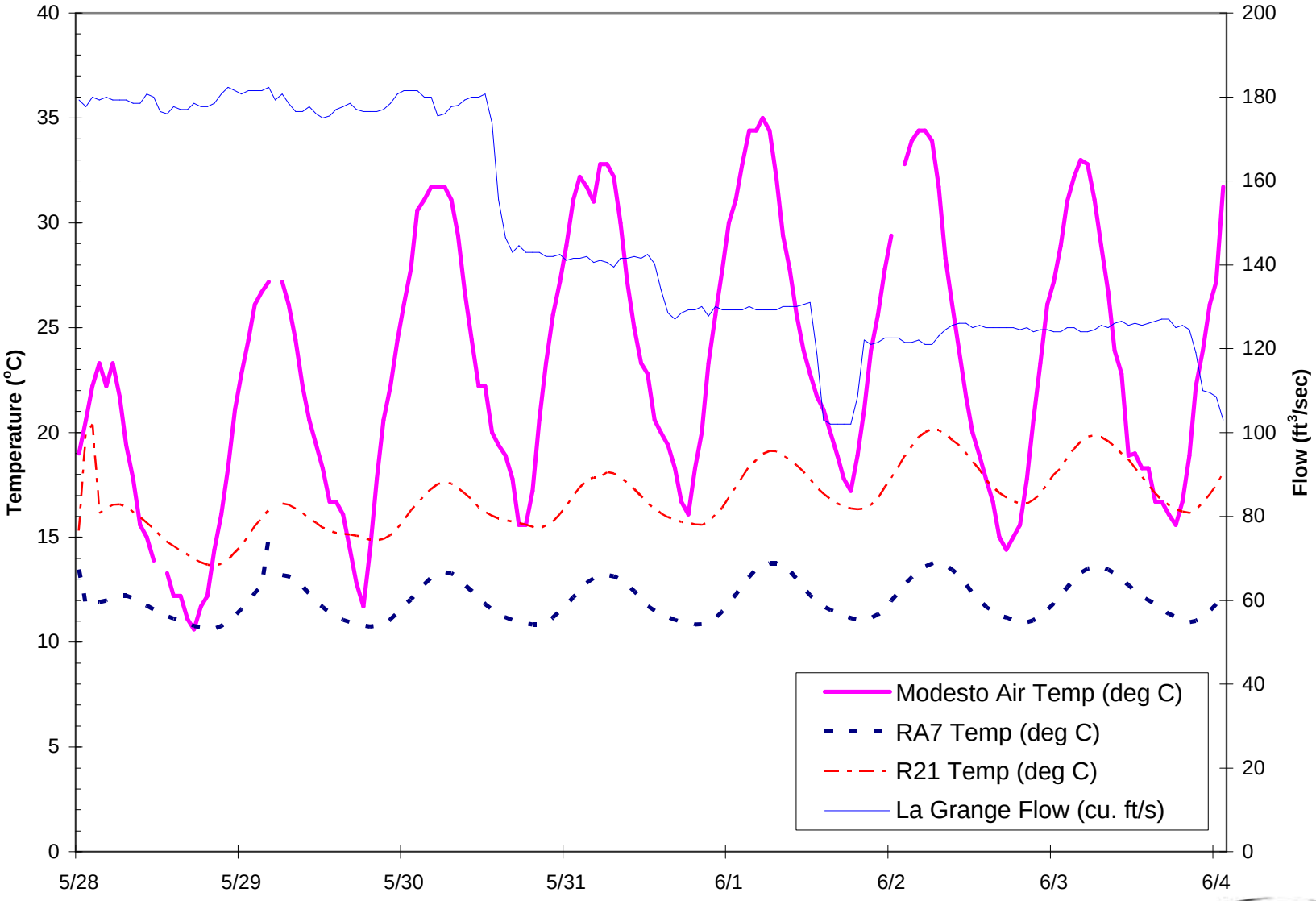

Figure 2. Air and water temperature variations from 5/28 to 6/7/2004 on the lower Tuolumne River

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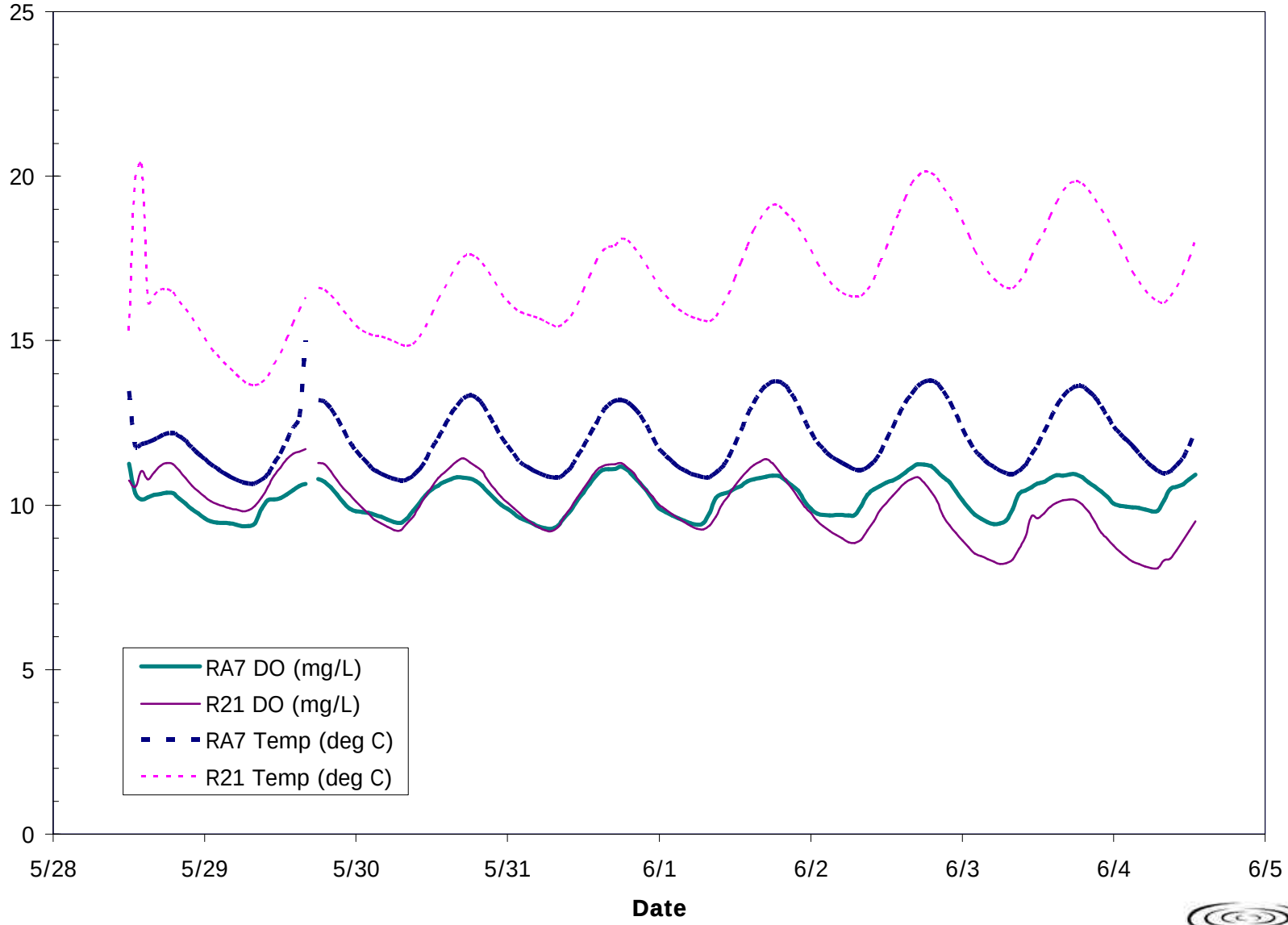

Figure 3. Air and water temperature variations from 5/28 to 6/7/2004 on the lower Tuolumne River

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Attachment A: Continuous water quality data record from RM 51 and RM 43 on the lower Tuolumne River May/June 2004

