SACRAMENTO MUNICIPAL UTILITY DISTRICT
UPPER AMERICAN RIVER PROJECT
(FERC Project No. 2101)

and

PACIFIC GAS AND ELECTRIC COMPANY
CHILI BAR PROJECT
(FERC Project No. 2155)

WATER QUALITY
TECHNICAL REPORT

Prepared by:

Devine Tarbell & Associates, Inc.
Sacramento, California

Prepared for:

Sacramento Municipal Utility District
Sacramento, California

and

Pacific Gas and Electric Company
San Francisco, California

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3.6 Water Quality Study Plan

This study is designed to provide information regarding overall water quality in the vicinity of the Sacramento Municipal Utility District's Upper American River Project (UARP) and Pacific Gas and Electric Company's Chili Bar Project (projects), identify potential water quality problems related to the projects, and where the projects can control such factors, develop resource measures for the protection, mitigation and enhancement of water quality. Basic *in situ* water quality information will be gathered in projects reservoirs and in bypassed stream reaches to evaluate general aquatic ecosystem conditions. Under this study plan, water quality constituents will be sampled at times and in locations that may best identify water quality problems (Triage Sampling), and where problems are identified, follow-up investigations will proceed immediately and to the extent needed to clearly identify the problem and potential resource measures (Contingency Sampling). Some immediate Contingency Sampling activities are identified in this plan, but the full extent of Contingency Sampling cannot be identified until a specific problem is identified and an appropriate course of action determined by the Aquatics TWG. For instance, if warranted, Contingency Sampling may include multi-season or multi-year sampling. In addition to water column analysis, the potential for metals within projects waters to bioaccumulate through the aquatic food chain will be evaluated using fish tissue analysis in representative reservoirs. The Licensees recognize that the sampling program described in this Water Quality Study Plan could ultimately be as broad or broader in scope than the May 3, 2002 program discussed with the resource agencies, and are fully committed to implementing such a program if warranted.

3.6.1 Pertinent Issue Questions

The Water Quality Study Plan addresses the following Aquatic/Water Issue Questions:

Is operation of the Project protective of Basin Plan Designated beneficial uses?

39. How does the Project affect water quality (e.g. turbidity) and sedimentation, specifically at Slab Creek Reservoir, as operation of this reservoir affects sediment transport into Chili Bar Reservoir? How can we manage that impact if it exists? What are the historic events that have affected sedimentation?
41. Do the waters below the Project reservoirs meet the water quality objectives of the Basin Plan? How can the Project be managed to help meet them?
45 What type of long-term sediment and water quality strategies, operational practices and maintenance strategies exist?
46. Do the waters within the reservoirs and the diverted reaches adequately protect all designated beneficial uses?
47. Identify the Project-related pollution events that may have occurred in the watershed.
55. What are the (Project induced) effects of recreation (including on water and upslope activities) on water quality in the reservoirs and stream reaches (e.g. dispersed recreation and outhouses)?
60. What is the location of all spoil piles within the Project area and what are the effects on water quality?

Note that Issue Questions 39 and 45 as they relate to sediment are addressed in the Channel Morphology Study Plan, and Issue Questions 55 and 60 as they relate to upslope Project facilities, including spoil piles, are addressed in the Project Sources of Sediment Study Plan. Water temperature in both streams and reservoirs as well as pH, dissolved oxygen and conductivity in reservoirs are addressed in detail in the Water Temperature Study Plan and are included in this study to the extent that concurrent sampling will take place along with dependent constituents.

3.6.2 Background

Attachment 1 provides an overview of water quality constituents that are of primary interest in this study. Included in Attachment 1 for each constituent is a discussion of why it is important and sampling periods that may best represent seasons when the constituent would appear within the water column. Samples will be collected in those periods shown in Attachment 1 and described below. Initial water quality screening efforts will incorporate the concept of seasonality and will apply a general sampling approach that brackets projects-affected stream reaches and selectively samples impounded waters. However, because historical data collected on the South Fork Silver Creek below Ice House Reservoir and on Silver Creek below Union Valley Reservoir during dam construction (1959-

1961), and on the South Fork of the American River upstream of and just downstream of Slab Creek Reservoir (1992) during dredging of the reservoir may indicate that elevated levels of trace metals within the watershed (including Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, and Zinc) occurred during those periods, initial sampling efforts will include a focus on metals. To strengthen data collected in the initial triage approach to water column sampling and to determine potential bioaccumulation of metals within the aquatic food chain, fish tissues will be analyzed.

3.6.3 Study Objectives

The study objectives are to:

1. Characterize water quality under current Project operations by directly monitor water quality and using historical information as well as information from the Water Temperature, Channel Morphology, Project Sources of Sediment and Aquatic Bioassessment studies, among other studies.

2. Determine if Basin Plan water quality objectives (and other applicable water quality criteria) are met and assess whether Basin Plan designated beneficial uses are protected. Note that the SWRCB will ultimately determine if Basin Plan designated beneficial uses are protected during the 401 process.

3. Identify any project-controllable resource measures for the protection, mitigation and enhancement of water quality.

3.6.4 Study Area and Sampling Locations

The study area includes all reservoirs associated with the projects (Rubicon, Rockbound, Buck Island, Loon Lake, Gerle Creek, Ice House, Union Valley, Junction, Camino, Brush Creek, Slab Creek and Chili Bar) excluding Robbs Peak Forebay due to its small size (30 acre-feet), and all stream reaches identified by the Aquatic TWG and Plenary Group (Rubicon Dam, Rockbound Dam, Buck Island Dam, Rubicon Tunnel Outlet, Loon Lake Dam, Gerle Creek Dam, Robbs Peak Dam, Ice House Dam, Junction Dam, Camino Dam, South Fork American, Brush Creek Dam, Slab Creek Dam and the Reach below Chili Bar Dam). The study area also includes, to the extent necessary, tributary inflows into the reservoirs and reaches. Sampling locations are listed in Attachment 2.

3.6.5 Information Needed From Other Studies

Information needed from other UARP relicensing studies includes:

1. Location of Project-related recreation facilities from the UARP Relicensing recreation studies

2. Results of the Water Temperature Study to assess compliance with the Basin Plan water temperature standards

3. Results of the Channel Morphology and Project Sources of Sediment studies
4. Flow data from the Hydrology Study

5. Results of the Aquatic Bioassessment Study to corroborate the results of the Water Quality Study

6. Results from other resource studies to assess level of protection provided for Basin Plan Designated Beneficial Uses

The output of this Water Quality study may be used in other studies to assist in determining the overall health of the aquatic ecosystem.

3.6.6 Study Methods And Schedule

The study methods will include the following subtasks:

Gather Historic Information: Interviews will be done with SMUD Operations staff, ENF, SWRCB, RWQCB and CDFG staff and others to identify any Project-related historic pollution events, and any water quality data routinely collected by SMUD (such as turbidity levels upstream and downstream of Slab Creek Reservoir) or others. Also, these interviews will help determine if there are any historical water quality data available other than what is reported in SMUD's Initial Information Package (SMUD 2001) and what has been discussed with the Aquatic TWG to date. Documentation of pollution events (i.e. reports of events and follow-up actions), potential affects of the projects, as well as other historical water quality data will be collected. An inventory shall be prepared of all historic pollution events identified and any mitigation actions taken, including reference sources and a companion map that presents locations of documented events and geographic expanse of known effects.

Water Quality Data Collection

Laboratory Reporting: The laboratory will provide for each constituent sample, the laboratory's current method detection limit, reporting limit, practical quantitation limit, and J-value as appropriate. The lab will attempt to obtain, and report at detection limits at or below the adjusted maximum regulatory criteria. (See glossary of terms included as Attachment 4)

Sample *In situ* Field Parameters: Basic water quality parameters, including temperature, dissolved oxygen, conductivity, and pH will be measured at all general sampling locations and specified bypassed stream reach stations (identified in Attachment 2) once each during the spring runoff, the summer low-flow period, the fall season, and following the first major rain event. Reservoir stations will include *in situ* profiles and stream stations will be sampled from the shoreline in moving flow with the sampler upstream of the meter. Turbidity and TSS will be analyzed in the laboratory.

Sample Standard Water Quality Parameters: Attachment 1 lists seasonal sampling periods for each constituent to be analyzed in the water quality screening effort. For planning purposes, sampling for the fall turnover season is expected to be conducted in 2002, first major rain event sampling will be conducted in November/December 2002, and the spring runoff sampling period will occur in April/May 2003. The summer low-flow sampling period will occur in August/early September 2003. The Licensees will sample once in each specified sampling period beginning with the summer low flow period in 2002. The constituents that will be sampled in each seasonal period are those that behave in a manner most likely to be represented during the designated sampling period(s) and those constituents required for analyzing standard constituents (indicated by an "X" in Attachment 1). Sampling for these constituents can be divided into two phases: Triage and Contingency.

a) Triage Sampling: Triage sampling is designed to screen for water quality problems associated with the projects. Water quality samples will be collected once immediately downstream of each projects facility, in each projects reservoir and in the major inflows to each reservoir (Attachment 2). It is expected that many of the water quality sampling locations will correspond to water temperature monitoring locations. Interested Aquatic TWG and Plenary Group Participants will be invited into the field to confirm the sampling locations before sampling locations are finalized. One sample will be taken from the riverbank in flowing water (sampler upstream) downstream of each project facility and in major inflows to each reservoir (Attachment 2). During the summer low flow period when the reservoirs may be stratified, water quality samples will be collected in the upper epilimnion and in the hypolimnion a few feet above the reservoir bottom. During the fall turnover, spring runoff and first major storm critical periods when the reservoirs are not stratified, one sample will be collected at a point approximately one-third the total depth below the surface. Timing of reservoir turnover will be determined by thermographic profiles in Loon Lake Reservoir (representing Rubicon, Rockbound, Buck Island, Gerle and Loon Lake reservoirs), Union Valley Reservoir (Junction and Union Valley reservoirs), and Slab Creek Reservoir (Brush Creek, Camino, Chili Bar and Slab Creek reservoirs),

conducted at intervals no greater than once weekly beginning October 1 and continuing through fall turnover. For this purpose, turnover will assume to occur when the thermocline has broken down (less than 1°C change in temperature per meter). The Licensees will determine whether Loon Lake or Union Valley reservoir profiling will act as a surrogate for commencing Ice House Reservoir fall turnover sampling after the September reservoir water temperature profiling is done per the Water Temperature Study Plan. Timing of the first major rain event will be assessed by the Licensees, who will provide the criteria for this event to the Aquatic TWG. When each sample is collected, a multi-parameter water analyzer will be used *in situ* to measure instantaneous water temperature, specific conductance, dissolved oxygen and pH At the same time, a grab sample will be collected in accordance with approved field sampling protocols. One Secchi depth measurement will be taken at each reservoir sampling location. Instruments will be calibrated prior to each field visit according to manufacturer's specifications. The date and time that the sample is collected, sampling site, jar number and other pertinent information will be recorded in the field for each sample, and the site will be located using a GPS unit. The grab sample jar will be labeled, preserved, stored and delivered to a State certified water quality laboratory and the contents analyzed using laboratory methods adequately sensitive to detect constituents at or below regulatory criteria levels. Where applicable, samples will be stored per laboratory standard operating procedures. Compliance with laboratory-approved storage procedures and with maximum holding periods allowed by lab method(s) used will be documented, and a chain-of-custody record will be maintained for each sample jar.

Triage sampling for MTBE and TPH will only be conducted on the epilimnion and hypolimnion stations of Loon Lake, Ice House, and Union Valley reservoirs where significant boat traffic occurs. Concurrent with the timing of seasonal grab samples, fecal coliform screening samples will be collected in surface waters at near-shore locations proximal to reservoir recreation facilities and in diverted stream reaches identified as high-use dispersed recreation areas by the Recreation TWG (Attachment 5 (a), Bacteria Screening Stations – to be drafted and approved by Aquatic TWG, in consultation with Recreation TWG). For the fecal coliform screening purposes (as compared to the detailed coliform program described below), the SWRCB and Licensees agree that EPA Method 9221 may be used and that the samples may be held for up to 24 hours before processing. For the screening analysis, the TWG agreed to use E. coli analyses instead of fecal coliform, as long as it was used consistently throughout the screening effort. Additionally, the SWRCB and Licensees agree that no chlorophyll-a sampling will be collected during initial triage efforts. Instead, the Aquatic TWG will review the Secchi disk and nutrient data for each reservoir for indications of excessive production (eutrophication). If such indications occur (low Secchi depth reading as compared to other reservoirs and high nutrient concentrations), the Licensees in consultation with the Aquatic TWG will develop a contingency Sampling Plan that may include chlorophyll-a sampling, and phytoplankton/zooplankton sampling.

For the grab samples, the lab will be instructed to immediately analyze the samples taken below the projects' facilities and in the reservoirs, including both epilimnion and hypolimnion samples collected during periods of reservoir stratification using the methods described in Attachment 3. The resulting data will be provided by email to the Aquatic TWG as soon as available from the lab. If SWRCB or other Aquatics TWG participants determine that data indicate that a problem might occur with one or more of the constituents (indicated by levels approaching regulatory numerical criteria thresholds, algae bloom noted in reservoirs or channel, or as otherwise identified by the Aquatic TWG), Contingency Sampling as described below will be initiated immediately.

b) Contingency Sampling: Contingency Sampling will focus on the specific water quality constituent(s) and areas where Triage Sampling data indicates a water quality problem might exist. It will include near-term and long-term activities to explore the problem. The near-term steps will include immediately directing the water quality lab to analyze the water quality samples taken from major inflows to the reservoirs for the constituent for which a problem is indicated. Because of the short laboratory holding times of certain constituents, SMUD and the laboratory will initiate special procedures to ensure that information is not lost due to expiration of the holding times. Constituents with short holding times include certain nutrients (e.g., Nitrate/Nitrite and Orthophosphate have 48

hour holding times) and TSS and TDS (7-day holding time). In these instances, the laboratory will be directed either to analyze for the specific constituents immediately upon arrival or to chemically preserve the samples for later analysis. Chemical preservation will only be performed in circumstances where the preservation does not influence the detection limit of the analytical technique. In addition, the Licensees will confer with the Aquatic TWG to identify any other locations (including downstream of the projects facilities and in tributaries to the reach) where additional samples should immediately be taken for the constituent. Some examples of where additional samples might be collected are listed in Attachment 2. The long-term activity will include developing a sampling program for the constituent at other times of the year or in multiple years, or in additional source or downstream locations if warranted based on the results of the near-term activities.

Fecal Coliform Sampling Program: A focused fecal coliform sampling effort will be conducted to demonstrate compliance with Basin Plan objectives requisite for protection of waters used for contact recreational activities. Samples will be taken at specified near-shore locations in the vicinity of reservoir recreation facilities and along diverted stream reaches known to be high dispersed-use areas (Attachment 5 (b), Fecal Coliform Program Sampling Stations – to be specified by Aquatics TWG, following consultation with the Recreation TWG). Samples will be collected no less than five times within a thirty-day period that includes either the Independence Day Holiday or the Labor Day Holiday.

Fish Tissue Analysis: Fish tissues will be sampled to assess potential bioaccumulation of metals in resident fish within specific reservoirs of the projects. Resident fish will be collected from locations within the Ice House, Union Valley, Slab Creek and Chili Bar Reservoirs, in accordance with CDFG Water Pollution Control Laboratory practices, and will be analyzed for Cadmium, Mercury, Arsenic, Nickel, Selenium, Chromium, Silver, Copper, Lead and Zinc, consistent with protocols of the SWRCB Toxic Substances Monitoring Program. Prior to initiating the tissue sampling effort, Licensees and their consultants shall provide to SWRCB staff and Aquatic TWG members a sampling plan that will meet the SWRCB and CDFG protocols.

QA/QC: All samples will be collected, handled and delivered to the lab consistent with specific EPA methods or other approved sampling/handling protocols including but not limited to Standard Methods for the Examination of Water and Wastewater. Appropriate QA/QC methods and documentation will be followed. Field QA/QC methods may somewhat vary by chemical constituents, but certain methods will be uniformly applied to all field sampling. Clean sampling techniques will be applied throughout the sampling effort. All sample bottles will be prepared by a California state-certified laboratory (ELAP). (Note that, due to the screening nature of the sampling, the Licensees and SWRCB agree that the single event fecal coliform/E. coli screening samples may be analyzed by a lab in Placerville, CA, if it is determined that the lab is reliable and even if it is not State certified.) The laboratory will prepare all sample bottles and, where necessary, place the appropriate amount and type of preservative in sample bottles. All field crew members collecting samples will be wearing gloves. All sample collection systems (e.g., Van dorn sampler) will be rinsed between sampling events with de-ionized water, and rinsed again with a portion of the sample water before filling of the sample jar. The labeled samples will be placed in closed, lightproof coolers filled with ice. Samples will delivered to the laboratory daily during sampling trips. The maximum holding times are indicated in Attachment 3. Iced samples are delivered to the laboratory within no more than 24 hours and typically within 12 hours of sample collection. In the case of mercury, EPA method 245.7 with a method detection limit of 10 parts per trillion (nanograms per liter) will be used as long as it is acceptable to the SWRCB. If this method is not acceptable to the SWRCB, a much more stringent field sampling regime will be followed in the future (EPA method 1631/1669). Quality control in the field will be assured by accurate and thoroughly completed sample labels, field sheets, chain of custody and sample log forms. Sample labels will include sample identification code, date, time, stream/lake name, sampling location, collector's name, sample type and preservative if applicable. Calibration of field instrumentation for field measurements of dissolved oxygen, temperature, pH, and conductivity will be done daily according to the manufacturer's instructions. Where appropriate, a two-point calibration will be applied. Hydrolabs deployed for continuous monitoring will be calibrated prior to initial deployment and at each data down loading interval (approximately every two weeks).

As discussed above, the result of the study will be presented to the Aquatic TWG as soon as available.

3.6.7 Analysis

All historical and newly gathered data will be summarized to characterize existing water quality conditions, and will be compared to regulatory criteria, standards and goals as identified by the SWRCB and members of the Aquatic TWG. As stated above, to assess compliance with Basin Plan water temperature and sediment objectives, the data from the Water Temperature, Channel Morphology, Project Sources of Sediment and Aquatic Bioassessment studies will be used. Further, the results of this study will be discussed with the results of the Hydrology Study.

3.6.8 Study Output

The Licensees and their consultants will provide data updates to the Aquatics TWG throughout the period of the water quality sampling program. A draft written water quality report will be presented to the Aquatics TWG for review and consideration no later than December of 2003. Based on one complete field season of data, and findings in the draft report, the SWRCB and members of the Aquatics TWG will determine the need for additional seasons of data collection and/or special constituent study. Final study output will be a written report that includes the issues addressed, objectives, study area including sampling locations, methods, laboratory reports and QA/QC, analysis, and results. A summary of results will be provided in tabloid format that shall include specific method detection limits for each constituent and analytical data reported. This report will include relevant graphs depicting the seasonal relationship between DO, temperature and pH at all locations. Additional graphs will be provided to more clearly demonstrate any changes in specific water quality parameters over time, depth, or longitudinal movement of flow through the system. Discussion appropriate to results and supportive of analyses and conclusions will be provided. All reports will be prepared in a format so that they can easily be incorporated into the SMUD's draft environmental assessment that will be submitted to FERC with Pacific Gas and Electric Company's Chili Bar license application.

3.6.9 Preliminary Estimated Study Cost

A cost estimate for this study will be developed after the Plenary Group has approved the study plan.

3.6.10 TWG/Plenary Endorsement

The Aquatic TWG approved this plan, as amended and with the understanding that the Licensees and SWRCB needed to resolve some items, on August 28, 2002 with the changes as noted. The participants at the meeting who said they could "live with" this study plan were USFS, CDFG, NMFS, PG&E and SMUD. None of the participants at the meeting said they could not "live with" this study plan. The Plenary Group approved this Study Plan on September 4, 2002, with the understanding that the Licensees and SWRCB would resolve their issues. The Plan was discussed again at the September 18, 2002 Aquatic TWG meeting and some modifications were made.

Since the SWRCB did not approve the study plan on August 28, 2002, the study plan was again discussed, revised and ultimately approved by the Aquatic TWG on December 2, 2002. The following TWG participants stated they could "live with" the study plan: USFS, PG&E, SWRCB, SMUD.

Given the changes in the text, the study plan was again presented to the Plenary Group on January 8, 2003 for final approval. The following participants stated they could "live with" the study plan: SWRCB, SMUD, USFS, PG&E, PCWA, GDPUD, Friends of El Dorado County, Camp Lotus, EID, and other participants. No one present at the meeting said they could not "live with" the study plan

3.6.11 Literature Cited

Regional Water Quality Control Board. 1998. Water Quality Control Plan (Basin Plan) for the Central Valley Region – Sacramento River and San Joaquin River Basins. Published by the California Regional Water Quality Control Board, Central Valley Region and the State Water Resources Control Board, Sacramento.

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Jordan, W.P. and Brown, R.J. 1993. American River Aquatic Sampling Report for November 1992. Prepared by Institute of Chemical Biology, University of San Francisco, for Sacramento Municipal Utility District.

Attachment 1 – Water Quality Sampling Periods
Attachment 2 – Water Quality Sampling Locations
Attachment 3 – Water Quality Analytical Methods
Attachment 4 – Glossary of Analytical Laboratory Terminology and Reporting Terms
Attachment 5 – Location of Fecal Coliform Sampling Stations (Developed by Aquatic TWG in consultation with the Recreation TWG)
Attachment 6 – Mercury in Tissue Sampling Protocol

ATTACHMENT 1

Water quality worksheet for the W Q Study Plan developed for relicensings of Sacramento Municipal Utility District's Upper American River Project and Pacific Gas and Electric Company's Chili Bar Project. (The column "What is it and why it is important" is provided as reference only.)

Constituent [4]	*What is It and Why is It Important?*	*SamplingPeriods* [1,2]			
		Spring Runoff [3]	*Summer Low Flow*	*Fall Turn-over*	*First Major Rain*
Water Temperature *	Temperature strongly influences aquatic biota. Increasing temperature results in lower dissolved oxygen concentrations. Temperature stratification in reservoirs can influence biological and chemical stratification in the reservoirs. Summer sampling is of most interest do to increased solar radiation and warmer water temperatures in riverine and reservoir reaches.	X	X	X	X
Dissolved Oxygen *	A measure of oxygen dissolved in water, measured as both ppm and saturation. In productive waters, large variation in dissolved oxygen can occur over a 24-hour period. Dissolved oxygen exhibits greatest fluctuations during periods of high photosynthetic activity (high DO) and high biotic activity and /or decomposition (low DO) in both riverine and reservoir reaches. Greatest fluctuations occur in late summer/early fall.	9.3-11.1 mg/L X	X	X	X
pH *	Logarithm of the reciprocal of the hydrogen ion concentration. This affects the solubility of metals in sediment and suspended material as well as toxicity of some compounds. A pH of 7 is neutral, a low pH is acidic, and a high pH is alkaline. Most aquatic biota require pH range of 6.5-8.5. 24-hour diurnal variations may exist most likely during late summer/early fall (similar to the dissolved oxygen diurnal patterns).	6.8-7.1 Units X	X	X	X
Turbidity	Measures inverse of water clarity, and affected by suspended and colloidal organic and inorganic matter. NTU scale is logarithmic. Elevated levels may cause gill abrasion in fish, reductions in incubation success, and impacts to benthic organisms.	<0.5-2 NTU's X	X	X	X
Hardness	Dependent primarily on amount of calcium and magnesium in water. Water with concentrations of 0 to 75 mg/l of calcium carbonate is considered "soft," and those between 150 and 300 are considered "hard." Good quality domestic water is usually less than 250 mg/l, and water above 500 mg/l encourages precipitation and scale. Often total alkalinity (see below) and hardness exhibit similar patterns. Regression models have been developed that have shown a positive linear relation between hardness and various trace metal concentrations.	4.5-7.2 mg/L X	X	X	X

ATTACHMENT 1 (continued)

Constituent [4]	*What is It and Why is It Important?*	*Sampling Periods* [1,2]			
		Spring Runoff [3]	*Summer Low Flow*	*Fall Turn-over*	*First Major Rain*
Specific Conductance *	Capacity to conduct an electric current and quick measure of ion concentration, and indicates total dissolved matter (metals and nutrients) and alkalinity. Streams with mixed fish populations usually have specific conductance between 150 and 500 µmhos/cm. Sierra streams usually have low specific conductance; hence the need to augment ion concentration by salt blocks when electrofishing.	12-24 µhmos/cm X	X	X	X
Total Suspended Solids (TSS)	A measure of solids in water which can be removed by filtration. The origin of suspended matter may be man-made wastes or natural sources such as silt. Elevated TSS concentrations generally occur during peak runoff. Over time, amounts of inert solids in excess of 90 mg/l can be lethal to fish.	<5-45 mg/L X	X	X	X
Total Dissolved Solids (TDS)	A measure of the amount of material dissolved in water mostly inorganic salts-carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, calcium, magnesium, manganese, sodium, potassium, and other cations. Most major ions are conservative; calcium, magnesium, carbonate levels can be affected by pH extremes. TDS will vary seasonally, generally based on flow regimes.	<10-21 mg/L X	X	X	
TOC.	TOC requires less sample and can be more reliable than BOD tests. Also, BOD typically used in systems that receive waste effluent.		X	X	
Nitrate/Nitrite	Nitrate result from normal decomposition of organic mater, and is a common form in which nitrogen is added to fertilizer. In general, nitrogen enters a watershed that has little human activity as rain.. In rivers with little human activity, total nitrogen is around 0.12 mg/l with nitrate representing about 85% of the nitrogen.	<0.52 -0.63 mg/L X	X	X	X
Total Kjeldahl Nitrogen	The total concentration of nitrogen in a sample present as ammonia or bound in organic compounds.		X	X	
Ammonia	Ammonia occurs as a result of organic decomposition and is common in sewage, fertilizers. Form of nitrogen most readily taken up by plants. Can be toxic to fish at low concentrations. Ammonia will often be converted to nitrate in the presence of oxygen.	<0.05 -0.076 mg/L X	X	X	

ATTACHMENT 1 (continued)

Constituent [4]	***What is It and Why is It Important?***	***Sampling Periods*** [1,2]			
		Spring Runoff [3]	***Summer Low Flow***	***Fall Turn-over***	***First Major Rain***
Total Phosphorous	Measure of the total amount of phosphorus – both biologically available and bound in organic compounds. Phosphorous results from normal decomposition of organic mater. In lakes, an N:P ratio greater than 16:1 indicates that phosphorous, rather than nitrogen, is limiting for production, which is typical in oligotrophic lakes in the Sierras.	<0.05 mg/L X	X	X	X
Dissolved Ortho-phosphate	Biologically available phosphorus – in the form of PO_4.	<0.2 mg/L	X	X	
Total Alkalinity (measured as $CaCO_3$)	Measures water's ability to neutralize acids (buffer capacity), and reduces toxicity of some metals. Levels above 400-600 mg/l may be harmful to crops and humans. Alkalinity of natural waters is due primarily to the presence of hydroxides, bicarbonates, carbonates and occasionally borates, silicates and phosphates.	<5-26 mg/L X	X	X	X
Calcium	Essential macronutrient, 5th most common element, and considered nontoxic. It is present in most natural systems introduced as water passes over calcium-rich formations. Contributes considerable to hardness (Sierra waters typically have low hardness) and may range from 0 to 200 mg/l naturally.	0.5-19 mg/L X	X	X	X
Chloride	Unlike free chlorine (which is toxic), the chloride ion is required by cells during photosynthesis.	0.32-0.92 mg/L X	X		
Magnesium	Essential macronutrient, primary component in photosynthetic pigments, 8th most common element. It is present in most natural systems, contributes considerable to hardness (Sierra waters typically have low hardness) and may range from 0 to several hundred mg/l naturally.	<0.5-0.63 mg/L X	X	X	
Potassium	Unlike terrestrial plants, K plays a minor role in plant growth. Needed in for enzyme activation.	<0.5 mg/L X	X		
Sodium	Sixth most abundant element and present in most waters naturally. Has low toxicity.	<0.5-2.1 mg/L X	X		
Sulfate		1.1-1.4 mg/L X	X	X	
Aluminum (Al)	Third most abundant metal in earth's crust. Not known to have a nutritional function in organisms. Enters system from leaching over aluminum-containing soils. Toxic in high concentrations and acidic (pH below 6.2) environments. In these cases, aluminum precipitates on fish gills, interfering with the transfer of calcium and sodium between blood and water. Also, in high concentrations may reduce primary productivity in lakes by combining with phosphates.	<0.05-0.130 mg/L as total Al X	X	X	X

ATTACHMENT 1 (continued)

Constituent [4]	*What is It and Why is It Important?*	*Sampling Periods* [1,2]			
		Spring Runoff [3]	*Summer Low Flow*	*Fall Turn-over*	*First Major Rain*
Arsenic (As)	Known carcinogen and a poison. Low levels occur naturally in surface water. Higher temperatures increase toxicity. Not affected by hardness.	<0.005 mg/L as total As X	X	X	
Barium (Ba)	16th most common element in nature, but only trace amounts usually found in surface waters.	<0.02 mg/L as total Ba X	X	X	
Cadmium (Cd)	Toxic metal and known human carcinogen, with bioaccumaltive properties carcinogen, with bioaccumaltive properties. Drinking water in the US has a mean of about 0.008 mg/l of total cadmium.	<0.0005 mg/L as total Cd X	X	X	
Copper (Cu)	Essential macronutrient for plants and animals. Generally considered to have low concentrations in oligotrophic aquatic systems of granitic alpine likes, which can limit photosynthesis. High concentrations of copper (usually as $CuSO_4$) are used to control algal blooms. Bradford et al (1968)[10] reported a mean concentration of 0.0012 mg/l of total Cu in 170 high Sierra lakes in CA. Exposure to levels less than 10 ppb (1µ/L) cause chronic toxicity symptoms in freshwater fish.	<0.001 mg/L as total Cu X	X	X	
Cyanide (CN)	Lethal toxin. Although not a metal, can combine to from alkali metal salts, and immobile metallocyanide. Often associated with gold extraction. At pH of 9.2 or less >90% occurs as free cyanide (CN^- or HCN). In general, cyanide has low persistance in surface waters (although may persist in groundwater). Cyanide has shown to adversely affect fish reproduction affecting the viability of the eggs. Not considered to be carcinogenic nor does it bioaccumulate.		X	X	
Iron (Fe)	Essential macronutrient for plants and animals. Enters watercourses from leaching of natural deposits in the form of relatively insoluble crystalines (i.e iron pyrite), particulates (organic matter or hydroxides) and soluble iron (ferric and ferrous iron). Hydrated ferric iron forms insoluable compounds and is deposited on sediments as a rust-colored layer called *ocher* ($Fe(OH)_3$). Bradford et al (1968) [5] reported a mean concentration of 0.0013 mg/l of total Fe in 170 high Sierra lakes in CA.	<0.1-0.120 mg/L as total Fe X	X	X	
Lead (Pb)	Toxic element that accumulates in animals, and toxicity is influenced by pH, alkalinity and hardness. Concentrations in natural waters usually less than 0.02 mg/l.	<0.0005-0.0028 mg/L as total Pb X	X	X	X

ATTACHMENT 1 (continued)

Constituent [4]	*What is It and Why is It Important?*	*Sampling Periods* [1,2]			
		Spring Runoff [3]	*Summer Low Flow*	*Fall Turn-over*	*First Major Rain*
Manganese (Mn)	Necessary macronutrient for plants and animals (needed as a cofactor in several enzyme systems, including those involved in respiration and nitrogen metabolism), and normally present in surface waters in various oxidation states as soluble complexes or suspended particles. Rarely exceeds 1 mg/l in natural waters. Bradford et al(1968) [5] reported a mean concentration of 0.0003 mg/l of total Mn in 170 high Sierra lakes in CA.	<.0.01-0.016 mg/L as total Mn	X	X	
Mercury (Hg)	Organic and inorganic salts very toxic and mercury naturally associated with Sierra soils. Mercury bioaccumulation within the aquatic food chain has potential to cause risks to piscivorous wildlife and human health.	<0.0002 mg/L as total Hg	X	X	X
Nickel (Ni)	Seldom found in natural waters, but may enter due to leaching of nickel-bearing geologic formations, such as serpentine rock and soils, which are common in Sierras. Toxicity related to hardness and may be mobilized with low pH conditions.	<0.01 mg/L as total Ni X	X		
Selenium (Se)	Essential macronutrient but may affect normal embryo development and be toxic in higher concentrations.	<0.002 –0.004 mg/L as total Se	X	X	
Silver (Ag)	Considered one of the most toxic heavy metal ions, but because monovalent silver ion is easily reduced it is not readily accessible to living organisms in the natural environment. Toxicity increases with hardness.	<0.0005 mg/L as total Ag	X	X	X
Zinc (Zn)	Essential macronutrient element for human growth and many aquatic organisms. Bradford et al (1968) [5] reported a mean concentration of 0.0015 mg/l of total Zn in 170 high Sierra lakes in CA.	<0.02 mg/L as total Zn	X	X	
Total Coliform Bacteria	Non-pathogenic microorganisms used in testing water to indicate the presence of pathogenic bacteria. This test is not recommended, as it will not provide any additional information over the fecal coliform or E. coli bacterial tests.			X	X
Fecal Coliform/E. coli Bacteria	A group of bacteria normally present in large numbers in the intestinal tracts of humans and other warm-blooded animals. Bacteria levels are of interest primarily during high recreational periods at local beaches, or during high runoff in areas with potential for inputs of untreated animal wastes. (USEPA tests have now shown E. coli to have better correlation with water contact and sickness.)	X[1]	X	X	X
Oil & Grease	Enters system from man.		X	X	X

[1] Assuming data gathered is not duplicative of El Dorado County's sampling efforts for three sites below Chili Bar Reservoir

ATTACHMENT 1 (continued)

Constituent [4]	*What is It and Why is It Important?*	*Sampling Periods* [1,2]			
		Spring Runoff [3]	*Summer Low Flow*	*Fall Turn-over*	*First Major Rain*
MTBE	Methyl-*tert*-butyl ether used as a gas additive to make fuel burn more efficient. Is a possible carcinogen, and is being phased out in California.		X	X	
Total Petroleum Hydrocarbon	Enters system from man.	<0.050 mg/L	X	X	

1. Sampling Periods are defined as spring runoff (April/May), summer low flow (August/early September), fall turnover (October/ November), and first major rain (November/December).
2. Sampling strategies are defined by X's or numerically. "X" indicates those periods in which SMUD proposes to sample for this constituent.
3. The numerical ranges represent actual values obtained during the June 10, 2002 sampling event at 10 water sampling sites: Gerle Creek below Loon Lake, SF Rubicon below Gerle Creek, SF Silver Creek below Ice House, Silver Creek below Junction Dam, Silver Creek below Camino Dam, SFAR above Camino Powerhouse, SFAR above Camino Powerhouse, Brush Creek below Brush Creek Reservoir, SFAR below Slab Creek Dam, and SFAR & Whiterock Powerhouse Discharge.
4. All constituents designated with * are identified as *In situ* sampling parameters, and shall be included as standard sampling parameters at all triage sampling stations plus the designated bypass reach stations identified as WQ Monitoring Stations 9, 13, and 36 on Table 2.