	Modesto Airport Conditions						La Grange	Riffle A7 Conditions					Riffle 21 Conditions					
Date/Time	Modesto Air Temp (deg C)	Modesto Air Temp (deg F)	Humidity	Press (in H2O)	Bar. at Modesto (mm Hg)	Weather	La Grange Flow (cu. ft/s)	RA7 Temp (deg C)	RA7 DO (%)	RA7 DO (mg/L)	RA7 Cond (uS/cm)	RA7 pH	R21 Temp (deg C)	R21 DO (%)	R21 DO (mg/L)	R21 Cond (uS/cm)	R21 pH	Turbidity (NTU)
5/28/04 12:00	19	66.2	68%	29.98	759.5	Overcast	179.3	13.5	107.9	11.26	19.0	6.6	15.3	107.2	10.75	57.4	6.9	1.2
5/28/04 13:00	20.6	69.08	63%	29.95	758.7	Overcast	177.8	11.8	95.7	10.37	32.0	6.8	19.9	115.9	10.56	66.3	7.0	1.2
5/28/04 14:00	22.2	71.96	57%	29.95	758.7	Partly Cloudy	180.0	11.9	94.1	10.18	32.0	6.8	20.4	122.3	11.03	67.0	7.0	1.2
5/28/04 15:00	23.3	73.94	53%	29.92	758.0	Scattered Clouds	179.3	11.9	94.7	10.23	32.0	6.8	16.2	109.7	10.79	64.2	7.5	0.4
5/28/04 16:00	22.2	71.96	55%	29.92	758.0	Overcast	180.0	12.0	95.7	10.31	32.0	6.9	16.4	112.3	11.00	64.0	7.6	0.3
5/28/04 17:00	23.3	73.94	48%	29.92	758.0	Partly Cloudy	179.3	12.1	96.2	10.34	32.0	6.9	16.6	114.8	11.20	64.0	7.7	0.3
5/28/04 18:00	21.7	71.06	44%	29.92	758.0	Scattered Clouds	179.3	12.2	96.7	10.38	32.0	6.9	16.6	115.7	11.28	64.0	7.8	0.4
5/28/04 19:00	19.4	66.92	45%	29.92	758.0	Scattered Clouds	179.3	12.2	96.6	10.36	32.0	6.9	16.5	115.1	11.25	64.0	7.8	0.3
5/28/04 20:00	17.8	64.04	50%	29.92	758.0	Clear	178.5	12.1	94.8	10.20	32.0	6.9	16.2	112.5	11.06	63.5	7.6	0.3
5/28/04 21:00	15.6	60.08	57%	29.92	758.0	Clear	178.5	12.0	93.2	10.05	32.0	6.9	16.0	109.7	10.83	63.0	7.5	0.3
5/28/04 22:00	15	59	60%	29.95	758.7	Clear	180.8	11.7	91.2	9.88	32.9	6.8	15.7	106.7	10.60	62.7	7.4	0.7
5/28/04 23:00	13.9	57.02	69%	29.95	758.7	Clear	180.0	11.6	89.6	9.75	33.0	6.8	15.4	104.4	10.43	62.0	7.3	0.5
5/29/04 0:00							176.5	11.4	87.9	9.60	33.0	6.8	15.1	102.0	10.27	61.2	7.2	0.5
5/29/04 1:00	13.3	55.94	75%	29.95	758.7	Clear	176.0	11.2	86.8	9.52	33.0	6.7	14.8	99.9	10.12	60.5	7.1	0.6
5/29/04 2:00	12.2	53.96	80%	29.95	758.7	Clear	177.8	11.1	86.1	9.48	33.0	6.7	14.6	98.6	10.03	60.0	7.1	0.5
5/29/04 3:00	12.2	53.96	80%	29.92	758.0	Clear	177.0	11.0	85.7	9.45	33.0	6.7	14.4	97.5	9.96	59.8	7.1	0.5
5/29/04 4:00	11.1	51.98	83%	29.92	758.0	Clear	177.0	10.9	85.4	9.45	33.0	6.7	14.2	96.4	9.90	59.0	7.0	0.6
5/29/04 5:00	10.6	51.08	86%	29.95	758.7	Clear	178.5	10.8	84.9	9.41	33.0	6.7	14.0	95.7	9.87	59.0	7.0	0.6
5/29/04 6:00	11.7	53.06	80%	29.95	758.7	Clear	177.8	10.7	84.3	9.36	33.0	6.7	13.8	94.9	9.82	58.4	7.0	0.6
5/29/04 7:00	12.2	53.96	83%	29.98	759.5	Clear	177.8	10.7	84.2	9.37	33.0	6.7	13.7	94.8	9.84	58.0	7.0	0.3
5/29/04 8:00	14.4	57.92	75%	29.98	759.5	Clear	178.5	10.7	85.0	9.45	32.5	6.7	13.6	96.1	9.98	58.0	7.0	0.2
5/29/04 9:00	16.1	60.98	67%	30.01	760.3	Clear	180.8	10.8	89.2	9.89	32.0	6.7	13.7	98.7	10.23	58.0	7.1	0.6
5/29/04 10:00	18.3	64.94	58%	30.01	760.3	Clear	182.3	10.9	91.9	10.14	32.0	6.7	13.9	102.3	10.56	58.0	7.1	0.1
5/29/04 11:00	21.1	69.98	53%	30.01	760.3	Clear	181.5	11.3	92.8	10.17	32.0	6.8	14.3	106.4	10.90	58.9	7.3	0.1
5/29/04 12:00	22.8	73.04	48%	30.01	760.3	Clear	180.8	11.6	93.8	10.21	32.0	6.8	14.6	109.6	11.14	59.3	7.3	0.1
5/29/04 13:00	24.4	75.92	37%	29.98	759.5	Clear	181.5	11.9	95.7	10.33	32.0	6.8	15.1	113.2	11.39	60.0	7.5	0.0
5/29/04 14:00	26.1	78.98	31%	29.98	759.5	Clear	181.5	12.3	97.8	10.46	32.0	6.9	15.5	115.9	11.56	61.0	7.6	0.1
5/29/04 15:00	26.7	80.06	29%	29.98	759.5	Clear	181.5	12.7	99.7	10.59	32.0	6.9	15.9	117.6	11.62	61.8	7.7	0.1
5/29/04 16:00	27.2	80.96	25%	29.95	758.7	Clear	182.3	15.0	105.1	10.64	21.3	6.5	16.3	119.4	11.71	62.4	7.9	0.1
5/29/04 17:00							179.3											
5/29/04 18:00	27.2	80.96	25%	29.92	758.0	Clear	180.8	13.2	102.9	10.80	32.0	7.0	16.6	115.8	11.29	63.5	7.8	0.6
5/29/04 19:00	26.1	78.98	29%	29.92	758.0	Clear	178.5	13.1	102.0	10.71	32.0	7.0	16.6	115.2	11.24	62.9	7.7	0.2
5/29/04 20:00	24.4	75.92	33%	29.95	758.7	Clear	176.5	12.9	99.9	10.54	32.0	7.0	16.4	112.7	11.03	62.0	7.6	0.2
5/29/04 21:00	22.2	71.96	40%	29.95	758.7	Clear	176.5	12.6	97.3	10.33	32.5	6.9	16.2	109.4	10.76	62.0	7.4	0.2
5/29/04 22:00	20.6	69.08	42%	29.98	759.5	Clear	177.8	12.3	94.2	10.09	33.0	6.9	15.9	106.2	10.50	61.3	7.3	0.4
5/29/04 23:00	19.4	66.92	42%	29.98	759.5	Clear	176.0	11.9	91.7	9.90	33.0	6.8	15.7	104.0	10.33	61.0	7.2	0.5
5/30/04 0:00	18.3	64.94	48%	29.98	759.5	Clear	175.0	11.7	90.5	9.82	33.0	6.8	15.5	101.3	10.11	60.3	7.1	0.4
5/30/04 1:00	16.7	62.06	58%	29.98	759.5	Clear	175.5	11.4	89.7	9.79	33.0	6.7	15.3	99.0	9.92	60.0	7.0	0.7
5/30/04 2:00	16.7	62.06	58%	29.95	758.7	Clear	177.0	11.2	89.0	9.76	33.0	6.7	15.2	97.0	9.74	60.0	7.0	0.5
5/30/04 3:00	16.1	60.98	62%	29.95	758.7	Clear	177.8	11.1	88.1	9.71	33.0	6.7	15.2	95.1	9.55	59.0	6.9	0.4
5/30/04 4:00	14.4	57.92	75%	29.98	759.5	Clear	178.5	10.9	87.4	9.65	33.0	6.7	15.1	93.9	9.44	59.0	6.9	0.5
5/30/04 5:00	12.8	55.04	80%	29.98	759.5	Clear	177.0	10.9	86.5	9.57	33.0	6.7	15.1	92.8	9.34	59.0	6.9	0.6
5/30/04 6:00	11.7	53.06	89%	29.98	759.5	Clear	176.5	10.8	85.6	9.49	33.0	6.7	15.0	91.6	9.24	59.0	6.9	0.5
5/30/04 7:00	14.4	57.92	78%	30.01	760.3	Clear	176.5	10.8	85.3	9.46	33.0	6.7	14.9	91.3	9.23	59.0	6.8	0.4
5/30/04 8:00	17.8	64.04	60%	30.01	760.3	Clear	176.5	10.8	86.5	9.59	33.0	6.7	14.8	93.2	9.43	58.3	6.9	0.3
5/30/04 9:00	20.6	69.08	51%	30.01	760.3	Clear	177.0	10.9	88.9	9.83	33.0	6.7	14.9	95.5	9.65	58.8	6.9	1.5
5/30/04 10:00	22.2	71.96	46%	30.01	760.3	Clear	178.5	11.1	91.4	10.06	33.0	6.7	15.1	99.0	9.96	59.0	7.0	0.2
5/30/04 11:00	24.4	75.92	40%	30.01	760.3	Clear	180.8	11.4	94.1	10.30	32.7	6.8	15.4	102.8	10.28	59.3	7.1	0.2
5/30/04 12:00	26.1	78.98	36%	30.01	760.3	Clear	181.5	11.7	96.6	10.48	32.0	6.8	15.8	106.5	10.55	60.1	7.2	0.2
5/30/04 13:00	27.8	82.04	30%	30.01	760.3	Clear	181.5	12.0	98.4	10.59	32.0	6.8	16.3	110.3	10.83	60.9	7.4	0.2
5/30/04 14:00	30.6	87.08	22%	29.98	759.5	Clear	181.5	12.4	100.2	10.71	32.0	6.9	16.6	112.8	10.99	61.6	7.5	0.2
5/30/04 15:00	31.1	87.98	24%	29.95	758.7	Clear	180.0	12.7	101.8	10.79	32.0	6.9	17.0	115.5	11.17	62.3	7.6	0.2
5/30/04 16:00	31.7	89.06	22%	29.95	758.7	Clear	180.0	13.0	103.0	10.84	32.0	6.9	17.3	118.0	11.33	63.0	7.8	0.2
5/30/04 17:00	31.7	89.06	22%	29.92	758.0	Clear	175.5	13.2	103.5	10.84	32.0	7.0	17.5	119.6	11.43	63.5	7.9	0.2
5/30/04 18:00	31.7	89.06	22%	29.92	758.0	Clear	176.0	13.3	103.4	10.82	32.0	7.0	17.6	118.5	11.31	64.0	7.9	0.2
5/30/04 19:00	31.1	87.98	22%	29.92	758.0	Clear	177.8	13.3	102.5	10.74	32.0	7.0	17.5	117.1	11.19	63.6	7.8	0.2