ATTACHMENT 2

Water quality sampling locations for relicensing of Sacramento Municipal Utility District's Upper American River Project and Pacific Gas and Electric Company's Chili Bar Project.

Water Quality Monitoring Station	*Triage Sampling*	*Contingency Sampling*	
	*Take & Analyze **	*Take with Triage Samples & Analyze if Problem*	*Take & Analyze if Problem*
1. Rubicon River inflow to Rubicon Resv.		X	
R-1. Rubicon Resv. mid-lake	1/3 depth / Epilimnion+hypolimnion		
2. Rubicon R. outflow from Rubicon Resv.	X		
3. Rubicon R. upstream of Rubicon Springs			X
3a. Fox Lake reach flow from Rubicon Resv		X	
4. Highland inflow to Rockbound Resv.		X	
R-2. Rockbound Lake mid-resv.	1/3 depth / Epilimnion+hypolimnion		
5. Rubicon outflow from Rockbound Lk.	X		
R-3. Buck Island Resv. mid-lake	1/3 depth / Epilimnion+hypolimnion		
6. Little Rubicon outflow from Buck Is. Lk.	X		
R-4a Loon Lake Resv. near dam	1/3 depth / Epilimnion+hypolimnion		
R-4b Loon Lk. mid-resv. in west body	1/3 depth / Epilimnion+hypolimnion		
R-4c Loon Lk. upper resv. N-E body	1/3 depth / Epilimnion+hypolimnion		
7. Gerle Ck. outflow from Loon Lake	X		
8. Jerrett Ck. upstream of Gerle Ck. con.			X
9. Gerle Ck. downstream of Jerret confl.	In situ *only*		X
10. Barts/Dellar Ck. upstream of Gerle Ck.			X
11. Gerle Ck. dwnstrm of Barts/Dellar conf.			X
12. Rocky Basin Ck. upstream of Gerle			X
13. Gerle Ck. dwnstrm of Rocky Basin conf	*In situ* only		X
14. Gerle Ck. inflow to Gerle Ck. Resv.	X		
R-5. Gerle Ck. Reservoir mid-resv.	1/3 depth / Epilimnion+hypolimnion		
15. Gerle Ck outflow from Gerle Ck Resv	X		
16. Gerle Ck Canal inflow to Robb's Frby	X		
17. S.F. Rubicon inflow to Robb's Foreb		X	
18. S.F. Rubicon upstream of Gerle Ck con.			X
19. S.F. Rubicon dwnstrm of Gerle Ck con.			X
20. S.F. Rubicon upstrm of Rubicon River	X		
21. Tells Ck. upstrm of Union Valley Resv.		X	
22. Big Silver Ck. upstrm of Union Valley		X	
23. Jones Fk Silver Ck inflow to Un.V. Res		X	
R-6a Union Valley Resv. near dam	1/3 depth / Epilimnion+hypolimnion		
R-6b Union Valley Resv. mid-resv.	1/3 depth / Epilimnion+hypolimnion		
R-6c Union Valley Resv. (Robb's Pk. PH tailrace zone)	1/3 depth / Epilimnion+hypolimnion		

ATTACHMENT 2 (continued)

Water Quality Monitoring Station	*Triage Sampling*	*Contingency Sampling*	
	*Take & Analyze **	*Take with Triage Samples & Analyze if Problem*	*Take & Analyze if Problem*
R-6d Union Valley Resv. Jones Fork arma	1/3 depth / Epilimnion+hypolimnion		
24. S.F. Silver Ck. upstrm of Ice House Res.		X	
R-7a Ice House Reservoir near dam	1/3 depth / Epilimnion+hypolimnion		
R-7b Ice House Reservoir mid-resv.	1/3 depth / Epilimnion+hypolimnion		
R-7c Ice House Reservoir upper lake body	1/3 depth / Epilimnion+hypolimnion		
25. S.F. Silver Ck. outflow from Ice House	X		
26a. S.F. Silver 3-4 mi. dwnstr of IH Resv	*In situ* only		X
26b. S.F. Silver upstrm of Big Hill Cnyn.			X
27. S.F. Silver Ck inflow to Junction Resv.	X		
28. Little Silver Ck. inflow to Junction Resv		X	
R-8 Junction Reservoir, mid-resv btwn arms	1/3 depth / Epilimnion+hypolimnion		
29. Silver Ck. outflow from Junction Resv.	X		
30. Onion Ck. upstream of Silver Creek			X
31. Silver Ck dwnstrm of Onion Ck confl.			X
32. Silver Ck. inflow to Camino Resv.	X		
33. Jay Bird Ck. inflow to Camino Resv.		X	
R-9. Camino Reservoir mid-resv.	1/3 depth / Epilimnion+hypolimnion		
34. Silver Ck. outflow from Camino Resv.	X		
36. Silver Ck. Immediately upstrm of SFAR	X		
37. SFAR upstream of Silver Ck confluence			X
38. SFAR upstream of Camino Powerhouse		X	
39. Brush Ck. inflow to Brush Ck. Resv.		X	
R-10. Brush Creek Resv. mid-resv. site	1/3 depth / Epilimnion+hypolimnion		
40. Brush Ck. outflow from Brush Ck Resv.	X		
41. SFAR dwnstrm of Camino Powerhouse	X		
R-11a Slab Creek Reservoir mid-resv. site	1/3 depth / Epilimnion+hypolimnion		
R-11b Slab Creek Resv. upper-resv. site	1/3 depth / Epilimnion+hypolimnion		
42. Slab Ck. inflow to Slab Ck. Reservoir		X	
43. SFAR outflow from Slab Ck Resv – upstream of Iowa- Brushy Cnyn Ck confl.	X		
44. SFAR between Slab Ck Res & Rock Ck			X
45. Rock Creek upstream of SFAR confl.			X
46. SFAR downstream of Rock Ck. confl.	X		
47. SFAR downstream of White Rock P.H.	X		
R-12a Chili Bar Reservoir near dam	1/3 depth / Epilimnion+hypolimnion		
R-12b Chili Bar Reservoir mid-resv. site	1/3 depth / Epilimnion+hypolimnion		
48. SFAR outflow from Chili Bar Resv.	X		
49. SFAR upstream of Dutch Creek			X
50. SFAR at Coloma gaging station			X

ATTACHMENT 2 (continued)

Water Quality Monitoring Station	*Triage Sampling*	*Contingency Sampling*	
	*Take & Analyze **	*Take with Triage Samples & Analyze if Problem*	*Take & Analyze if Problem*
51. SFAR dwnstrm of Greenwood Creek, near ex-USGS 11445500	X		
52. SFAR upstream of Weber Creek			X
53. Weber Ck upstream of confl. w/ SFAR			X
54. SFAR below Weber Creek confluence in a riverine environment	X		

* During periods of reservoir stratification, samples will be collected within the upper epilimnion layer and also in the hypolimnion layer a few feet above the reservoir bottom. When reservoir profile is mixed, samples will be collected at a point below the water surface equivalent to approximately one-third the total water column depth.

ATTACHMENT 3

Water Quality Analytical Method and Maximum Lab Holding Times

Constituent	Method	Hold time
Al	EPA 200.8 and 245.7	180 d
As	EPA 200.8 and 245.7	180 d
Ba	EPA 200.8 and 245.7	180 d
Cd	EPA 200.8 and 245.7	180 d
Cu	EPA 200.8 and 245.7	180 d
Fe	EPA 200.8 and 245.7	180 d
Pb	EPA 200.8 and 245.7	180 d
Mn	EPA 200.8 and 245.7	180 d
Hg	EPA 245.7	28 d
Ni	EPA 200.8 and 245.7	180 d
Se	EPA 200.8 and 245.7	180 d
Ag	EPA 200.8 and 245.7	180 d
Zn	EPA 200.8 and 245.7	180 d
Oil and grease	EPA 1664	28 d
MTBE	SW 5030B/SW 83260B	14 d
TPH	SW 5030B/SW 8021B/9015	14 d
Nitrate-Nitrite	EPA 300.0	48 h
Ammonia as N	EPA 350.2	28 d
TKN as N	EPA 351.3	28 d
Total phosphorous	EPA 365.2	28 d
Orthophosphate	EPA 365.3	48 h
TOC	EPA 415.1	28 d
Hardness	EPA 130.2	180 d
Total Alkalinity	EPA 310.1	14 d
TSS	EPA 160.2	7 d
TDS	EPA 160.1	7 d
Cn	EPA 335.2	180 d
Ca	EPA 200.7	180 d
Mg	EPA 200.7	180 d
K	EPA 200.7	180 d
Na	EPA 200.7	180 d
chloride	EPA 200.7	28 d
sulfate	EPA 200.7	180 d
coliform/E. coli (screening)	9221/9222 D or as available	24 h
fecal coliform (regulatory)	9222	24 h

ATTACHMENT 4

Glossary of Analytical Laboratory Terminology and Reporting Terms

Method Detection Limit (MDL):

Is a measure of the method sensitivity. The MDL is the lowest concentration that can be detected by an instrument with correction for the effects of sample matrix and method-specific parameters such as sample preparation. It is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in 40 CFR 136, Appendix B, revised as of May 14, 1999.

Criterion Quantitation Limit (CQL):

The level of analytical resolution needed to assess regulatory compliance. The CQL is the lowest amount of an analyte in a sample that can be quantitatively determined with suitable precision and accuracy. The desired criterion quantitation levels for the analysis of sampled constituents shall be set at 10% below the controlling (or lowest) applicable Basin Plan water quality objective, or California and National Toxics Rule criteria.

Practical Quantitation Limit (PQL):

The concentration that can be reliably measured within specified limits and accuracy during routine laboratory operating conditions. It is typically determined by a combination of the IDL (Instrument Detection Limit--the lowest the instrument is capable of seeing with specified confidence limits) and the lowest calibration standard used. The calibration level is selected (usually greater than the IDL) based upon the needs of the specific batch of samples being run (e.g. based on the levels set by the client, etc.)

Reporting Limit (RL):

The reporting limit for the laboratory. This is the lowest quantifiable (vs. estimated) concentration that the laboratory can determine, must be greater than or equal to the PQL, and is chosen based on client's needs and/or quality control. Ideally, the RL should be equal to or lower than the desired minimum CQL to meet the purposes of this monitoring. Due to the low limits that are required for the water quality analysis, the reporting limit will be set as low as possible (i.e. the same as the practical quantitation limit). If it is not possible for the laboratory to reliably measure concentrations at the desired minimum CQL for a given constituent using the most sensitive commonly available methodology, estimated concentrations will be reported down to the MDL (even though these estimated concentrations are below the "reporting limit" – See *Procedures for Reporting Results*.)

Procedures for Reporting Results:

1. Sample results greater than or equal to the RL shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).
2. Sample results less than the RL, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified" or DNQ. If the laboratory is unable to reliably measure concentrations at the desired minimum CQL for a given constituent (thus the RL is above the controlling applicable water quality objective or criteria), the estimated chemical concentration of the sample shall also be reported.
3. Sample results less than the laboratory's MDL shall be reported as "Not Detected," or ND.

ATTACHMENT 5

Location of Fecal Coliform / E. coli Sampling Stations

Attachment 5. Fecal/*E.coli* Sampling Sites For "5 in 30" and "Seasonal" sampling efforts

Site #	"5 in 30"	"Seasonal"	Location/Notes
UARP			
	X[2]		Buck Island reservoir near dam at dispersed camping site
		X	Buck Island reservoir north shore beach
		X	Loon Lake reservoir near-shore at northeast end at Pleasant campground
	X		Loon Lake reservoir at Ellis Creek inflow on west side of creek
		X	Loon Lake reservoir near-shore west of main dam
	X		Gerle Creek below Loon Lake gaging station at USFS property boundary (marked)
	X		Loon Lake reservoir near-shore near Northshore campground in dispersed recreation area between RV CG and main dam
		X	Loon Lake near-shore east of Loon Lake campground
		X	Gerle Creek below Ice House Road bridge below dispersed area
	X		Gerle Creek reservoir near-shore between dock and day use area
		X	Union Valley reservoir near-shore at Wench Creek campground
		X	Union Valley reservoir near-shore at Yellowjacket campground
	X		Union Valley reservoir near-shore at Camino Cove
	X	X	Union Valley reservoir near-shore at Fashoda beach (Peninsula)
	X		Union Valley reservoir near-shore at Jones Fork campground
		X	Union Valley reservoir near-shore at West Point boat ramp
	X		Jones Fork Silver Creek at Ice House road
	X		Big Silver Creek at bike bridge
		X	Ice House reservoir at inflow of South Fork Silver creek
	X		Ice House reservoir near-shore at east end near day use area
		X	Ice House reservoir near-shore at peninsula cove on north shore mid-length of reservoir ("Highland" area)
	X		Ice House reservoir near-shore near youth camp boat storage area
		X	Ice House reservoir near-shore west of boat launch area
	X		Ice House reservoir near-shore on west end of reservoir near day use area
		X	South Fork Silver Creek downstream of SMUD gaging station
		X	Junction reservoir near boat ramp dispersed camp area
		X	Camino reservoir near road
		X	Brush Creek boat ramp
	X		Brush Creek boat ramp
		X	Slab Creek reservoir boat ramp
	X		SFAR below bridge at Camino powerhouse
Chili Bar dam and reservoir			
		X	Chili Bar reservoir near shoreline (dam road)
	X	X	SFAR at gage station below dam

[2] "5 in 30" surveys will be performed to include Labor Day for upper elevation waterways; "5 in 30" surveys will be done during July 4 weekend for lower elevation waterways.

The downstream reach			
	X		SFAR downstream of Miner's cabin (in coordination with BLM)
	X		SFAR at County Park parking lot
	X	X	SFAR downstream of Greenwood Creek
	X		SFAR upstream of Hastings Creek (in coordination with BLM)
	X		SFAR downstream of Weber Creek (in coordination with BLM)
		X	SFAR upstream of Salmon Falls (above inundation zone)

ATTACHMENT 6

SMUD UARP WATER QUALITY MONITORING PROJECT
FISH TISSUE STUDY

RESERVIORS SAMPLED	DAYS EFFORT
Slab Creek/Chili Bar	2
Union Valley/Ice House	1
Gerle/Loon Lake	2

TARGET SPECIES - Indigenous predator, either trout or bass.

Brown and Brook Trout are not hatchery raised and are good target species. Rainbows are often planted as catchables, but some occur as wild fish. The hatchery fish are identified by their fins. Wild fish have sharp edges on their fins, the rays are straight and the fins often have white tips. Hatchery raised fish have deformed fins, the rays are crooked and the edges are often fleshy. Hatchery trout that have survived several years after planting show regeneration of their fins. The new growth shows some characteristics of wild trout fins.

Bass (Largemouth or Smallmouth)
Probably only smallmouth bass will be found in these reservoirs and lakes.

Six fish of similar size (25% rule) will be collected from each reservoir and composited into one sample.

COLLECTION METHODS

The preferred method of collecting fish samples is electro fishing from a boat. This is effective along the shoreline and especially near the mouths of inflowing streams. To do this, there must be boat launching available and the water must have enough dissolved solids to carry an electric current. Alternatively, a gill net will be fished overnight.

Sampling should be completed by September 1, 2003.

SAMPLE PREPARATION

Fish will be dissected and homogenized using clean techniques according to DFG Fish and Wildlife Water Pollution Control Laboratory standard operating procedures. Liver and fillets will be composited and homogenized separately.

SAMPLE ANALYSIS - $386/sample or composite

Fish tissues will be analyzed for trace elements by ICP-MS at the DFG Marine Pollution Studies Laboratory at Moss Landing.

Tissue	Trace Elements Analyzed
Fillets	mercury, selenium, arsenic, cadmium, nickel
Liver	silver, chromium, copper, lead, zinc

ESTIMATED COMPLETION DATE – November 1, 2003

MERCURY IN TISSUE

1.0 SCOPE AND APPLICATION

This is an atomic spectroscopy method for the determination of mercury in fish tissue.

2.0 SUMMARY OF METHOD

2.1 Fish tissue is digested with concentrated nitric acid.

The mercury ions are reduced to elemental mercury with stannous chloride. The mercury vapor is analyzed by cold vapor atomic spectroscopy.

2.2 The detection limit for this method is approximately 0.02 µg/g wet weight for a 1.0 g sample.

3.0 INTERFERENCES

Certain volatile organic materials that absorb at this wavelength (253.7 nm) may cause interference. A preliminary run without reagents should determine if this type of interference is present. Chlorine causes severe interference.

4.0 APPARATUS AND MATERIALS

4.1 Digestion tubes: polypropylene digestion vessels - Cat. # SC499 or SC500 from Environmental Express

4.2 Ribbed watch glass - Cat. # SC505 from Environmental Express

4.3 50 ml Rohre/Tube - Cat. # 62.559 from Sarstedt (Aktiengesellschaft & Co)

4.4 15 ml Rohre/Tube - Cat. # 62.554.01 from Sarstedt (Aktiengesellschaft & Co)

4.5 Filter papers - Cat. # 1004 090 from Whatman, for use if filtration is needed for the sample

4.6 Hot block for metals digestions - Cat. # SC154 from Environmental Express

4.7 Teflon spatulas

4.8 Mercury lamp

4.9 Compressed argon

4.10 Atomic Spectroscopy Perkin Elmer equipped with: flow injection mercury system 400 (FIMS 400), data system, programmable autosampler (AS-90 series).

5.0 REAGENTS

5.1 Type II water

5.2 Stannous chloride dihydrate, crystal ("Baker Analyzed" JT3980-11), 25%$SnCl_2*2H_2O$ in 20% HCl. Dissolve 50g $SnCl_2*2H_2O$ in 40 ml HCl. Mix and allow to stand until $SnCl_2*2H_2O$ has dissolved and solution is clear. Bring to volume (200 ml) with type II water. PREPARE FRESH DAILY. (approximately 800 ml needed for the set of 32 tubes of sample, 5 tubes for standard curve and quality control)

5.3 Mercury Standard Solution (stock) – J.T. Baker, 1000 ppm

5.4 Mercury Standard Solution (intermediate) - 1.0 ppm in 1.0% nitric acid.
Partially fill a 1000 ml volumetric flask with Type II water. Add 1 ml of 1000 ppm $HgCl_2$. Bring to volume (1000 ml) with Type II water.

5.5 Mercury calibration standards: Partially fill each volumetric flask with Type II water, add the appropriate volume of 1.0 ppm $HgCl_2$ standard and 40 ml concentrated nitric acid and bring to volume with Type II water. As solution cools, it will be necessary to add water to keep level at 100 ml. Mix well.

0.0010 ppm: Add 0.10 ml of 1.0 ppm $HgCl_2$
0.0050 ppm: Add 0.50 ml of 1.0 ppm $HgCl_2$
0.0100 ppm: Add 1.00 ml of 1.0 ppm $HgCl_2$
0.0250 ppm: Add 2.50 ml of 1.0 ppm $HgCl_2$
0.0005 ppm: Add 5.00 ml of 0.01 ppm $HgCl_2$

5.6 Mercury Check Standard and Spike Standard: E.M. Science, 1000ppm.

5.7 Intermediate solution (A): 100.0 ppm in 1.0% nitric acid. Partially fill a 100 ml volumetric flask with Type II water. Add 10.0 ml of 1000 ppm $HgCl_2$. Bring to volume with Type II water.

5.8 Intermediate solution (B): 1.0 ppm in 1.0% nitric acid. Partially fill a 100 ml volumetric flask with Type II water. Add 1.0 ml of solution (A). Bring to volume with Type II water.

5.9 Check Standard: 0.010 ppm in 40% nitric acid. Partially fill a 100 ml volumetric flask with Type II water. Add 1.0 ml of solution (B). Bring to volume withType II water.

5.10 Hydrochloric acid (HCl), concentrated, reagent grade.

5.11 Nitric acid (HNO_3), concentrated, reagent grade.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must have been collected using a sampling plan that addresses the considerations discussed in this manual.

6.2 All sample containers must be prewashed with detergents, acids, and Type II water. Plastic and glass containers are both suitable.

6.3 Nonaqueous samples shall be frozen, when possible, and analyzed as soon as possible.

7.0 PROCEDURE FOR SAMPLE PREPARATION

Preparation of samples:

7.1 With each set of analyses, prepare 2 method blanks, 2 standard reference materials (~ 0.25 g dry tissue - Dorm 2 or NBS 1566a), 2 matrix spike, 2 laboratory control spike, and one duplicate for every 10 samples.

7.2 Samples with equal weight of water added: Place 2.0 ± 0.5 g into clean digestion tube.

7.3 Samples without added water: Place 1.0 ± 0.5 g into clean digestion tube.
7.4 Add 10 ml concentrated nitric acid and let stand overnight.

7.5 The next day, digest samples in a programmable hot block. The parameters for heating are as follows:

Ramp: 5^0 C / min.
Set temperature: 105-108^0 C.
Hold: 2 ½ hours

7.6 Allow the tubes to cool, then add Type II water to the calibration mark (25ml). Vortex tubes to mix well.

7.7 Moisture Determination, if required

1. Number an aluminum weighing dish to correspond to the sample beaker number.

2. Weigh the aluminum weighing dish and record its weight.

3. Tare the aluminum weighing dish.

4. Weigh ~ 3g (minimum 1g) tissue and record the weight.

5. Place moisture samples in a 70°C oven for 48 hours.

6. After cooling samples, weigh and record the dry weights.

Percent Moisture Calculation

$$1 - \frac{\text{(Dry sample weight plus aluminum dish)} - \text{(Aluminum dish weight)}}{\text{(Wet sample weight)} \times \text{(F)}} \times 100$$

F = the added water factor = 0.6666 when added water equals one half of the sample weight (i.e. flesh samples - Selenium Verification Program)

0.5 when added water equals the sample weight (i.e. flesh samples - Toxic Substance Monitoring Program) 1 when water was not added to the sample (i.e. liver and sediment samples)

8.0 ANALYTICAL PROCEDURE

8.1 Prepare reagents:

8.1.1 25% $SnCl_2$ (see Section 5.2)
8.1.2 Rinse water -3.0% HCl (Prepare 1000 ml: 30 ml HCl add to 970 ml Type II water)
8.1.3 Reagent blank solution - 40% HNO_3 (Prepare 500 ml: 200 ml HNO_3 add to 300 ml Type II water)

8.1.4 Calibration standards (see Section 5.5)
8.1.5 Check standard (see Section 5.9)

8.2 Transfer calibration standards and check standard to 50 ml Rohre/Tube, samples to 15 ml Rohre/Tube. The tubes should be numbered to correspond to sample number.

8.3 Operation of FIMS 400 and auto sampler

8.3.1 Switch on the fume ventilation system, then the carrier gas supply (argon), adjust the pressure to 52 psig and finally switch on FIMS 400.

8.3.2 Switch on the computer, printer and start Windows.

8.3.3 In the Program Manager, double-click on AA 2.50.

8.3.4 When "AA WinLab" appears, proceed as follows:

- From the Tools menu, choose Open Workspace, or on the Toolbar, click on WkSpace.
- Select **hgtissue.fms**, then click on OK. The window appears.
- On the Toolbar, click on MethEd. Select **Tissue Hg Test**. All of the desired parameters have been entered for

  Inst – Instrument parameters
  Calib – Calibration parameters
  FIAS – FIAS program instructions
  Checks – Analytical checks for sample and calibration solutions
  QC – Locations of quality control solutions and instructions for performing quality control procedures
  Options – Remarks about the Method and options for saving and printing data

  - Saving a method: From the File menu, choose Save As Method. A dialog appears. If you want to save the Method under a new name, type a name for the file, then press Enter or click on OK. To save the Method with the original name, press Enter or click on OK.
  - Click on SampInfo on the Toolbar to enter the pertinent information (e.g. description, batch ID, analyst, the first sample ID should be at auto sampler location # 9).
  - Saving a sample information file: From the File menu, choose Save As ► Sample Infor File. A dialog appears. If you want to save the Sample Infor File under a new name, type a name for the file, then press Enter or click on OK.
  - Printing the Autosampler Loading List: From the File menu, choose Print ► Autosampler Loading List.
  - Select the name of the Results Data Set where you will save the results. If the data set exists, new data will be added to it.
  - Select the Save Data check box if you want the results saved in the data set specified.
  - Select the Print Log check if you want the results to be printed.

- Select the Off After Analysis: Lamp, Pumps check boxes to switch these items off at the end of the analysis.
- On the Automated Analysis window, check on "use Entire Sample Infor File" column.

- Click on the tab containing "Analyze": click on "Analyze all"after the reagents have been prepared, the signal has been optimized, the FIMS 400 flows have been set, the autosampler has been turn on, and the samples have been loaded.

8.3.5 To optimize the signal

- The absorbance values for each replicate should be similar. If the absorbance for the first replicate is higher than that for the subsequent ones, lengthen the Fill step on the FIAS page of the Method. If the absorbance of the first is replicate is lower, Lengthen the Prefill step.

- Ensure that the Read Delay (0 s) and Read Time (15 s) values are set correctly on the Inst page of the Method.

- Slight adjustments to the gas flow may improve sensitivity. If the peak maximum appears too early, slightly decrease the carrier gas flow. If the peak maximum appears too late, slightly increase the carrier gas flow.

  Note: If the carrier gas flow is too high, the mercury vapor is dispersed too rapidly. If the flow is too low, mercury vaporflows into the cell too slowly. In both situations the signal and sensitivity are low. A flow in the range 40-70 ml/min is generally suitable.

- A slight decrease in the outflow from the gas/liquid separator may improve sensitivity.

  Note: If the outflow from the gas/liquid separator is too high, mercury vapor may escape through the waste outlet. If the out-flow is too low, the fluid level may rise so high that moisture escapes into the sample transfer tube and the FIMS-cell. If liquid does enter the FIMS-cell, you must clean the cell as described in FIMS: Installation, Maintenance, System Description.

- Slight adjustments to the carrier and reductant flows may improve sensitivity.

- If the FIMS-cell is contaminated, e.g. because liquid has entered the cell, you must clean the cell as described in FIMS: Installation, Maintenance, System Description.

8.3.6 To set up the FIMS – 400

- The carrier gas stream has a large influence on sensitivity. If he flow is too high, the atom or hydride cloud is dispersed too

- rapidly. If the flow is too low, the resulting signal and sensitivity are lower. A flow of 50-100 mL/min for the carrier stream is suitable. If there is no gas flow, the automatic gas valve may be closed. To start the flow, in the FIAS Control window, click on Valve Fill/Inject.

- Place the inlets of the carrier pump tube (yellow/blue), reductant pump tube (red/red) and sampling tube (leading to the FIAS valve) in containers of deionized water.

- Swing the pump pressure levers over to press the pump tube magazines against the rollers.

- On the Toolbar, click on FIAS. Then, in the FIAS Control window:

- Click on Valve Fill/Inject to set the valve to the Fill position. Type 100 for Pump # 1 Speed, and type 120 for Pump # 2 Speed. Click on Pump # 1 and Pump # 2 to start the pumps.

- The flows should be checked before every run. When checking flows, only use P-2. P-1 is dry except when sample is being pumped. The carrier pump tube (yellow/blue) should have a flow of 9-11 ml/min; the reductant pump tube (red/red) should have a flow of 5-7 ml/min. It is recommended that the tubes be replaced after two runs and that they are reversed when they are run the 2 nd time.

- After setting the flows, position the reagents.

- For gas/liquid separator, put filter paper's shiny side up

8.3.7 Sample Changer

- Load the sample carousel with standards, reagent blank solution and samples. Set in place the rinse solution (MQ H_2O) at location 0.

8.3.8 Initiate the run

- On the Toolbar, click on Analyses, select Autozero signal to zero the instrument.

- To analyze all the solutions: In the Automated Analysis Control window, click on Analyze All. All the solutions will be analyzed. The calibration solutions will be analyzed first, immediately followed by the samples and any other solutions (QC, reslope etc.).

PRECAUTIONS:

Check that the drain tube is connected to the gas / liquid separator and freely drains into collection vessel. The end of the drain tube must not be submerged in liquid. The exhaust hood over the FIMS should be left on at all times.

8.3.9 Post run: Rinsing procedure after automatic analyses

- Place the inlets of the carrier and reagent (e.g. reductant, buffer) tubes in a container of deionized water.

- On the Toolbar, click on Auto.

- In the Automated Analysis Control window, click on Analyze page tab.

  – Click on Select Location. In the dialog box, select the Go to wash option, then click on OK.

- In the Automated Analysis Control window, click on Move Probe Up/Down to raise the sampling probe.
- Place a beaker with the first rinse solution in the wash location (usually location 0).

- Click on Move Probe Up/Down to lower the probe into the rinse solution.

- On the Toolbar, click on FIAS.

- In the FIAS Control window:

- Click on Valve Fill/Inject to turn the valve to the Fill position. (The position is shown in the Status display of the window.)

- In the FIAS Control window:

- Click on the Pump 1 and Pump 2 buttons to start the pump.

- In the FIAS Control window, click on Valve Fill/Inject a number of times while the pumps are running. This ensures that sample channel and the inside of the FIAS-valve are rinsed effectively. Rinse the tubing with the de-ionized water for as long as necessary to remove all traces of the previous reagent.

8.3.10 Quality Control

- All quality control data should be maintained and available for easy reference or inspection.

- Calibration curves must be composed of a minimum of blank and three standards. After running the calibration curve, analyze an initial calibration blank and an initial calibration check standard (ICB, ICV). A continuing calibration blank (CCB) and a continuing calibration check standard (CCV) should be analyzed. This check standard is used to check the validity of the calibration curve standard and therefore should be obtained different vendor. The CCV result must be within 85-115% of the expected concentration. After the last sample in the run, a final FCB and FCV should be analyzed.

- Dilute samples if they are more concentrated than the highest standard.

- Analyze a minimum of two blanks per sample batch to determine if contamination or any memory effects occur.

- Analyze two standard reference material (SRMs) of a comparable matrix with each set of samples.

- Analyze on duplicate sample for every ten samples.

- Analyze a matrix spike (MS) and matrix spike duplicate (MSD) with each run.

- Analyze a laboratory control spike (LCS) and laboratory control spike duplicate with each run.

9.0 REFERENCES

9.1 Evans, S.J., Johnson, M.S., Leah, R.T. 1986. Determination of Mercury in Fish Tissue, a Rapid, Automated Technique for Routine Analysis. Varian Publication Number AA-60.

9.2 Perkin Elmer, Publication B3118.20. FIMS Flow Injection Mercury System. Setting Up and Performing Analyses. Atomic Spectroscopy.

Analyst:_____ Date:_____

Reviewed by:_____ Date:_____

Laboratory Director:_____ Date:_____

WATER QUALITY TECHNICAL REPORT

SUMMARY

From 2002 through 2004, the Sacramento Municipal Utility District (SMUD) and Pacific Gas and Electric Company (jointly referred to as the Licensees) performed water quality studies to support the relicensing of SMUD's Upper American River Project (UARP) and Pacific Gas and Electric Company's Chili Bar Project (jointly referred to as the Projects). The studies were conducted in the 10 UARP reservoirs, Rockbound Lake and Chili Bar Reservoir and in river reaches that could be affected by operations of the Projects, as well as many inflowing streams to the reservoirs. The studies were conducted in conformance to study plans developed by the UARP Relicensing Aquatic Technical Working Group and approved by the UARP Relicensing Plenary Group. This Water Quality Technical Report provides the results of that effort except for the complete sets of data for water temperature, dissolved oxygen, pH, specific conductance and Secchi disk depth that were collected during reservoir profiling; the reservoir profile data are summarized in this report and are provided in full in the Licensees' Water Temperature Technical Report.