	Modesto Airport Conditions						La Grange	Riffle A7 Conditions					Riffle 21 Conditions					
Date/Time	Modesto Air Temp (deg C)	Modesto Air Temp (deg F)	Humidity	Press (in H2O)	Bar. at Modesto (mm Hg)	Weather	La Grange Flow (cu. ft/s)	RA7 Temp (deg C)	RA7 DO (%)	RA7 DO (mg/L)	RA7 Cond (uS/cm)	RA7 pH	R21 Temp (deg C)	R21 DO (%)	R21 DO (mg/L)	R21 Cond (uS/cm)	R21 pH	Turbidity (NTU)
5/30/04 20:00	29.4	84.92	26%	29.92	758.0	Clear	178.0	13.1	100.6	10.58	32.3	7.0	17.4	114.9	11.03	63.0	7.6	0.2
5/30/04 21:00	26.7	80.06	34%	29.92	758.0	Clear	179.3	12.7	97.9	10.38	33.0	6.9	17.1	111.2	10.72	63.0	7.4	0.2
5/30/04 22:00	24.4	75.92	37%	29.92	758.0	Clear	180.0	12.4	95.5	10.19	33.0	6.9	16.8	108.0	10.48	62.0	7.3	0.4
5/30/04 23:00	22.2	71.96	46%	29.95	758.7	Clear	180.0	12.1	93.1	10.01	33.0	6.8	16.4	104.9	10.26	61.6	7.2	0.6
5/31/04 0:00	22.2	71.96	46%	29.95	758.7	Clear	180.8	11.8	91.4	9.89	33.0	6.8	16.2	102.7	10.09	61.0	7.1	1.0
5/31/04 1:00	20	68	59%	29.95	758.7	Clear	173.8	11.6	89.6	9.75	33.0	6.8	16.0	100.5	9.91	60.8	7.0	0.7
5/31/04 2:00	19.4	66.92	61%	29.92	758.0	Clear	155.5	11.3	87.8	9.61	33.0	6.7	15.9	98.5	9.74	60.0	7.0	41.6
5/31/04 3:00	18.9	66.02	59%	29.92	758.0	Clear	146.5	11.2	86.7	9.52	33.0	6.7	15.8	96.6	9.58	60.0	6.9	1.0
5/31/04 4:00	17.8	64.04	67%	29.92	758.0	Clear	143.0	11.1	85.7	9.44	33.0	6.7	15.7	94.9	9.42	60.0	6.9	0.6
5/31/04 5:00	15.6	60.08	75%	29.92	758.0	Clear	144.5	11.0	84.7	9.34	33.0	6.7	15.7	93.8	9.32	60.0	6.9	0.7
5/31/04 6:00	15.6	60.08	78%	29.92	758.0	Clear	143.0	10.9	84.1	9.30	33.0	6.7	15.6	92.7	9.23	59.3	6.9	0.8
5/31/04 7:00	17.2	62.96	67%	29.92	758.0	Clear	143.0	10.8	83.9	9.28	33.0	6.7	15.5	92.5	9.22	59.0	6.9	0.6
5/31/04 8:00	20.6	69.08	53%	29.92	758.0	Clear	143.0	10.8	84.7	9.38	33.0	6.7	15.4	93.6	9.35	59.0	6.9	0.4
5/31/04 9:00	23.3	73.94	43%	29.92	758.0	Clear	142.0	10.9	87.1	9.62	33.0	6.7	15.6	96.9	9.65	59.7	6.9	0.3
5/31/04 10:00	25.6	78.08	39%	29.92	758.0	Clear	142.0	11.1	89.6	9.84	33.0	6.7	15.7	99.9	9.92	60.1	7.0	0.3
5/31/04 11:00	27.2	80.96	36%	29.92	758.0	Clear	142.5	11.5	92.9	10.13	33.0	6.7	16.1	103.7	10.22	61.3	7.1	0.2
5/31/04 12:00	28.9	84.02	34%	29.89	757.2	Clear	141.0	11.8	95.8	10.38	33.0	6.8	16.5	107.6	10.50	62.3	7.2	0.3
5/31/04 13:00	31.1	87.98	32%	29.86	756.5	Scattered Clouds	141.5	12.1	99.0	10.64	32.9	6.8	17.0	111.3	10.77	63.7	7.4	0.2
5/31/04 14:00	32.2	89.96	29%	29.86	756.5	Clear	141.5	12.5	102.1	10.89	32.2	6.8	17.4	115.2	11.04	64.6	7.6	0.3
5/31/04 15:00	31.7	89.06	29%	29.83	755.7	Scattered Clouds	142.0	12.8	104.6	11.07	32.0	6.9	17.7	117.4	11.18	65.3	7.7	0.3
5/31/04 16:00	31	87.8	29%	29.83	755.7	Scattered Clouds	140.5	13.0	105.4	11.10	32.0	6.9	17.9	118.2	11.23	65.9	7.8	0.2
5/31/04 17:00	32.8	91.04	23%	29.8	754.9	Clear	141.0	13.2	105.8	11.10	32.0	6.9	17.9	118.5	11.24	66.0	7.8	0.5
5/31/04 18:00	32.8	91.04	24%	29.77	754.2	Clear	140.5	13.2	106.5	11.17	32.0	6.9	18.1	119.4	11.28	66.0	7.9	0.2
5/31/04 19:00	32.2	89.96	27%	29.77	754.2	Clear	139.5	13.1	105.3	11.07	32.2	7.0	18.1	117.8	11.14	65.9	7.8	0.2
5/31/04 20:00	30	86	30%	29.77	754.2	Clear	141.5	13.0	103.0	10.86	33.0	6.9	17.9	115.6	10.98	65.2	7.7	0.2
5/31/04 21:00	27.2	80.96	34%	29.77	754.2	Clear	141.5	12.7	100.6	10.67	33.0	6.9	17.6	112.1	10.70	64.8	7.5	0.4
5/31/04 22:00	25	77	40%	29.8	754.9	Clear	142.0	12.4	97.9	10.45	33.0	6.9	17.3	108.9	10.46	64.0	7.3	0.9
5/31/04 23:00	23.3	73.94	41%	29.8	754.9	Clear	141.5	12.1	94.5	10.17	33.0	6.8	17.0	106.2	10.26	63.5	7.2	0.5
6/1/04 0:00	22.8	73.04	37%	29.8	754.9	Clear	142.5	11.7	91.4	9.91	33.1	6.7	16.6	102.9	10.03	62.8	7.1	1.3
6/1/04 1:00	20.6	69.08	47%	29.8	754.9	Clear	140.3	11.5	89.8	9.79	33.2	6.7	16.4	100.8	9.87	62.0	7.0	1.0
6/1/04 2:00	20	68	42%	29.8	754.9	Clear	134.0	11.3	88.6	9.69	33.0	6.7	16.1	98.8	9.72	61.8	7.0	0.8
6/1/04 3:00	19.4	66.92	49%	29.77	754.2	Clear	128.5	11.2	87.4	9.60	33.0	6.7	16.0	97.2	9.61	61.0	6.9	0.7
6/1/04 4:00	18.3	64.94	52%	29.77	754.2	Clear	127.0	11.1	86.5	9.53	33.0	6.6	15.8	95.7	9.48	61.0	6.9	0.6
6/1/04 5:00	16.7	62.06	62%	29.77	754.2	Clear	128.5	11.0	85.6	9.45	33.1	6.6	15.7	94.4	9.37	61.0	6.9	0.7
6/1/04 6:00	16.1	60.98	64%	29.77	754.2	Clear	129.3	10.9	85.1	9.41	33.7	6.6	15.7	93.4	9.29	60.3	6.9	0.7
6/1/04 7:00	18.3	64.94	54%	29.8	754.9	Clear	129.3	10.8	85.5	9.47	33.6	6.6	15.6	93.1	9.27	60.0	6.9	0.5
6/1/04 8:00	20	68	50%	29.8	754.9	Clear	130.0	10.9	88.2	9.76	33.0	6.6	15.6	94.2	9.38	60.0	6.9	0.4
6/1/04 9:00	23.3	73.94	40%	29.8	754.9	Clear	127.8	11.0	92.7	10.23	33.0	6.7	15.7	97.3	9.65	60.8	6.9	0.3
6/1/04 10:00	25.6	78.08	39%	29.8	754.9	Clear	130.0	11.2	94.1	10.34	33.0	6.7	16.1	101.8	10.03	61.4	7.0	0.3
6/1/04 11:00	27.8	82.04	39%	29.8	754.9	Clear	129.3	11.5	95.2	10.39	33.0	6.7	16.4	105.2	10.29	62.2	7.1	0.3
6/1/04 12:00	30	86	36%	29.8	754.9	Clear	129.3	11.8	97.0	10.50	33.0	6.8	16.9	109.3	10.59	63.2	7.3	0.3
6/1/04 13:00	31.1	87.98	35%	29.8	754.9	Clear	129.3	12.3	98.8	10.59	33.0	6.8	17.4	113.1	10.84	64.3	7.5	0.3
6/1/04 14:00	32.8	91.04	29%	29.77	754.2	Clear	129.3	12.7	101.2	10.73	33.0	6.8	17.9	116.3	11.04	65.5	7.6	0.3
6/1/04 15:00	34.4	93.92	28%	29.77	754.2	Clear	130.0	13.1	102.6	10.78	33.0	6.9	18.4	119.5	11.22	66.5	7.8	0.2
6/1/04 16:00	34.4	93.92	25%	29.74	753.4	Clear	129.3	13.4	103.8	10.83	33.0	6.9	18.7	121.3	11.33	67.5	7.9	0.4
6/1/04 17:00	35	95	25%	29.71	752.7	Clear	129.3	13.6	104.6	10.87	32.9	7.0	19.0	122.8	11.39	68.0	8.1	0.2
6/1/04 18:00	34.4	93.92	24%	29.71	752.7	Clear	129.3	13.8	105.2	10.90	32.9	7.0	19.1	121.8	11.27	68.0	8.1	0.2
6/1/04 19:00	32.2	89.96	24%	29.71	752.7	Clear	129.3	13.8	105.1	10.89	33.0	7.0	19.1	119.3	11.04	68.0	7.9	0.3
6/1/04 20:00	29.4	84.92	28%	29.71	752.7	Clear	130.0	13.6	103.5	10.76	33.0	7.0	18.9	116.0	10.78	68.0	7.7	0.3
6/1/04 21:00	27.8	82.04	28%	29.74	753.4	Clear	130.0	13.4	101.6	10.61	33.0	7.0	18.7	112.7	10.52	67.4	7.5	0.8
6/1/04 22:00	25.6	78.08	35%	29.74	753.4	Scattered Clouds	130.0	13.0	99.1	10.44	33.0	6.9	18.4	108.9	10.22	67.0	7.3	0.5
6/1/04 23:00	23.9	75.02	40%	29.77	754.2	Partly Cloudy	130.5	12.6	95.1	10.12	33.0	6.8	18.1	105.5	9.96	66.2	7.2	1.0
6/2/04 0:00	22.8	73.04	42%	29.77	754.2	Cl	131.0	12.2	92.3	9.89	33.0	6.8	17.8	102.6	9.76	65.4	7.1	1.1
6/2/04 1:00	21.7	71.06	47%	29.77	754.2	Clear	118.5	11.9	90.2	9.74	33.0	6.7	17.4	99.2	9.52	64.8	7.0	0.8
6/2/04 2:00	21.1	69.98	49%	29.74	753.4	Clear	103.0	11.7	89.4	9.70	33.0	6.7	17.1	97.0	9.35	64.0	7.0	0.9
6/2/04 3:00	20	68	55%	29.74	753.4	Clear	102.0	11.5	88.9	9.69	33.0	6.7	16.8	94.9	9.22	63.2	7.0	0.9
6/2/04 4:00	18.9	66.02	63%	29.74	753.4	Clear	102.0	11.4	88.8	9.71	33.0	6.7	16.6	93.5	9.11	62.7	6.9	1.2