SMUD is aware of five historic spills of hazardous material from the UARP. Four occurred in the Camino reach area and one in the Union Valley Dam area. Pacific Gas and Electric Company is unaware of any spills of hazardous materials at the Chili Bar Project.

Reservoirs

In general, waters in the 12 reservoirs are soft with hardness readings ranging from less than 1 to about 15 mg/l, and total alkalinity levels ranging from about 1 to 14 mg/l, indicating a low buffer capacity to changes in pH. The water is low in total suspended and dissolved solids (TSS/TDS); generally less than 4 mg/l and 20 mg/l, respectively. Mineral levels are low. All organic compounds (oil and grease, methyl-t-butyl ether [MTBE], total petroleum hydrocarbons [TPH], and gasoline range organics) are below detection limits. Based on Secchi disk depth, total nitrogen and total phosphorus readings, the reservoirs range in trophic status from mesotrophic (represented best by Chili Bar Reservoir) to oligotrophic (represented best by Junction Reservoir). The maximum nitrate concentration in each reservoir is well below the 1.0-mg/l nitrate standard typically used to characterize waters that can stimulate algal growth. The Licensees are unaware of any reports of floating material that would affect designated beneficial uses. All of the 12 reservoirs are generally well oxygenated. Dissolved oxygen (DO) concentrations in the upper portions of the reservoir in summer are typically greater than 85% saturation and 8.0 milligrams per liter (mg/l). None of the reservoirs showed bottom anoxic conditions, although lower DO concentrations (less than about 3 mg/l and 30% saturation) were found at the bottom of Ice House, Union Valley and Brush Creek reservoirs. The water is basic to slightly alkaline with pH readings ranging from about 6.0 to 8.0. Specific conductance showed an increasing trend from upstream reservoirs (readings ranging from about 6 to 13 μS/cm) to the downstream reservoirs (20 to 37 μS/cm), indicating increasing ion concentration from the upper to lower elevation reservoirs. Water in the reservoirs is relatively clear, with Secchi disk readings from about 10 to 30 feet.

With the exception of lead during the 2004 sampling events (i.e., during 2004 Spring Runoff, Summer Low Flow, First Major Rain and Fall Turnover), mercury during the 2003 Summer Low Flow sampling event, and iron during the 2003 Summer Low Flow sampling event, total metal concentrations in the reservoirs were less than Primary and Secondary Maximum Contaminant Levels (MCLs) established by the California Department of Health Services (DHS) pursuant to the California Safe Drinking Water Act. The Primary MCL for lead of 15 μg/l was exceeded in 46 reservoir samples (10 reservoirs: Rockbound, Buck Island, Loon Lake, Gerle Creek, Union Valley, Ice House, Junction, Brush Creek, Slab Creek and Chili Bar) during May to November 2004, ranging from 15-190 μg/l. It has since been confirmed by laboratory testing that the reservoir sampling equipment (Kemmerer sampler) used only during the 2004 sampling events was the source of elevated lead concentrations in reservoir samples during 2004. There were no other exceedences of lead MCLs except for samples collected with the 2004 Kemmerer reservoir sampler. Eight mercury samples exceeded the Primary MCL of 2 ug/l in five reservoirs (Loon Lake, Union Valley, Ice House, Slab Creek and Chili Bar) ranging from 2.1-5.7 ug/l. The reservoir sampling equipment (i.e., Van Dorn

and Kemmerer depth sampler) appear to be the source of elevated mercury levels in reservoir samples in 2003 as well as for elevated levels of lead in reservoir samples in 2004. The Van Dorn sampler that caused elevated mercury concentrations during 2003 was replaced with a Kemmerer sampler for the 2004 sampling events. Analysis of subsequent reservoir samples collected in 2004 with the new Kemmerer showed low mercury concentrations (<0.001 – 0.005 μg/l), however, lead concentrations jumped significantly in 2004 using the new Kemmerer sampler. A quality-assurance sample collected in the field (i.e., deionized water rinse of the Kemmerer sampler) during the 2004 Spring sampling event indicated the new Kemmerer sampler to be the likely source of lead in reservoir samples collected in 2004. Laboratory leaching tests conducted on the Kemmerer sampler during March 2005 confirmed that it was the source of elevated lead concentrations in the 2004 reservoir samples. The secondary MCL of 300 μg/l for total iron iron was exceeded in seven samples; in four reservoirs (Rubicon, Rockbound, Ice House and Chili Bar), ranging from 330-980 ug/l. Secondary MCLs do not have specific human health considerations, but are related to taste and odor.

SMUD collected fish from reservoirs that experience at least a moderate level of fishing pressure and analyzed filets for metals. Of the 30 filets examined, none had metal concentrations that exceeded SWRCB's Maximum Tissue Residue Levels (MTRL) guidelines. Two samples exceeded the USEPA Screening Value (SV) for arsenic of 0.026 ppm; at Union Valley Reservoir (brown trout, 0.06 ppm) and at Ice House Reservoir (rainbow trout, 0.16 ppm). Two samples exceeded the USEPA's SV guideline of 0.4 ppm for mercury, and an additional sample exceeded the USEPA (2002) guideline of 0.3 ppm for mercury; at Gerle Creek Reservoir (brown trout, 0.32 ppm), Union Valley Reservoir (smallmouth bass, 0.42 ppm), and Slab Creek Reservoir (brown trout, 0.59 ppm). Note that exceedence of USEPA's SV guidelines does not necessarily indicate a human health risk, but only that "*…more intensive site specific monitoring and/or evaluation of human health risk should be conducted."* (USEPA 2000).

All of the fecal coliform samples collected by the Licensees in reservoirs met the Basin Plan Water Quality Objective for geometric mean (less than 200 organisms/100 ml). The single sample criterion (less than 400 organisims/100 ml) was exceeded in five samples in Union Valley Reservoir in June and July 2003 near the Camino Cove, Fashoda Beach and Jones Fork recreation areas. None of the *E. coli* samples collected by the Licensees in reservoirs exceeded the SWRCB staff's proposed Basin Plan water quality objective for *E. coli*, although exceedences occurred in upstream or downstream locations where high levels of dispersed recreational activities occur.

As requested by the Aquatic TWG, the Licensees collected additional information regarding total and dissolved metal concentrations for comparison with the California Toxics Rule (CTR) Criterion Maximum Concentrations (CMC) and Criterion Continuous Concentrations (CCC) for Freshwater Aquatic Life. The results of this sampling and the data analysis with respect to the CCC and CMC are included in this Water Quality Technical Report for dissolved metals concentrations in samples collected during the 2004 sampling events. The CCC and CMC for copper were exceeded in 15 UARP reservoir samples (Rockbound, Buck Island, Loon Lake, Gerle Creek, Union Valley, Ice House, Camino, and Slab Creek reservoirs) and four Chili Bar Reservoir samples. Two cadmium samples from UARP reservoirs (Loon Lake and Gerle Creek) exceeded the CCC and CMC, and two silver samples from UARP reservoirs (Rockbound and Ice House) exceeded the CMC (the CCC for silver has not been established). One cadmium and one zinc sample from Chili Bar Reservoir exceeded both criteria.

River Reaches

Alkalinity in waters in the UARP reaches and the Reach Downstream of Chili Bar, is low, with most readings less than 10 mg/l, indicating a low buffer capacity for changes in pH. The highest reading (110 mg/l) was recorded in the Reach Downstream of Chili Bar at a site downstream from the Salmon Falls/Highway 49 Bridge. Excluding this one reading, the alkalinity readings in this reach ranged from 9.6 to 28 mg/l. Turbidity and total suspended solids are also low, with mean values of less than 1 Nephelometric Turbidity Unit (NTU) and 1.3 mg/l, respectively. Total dissolved constituents, measured as total dissolved solids or individually as calcium, magnesium, potassium, sodium, chloride, and sulfate are also low. Values are generally below reporting limits, with minimal site or seasonal differences. All organic compounds (oil and grease, MTBE, TPH, and gasoline range organics) are below detection limits. All UARP reaches and the Reach Downstream of Chili Bar are well-oxygenated with dissolved oxygen concentrations greater than 85% saturation and 7.0 mg/l of oxygen except for five sampling occasions, two

of which were in a UARP–affected reach (5.5 mg/l on October 8, 2002 in the outflow from Loon Lake Dam, and 4.7 mg/l on September 13, 2004 in the South Fork American River outflow from Slab Creek Reservoir), and one of which was in a Chili Bar-affected reach (6.1 mg/l on September 13, 2004 on the South Fork American River downstream of Greenwood Creek). The other two occasions were in stream reaches not affected by the UARP or Chili Bar Project: 3.1 mg/l in Jerrett Creek on October 8, 2002; and 3.7 mg/l in Rocky Basin Creek on September 17, 2003. The water is very soft with hardness readings ranging from less than 1 mg/l to 27 mg/l. Nutrients are also low. Total phosphorus and ortho-phosphorus each ranged from a low of less than 0.01 mg/l to a high of 0.22 mg/l for total phosphorus and a low of 0.003 mg/l to a high of 0.3 mg/l for orthophosphorus. Total Kjeldahl nitrogen ranged from less than 0.023 mg/l to 1.5 mg/l. Nitrate-nitrite ranged from less than 0.005mg/l to 3.0 mg/l. However, in general, the nitrate concentration in each reach is well below the 1.0-mg/l nitrate standard used to characterize source waters that can stimulate algal growth. As with the reservoirs, pH generally ranged from about 6.0 to 8.0 and mineral levels are low. Three pH values were measured below 6.0, all of which occurred in non-project affected reaches: 5.0 on September 17, 2003 at South Fork Rubicon inflow to Robbs Peak Forebay; and Highland Creek inflow to Rockbound Reservoir on June 11, 2003 and May 12, 2004 (5.75 and 5.83, respectively).

There were no values for total metals concentrations in the reaches that exceeded Primary MCLs. The Secondary MCL for aluminum of 200 µg/l was exceeded in three samples, ranging from 230 to 290 µg/l of total aluminum. Ten iron concentrations exceeded the Secondary MCL level of 300 µg/l of total iron, ranging from 300 to 990 µg/l of total iron. Secondary MCLs do not have specific human health considerations, but are related to taste and odor.

All bacteria samples collected by the Licensees met the Basin Plan Water Quality Objective for fecal coliform geometric mean and single sample criteria, as well as the SWRCB staff's proposed water quality objective for *E. coli*. However, fecal coliform concentrations in tributaries to Union Valley Reservoir exceeded single sample fecal coliform occasions at times during increased dispersed recreational use.

Fecal coliform and *E. coli* criteria were exceeded in the Reach Downstream of Chili Bar. The fecal coliform geometric mean criterion was exceeded at two sites: upstream of Hastings Creek (322 organisms/100 ml) and downstream of Weber Creek (327 organisms/100 ml). The single sample objective for *E. coli* exceeded in the Reach Downstream of Chili Bar at one site: below Chili Bar Dam (236 /100 ml). Fecal coliform single sample criterion was exceeded on a number of occasions, but did not follow an upstream to downstream pattern. While *E. coli* concentrations from the Licensees' sampling were low in the Reach Downstream of Chili Bar, sampling by El Dorado County in the Reach Downstream of Chili Bar from 1997 through 2002 included approximately 3 percent of the samples that would have exceeded the SWRCB staff's proposed *E. coli* water quality objective.

As with reservoirs, the Licensees collected additional information regarding dissolved metal concentrations during 2004 for comparison with the CTR's CCC and CMC for Freshwater Aquatic Life UARP project riverine samples exceeded criteria in three cadmium, 11 copper, 22 lead, one silver and three zinc samples. Chili Bar riverine samples exceeded criteria in three copper samples and one lead sample. Non-project riverine samples exceeded CCC/CMC criteria in one copper, ten lead and two silver samples at the following sampling sites: copper and lead criteria were exceeded at Highland Creek inflow to Rockbound Reservoir; lead criteria were exceeded at Rubicon River inflow to Rubicon Reservoir, Tells Creek inflow to Union Valley Reservoir, Big Silver Creek inflow to Union Valley Reservoir, and South Fork Silver Creek inflow to Ice House Reservoir; and silver criteria were exceeded at Jones Fork Silver Creek inflow to Union Valley Reservoir and Little Silver Creek inflow to Junction Reservoir.

1.0 INTRODUCTION

This technical report is one in a series of reports prepared by Devine Tarbell & Associates, Inc., (DTA) for the Sacramento Municipal Utility District (SMUD) and Pacific Gas and Electric Company (jointly referred to as the Licensees) to support the relicensings of SMUD's Upper American River Project (UARP) and Pacific Gas and Electric Company's Chili Bar Project (jointly referred to as the Projects). The Licensees intend to append this technical report to their

respective applications to the Federal Energy Regulatory Commission (FERC) for new licenses. This report addresses water quality in UARP reservoirs and stream reaches affected by the UARP and in the Chili Bar Reservoir and in the Reach Downstream of Chili Bar. This report does not include the complete sets of data for water temperature, dissolved oxygen, pH, specific conductance and Secchi disk depth that were collected during reservoir profiling; the reservoir profile data are summarized in this report and are provided in full in the Licensees' Water Temperature Technical Report. The water quality technical report includes the following sections:

- **BACKGROUND** – Includes when the applicable study plans were approved by the UARP Relicensing Plenary Group; a brief description of the issue questions addressed, in part, by the study plans; the objectives of the study plans, and the study area. This section also includes agency requested information on historical water quality studies in the area and historical spill and waste discharge events.
- **METHODS** – A description of the methods used in the study, including a listing of study sites and sampling events.
- **RESULTS** – A description of the salient data results.
- **LITERATURE CITED** – A listing of all literature cited in the report.

This technical report does not include a detailed description of the UARP Alternative Licensing Process (ALP) or the UARP, which can be found in the following sections of SMUD's application for a new license: The UARP Relicensing Process, Exhibit A (Project Description), Exhibit B (Project Operations), and Exhibit C (Construction). Nor does this technical report include a detailed discussion of Pacific Gas and Electric Company's relicensing process for the Chili Bar Project.

This technical report does not attempt to characterize or conclude whether continued operation of the Projects is consistent with water quality policies and plans identified herein (ultimately, the State Water Resources Control Board (SWRCB) will make the final determination regarding consistency with such policies and plans). This technical report also does not include a detailed discussion regarding the long- or short-term effects of the continued operation of the Projects on water quality, or a discussion of appropriate protection, mitigation, and enhancement (PM&E) measures. Analysis of consistency and/or impacts regarding the operation of the UARP is included in SMUD's applicant-prepared preliminary draft environmental assessment (PDEA) document, which is part of SMUD's application for a new license for the UARP. Similarly, an impacts discussion regarding the Chili Bar Project will be included in Pacific Gas and Electric Company's Chili Bar Project license application. Development of PM&E measures will occur in settlement discussions in 2005, and will be reported on in the UARP application PDEA and the Chili Bar Project license application.

2.0 BACKGROUND

2.1 Water Quality Study Plan

On January 8, 2003, the UARP Relicensing Plenary Group approved a Water Quality Study Plan that was developed and initially approved by the relicensing Aquatic TWG on August 28, 2002, which was revised and again approved on December 2, 2002. The study plan was designed to address, in part, the following issues questions developed by the Plenary Group:

Issue Question 39.	How does the Project affect water quality (e.g. turbidity) and sedimentation, specifically at Slab Creek Reservoir, as operation of this reservoir affects sediment transport into Chili Bar Reservoir? How can we manage that impact if it exists? What are the historic events that have affected sedimentation?
Issue Question 41.	Do the waters below the Project reservoirs meet the water quality objectives of the Basin Plan? How can the Project be managed to help meet them?
Issue Question 45.	What type of long-term sediment and water quality strategies, operational practices and maintenance strategies exist?
Issue Question 46.	Do the waters within the reservoirs and the diverted reaches adequately protect all designated beneficial uses?
Issue Question 47.	Identify the Project-related pollution events that may have occurred in the watershed.
Issue Question 55.	What are the (Project-induced) effects of recreation (including on water and upslope activities) on water quality in the reservoirs and stream reaches (e.g. dispersed recreation and outhouses)?
Issue Question 60.	What is the location of all spoil piles within the Project area and what are the effects on water quality?

Specifically, the objectives of the study plan were:

- Characterize water quality under current operations of the Projects by direct monitoring of water quality, evaluation of historical information and evaluation of current ongoing studies in the area of the Projects such as the water temperature, channel morphology, Projects sources of sediment and aquatic bioassessment studies.
- Determine if Basin Plan water quality objectives (and other applicable water quality criteria) are met and assess whether Basin Plan-designated beneficial uses are protected.

The study area included all reservoirs associated with the Projects excluding Robbs Peak Reservoir due to its small size, and includes all stream reaches potentially affected by the UARP and Chili Bar Project, as well as a number of streams flowing into Project reservoirs.