	Modesto Airport Conditions						La Grange	Riffle A7 Conditions					Riffle 21 Conditions					
Date/Time	Modesto Air Temp (deg C)	Modesto Air Temp (deg F)	Humidity	Press (in H2O)	Bar. at Modesto (mm Hg)	Weather	La Grange Flow (cu. ft/s)	RA7 Temp (deg C)	RA7 DO (%)	RA7 DO (mg/L)	RA7 Cond (uS/cm)	RA7 pH	R21 Temp (deg C)	R21 DO (%)	R21 DO (mg/L)	R21 Cond (uS/cm)	R21 pH	Turbidity (NTU)
6/2/04 5:00	17.8	64.04	65%	29.77	754.2	Clear	102.0	11.3	88.6	9.71	33.0	6.7	16.5	92.0	8.99	62.0	6.9	1.0
6/2/04 6:00	17.2	62.96	65%	29.77	754.2	Clear	102.0	11.2	88.2	9.69	33.0	6.7	16.4	90.7	8.88	62.0	6.9	0.9
6/2/04 7:00	18.9	66.02	56%	29.77	754.2	Clear	108.5	11.1	88.2	9.71	33.0	6.6	16.3	90.3	8.85	62.0	6.9	0.9
6/2/04 8:00	21.1	69.98	49%	29.77	754.2	Clear	122.0	11.1	90.6	9.97	33.0	6.7	16.4	91.4	8.95	62.0	6.9	0.5
6/2/04 9:00	23.9	75.02	41%	29.8	754.9	Clear	121.0	11.1	93.8	10.31	33.0	6.7	16.6	94.6	9.23	62.3	7.0	0.5
6/2/04 10:00	25.6	78.08	39%	29.8	754.9	Clear	121.5	11.3	95.7	10.48	33.0	6.7	16.9	98.2	9.52	63.2	7.0	0.4
6/2/04 11:00	27.8	82.04	37%	29.77	754.2	Clear	122.5	11.6	97.2	10.58	33.0	6.7	17.4	102.7	9.85	64.5	7.2	0.4
6/2/04 12:00	29.4	84.92	36%	29.77	754.2	Clear	122.5	12.0	99.1	10.68	33.0	6.8	17.8	105.9	10.06	65.7	7.3	0.8
6/2/04 13:00							122.5	12.3	100.6	10.75	33.0	6.8	18.4	109.5	10.29	67.3	7.5	0.4
6/2/04 14:00	32.8	91.04	28%	29.74	753.4	Clear	121.5	12.7	102.4	10.85	33.0	6.9	18.9	112.8	10.49	68.7	7.7	0.4
6/2/04 15:00	33.9	93.02	29%	29.74	753.4	Clear	121.5	13.1	104.5	10.99	32.9	6.9	19.3	116.0	10.69	70.0	7.9	0.4
6/2/04 16:00	34.4	93.92	24%	29.71	752.7	Clear	122.0	13.4	106.5	11.13	33.0	7.0	19.8	118.2	10.79	71.0	8.1	0.4
6/2/04 17:00	34.4	93.92	23%	29.71	752.7	Clear	121.0	13.6	108.1	11.24	33.0	7.0	20.0	119.4	10.85	71.3	8.3	0.4
6/2/04 18:00	33.9	93.02	27%	29.71	752.7	Clear	121.0	13.7	108.4	11.24	33.0	7.0	20.1	117.8	10.68	71.3	8.2	0.5
6/2/04 19:00	31.7	89.06	22%	29.71	752.7	Clear	123.0	13.8	108.2	11.20	33.0	7.0	20.1	114.8	10.41	71.0	8.0	0.7
6/2/04 20:00	28.3	82.94	21%	29.74	753.4	Clear	124.5	13.7	106.4	11.03	33.0	7.0	19.9	111.2	10.12	70.5	7.8	0.5
6/2/04 21:00	26.1	78.98	24%	29.74	753.4	Clear	125.5	13.5	104.1	10.85	33.0	6.9	19.6	105.6	9.67	69.7	7.5	0.9
6/2/04 22:00	23.9	75.02	29%	29.77	754.2	Clear	126.0	13.2	101.9	10.70	33.0	6.9	19.4	101.9	9.39	69.0	7.4	1.1
6/2/04 23:00	21.7	71.06	38%	29.77	754.2	Partly Cloudy	126.0	12.8	98.5	10.43	33.0	6.9	19.0	98.7	9.15	68.3	7.2	1.1
6/3/04 0:00	20	68	47%	29.8	754.9	Clear	125.0	12.3	94.9	10.15	33.0	6.8	18.6	95.5	8.93	67.7	7.1	1.1
6/3/04 1:00	18.9	66.02	52%	29.8	754.9	Clear	125.5	12.0	92.0	9.92	33.8	6.7	18.2	92.6	8.72	66.7	7.1	1.2
6/3/04 2:00	17.8	64.04	58%	29.8	754.9	Clear	125.0	11.7	89.5	9.72	34.0	6.7	17.7	89.7	8.53	65.6	7.0	1.3
6/3/04 3:00	16.7	62.06	62%	29.83	755.7	Clear	125.0	11.5	87.9	9.58	34.0	6.7	17.4	88.2	8.45	65.0	7.0	0.9
6/3/04 4:00	15	59	72%	29.83	755.7	Clear	125.0	11.3	86.6	9.49	34.0	6.7	17.1	86.7	8.36	64.2	6.9	0.9
6/3/04 5:00	14.4	57.92	75%	29.83	755.7	Clear	125.0	11.2	85.7	9.42	34.0	6.6	16.9	85.5	8.29	63.6	6.9	3.3
6/3/04 6:00	15	59	72%	29.83	755.7	Clear	125.0	11.0	85.7	9.44	34.0	6.6	16.7	84.5	8.21	63.0	6.9	1.3
6/3/04 7:00	15.6	60.08	72%	29.86	756.5	Clear	124.5	11.0	86.4	9.53	34.0	6.6	16.6	84.5	8.23	62.8	6.9	1.9