2.2 Agency Requested Information

Following a review of the *Water Quality Technical Report* dated January 2004 (Version 0), the agencies forwarded a letter dated May 13, 2004 to the Licensees, in which the agencies requested that the technical report be revised to include the following information:

> Objectives of the Water Quality Study Plan focus on the collection of data adequate to determine if Basin Plan water quality objectives (and other applicable water quality criteria) are met and whether operation of the project provides for protection of all beneficial uses designated for project-affected waters. In reviewing the draft Water Quality Technical Report, the following concerns are noted and should be addressed through edits to the draft Report or additional seasons of study and subsequent addendum to allow completion of a final Report.
>
> 1. The Water Quality Study Plan was designed to address various Issue Questions, primary among these being: *Is operation of the Project protective of Basin Plan designated beneficial uses?* Although this question introduces section 3.6.1 of the study plan and is re-emphasized as Issue Question 46, nowhere in the draft Water Quality Report are the beneficial uses listed or levels of protection considered. A summary table should be prepared that displays the beneficial uses as designated in the Basin Plan for the following water bodies and stream segments: Desolation Valley Lakes, Middle Fork American River from the source to Folsom Lake (Rubicon drainage), South Fork American River (SFAR) from the source to Placerville, and SFAR from Placerville to Folsom Lake. This table should also provide a listing of water quality parameters that may have the potential to affect any (or all) of these beneficial uses. In the table, the range of values obtained for constituents sampled in each of the water bodies or stream segments should be applied to any beneficial use that may potentially be affected. A discussion of the applicability of the various constituents to each of the beneficial uses should be included with this table in the final Report.
>
> 2. Section 2.1 of the *Background* attempts to paraphrase the purpose of the Water Quality Study Plan, but in its brevity disregards the need to address Issue Questions 39, 47, 55 and 60. Regardless of the expectation that some information will be obtained from other studies to aid in answering these questions, the Water Quality Report must address the effects on surface water quality that may potentially occur as a result of sediment movement, run-off from spoils piles, historic pollution events, and project-induced recreation. Any data necessary to answer these Issue Questions must be summarized and presented in this stand-alone document. An analysis that integrates the appropriate data sets from this

and other studies should be conducted and provided within the final Report to answer the Issue Questions.

3. Limited data has been provided to document historic water quality conditions and spill or waste discharge events within the UARP (section 2.4). In the Water Quality Study Plan the TWG requested that interviews be conducted to identify any Project-related historic pollution events and any water quality data routinely collected by SMUD or others. It is unclear whether consultation regarding discharge events or ongoing sampling on project waters has been conducted between SMUD and any of the following: El Dorado County Health Department, El Dorado County Environmental Management, California Department of Fish and Game, El Dorado National Forest, Regional Water Quality Control Board or others. Informal discussions with some of these entities suggest that there may be turbidity data associated with a Slab Creek Reservoir monitoring program, that bacterial monitoring may have been conducted by the County, and that dredged spoils may have been discharged to land on a number of occasions with the potential to introduce sediments or contaminants into the water bodies downslope. A discussion of the scope of research on these issues should be provided, and if information sources have been overlooked, they should be investigated and findings included in this inventory of historic events.

4. Throughout the document, mean and median values are discussed and there are general conclusions drawn regarding specified constituents based on these values. In many cases these "mean values" appear to be the result of averaging across seasons and/or averaging of data from multiple sampling locations. Unless specified in regulatory standards, it is inappropriate to average constituent values or attempt to apply measures of central tendency across geographic or temporal space. Use of a median or mean value on a watershed scale is misleading and steps away from the intent of characterizing water quality on each project water body for determining levels of aquatic species protection. A global review of the draft Report should be made, and all references to median or mean values should be critically considered for applicability and either deleted or more clearly described.

5. To analyze compliance of the measured water quality parameters with regulatory criteria, the Report should provide for a comparison of the environmental data to Basin Plan objectives (numeric and narrative), California Toxics Rule Freshwater Aquatic Life Protection criteria, U.S. EPA National Ambient Water Quality Criteria, Code of California Regulations Title 22 Drinking Water Standards (maximum contaminant levels), Public Health Goals (OEHHA), and California Toxics Rule Human Health Protection levels as applicable for individual constituents. To facilitate this comparison, a table similar to Table 4.4-1 should be developed and expanded to include each sampling parameter (see Table 3.2-3) and any specific maximum thresholds allowable under appropriate regulatory criteria, objectives and goals listed above.

6. Although arsenic and cyanide data are reported to be total values (pp. 28-29), the draft document is silent on what concentrations were analyzed and reported for other constituents. Regulatory standards established for metals as objectives in the Basin Plan, as CTR Freshwater Aquatic Life Protection criteria, and as National Ambient Water Quality Criteria are mostly based on dissolved concentrations (with aluminum and iron being the exceptions). Maximum contaminant levels set forth in Title 22 and the California Toxics Rule Human Health Protection levels are provided as total recoverable concentrations. Metals criteria for the protection of aquatic life are generally more stringent than human health protection levels (with the exception of inorganic mercury, where the California Toxics Rule Human Health Protection level is more sensitive). This requires that values be reported as the dissolved fraction to allow for appropriate comparisons. The Report should be edited to clearly identify the concentration analyzed for each metal.

7. Summary discussions found in the draft Report indicate numerous exceedences of the metals criteria defined for Freshwater Aquatic Life Protection when comparisons are made between environmental values measured on UARP water bodies and these California Toxics Rule criteria. It is unclear whether data are reported as dissolved concentrations that allow for a direct comparison to aquatic life criteria or as total values that are not directly comparable to the dissolved metals criteria. A determination of follow-up measures necessary for completion of a final Report will depend on whether laboratory values for metals are reported as dissolved concentrations or as total recoverable concentrations. Follow-up and revisions to the draft Report must proceed as follows:

   - If laboratory analyses conducted on water column samples for 2002-2003 report data as total recoverable metals concentrations, it will be necessary to convert the California Toxics Rule criteria for Cd, Cu, Pb, Ni, Ag, and Zn to total recoverable expressions to allow for comparability. To salvage total metals data for consideration, California Toxics Rule aquatic life criteria must be converted from dissolved expressions to criteria expressed as total recoverable fractions using the California Toxics Rule recommended conversion factors (40 CFR Part 131.38). Following this exercise, measured total metal values and the converted criteria expressed as total recoverable fractions must be included in the Report, along with a complete discussion of the circumstances and the conversion process undertaken. A revised comparison of project data compliance with the converted criteria must be completed. In addition, another year of metals data must be collected and reported for all sampling stations in the Spring, Summer, Fall Turnover, and First Rain periods of 2004 for all metals. Laboratory analyses on these samples must be conducted to obtain both total and dissolved measured values (along with site-specific hardness) to allow direct comparison of environmental values to the established dissolved metals criteria for aquatic life and to compare total values for all metals to human health criteria.

- If the 2002-2003 values are reported as dissolved metals concentrations, direct comparison of the data to the established criteria indicates a continuing environmental problem. The number of samples that exceed the California Toxics Rule priority pollutant thresholds for metals trigger the need for another full year of sampling and appropriate analyses of all metals, at all sampling stations, in Spring, Summer, Fall Turnover, and First Rain periods of 2004. Laboratory analyses must provide measured values for both total and dissolved metals (along with site-specific hardness) to allow for appropriate comparisons with established state and federal regulatory criteria.

8. Mercury data sets provided in the draft Report are incomplete. Thirty-three of 68 samples collected during the Summer sampling period failed the laboratory QA/QC for Hg (Appendix A-30). In addition, Summer water column mercury data are missing for the Big Silver Creek site (#22), a tributary to Union Valley Reservoir where elevated mercury levels were reported in fish tissues. An additional Summer Hg data set should be provided in the final Report for all sampling stations; it is expected that these data will be collected through the 2004 water quality sampling effort discussed above.

9. The study conducted to screen for potential bioaccumulation of metals by resident fish was expanded in geographic scope from four reservoirs identified in the Water Quality Study Plan to six reservoirs actually sampled. Although TWG participants commend the Licensee's efforts to include Loon Lake and Gerle Creek Reservoir, it is unfortunate that small numbers of fish were collected at Gerle Creek, Union Valley, and Slab Creek Reservoirs (section 3.4). Based on discussion provided at section 3.4 and data presented at section 4.7 it is unclear whether the composite sample prepared for Slab Creek Reservoir included multiple species – the single data point suggests that Sacramento Pikeminnow and Brown Trout were mixed in that sample. Language to clarify the laboratory strategy taken on this sample should be added to the discussion. In addition, both total and fork lengths of all fish should be provided for appropriate analysis. Table 3.4-1 should be expanded to include total length (demonstrating "catchable size" of each individual), and Table 4.6-3 should be expanded to include fork length (demonstrating that composites follow the 75% rule) to allow for analysis of relative size/age class to body burden of the metal concentrations. Laboratory data sets for the fish tissue analysis should be provided as Appendix A-34.

10. The draft Water Quality Report includes no Laboratory QA/QC. A copy of the QA/QC report from each laboratory (ToxScan of Watsonville, Sequoia Analytical, El Dorado County Health Department Laboratory, and Moss Landing Marine Laboratory) should be referenced in the final Report and must be provided in electronic format on the Water Quality Report CD.

2.3 Water Year Type

The information in this subsection is provided for informational purposes, as requested by agencies. The UARP Relicensing Water Balance Model Subcommittee established five water year types to be applied to all preliminary analysis with the understanding that the UARP Relicensing Plenary Group, with cause, may modify the current water year types in the future. The five current water year types are triggered by the February 1, March 1, April 1 and May 1 California Department of Water Resources (CDWR) forecast for total water year unimpaired inflow into Folsom Reservoir. An additional trigger is CDWR's October 1 estimate of the actual total water year unimpaired inflow into Folsom Reservoir. The February 1 forecast determines the water year type applied for the period from February 10 through March 9: the March 1 forecast the period from March 10 through April 9; the April 1 forecast the period from April 10 through May 9; the May 1 forecast the period from May 10 through October 9; and the October 1 estimate the period from October 10 through February 9. The inflow levels are:

- Critically Dry (CD) Water Year: Less than 900,000 acre-feet
- Dry (D) Water Year: From 900,001 to 1,700,000 acre-feet
- Below Normal (BN) Water Year: From 1,700,000 to 2,600,000 acre-feet
- Above Normal (AN) Water Year: From 2,600,000 to 3,500,000 acre-feet
- Wet (W) Water Year: More Than 3,500,000 acre-feet

The fieldwork performed for this study occurred in 2002, 2003 and 2004. For this period, the CDWR forecasts and estimates were:

Table 2.3-1. CDWR Folsom Reservoir forecast for 2001-2004.

Year/Month	Feb	Mar	Apr	May	Oct
2001	1,400	1,440	1,100	1,200	1,022
2002	2,380	2,070	2,170	2,070	2,019
2003	2,120	1,760	1,600	2,190	2,287
2004	2,120	2,210	1,925	1,725	1,616

Applying this water year type scenario and the CDWR forecasts and estimates to the study period results in the following:

Table 2.3-2. Water year types applied to individual months of years 2001-2004.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2001	AN	D	D	D	D	D	D	D	D	D	D	D
2002	D	BN	BN	BN	BN	BN	BN	BN	BN	BN	BN	BN
2003	BN	BN	BN	D	BN	BN	BN	BN	BN	BN	BN	BN
2004	BN	BN	BN	BN	BN	BN	BN	BN	BN	D	D	D

3.0 METHODS

The methods for the water quality studies for general limnology, dissolved and suspended substances, organics, and metals sampling are discussed. The methods for the coliform

sampling, both *Escherichia coli* (*E. coli*) and fecal coliform, and fish tissue analysis are discussed separately in Section 3.3 and Section 3.4. The study methods conformed to those approved by the Aquatic TWG Plenary Group.

3.1 Study Area

As described above, the study area included all reservoirs associated with the Projects excluding Robbs Peak Reservoir. Rockbound Lake, although associated with the UARP, is not a UARP project feature nor within the FERC-defined UARP Project Boundary. Robbs Peak Reservoir was excluded from sampling due to its small size (30 acre-feet). The reservoirs in the study area included:

Rubicon	Gerle Creek	Camino
Rockbound	Ice House	Brush Creek
Buck Island	Union Valley	Slab Creek
Loon Lake	Junction	Chili Bar

In addition, the study area included all stream reaches and those tributary inflows that were identified by the Aquatic TWG and Plenary Group. These stream reaches are listed below:

Rubicon Dam	Robbs Peak Dam	Camino Dam
Buck Island Dam	Ice House Dam	Brush Creek Dam
Loon Lake Dam	Union Valley Dam	Slab Creek Dam
Gerle Creek Dam	Junction Dam	Reach Downstream of Chili Bar

Additional samples were collected in sections of streams unaffected by the Projects. These included:

- Rubicon River upstream of Rubicon Reservoir
- Highland Creek upstream of Rockbound Lake
- South Fork Rubicon River Upstream of Robbs Peak Reservoir
- Tells Creek, Big Silver Creek, and Jones Fork Silver Creek upstream of Union Valley Reservoir
- South Fork Silver Creek upstream of Ice House Reservoir
- Jaybird Canyon Creek upstream of Camino Reservoir
- Little Silver Creek upstream of Junction reservoir
- Brush Creek upstream of Brush Creek Reservoir
- Slab Creek upstream of Slab Creek Reservoir

3.2 Sampling Methods and Parameters

The selected constituents were sampled using a triage sampling and contingency sampling plan as identified in Table 3.2-1. The triage sampling was designed to screen for elevated constituent levels within the Projects' study area. Water quality samples were collected immediately downstream of each UARP facility and the Chili Bar Dam, in each UARP reservoir and Chili

Bar Reservoir, and in the major unimpaired inflows to each reservoir. The contingency sampling focused on the specific water quality constituent(s) and areas where triage sampling data indicated a water quality problem might exist. It included near-term and long-term activities to explore the problem. The near-term steps included immediately directing the water quality lab to analyze the water quality samples taken from major inflows to the reservoirs for the constituent for which a problem was indicated. Because of the short laboratory holding times of certain constituents, the Licensees and the laboratory initiated special procedures to ensure that information was not lost due to expiration of the holding times. In other cases, samples that were to be held until a determination was made to analyze them were ultimately analyzed along with all other samples. Constituents with short holding times included certain nutrients (e.g., nitrate-nitrite and ortho-phosphorus have 48 hour holding times) and total suspended solids and total dissolved solids (7-day holding time). In these instances, the laboratory was directed either to analyze for the specific constituents immediately upon arrival or to chemically preserve the samples for later analyses.

Water quality sampling locations are shown on the maps in Appendix B. Appendix B-1 includes four map files on CD that show all study site locations for the water quality study as well as for other aquatic relicensing studies. Attached in Appendix B-2 is a map that shows all water quality sampling sites except for locations on the Reach Downstream of Chili Bar. The map in Appendix B-2 is included as a convenience to the reader in addition to the full set of maps in Appendix B-1.

Table 3.2-1. Water quality sampling locations for relicensing of Sacramento Municipal Utility District's Upper American River Project and Pacific Gas and Electric Company's Chili Bar Project.

		Triage Sampling	Contingency Sampling	
	Water Quality Monitoring Station	**Take & Analyze ***	**Obtain with Triage Samples, Analyze if Problem**	**Take & Analyze if Problem**
1.	Rubicon River inflow to Rubicon Res.		X	
R-1.	Rubicon Res. mid-lake	X		
2.	Rubicon R. outflow from Rubicon Res.	X		
3.	Rubicon R. upstream of Rubicon Springs			X
3a.	Fox Lake reach flow from Rubicon Res.		X	
4.	Highland inflow to Rockbound Res.		X	
R-2.	Rockbound Lake mid-res.	X		
5.	Rubicon outflow from Rockbound Lk.	X		
R-3.	Buck Island Res. mid-lake	X		
6.	Little Rubicon outflow from Buck Is. Lk.	X		
R-4a	Loon Lake Res. near dam	X		
R-4b	Loon Lk. mid-res. in west body	X		
R-4c	Loon Lk. upper res. N-E body	X		
7.	Gerle Ck. outflow from Loon Lake	X		
8.	Jerrett Ck. upstream of Gerle Ck. con.			X
9.	Gerle Ck. downstream of Jerret confl.	In situ *only*		X
10.	Barts/Dellar Ck. upstream of Gerle Ck.			X
11.	Gerle Ck. dwnstrm of Barts/Dellar conf.			X
12.	Rocky Basin Ck. upstream of Gerle			X

Table 3.2-1. Water quality sampling locations for relicensing of Sacramento Municipal Utility District's Upper American River Project and Pacific Gas and Electric Company's Chili Bar Project.