6/3/04 8:00	17.8	64.04	65%	29.86	756.5	Clear	125.0	10.9	89.4	9.88	33.0	6.7	16.6	85.7	8.35	62.0	6.9	1.5
6/3/04 9:00	20.6	69.08	54%	29.89	757.2	Clear	124.0	11.0	93.8	10.33	33.0	6.7	16.8	89.2	8.67	62.9	7.0	0.5
6/3/04 10:00	23.3	73.94	46%	29.89	757.2	Clear	124.5	11.2	95.2	10.45	33.0	6.7	17.1	93.4	9.02	63.0	7.1	0.6
6/3/04 11:00	26.1	78.98	39%	29.89	757.2	Clear	124.5	11.5	96.9	10.55	33.0	6.8	17.6	101.2	9.66	64.1	7.2	2.2
6/3/04 12:00	27.2	80.96	35%	29.92	758.0	Clear	124.0	11.8	98.5	10.65	33.0	6.8	18.0	101.3	9.59	65.0	7.3	0.8
6/3/04 13:00	28.9	84.02	31%	29.92	758.0	Clear	124.0	12.2	99.9	10.71	33.0	6.9	18.3	103.7	9.75	65.7	7.4	0.5
6/3/04 14:00	31	87.8	25%	29.92	758.0	Scattered Clouds	125.0	12.6	101.8	10.83	33.0	6.9	18.8	106.7	9.94	66.8	7.6	0.5
6/3/04 15:00	32.2	89.96	25%	29.89	757.2	Clear	125.0	13.0	103.6	10.91	33.0	7.0	19.2	109.1	10.08	67.6	7.7	0.5
6/3/04 16:00	33	91.4	24%	29.89	757.2	Overcast	124.0	13.3	104.1	10.90	33.0	7.0	19.6	110.7	10.15	68.4	7.9	0.4
6/3/04 17:00	32.8	91.04	23%	29.89	757.2	Clear	124.0	13.5	104.9	10.93	33.0	7.0	19.8	111.4	10.17	69.0	8.1	0.4
6/3/04 18:00	31.1	87.98	24%	29.89	757.2	Clear	124.5	13.6	105.2	10.93	33.0	7.1	19.9	111.2	10.14	69.1	8.1	0.5
6/3/04 19:00	28.9	84.02	26%	29.89	757.2	Clear	125.5	13.6	104.4	10.85	33.0	7.1	19.8	109.7	10.02	69.1	8.1	0.5
6/3/04 20:00	26.7	80.06	29%	29.92	758.0	Clear	125.0	13.5	102.6	10.70	33.0	7.0	19.6	106.9	9.80	69.0	7.9	0.4
6/3/04 21:00	23.9	75.02	34%	29.92	758.0	Clear	126.0	13.3	100.9	10.57	33.0	7.0	19.3	103.0	9.50	68.7	7.6	0.5
6/3/04 22:00	22.8	73.04	34%	29.95	758.7	Clear	126.5	13.0	98.9	10.42	33.0	6.9	19.0	98.8	9.16	67.9	7.4	0.5
6/3/04 23:00	18.9	66.02	45%	29.95	758.7	Partly Cloudy	125.5	12.7	96.7	10.26	33.0	6.9	18.7	96.1	8.97	67.3	7.3	0.7
6/4/04 0:00	19	66.2	46%	29.95	758.7	Mostly Cloudy	126.0	12.4	94.1	10.05	33.0	6.8	18.3	93.2	8.77	66.4	7.2	0.7
6/4/04 1:00	18.3	64.94	43%	29.95	758.7	Scattered Clouds	125.5	12.2	93.0	9.98	33.0	6.8	17.9	90.5	8.58	65.5	7.1	0.8
6/4/04 2:00	18.3	64.94	45%	29.95	758.7	Scattered Clouds	126.0	12.0	92.3	9.95	33.0	6.8	17.5	88.1	8.43	64.9	7.1	0.9
6/4/04 3:00	16.7	62.06	53%	29.95	758.7	Scattered Clouds	126.5	11.8	91.7	9.93	33.0	6.7	17.1	85.9	8.29	63.9	7.0	0.9
6/4/04 4:00	16.7	62.06	53%	29.95	758.7	Scattered Clouds	127.0	11.6	91.2	9.92	33.0	6.7	16.8	84.6	8.20	63.2	7.0	0.9
6/4/04 5:00	16.1	60.98	58%	29.95	758.7	Scattered Clouds	127.0	11.4	90.3	9.87	33.0	6.7	16.5	83.4	8.14	62.8	6.9	1.0
6/4/04 6:00	15.6	60.08	62%	29.95	758.7	Scattered Clouds	125.0	11.2	89.4	9.81	33.0	6.7	16.3	82.5	8.08	62.0	6.9	1.0
6/4/04 7:00	16.7	62.06	60%	29.98	759.5	Scattered Clouds	125.5	11.0	89.2	9.82	33.0	6.7	16.2	82.3	8.08	62.0	6.9	0.9
6/4/04 8:00	18.9	66.02	59%	29.98	759.5	Scattered Clouds	124.5	11.0	91.9	10.14	33.0	6.7	16.1	84.6	8.32	65.1	6.9	0.8
6/4/04 9:00	22.2	71.96	48%	29.98	759.5	Clear	119.0	11.0	95.2	10.49	33.0	6.7	16.3	85.5	8.37	66.5	6.9	0.8
6/4/04 10:00	23.9	75.02	40%	29.98	759.5	Clear	110.0	11.2	96.2	10.56	33.0	6.8	16.6	88.7	8.64	67.2	7.0	0.6
6/4/04 11:00	26.1	78.98	36%	29.98	759.5	Clear	109.5	11.4	97.4	10.63	33.0	6.8	17.0	92.5	8.93	67.6	7.1	0.5
6/4/04 12:00	27.2	80.96	34%	29.98	759.5	Clear	108.5	11.8	99.6	10.78	33.0	6.9	17.5	96.4	9.22	68.8	7.1	0.7
6/4/04 13:00	31.7	89.06	31%	29.98	759.5	Clear	103.0	12.2	101.9	10.92	33.0	6.9	18.1	100.6	9.51	70.4	7.2	0.4

Attachment B: Physical water quality data from spot checks by meso-habitat and distance downstream from La Grange Dam May/June 2004

Date	Time	Weather	Bar. P (mm Hg)	Air Temp C	location	RM	GPS	depth	H2O Temp C	DO mg/L	DO %	Sp Cond (umhos/cm 25C)	Sp Cond (umhos/cm)	pH	unit used	Notes
05/28/04	12:53	overcast	757		La Grange Gage	51.8	10S 0725712 4171722	1.50	11.44	10.59	97.1	29		6.95	600XL-SW	backwater on RL bank
05/28/04	12:48	overcast	757		La Grange Gage	51.8	10S 0725712 4171722	12.00	11.33	10.66	97.5	29		7.11	600XL-SW	pool with bedrock
05/28/04	12:51	overcast	757		La Grange Gage	51.8	10S 0725712 4171722	1.50	11.36	10.62	97.1	29		7.03	600XL-SW	surface of pool
05/28/04	12:15	overcast	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	1.00	12.84	10.36	97.9	31		7.10	600XL-TID	backwater on RL bank
05/28/04	12:07	overcast	757		Riffle A7	50.8	10S 0724340 4171517	6.00	11.77	10.44	96.3	31		7.00	600XL-TID	pool tail above riffle
05/28/04	12:10	overcast	757		Riffle A7	50.8	10S 0724340 4171517	0.50	11.90	10.32	96.0	31		6.95	600XL-TID	pool surface above riffle
05/28/04	11:06	overcast	757		Riffle A7	50.8	10S 0724340 4171517	1.50	11.60	10.29	94.6	29		6.64	600XL-SW	mid riffle depression to RL of island (~20 ft into river from RL)
05/28/04	11:08	overcast	757		Riffle A7	50.8	10S 0724340 4171517	2.00	11.64	10.09	92.9	31		6.90	600XL-TID	mid riffle to RR of island
05/28/04	12:05	overcast	757		Riffle A7	50.8	10S 0724340 4171517	3.00	11.74	10.75	99.0	31		7.00	600XL-TID	riffle head
05/28/04	12:00	overcast	757		Riffle A7	50.8	10S 0724340 4171517	3.00	11.75	10.31	95.1	31		6.93	600XL-TID	riffle tail
05/28/04	11:02	overcast	757		Riffle A7	50.8	10S 0724340 4171517	0.50	11.75	10.93	101.2	31		6.85	600XL-TID	mid riffle RL edge
05/28/04	15:21	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	1.06	15.34	9.21	92.0	32		7.14	600XL-SW	backwater along edge of RB
05/28/04	15:14	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	2.20	14.00	11.00	107.0	31		7.10	600XL-SW	pool tail at end of run
05/28/04	15:27	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	4.40	14.18	10.58	103.0	31		7.13	600XL-SW	pool head on RB below backwater
05/28/04	15:17	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	0.60	10.05	10.75	104.0	31		7.03	600XL-SW	riffle head below pool
05/28/04	15:24	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	1.30	14.07	10.72	104.0	31		7.03	600XL-SW	riffle tail
05/28/04	16:11	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	3.20	15.66	10.47	105.3	40		7.06	600XL-SW	backwater bottom
05/28/04	16:12	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	0.50	15.70	10.46	105.2	41		7.06	600XL-SW	backwater surface
05/28/04	16:16	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	1.90	14.93	10.55	104.4	33		7.02	600XL-SW	head of pool below riffle
05/28/04	16:04	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	3.80	16.66	10.50	107.8	35		7.20	600XL-SW	backwater on RR
05/28/04	15:59	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	1.80	14.93	10.72	106.2	33		7.05	600XL-SW	riffle (75 feet downstream of pump that park next to)
05/28/04	16:09	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	2.00	14.88	10.56	104.4	33		7.03	600XL-SW	riffle tail (300 feet below pump)
05/28/04	14:02	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	2.00	16.50	10.34	105.9	39		7.09	600XL-SW	shallow pool
05/28/04	14:07	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	4.00	16.55	10.28	105.4	39		7.16	600XL-SW	located at sonde in shallow pool
05/28/04	14:10	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	4.00	16.51	10.32	105.7	39		7.15	600XL-SW	shallow pool

Date	Time	Weather	Bar. P (mm Hg)	Air Temp C	location	RM	GPS	depth	H2O Temp C	DO mg/L	DO %	Sp Cond (umhos/cm 25C)	Sp Cond (umhos/cm)	pH	unit used	Notes
05/28/04	17:08	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	0.50	17.82	9.72	102.0	45		7.41	600XL-SW	backwater on RL (in shade)
05/28/04	17:03	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	2.30	18.05	10.54	111.5	43		7.34	600XL-SW	pool head 50 yards below campground
05/28/04	17:15	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	1.30	17.99	10.37	109.4	42		7.44	600XL-SW	riffle head
05/28/04	17:11	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	2.80	18.01	10.25	108.0	43		7.36	600XL-SW	riffle tail
05/28/04	17:14	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	0.80	18.04	10.35	109.0	42		7.43	600XL-SW	riffle opposite west campground
05/29/04	15:06	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	1.00	12.97	10.78	102.1	29		7.16	600XL-TID	surface of pool above sonde
05/29/04	15:07	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	4.50	12.82	10.78	101.9	29		7.16	600XL-TID	pool profile above sonde
05/29/04	15:08	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	2.50	12.91	10.72	101.6	29		7.14	600XL-TID	pool profile above sonde
05/29/04	15:10	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	7.50	12.84	10.76	101.7	29		7.11	600XL-TID	pool profile above sonde
05/29/04	16:33	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	0.50	17.08	10.87	112.7	38		7.32	600XL-TID	surface
05/29/04	16:34	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	1.50	17.09	10.84	112.4	38		7.39	600XL-TID	mid profile
05/28/04	12:53	overcast	757		La Grange Gage	51.8	10S 0725712 4171722	1.50	11.44	10.59	97.1	29		6.95	600XL-SW	backwater on RL bank
05/28/04	12:48	overcast	757		La Grange Gage	51.8	10S 0725712 4171722	12.00	11.33	10.66	97.5	29		7.11	600XL-SW	pool with bedrock
05/28/04	12:51	overcast	757		La Grange Gage	51.8	10S 0725712 4171722	1.50	11.36	10.62	97.1	29		7.03	600XL-SW	surface of pool
05/28/04	12:15	overcast	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	1.00	12.84	10.36	97.9	31		7.10	600XL-TID	backwater on RL bank
05/28/04	12:07	overcast	757		Riffle A7	50.8	10S 0724340 4171517	6.00	11.77	10.44	96.3	31		7.00	600XL-TID	pool tail above riffle
05/28/04	12:10	overcast	757		Riffle A7	50.8	10S 0724340 4171517	0.50	11.90	10.32	96.0	31		6.95	600XL-TID	pool surface above riffle
05/28/04	11:06	overcast	757		Riffle A7	50.8	10S 0724340 4171517	1.50	11.60	10.29	94.6	29		6.64	600XL-SW	mid riffle depression to RL of island (~20 ft into river from RL)
05/28/04	11:08	overcast	757		Riffle A7	50.8	10S 0724340 4171517	2.00	11.64	10.09	92.9	31		6.90	600XL-TID	mid riffle to RR of island
05/28/04	12:05	overcast	757		Riffle A7	50.8	10S 0724340 4171517	3.00	11.74	10.75	99.0	31		7.00	600XL-TID	riffle head
05/28/04	12:00	overcast	757		Riffle A7	50.8	10S 0724340 4171517	3.00	11.75	10.31	95.1	31		6.93	600XL-TID	riffle tail
05/28/04	11:02	overcast	757		Riffle A7	50.8	10S 0724340 4171517	0.50	11.75	10.93	101.2	31		6.85	600XL-TID	mid riffle RL edge
05/28/04	15:21	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	1.06	15.34	9.21	92.0	32		7.14	600XL-SW	backwater along edge of RB
05/28/04	15:14	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	2.20	14.00	11.00	107.0	31		7.10	600XL-SW	pool tail at end of run
05/28/04	15:27	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	4.40	14.18	10.58	103.0	31		7.13	600XL-SW	pool head on RB below backwater
05/28/04	15:17	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	0.60	10.05	10.75	104.0	31		7.03	600XL-SW	riffle head below pool