		Triage Sampling	Contingency Sampling	
	Water Quality Monitoring Station	**Take & Analyze ***	**Obtain with Triage Samples, Analyze if Problem**	**Take & Analyze if Problem**
13.	Gerle Ck. dwnstrm of Rocky Basin conf	*In situ* only		X
14.	Gerle Ck. inflow to Gerle Ck. Res.	X		
R-5.	Gerle Ck. Reservoir mid-res.	X		
15.	Gerle Ck outflow from Gerle Ck Res	X		
16.	Gerle Ck Canal inflow to Robb's Frby	X		
17.	S.F. Rubicon inflow to Robb's Forebay		X	
18.	S.F. Rubicon upstream of Gerle Ck con.			X
19.	S.F. Rubicon dwnstrm of Gerle Ck con.			X
20.	S.F. Rubicon upstrm of Rubicon River	X		
21.	Tells Ck. upstrm of Union Valley Res.		X	
22.	Big Silver Ck. upstrm of Union Valley		X	
23.	Jones Fk Silver Ck inflow to Union Valley Res.		X	
R-6a	Union Valley Res. near dam	X		
R-6b	Union Valley Res. mid-res.	X		
R-6c	Union Valley Res. (near Robb's Pk. PH tailrace)	X		
R-6d	Union Valley Res. Jones Fork arma	X		
24.	S.F. Silver Ck. upstrm of Ice House Res.		X	
R-7a	Ice House Reservoir near dam	X		
R-7b	Ice House Reservoir mid-res.	X		
R-7c	Ice House Reservoir upper lake body	X		
25.	S.F. Silver Ck. Outflow from Ice House	X		
26a.	S.F. Silver 3-4 mi. dwnstrm of IH Res	*In situ* only		X
26b.	S.F. Silver upstrm of Big Hill Cnyn.			X
27.	S.F. Silver Ck inflow to Junction Res.	X		
28.	Little Silver Ck. Inflow to Junction Res		X	
R-8	Junction Reservoir, mid-resv btwn arms	X		
29.	Silver Ck. outflow from Junction Res.	X		
30.	Onion Ck. upstream of Silver Creek			X
31.	Silver Ck dwnstrm of Onion Ck confl.			X
32.	Silver Ck. inflow to Camino Res.	X		
33.	Jay Bird Ck. inflow to Camino Res.		X	
R-9.	Camino Reservoir mid-resv.	X		
34.	Silver Ck. outflow from Camino Res.	X		
36.	Silver Ck. Immediately upstrm of SFAR	X		
37.	SFAR upstream of Silver Ck confluence			X
38.	SFAR upstream of Camino Powerhouse		X	
39.	Brush Ck. inflow to Brush Ck. Res.		X	
R-10.	Brush Creek Res. mid-res. Site	X		
40.	Brush Ck. outflow from Brush Ck Res.	X		
41.	SFAR dwnstrm of Camino Powerhouse	X		
R-11a	Slab Creek Reservoir mid-res. site	X		
R-11b	Slab Creek Res. upper-res. site	X		

Table 3.2-1. Water quality sampling locations for relicensing of Sacramento Municipal Utility District's Upper American River Project and Pacific Gas and Electric Company's Chili Bar Project.

Water Quality Monitoring Station		Triage Sampling	Contingency Sampling	
		Take & Analyze *	Obtain with Triage Samples, Analyze if Problem	Take & Analyze if Problem
42.	Slab Ck. inflow to Slab Ck. Reservoir		X	
43.	SFAR outflow from Slab Ck Res – upstream of Iowa- Brushy Cnyn Ck confl.	X		
44.	SFAR between Slab Ck Res & Rock Ck			X
45.	Rock Creek upstream of SFAR confl.			X
46.	SFAR downstream of Rock Ck. confl.	X		
47.	SFAR downstream of White Rock P.H.	X		
R-12a	Chili Bar Reservoir near dam	X		
R-12b	Chili Bar Reservoir mid-res. Site	X		
48.	SFAR below Chili Bar Dam	X		
49.	SFAR upstream of Dutch Creek			X
50.	SFAR at Coloma gaging station			X
51.	SFAR dwnstrm of Greenwood Creek, near ex-USGS 11445500	X		
52.	SFAR upstream of Weber Creek			X
53.	Weber Ck upstream of confl. w/ SFAR			X
54.	SFAR below Weber Creek confluence in a riverine environment	X		

* During periods of reservoir stratification, samples were collected within the upper epilimnion layer and also in the hypolimnion layer a few feet above the reservoir bottom. When the reservoir profile was mixed, samples were collected at a point below the water surface equivalent to approximately one-third the total water column depth.

The Water Quality Study Plan required the Licensees to conduct the water quality study efforts over four seasons: Spring Runoff, Summer Low-Flow, Fall Turnover and First Major Rain (Table 3.2-2). These samplings were conducted beginning in Fall 2002 through Fall 2003. In response to a request from the State Water Resources Control Board and Department of Fish and Game, the four seasons of sampling were repeated in 2004 for dissolved and total metals for all locations identified in the study plan. The Licensees obtained water temperature profiles in Fall 2002 and Fall 2004 to determine the specific timing of the fall turnover for the three storage reservoirs and associated regulation reservoirs. Profiling was conducted in Loon Lake Reservoir (representing Rubicon, Rockbound, Buck Island, Gerle and Loon Lake reservoirs), Union Valley Reservoir (Junction and Union Valley reservoirs), Ice House Reservoir, and Slab Creek Reservoir (Brush Creek, Camino, Chili Bar and Slab Creek reservoirs). For this purpose, turnover was assumed to have occurred when the thermocline had broken down: that is, when at nowhere in the reservoir was there a more than 1°C change in temperature per meter of depth. Reservoir profiling data indicate that complete turnover is a relatively slow process and can span several weeks.

The Fall 2002 Turnover sampling extended over a two-month period, as Ice House Reservoir and Union Valley Reservoir remained stratified through October. In the case of Ice House Reservoir,

stratification persisted through the 2002 First Major Rain event. Timing of the 2002 First Major Rain event was triggered by more than 1 inch of precipitation.

Table 3.2-2. Sampling dates for UARP and Chili Bar Project Sites, 2002-2004.

Reservoir[1]	Fall 2002 Turnover	2002 First Major Rain	Spring 2003 Runoff	Summer 2003 Low Flow	Spring 2004 Runoff	Summer 2004 Low Flow	Fall 2004 Turnover	2004 First Major Rain
Rubicon	Oct. 7	**[2]	Jun. 11	Sep. 17	May 12	Sep. 21	--	--
Rockbound	Oct. 7	**[2]	Jun. 11	Sep. 17	May 12	Sep. 21	Nov. 2	**[2]
Buck Island	Oct. 7	**[2]	Jun. 11	Sep. 17	May 12	Sep. 21	Nov. 2	**[2]
Loon Lake	Oct. 8	Nov. 11	May 14	Sep. 16	May 6	Sep. 22	Nov. 10	**[2]
Gerle Creek	Oct. 8	Nov. 11	May 14	Sep. 19	May 6	Sep. 15	Nov. 10	**[2]
Union Valley	**[2]	Nov. 14[2]	May 7, 13	Sep. 18	May 5	Sep. 14	Nov. 8	**[2]
Ice House	Nov. 26[3]	Nov. 14	May 11, 13; Jun. 12	Sep. 18	May 11	Sep. 20	Nov. 1	Dec. 1
Junction	**[2]	Nov. 14[2]	May 11, 13	Sep. 16	May 5	Sep. 14	Nov. 8	**[2]
Camino	**[2]	Nov. 13[2]	May 6	Sep. 16	May 4	Sep. 12	Oct. 24	**[2]
Brush Creek	**[2]	Nov. 13	May 6	Sep. 16	May 4	Sep. 20	Nov. 1	**[2]
Slab Creek	Oct. 7-9	Nov. 12	May 5	Sep. 15	May 3	Sep. 13	Oct. 25	**[2]
Chili Bar	Oct. 9	Nov. 13	May 5	Sep. 15	May 3	Sep. 13	Oct. 25	**[2]

[1] Riverine sites, which include tributaries and reaches below the project reservoirs, were sampled at the same dates as the nearby reservoir.

[2] Fall Turnover sampling concurrent with First Rain sampling.

[3] Fall Turnover sampling occurred after the First Rain sampling. Ice House Reservoir remained stratified through mid-November.

Fifty-five water quality parameters were evaluated for samples taken in the UARP reservoirs and Chili Bar Reservoir, major tributaries, and main stem tributary reaches during the eight sampling events (Table 3.2-3). Selection of the water quality parameters was based on existing water quality objectives as defined by the Aquatic TWG and approved by the Plenary Group.

All procedures used for the purpose of collecting, preserving and analyzing samples followed established USEPA or Standard Methods protocol. All samples were collected manually into certified pre-cleaned, Nalgene or glass containers provided by the laboratory and placed on ice during transport. Samples processed for metals, certain nutrients and organics were shipped to ToxScan Laboratories of Watsonville, California at the end of the sampling week. Samples with constituents with short hold-times (e.g. turbidity, nitrate-nitrite, ortho-phosphorus and fecal coliform) were delivered to Sequoia Analytical Laboratories in Sacramento. *E. coli* samples were delivered to El Dorado County Health Department Laboratory in Placerville and processed within 24 hours of sampling.

At the stream reach sites, a single grab sample was obtained where sufficient turbulence provided good lateral and vertical mixing and when possible, near the approximate thalweg. Reservoir samples were obtained from a boat using Van Dorn and Kemmerer samplers. Camino Reservoir was usually sampled along the near-shore due to safety policy. When a reservoir was not temperature-stratified, water chemistry sampling consisted of one grab sample collected at

one-third of the maximum depth. If a reservoir was stratified, a sample was obtained from both the epilimnion and hypolimnion, as determined by thermal profiling. Thermal stratification was defined as temperature change of more than 1.0°C per 1.0 meter of depth anywhere in the reservoir, which is referred to as the location of the thermocline (Horne and Goldman, 1994).

Dissolved oxygen (DO), pH, temperature and specific conductance were measured at each site at the time of nutrient sampling with a Yellow Springs Instrument (YSI) or Hydrolab Multiprobe meter. Instrument calibrations were performed for DO, temperature, pH and specific conductance prior to each sampling season. Transparency was measured in reservoirs with a standard 7.9-inch-diameter Secchi disk.

Table 3.2-3. Sampling Parameters, Methods, and Sampling Event.

		Sampling Event							
Constituent	**Method**	**Fall 2002 Turn-over**	**2002 First Rain**	**Spring 2003 Runoff**	**2003 Summer Low Flow[1]**	**2004 Spring Runoff**	**2004 Summer Low Flow[1]**	**Fall 2004 Turn-over**	**2004 First Rain**
General Limnology									
Water Temperature	Hydrolab/YSI	X	X	X	X	X	X	X	X
Dissolved Oxygen	Hydrolab/YSI	X	X	X	X	X	X	X	X
pH	Hydrolab/YSI	X	X	X	X	X	X	X	X
Specific Conductance	Hydrolab/YSI	X	X	X	X	X	X	X	X
Secchi Depth	Secchi Disk	X	X	X	X	X	X	X	X
General Limnology									
Nitrate-Nitrite	EPA 300.0	X	X	X	X				
Ammonia as N	EPA 350.2	X		X	X				
TKN as N	EPA 351.3	X			X				
Total phosphorous	EPA 365.2	X	X	X	X				
Ortho-phosphate	EPA 365.3	X			X				
TOC	EPA 415.1	X			X				
Turbidity, Total Suspended Solids, Total Dissolved Solids									
Turbidity		X	X	X	X				
Total Alkalinity	EPA 310.1	X	X	X	X				
TSS	EPA 160.2	X	X	X	X				
TDS	EPA 160.1	X		X	X				
Calcium	EPA 200.7	X		X	X				
Magnesium	EPA 200.7	X		X	X				
Potassium	EPA 200.7	X		X	X				
Sodium	EPA 200.7	X		X	X				
Chloride	EPA 200.7	X		X	X				
Sulfate	EPA 200.7	X		X	X				

Table 3.2-3. Sampling Parameters, Methods, and Sampling Event.									
		Sampling Event							
Constituent	**Method**	**Fall 2002 Turn-over**	**2002 First Rain**	**Spring 2003 Runoff**	**2003 Summer Low Flow[1]**	**2004 Spring Runoff**	**2004 Summer Low Flow[1]**	**Fall 2004 Turn-over**	**2004 First Rain**
Organics									
Oil and grease	EPA 1664	X	X		X.				
MTBE	SW 5030B/SW 83260B	X[1]			X				
TPH	SW 5030B/SW 8021B/9015	X[1]			X				
Metals: Measured as Total Recoverable Metals									
Aluminum	EPA 200.8 and 245.7	X	X	X	X	X	X	X	X
Arsenic	EPA 200.8 and 245.7	X	X	X	X	X	X	X	X
Barium	EPA 200.8 and 245.7	X	X	X	X	X	X	X	X
Iron	EPA 200.8 and 245.7	X		X	X	X	X	X	X
Manganese	EPA 200.8 and 245.7	X			X		X	X	X
Mercury	EPA 245.7	X			X		X	X	X
Selenium	EPA 200.8 and 245.7	X			X		X	X	X
Total Cyanide[3]	EPA 335.2	X			X				
Metals-Hardness: Measured as Total Recoverable Metals									
Hardness	EPA 130.2	X	X	X	X	X	X	X	X
Barium	EPA 200.8 and 245.7	X		X	X	X	X	X	X
Cadmium	EPA 200.8 and 245.7	X		X	X	X	X	X	X
Copper	EPA 200.8 and 245.7	X		X	X	X	X	X	X
Lead	EPA 200.8 and 245.7	X	X	X	X	X	X	X	X
Nickel	EPA 200.8 and 245.7	X		X	X	X	X	X	X
Silver	EPA 200.8 and 245.7	X	X	X	X	X	X	X	X
Zinc	EPA 200.8 and 245.7	X			X		X	X	X
Metals: Dissolved									
Aluminum	EPA 200.8					X	X	X	X
Arsenic	EPA 200.8					X	X	X	X
Barium	EPA 200.8					X	X	X	X
Cadmium	EPA 200.8					X	X	X	X
Copper	EPA 200.8					X	X	X	X
Iron	EPA 200.7					X	X	X	X
Lead	EPA 200.8					X	X	X	X

Table 3.2-3. Sampling Parameters, Methods, and Sampling Event.

		Sampling Event							
Constituent	**Method**	**Fall 2002 Turn-over**	**2002 First Rain**	**Spring 2003 Runoff**	**2003 Summer Low Flow[1]**	**2004 Spring Runoff**	**2004 Summer Low Flow[1]**	**Fall 2004 Turn-over**	**2004 First Rain**
Manganese	EPA 200.8						X	X	X
Mercury	EPA 1631E & 245.7						X	X	X
Nickel	EPA 200.8					X	X	X	X
Selenium	EPA 200.8						X	X	X
Silver	EPA 200.8					X	X	X	X
Zinc	EPA 200.8					X	X	X	X
Coliform									
Coliform/E. coli	9221/9222D as available	X	X	X	X				
Fecal coliform	9222			X	X				

1. If the reservoir was stratified samples were obtained from the epilimnion and hypolimnion. If the reservoir was not stratified, samples were obtained from 1/3 depth.
2. At selected reservoir sites only during the fall turnover and spring sampling.
3. Although not a metal, cyanide is included in the metals section throughout this report. Cyanide was measured as total cyanide.

3.2.1 Data Reporting

The Licensees requested the analytical laboratories to obtain the lowest method detection limits (MDL) and reporting limits (RL) practicable for the water quality samples. The MDL is defined as the lowest concentration that can be detected by an instrument with correction for the effects of sample matrix and method-specific parameters. The RL was equivalent to the Practical Quantification Limit (PQL). The PQL is defined as the lowest quantifiable concentration that the laboratory can reliably determine within specified limits and accuracy during routine laboratory operating conditions.

Rather than list non-detect (ND) in the tables of this report (unless otherwise noted), the value is listed to the RL and is indicated by the less than (<) sign. In Appendix A, however, estimated values are listed and are marked with a "J." These are values that were below the RL, but above the MDL.

3.2.2 Data Analysis

Data analysis did not include statistical significance testing. The trophic status of the reservoirs, based on nitrogen, phosphorus and Secchi disk depth, were determined using the Trophic Status Indices (TSI). TSI were calculated for total phosphorus (TP) and Secchi Depth (SD) according to Carlson (1977). Total nitrogen (TN) TSI calculations were also included according to Kratzer and Brezonik (1981). TSI calculations are based on log-based regressions with values that range from 0 – 100 units. TSI values greater than 60 units are classified as eutrophic; 50 to 59 units as meso-eutrophic; 40 to 49 units as mesotrophic; and 30 to 39 as meso–oligotrophic (Carlson 1977).