Date	Time	Weather	Bar. P (mm Hg)	Air Temp C	location	RM	GPS	depth	H2O Temp C	DO mg/L	DO %	Sp Cond (umhos/cm 25C)	Sp Cond (umhos/cm)	pH	unit used	Notes
05/28/04	15:24	sunny	757	27.0	Riffle 5B (New Basso Br.)	47.9	10S 0721197 4169903	1.30	14.07	10.72	104.0	31		7.03	600XL-SW	riffle tail
05/28/04	16:11	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	3.20	15.66	10.47	105.3	40		7.06	600XL-SW	backwater bottom
05/28/04	16:12	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	0.50	15.70	10.46	105.2	41		7.06	600XL-SW	backwater surface
05/28/04	16:16	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	1.90	14.93	10.55	104.4	33		7.02	600XL-SW	head of pool below riffle
05/28/04	16:04	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	3.80	16.66	10.50	107.8	35		7.20	600XL-SW	backwater on RR
05/28/04	15:59	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	1.80	14.93	10.72	106.2	33		7.05	600XL-SW	riffle (75 feet downstream of pump that park next to)
05/28/04	16:09	sunny	757	24.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	2.00	14.88	10.56	104.4	33		7.03	600XL-SW	riffle tail (300 feet below pump)
05/28/04	14:02	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	2.00	16.50	10.34	105.9	39		7.09	600XL-SW	shallow pool
05/28/04	14:07	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	4.00	16.55	10.28	105.4	39		7.16	600XL-SW	located at sonde in shallow pool
05/28/04	14:10	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	4.00	16.51	10.32	105.7	39		7.15	600XL-SW	shallow pool
05/28/04	17:08	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	0.50	17.82	9.72	102.0	45		7.41	600XL-SW	backwater on RL (in shade)
05/28/04	17:03	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	2.30	18.05	10.54	111.5	43		7.34	600XL-SW	pool head 50 yards below campground
05/28/04	17:15	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	1.30	17.99	10.37	109.4	42		7.44	600XL-SW	riffle head
05/28/04	17:11	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	2.80	18.01	10.25	108.0	43		7.36	600XL-SW	riffle tail
05/28/04	17:14	sunny	757	24.0	Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	0.80	18.04	10.35	109.0	42		7.43	600XL-SW	riffle opposite west campground
05/29/04	15:06	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	1.00	12.97	10.78	102.1	29		7.16	600XL-TID	surface of pool above sonde
05/29/04	15:07	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	4.50	12.82	10.78	101.9	29		7.16	600XL-TID	pool profile above sonde
05/29/04	15:08	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	2.50	12.91	10.72	101.6	29		7.14	600XL-TID	pool profile above sonde
05/29/04	15:10	sunny	757	26.0	SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	7.50	12.84	10.76	101.7	29		7.11	600XL-TID	pool profile above sonde
05/29/04	16:33	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	0.50	17.08	10.87	112.7	38		7.32	600XL-TID	surface
05/29/04	16:34	overcast	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715179 4167681	1.50	17.09	10.84	112.4	38		7.39	600XL-TID	mid profile
06/04/04		sunny	757		Riffle A7	50.8	10S 0724340 4171517							7.00	600XL-TID	pH after recalibration
06/04/04		sunny	757		Riffle A7	50.8	10S 0724340 4171517							7.00	600XL-SW	pH after recalibration
06/04/04	12:51	sunny	757		Riffle A7	50.8	10S 0724340 4171517		13.38	10.82	105.4	32	25	7.63	600XL-TID	final parallel calibration check
06/04/04	12:51	sunny	757		Riffle A7	50.8	10S 0724340 4171517		13.31	10.83	106.6	30	23	6.61	600XL-SW	final parallel calibration check
06/04/04	13:01:3	sunny	757		Riffle A7	50.8	10S 0724340 4171517		13.51	11.07	106.8	32	25	6.98	600XL-TID	final parallel calibration check

Date	Time	Weather	Bar. P (mm Hg)	Air Temp C	location	RM	GPS	depth	H2O Temp C	DO mg/L	DO %	Sp Cond (umhos/cm 25C)	Sp Cond (umhos/cm)	pH	unit used	Notes
06/04/04	13:01:4	sunny	757		Riffle A7	50.8	10S 0724340 4171517		13.37	10.91	104.9	30	23	6.64	600XL-SW	final parallel calibration check
06/04/04	15:02	sunny	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715023 4167522	0.50	19.69	10.56	115.5	37	34	7.23	600XL-SW	surface of shallow pool
06/04/04	15:03	sunny	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715023 4167522	1.85	19.70	10.51	114.9	37	34	7.27	600XL-SW	middle of shallow pool
06/04/04	15:04	sunny	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715023 4167522	3.35	19.71	10.17	114.6	37	34	7.33	600XL-SW	bottom of shallow pool
06/04/04	17:11	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		0.50	20.35	10.39	115.1	37	34	7.68	600XL-SW	surface of deeper pool. Profile collected at site of sampler which was moved ~55 ft d/s toward RR from original deployed position and placed in a bed of aquatic vegetation
06/04/04	17:13	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		2.33	20.31	10.34	114.4	38	35	7.68	600XL-SW	middle of deeper pool. Profile collected at site of sampler which was moved ~55 ft d/s toward RR from original deployed position and placed in a bed of aquatic vegetation
06/04/04	17:13	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		3.83	20.18	10.03	111.3	44	40	7.59	600XL-SW	bottom of deeper pool. Profile collected at site of sampler which was moved ~55 ft d/s toward RR from original deployed position and placed in a bed of aquatic vegetation
06/04/04	17:35	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0			18.48	5.98	63.9	50	44	6.65	600XL-TID	post retrieval parallel readings. Collected on channel edge dense with aquatic vegetation on RL. GPS was 11 ft accuracy
06/04/04	17:34	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0			18.42	5.66	60.5	47	41	6.83	600XL-SW	post retrieval parallel readings. Collected on channel edge dense with aquatic vegetation on RL. GPS was 11 ft accuracy
06/04/04	17:35	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0			18.12	5.81	62.1	86	75	6.68	6920-SW	post retrieval parallel readings. Collected on channel edge dense with aquatic vegetation on RL. GPS was 11 ft accuracy
06/05/04	10:10	sunny	757	25.1	La Grange Gage	51.8	10S 0725712 4171724	0.50	11.11	9.86	89.7	31	23	6.40	600XL-SW	surface #1. pool profile in center of river toward RR, just before last break in shelf.
06/05/04	10:11	sunny	757	25.1	La Grange Gage	51.8	10S 0725712 4171724	0.50	11.17	9.84	89.6	31	23	6.41	600XL-SW	surface #2. pool profile in center of river toward RR, just before last break in shelf.
06/05/04	10:13	sunny	757	25.1	La Grange Gage	51.8	10S 0725712 4171724	5.45	11.11	9.83	89.4	31	23	6.44	600XL-SW	middle. pool profile in center of river toward RR, just before last break in shelf.
06/05/04	10:14	sunny	757	25.1	La Grange Gage	51.8	10S 0725712 4171724	10.95	11.11	9.78	89.0	32	23	6.45	600XL-SW	bottom. pool profile in center of river toward RR, just before last break in shelf.
06/05/04	10:28	sunny	757	25.1	La Grange Gage	51.8	10S 0725712 4171724		11.60	9.94	91.4	32	23	6.50	600XL-SW	post sample profile collection
06/05/04	10:28	sunny	757	25.1	La Grange Gage	51.8	10S 0725712 4171724		11.59	9.95	91.5	32	24	6.88	600XL-TID	post sample profile collection
06/05/04	10:23	sunny	757	25.1	La Grange Gage	51.8	10S 0725712 4171724	5.00	13.69	9.65	92.1	33	26	6.50	600XL-SW	collected in backwater (1.5 ft deep) area very shallow on RL just d/s of pool sample site.
06/05/04	9:22		757		La Grange Gage	51.8	10S 0725712 4171724		11.18	10.15	92.5	32	23	7.00	600XL-TID	Unit 1- pre- in situ calibration
06/05/04	10:04		757		La Grange Gage	51.8	10S 0725712 4171724		11.41	10.08	92.3	32	23	6.96	600XL-TID	Unit 1- post- in situ calibration
06/05/04	9:21		757		La Grange Gage	51.8	10S 0725712 4171724		11.05	10.03	89.3	30	22	6.63	600XL-SW	Unit 2- pre- in situ calibration
06/05/04	10:04		757		La Grange Gage	51.8	10S 0725712 4171724		11.49	9.80	89.9	32	24	6.63	600XL-SW	Unit 2- post- in situ calibration
06/05/04	11:01	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	0.50	11.89	10.42	96.8	32	24	6.71	600XL-SW	profile collected at sample site where datalogger was originally depolyed, 8.97' was deepest point btw RL bank and diel profile.
06/05/04	11:02	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	3.30	11.74	10.23	94.6	32	24	6.71	600XL-SW	profile collected at sample site where datalogger was originally depolyed, 8.97' was deepest point btw RL bank and diel profile.
06/05/04	11:03	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	7.30	11.67	10.19	93.9	32	24	6.72	600XL-SW	profile collected at sample site where datalogger was originally depolyed, 8.97' was deepest point btw RL bank and diel profile.
06/05/04	11:14	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	0.50	11.97	10.35	96.3	32	24	6.73	600XL-SW	pool tail surface
06/05/04	11:15	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	1.73	11.73	10.25	94.6	32	24	6.76	600XL-SW	pool tail mid profile

Date	Time	Weather	Bar. P (mm Hg)	Air Temp C	location	RM	GPS	depth	H2O Temp C	DO mg/L	DO %	Sp Cond (umhos/cm 25C)	Sp Cond (umhos/cm)	pH	unit used	Notes
06/05/04	11:16	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	3.73	11.67	10.19	94.0	32	24	6.77	600XL-SW	pool tail bottom
06/05/04	11:37	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	0.67	15.36	10.00	99.6	32	26	6.73	600XL-SW	backwater on RL at rifflehead. Note: backwater sites had small fish/tadpoles and some type of biofilm
06/05/04	11:24	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	1.91	11.89	10.05	93.1	32	24	6.61	600XL-SW	mid riffle elevation dip u/s of island
06/05/04	11:28	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	2.90		10.06	93.2	32	24	6.53	600XL-SW	mid riffle RR of island
06/05/04	11:32	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	2.58	12.00	10.05	93.3	32	24	6.56	600XL-SW	mid riffle RR d/s of island
06/05/04	11:17	sunny, clear, breezy	757		SRP 1 (pool above RA7)	51.0	10S 0724519 4171481	1.19	11.71	10.13	93.4	32	24	6.70	600XL-SW	rifflehead
06/05/04	12:13	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	1.49	16.59	10.25	105.4	35	29	6.99	600XL-SW	center backwater pool u/s of boulder in center
06/05/04	12:08	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	0.95	21.43	7.36	83.8	48	45	6.81	600XL-SW	backwater RR stagnant pool
06/05/04	12:18	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	1.85	15.75	10.26	103.5	35	29	6.85	600XL-SW	mid riffle
06/05/04	12:06	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	1.53	15.55	10.45	104.8	35	28	6.79	600XL-SW	rifflehead
06/05/04	12:33	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	1.39	15.94	10.25	103.9	35	29	6.87	600XL-SW	riffle head repeat
06/05/04	12:29	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	2.34	15.91	10.16	102.7	35	29	6.88	600XL-SW	riffle tail u/s of deep tailend reading
06/05/04	12:38	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430		16.23	10.77	109.8	35	29	7.32	600XL-TID	post sample parallel reading: set in turbulent water
06/05/04	12:37	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430		16.17	10.30	104.8	35	29	6.94	600XL-SW	post sample parallel reading: set in turbulent water
06/05/04	12:41	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430		16.49	10.65	109.0	35	29	7.36	600XL-TID	post sample parallel reading: set in still water
06/05/04	12:41	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430		16.46	10.20	104.3	35	29	7.02	600XL-SW	post sample parallel reading: set in still water
06/05/04	12:22	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	0.50	15.96	10.17	103.1	35	29	6.92	600XL-SW	RR at large boulders. Riffle tail RR at end of backwater.
06/05/04	12:24	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	2.82	16.01	10.15	102.9	35	29	6.93	600XL-SW	RR at large boulders. Riffle tail mid depth
06/05/04	12:25	sunny	757		Riffle 5B (New Basso Br.)	47.9	10S 0706328 4168430	6.82	16.00	10.16	103.0	35	29	6.97	600XL-SW	RR at large boulders. riffle tail bottom.
06/05/04	13:22	sunny, breezy, cirrus clouds blowing in	757	31.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	2.76	19.09	9.58	103.4	39	34	7.00	600XL-SW	backwater center of first pool on RR (biofilm)
06/05/04	13:25	sunny, breezy, cirrus clouds blowing in	757	31.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	2.83	17.53	9.67	101.1	37	32	6.85	600XL-SW	mid riffle main flow.
06/05/04	13:19	sunny, breezy, cirrus clouds blowing in	757	31.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	1.57	17.27	9.84	102.4	36	31	6.91	600XL-SW	rifflehead end of ~200ft run
06/05/04	13:28	sunny, breezy, cirrus clouds blowing in	757	31.0	Riffle 13B (Zanker)	45.5	10S 0718851 4167324	1.52	17.41	9.67	100.9	36	31	6.90	600XL-SW	riffle tail at start of straight section with small pool on RR.
06/05/04	14:06	sunny	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715023 4167522	0.50	19.76	10.07	10.3	41	37	7.85	600XL-SW	surface of shallow pool. original sonde location (u/s)
06/05/04	14:07	sunny	757		Riffle 21 (TRR/BobCat-orig.)	43.0	10S 0715023 4167522	3.24	19.78	9.96	109.2	42	37	7.84	600XL-SW	bottom of shallow pool. original sonde location (u/s)
06/05/04	14:24	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		0.50	19.99	11.06	121.7	42	38	7.68	600XL-SW	surface of deeper pool. Final sonde location (d/s).

Date	Time	Weather	Bar. P (mm Hg)	Air Temp C	location	RM	GPS	depth	H2O Temp C	DO mg/L	DO %	Sp Cond (umhos/cm 25C)	Sp Cond (umhos/cm)	pH	unit used	Notes
06/05/04	14:25	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		4.02	19.97	10.99	120.8	42	38	7.67	600XL-SW	middle of deeper pool. Final sonde location (d/s).
06/05/04	14:26	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		8.02	19.95	10.95	120.3	42	38	7.67	600XL-SW	bottom of deeper pool. Final sonde location (d/s).
06/05/04	14:30	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		0.50	20.00	10.91	120.0	42	38	7.61	600XL-SW	surface of deeper pool. Final sonde location (d/s).
06/05/04	14:32	sunny	757		Riffle 21 (TRR/BobCat-final)	43.0		3.81	19.93	10.78	118.5	45	41	7.58	600XL-SW	bottom of deeper pool. Final sonde location (d/s).
06/05/04	15:23	sunny	757		Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	0.72	20.89	9.93	111.1	49	45	7.56	600XL-SW	backwater RL under overhanging willows
06/05/04	15:15	sunny	757		Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	2.28	21.18	10.95	123.3	47	44	7.58	600XL-SW	mid riffle main flow.
06/05/04	15:19	sunny	757		Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	1.55	21.21	10.92	123.0	47	44	7.54	600XL-SW	mid riffle top of long run.
06/05/04	15:11	sunny	757		Riffle 24B (TLSRA)	41.6	10S 0713142 4167530	1.10	21.10	11.14	125.4	47	43	7.62	600XL-SW	rifflehead.
06/05/04	15:46	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	3.93	21.38	10.59	119.8	63	59	7.43	600XL-SW	pool tail
06/05/04	15:50	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	3.75	21.43	10.45	118.2	63	59	7.28	600XL-SW	pool tail #2
06/05/04	16:07	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	4.35	21.53	9.59	108.8	63	59	7.26	600XL-SW	pool tail #3 bottom
06/05/04	16:06	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	0.50	21.67	9.55	108.6	63	59	7.23	600XL-SW	pool tail #3 surface
06/05/04	16:00	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	3.61	21.54	10.03	113.7	87	87	7.12	600XL-SW	backwater
06/05/04	15:53	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	0.84	21.52	10.37	117.4	63	59	7.21	600XL-SW	mid riffle
06/05/04	15:56	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	2.35	21.51	10.36	112.3	63	59	7.19	600XL-SW	riffle tail
06/05/04	15:48	sunny	757		Roberts Ferry Bridge	39.4	10S 070261 416785	0.73	21.44	10.47	118.5	63	59	7.28	600XL-SW	rifflehead (shade)
06/05/04	17:19	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	0.50	23.33	9.58	112.4	66	64	7.91	600XL-SW	pool head surface
06/05/04	17:20	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	3.50	23.33	9.60	112.6	66	64	7.92	600XL-SW	pool head middle
06/05/04	17:21	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	6.50	23.32	9.57	112.3	67	64	7.92	600XL-SW	pool head bottom
06/05/04	17:28	sunny, breeze ~3-8 mph)	757		Riffle 35B (Santa Fe Aggr.)	36.8	10S 0706328 4168430	2.74	23.23	9.62	112.8	67	64	7.89	600XL-SW	pool tail
06/05/04	17:10	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	1.30	23.23	9.71	113.7	67	64	7.90	600XL-SW	mid riffle
06/05/04	17:07	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	10.85	23.23	9.76	114.3	67	64	7.96	600XL-SW	rifflehead
06/05/04	17:07	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	0.85	23.28	9.75	114.3	67	65	8.18	600XL-TID	rifflehead (TID unit)
06/05/04	17:15	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	0.50	23.29	9.62	112.9	66	64	7.92	600XL-SW	riffle tail surface
06/05/04	17:17	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.8	10S 0706328 4168430	4.18	23.26	9.64	113.1	67	64	7.92	600XL-SW	riffle tail bottom
06/05/04	17:39	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7		3.05	23.32	9.58	112.4	67	64	7.95	600XL-SW	pool tail #2

Date	Time	Weather	Bar. P (mm Hg)	Air Temp C	location	RM	GPS	depth	H2O Temp C	DO mg/L	DO %	Sp Cond (umhos/cm 25C)	Sp Cond (umhos/cm)	pH	unit used	Notes
06/05/04	17:44	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7		1.35	24.29	8.21	98.2	81	80	7.79	600XL-SW	Backwater RL on d/s end of island
06/05/04	17:35	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7		1.31	23.34	9.57	111.7	67	65	7.92	600XL-SW	riffle tail
06/05/04	17:32	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7		2.09	23.34	9.62	112.9	67	64	7.89	600XL-SW	mid riffle RL edge
06/05/04	17:48	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7			22.75	8.79	102.1	104	99	8.11	6920-SWS	post sampling parallel readings
06/05/04	17:48	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7			23.32	9.68	113.9	69	67	7.84	6600-TID	post sampling parallel readings
06/05/04	17:48	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7			23.32	9.37	110.0	68	66	8.00	600XL-TID	post sampling parallel readings
06/05/04	17:48	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7			23.30	9.17	107.5	67	65	7.87	600XL-SW	post sampling parallel readings
06/05/04	17:30	sunny, breeze ~3-8 mph)	757		Riffle 36A (Santa Fe Aggr.)	36.7		0.93	23.33	9.62	112.8	67	64	7.88	600XL-SW	riffle head RL