3.3 Coliform Sampling

The Licensees performed two types of coliform sampling. The first involved screening for *E. coli* concurrent with the water quality sampling. The second included sampling for fecal coliform following regulatory procedures[1] at high-use recreation sites as determined by the Aquatic TWG in conjunction with participants of the Recreation TWG. The Licensees obtained *E. coli* samples at the water quality sites during the 2002 Fall Turnover and First Major Rain, and 2003 Spring Runoff sampling events (Table 3.2-1). *E. coli* sampling in the 2003 Summer Low Flow event was at selected near-shore sites at UARP reservoirs (Table 3.3-1) according to Attachment 5 of the Water Quality Sampling Plan. The samples were collected, placed on ice and processed within 24 hours of collection by El Dorado County Health Department Laboratory using EPA SM 9222D ("Colilert").

Table 3.3-1. Summer 2003 *E. coli* sampling sites.

***E. coli* Sampling Site**	***E. coli* Sampling Site**
R-3b. Buck Island Res. north shore	R-7e. Ice House Res. West of boat launch
R-4d. Loon Lake Res. Near shore at NE end of Point Pleasant Campground	26a. S.F Silver Ck. Downstream of Ice House Road.
R-4e. Loon Lake near shore west of main dam	R-8b. Junction Res. near boat ramp
R-4f. Loon Lake Res. east of Loon Lake Campground	R-9b. Camino Res. near boat Ramp
13a. Gerle Ck. Below Ice House Road	R-10b. Brush Ck. near boat ramp
R-6e. Union Valley Res. Near Wench Ck. Campground	R-11c. Slab Ck. near boat ramp
R-6f. Union Valley Res. Near Yellowjacket Campground	R-12c. Chili Bar near boat ramp
R-6g. Union Valley Res. Near West Point boat ramp	48. SFAR below Chili Bar Dam
R-6h. Union Valley Res. Near Fashoda Beach	51. SFAR at Coloma gage station
24. S.F. Silver Ck. upstream of Ice House Res.	54. SFAR downstream of Highway 49 Bridge
R-7d. Ice House Res. At Peninsula Cove on north shore	

During Summer 2003, the Licensees obtained fecal coliform samples within UARP reservoirs and in river reaches, generally near areas of high recreational use (Table 3.3-2) according to Attachment 5 of the Water Quality Sampling Plan. Sampling was targeted around the Independence Day weekend for the lower and middle reach reservoirs and the Labor Day weekend for reservoirs in the upper reach (Loon Lake and Buck Island), with repeat sampling consisting of five samples collected within a 30-day period for each location. Samples were collected near-shore in shallow water, placed on ice and processed within 24 hours of collection by Sequoia Analytical Laboratory using EPA SM 9222.

Table 3.3-2. Fecal Coliform Sampling Sites and Dates, 2003.

Site #	Location	Sampling Dates
FC-1	Gerle Ck. Res. between dock and day-use area	6/23, 7/1, 7/8, 7/15, 7/22
FC-2	Union Valley Reservoir at Camino Cove	6/23, 7/1, 7/8, 7/15, 7/22
FC-3	Union Valley Reservoir near shore at Fashoda Beach	6/23, 7/1, 7/8, 7/15, 7/22
FC-4	Union Valley Reservoir at Jones Fork Campground	6/23, 7/1, 7/8, 7/15, 7/22

[1] This sampling followed a "5 day in 30 day" sampling in which sampling periods preceded and directly followed the Fourth of July and Labor Day holidays

Table 3.3-2. Fecal Coliform Sampling Sites and Dates, 2003.		
Site #	**Location**	**Sampling Dates**
FC-5	Jones Fork Silver Creek at Ice House Road	6/23, 7/1, 7/8, 7/15, 7/22
FC-6	Big Silver Creek at bike bridge	6/23, 7/1, 7/8, 7/15, 7/22
FC-7	Ice House Res. at east end near day-use area	6/23, 7/1, 7/8, 7/15, 7/22
FC-8	Ice House Res near youth camp boat storage	6/23, 7/1, 7/8, 7/15, 7/22
FC-9	Ice House Res. on west end near day-use area	6/23, 7/1, 7/8, 7/15, 7/22
FC-10	Brush Creek boat ramp	6/23, 7/1, 7/8, 7/15, 7/22
FC-11	SFAR below Bridge at Camino Powerhouse	6/23, 7/1, 7/8, 7/15, 7/22
FC-12	SFAR at Coloma Gage Station below dam	6/23, 7/1, 7/8, 7/15, 7/22
FC-13	SFAR downstream of Miner's Cabin	6/25, 7/1, 7/8, 7/15, 7/22
FC-14	SFAR at County Park parking lot	6/23, 7/1, 7/8, 7/15, 7/22
FC-15	SFAR downstream of Greenwood Creek	6/23, 7/1, 7/8, 7/15, 7/22
FC-16	SFAR upstream of Hastings Creek	6/25, 7/1, 7/8, 7/15, 7/22
FC-17	SFAR downstream of Weber Creek	6/25, 7/1, 7/8, 7/15, 7/22
FC-18	Buck Island Near Dam at dispersed camp site	8/19, 8/26, 9/2, 9/17, 9/23
FC-19	Loon Lake Reservoir at Ellis Creek Inflow on west side of creek	8/19, 8/26, 9/2, 9/17, 9/23
FC-20	Loon Lake Reservoir near dam, Northshore Campground, and in a dispersed recreation area	8/19, 8/26, 9/2, 9/17, 9/23
FC-21	Gerle Creek below Loon Lake gaging station at USFS property boundary.	8/19, 8/26, 9/2, 9/17, 9/23

3.4 Bioaccumulation - Fish Tissue Analysis

Sampling and analytical methods were done according to the California State Water Resources Control Board Toxic Substances Monitoring Program (TSMP). The fish collection was conducted by California Department of Fish and Game (CDFG). Four species of fish - brown trout (*Salmo trutta*), smallmouth bass (*Micropterus dolomieu*), rainbow trout (*Oncorhynchus mykiss*) and Sacramento pikeminnow (*Ptychocheilus grandis)* - were collected at five UARP reservoirs and in Chili Bar Reservoir (Table 3.4-1). The fish selected were piscivorous fish, representing the top reservoirs level of the food chain in their respective reservoirs. These fish are most likely to have the highest tissue levels of metals (e.g. mercury) due to biomagnification via the food chain.

Table 3.4-1. UARP/ Chili Bar Reservoir fish tissue analysis in 2003: sampling location, date, species, and fork length.				
Site	**Sample Date**	**Composite Sample Number & Species**	**Fork Length (mm)**	**Weight (g)**
Loon Lake	9/18/03	6 Brown Trout	374 342 368 350 350 350	564.9 475.8 562.4 453.1 442.2 442.7
Gerle Creek Reservoir	9/23/03	1 Brown Trout	510	1,716.9

Table 3.4-1. UARP/ Chili Bar Reservoir fish tissue analysis in 2003: sampling location, date, species, and fork length.

Site	Sample Date	Composite Sample Number & Species	Fork Length (mm)	Weight (g)
Union Valley Reservoir	6/26/03	4 Smallmouth Bass	340	620.7
			325	618.4
			300	414.4
			400	903.6
Ice House Reservoir	6/26/03	7 Rainbow Trout	340	400.8
			335	377.8
			278	281.4
			285	312.4
			308	301.1
			272	260.0
			214	144.4
Slab Creek Reservoir	8/14/03	1 Brown Trout	485	1,297.2
Chili Bar Reservoir	9/24/03	8 Sacramento Pikeminnow	325	357.9
			303	254.7
			301	276.9
			280	250.4
			275	220.8
			277	245.2
			257	193.0
			238	148.7

After collection, the fish were frozen for later analysis by the Moss Landing Marine Laboratories – Marine Pollution Studies Laboratory. A composite fish sample was obtained for each reservoir for analysis of trace metals in both the muscle (filet) and liver tissues. However, mercury, which tends to accumulate in the muscle tissue, was not analyzed from the liver tissue. In an earlier version of this report, it was erroneously reported in Table 3.4-1 that the fish sampled for Slab Creek Reservoir included three Sacramento pike minnows and one brown trout. Only the brown trout was sampled and analyzed. The three pike minnows from Slab Creek Reservoir were archived by the lab but not analyzed.

The constituents, method, method detection limit and reporting limit are listed in Table 3.4-2.

Table 3.4-2. Metals, methods, detection limits and reporting limits for the fish tissue analysis.

Metal	EPA Method	Method Detection Limit (ppm)	Reporting Limit (ppm)
Aluminum	EPA 1638	0.02	0.06
Arsenic	EPA 1638	0.02	0.06
Cadmium	EPA 1638	0.0004	0.0012
Copper	EPA 1638	0.0006	0.0018
Lead	EPA 1638	0.0004	0.0012
Manganese	EPA 1638	0.0006	0.0018
Mercury	EPA 1638	0.001	0.003
Nickel	EPA 1638	0.001	0.003
Selenium	EPA 1638	0.02	0.06

Table 3.4-2. Metals, methods, detection limits and reporting limits for the fish tissue analysis.			
Metal	**EPA Method**	**Method Detection Limit (ppm)**	**Reporting Limit (ppm)**
Silver	EPA 1638	0.002	0.006
Zinc	EPA 1638	0.004	0.012
Chromium	EPA 1638	0.006	0.018

4.0 RESULTS

4.1 Historical Spill/Waste Discharge Events

SMUD reported that historic non-permitted waste discharge events resulting from construction, operation and maintenance of the UARP are infrequent. Five events have occurred since 1997, before which records are not well-documented. Pacific Gas and Electric Company was unaware of any similar events for the Chili Bar Project. Each of the five UARP events is discussed below.

4.1.1 Camino Powerhouse Transformer Oil Spill

On January 1, 1997 the Camino Powerhouse transformer oil spilled into the South Fork American River (SFAR) as a result of flood flows in the river estimated to be as high as 80,000 cfs. The transformer reservoir of one of two transformers located on the service deck of the powerhouse was lost as a result of the high flows. Since the event was of such high volume, no remediative action was possible nor recommended by state agencies. The content of the transformer was certified non-poly chlorinated bi-phenyl (PCB). SMUD reported this incident to the Central Valley Regional Water Quality Control Board (RWQCB) and the CDFG. No action was taken by the RWQCB or CDFG.

4.1.2 Concrete Spills During Camino Penstock Stabilization Project

The Camino Penstock Stabilization Project was initiated in Fall 1996 to protect the Camino Powerhouse penstock from damage by geomorphic movement of the hillside on which it is located. A component of the work was to pump Portland cement into holes drilled deep (60 – 100 feet) into the hillside. On three occasions during July 23 and September 4, 1997 grout coursed with underground springs to migrate 500 to 600 feet to the base of the hillside and into the SFAR. SMUD reported these incidents to the RWQCB and the CDFG. A Notice of Violation was issued by the RWQCB for the incidents, with the major concern by the RWQCB being the hexavalent chrome (Cr VI+) fraction of the cement. Grouting operations ceased until leak issues were addressed. Remedial and mitigative efforts were implemented to prevent subsequent reoccurrences of the leakage, including use of straw bales, geotextile fabric, “baker” holding tanks, pumping spring water to the top of the hillside (~800 feet) to settling ponds and continuous monitoring and reporting to the RWQCB. This work was completed in 2001.

4.1.3 Mass Wasting into Camino Reservoir

Following the flood of 1997, Camino Reservoir was the recipient of a mass-wasting event, which resulted in an estimated 250,000 cubic yards of mountain earth sliding into the reservoir. Following this event, SMUD implemented a phased sediment removal program over the course of one year (October 1999 to October 2000) to remove about 100,000 cubic yards of the sediment. An application to the RWQCB to complete the sediment removal was made and approved. As a condition of the work, Reports of Waste Discharge were submitted to the RWQCB for review. All best management practices and mitigation requirements as promulgated by the RWQCB were followed. A component of the sediment removal work was providing sediment sample analyses to the RWQCB for review. No subsequent action on behalf of the RWQCB was required as a result of this work.

4.1.4 Release of Turbid Water from Union Valley Power Tunnel

Approximately 19,680 gallons of water, with an estimated total suspended solids concentration of 86 mg/l, was released into Silver Creek from the Union Valley Powerhouse tunnel on December 8 and 9, 2002. The source of suspended solids was preparation work within the tunnel penstock for a protective coating application, which involved washing the outside of the penstock with a high-pressure washer. This release was diluted by an estimated 678 million gallons of water that coursed through the Union Valley Dam. SMUD reported this incident to the RWQCB.

Although SMUD had notified the RWQCB with a Notice of Intent to proceed with the work, the RWQCB had not notified SMUD that a permit would be required. Subsequent to receipt of a Notice of Violation, SMUD implemented a monitoring program to ensure subsequent releases did not exceed the maximum instantaneous limits established for total suspended solids. No further action was taken on behalf of the RWQCB.

4.1.5 Release of Sewage at Camino Powerhouse

On September 17, 2003 approximately 10 gallons of sewage was discharged into a 4,000-gallon sump, which was eventually discharged into the SFAR. The cause of the discharge was a malfunctioning toilet float-valve. SMUD reported this incident to the RWQCB. No action was taken by the RWQCB. Remedial action was taken by SMUD to ensure future events as such at all powerhouses would not occur.

4.2 Basin Plan Designated Beneficial Uses

Section 401 of the Clean Water Act (CWA) requires that all applicants for a federal license or permit must seek certification that the proposed project is in compliance with established water quality standards, which consist of designated beneficial uses and water quality objectives to support those beneficial uses. Certification may be conditioned with other limitations to assure compliance with various CWA provisions. In California, the SWRCB is the administrator of the CWA. Water quality certificates were not issued for the initial FERC licenses for the UARP and Chili Bar Project because licenses were issued prior to the enactment of the CWA. SMUD and

Pacific Gas and Electric Company must submit applications for water quality certificates (or the certificates themselves) to the SWRCB (not obtain the permit) within 60 days of FERC publishing a notice in the Federal Register that SMUD's and Pacific Gas and Electric Company's license applications are ready for environmental analysis.

The beneficial uses established for the general areas affected by the Projects, as stated in the Sacramento River and San Joaquin River Basin Plan (RWQCB 2004), are shown in Table 4.2-1. Note that the Basin Plan was developed and first published in 1971, more than 10 years after the UARP and Chili Bar Project were licensed by FERC and began commercial operations.

Table 4.2-1. Designated Beneficial Uses of the Desolation Valley Lakes (Hydro Unit Number 514.4.46), Middle Fork American River, Source to Folsom Lake (514.4.45), South Forks American River, Source to Folsom Lake (514.3.48) and South Fork American River, Placerville to Folsom Lake (514.32.49) in the vicinity of the Upper American River Project and the Chili Bar Project as designated by the Central Valley Regional Water Quality Control Board in the Sacramento River and San Joaquin Basin Plan. (SOURCE: Table II-1, Basin Plan, RWQCB 2004.)

Designated Beneficial Use	Description	Desolation Valley Lakes	Middle Fork to Folsom	South Fork to Placerville	South Fork to Folsom
Municipal and Domestic Supply (MUN)	Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.	-----	Existing	Existing	Existing
Agriculture (AGR)	Use of water for farming, horticulture, or ranching including but not limited to irrigation, stock watering or support of vegetation for range grazing.	-----	Existing	-----	Existing
Hydropower Generation (POW)	Use of water for hydropower generation.	-----	Existing	Existing	Existing
Water Contact Recreation (REC-1)	Use of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, white water activities, fishing or use of natural hot springs.	Existing	Existing	Existing	Existing

Table 4.2-1. Designated Beneficial Uses of the Desolation Valley Lakes (Hydro Unit Number 514.4.46), Middle Fork American River, Source to Folsom Lake (514.4.45), South Forks American River, Source to Folsom Lake (514.3.48) and South Fork American River, Placerville to Folsom Lake (514.32.49) in the vicinity of the Upper American River Project and the Chili Bar Project as designated by the Central Valley Regional Water Quality Control Board in the Sacramento River and San Joaquin Basin Plan. (SOURCE: Table II-1, Basin Plan, RWQCB 2004.)

Designated Beneficial Use	Description	Desolation Valley Lakes	Middle Fork to Folsom	South Fork to Placerville	South Fork to Folsom
Non-Contact Water Recreation (REC-2)	Use of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach-combing, camping, boating, tide-pool and marine life study, hunting, sightseeing or aesthetic enjoyment in conjunction with the above activities.	Existing	Existing	Existing	Existing
Warm Freshwater Habitat[1] (WARM)	Uses of water that support warmwater ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	-----	Potential	Potential	Existing
Cold Freshwater Habitat (COLD)	Uses of water that support coldwater ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	Existing	Existing	Existing	Existing
Cold Freshwater Spawning (SPWN)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.	Existing	Existing	-----	-----
Wildlife Habitat (WILD)	Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation or enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.	Existing	Existing	Existing	Existing

[1] Table II-1, footnote 2 in the Basin Plan states, "Any stream segment with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of the water quality objectives."

Those Designated Beneficial Uses established for the Desolation Valley Lakes apply to Rubicon Reservoir and the surface waters in the vicinity of the reservoir since Rubicon Reservoir is located in the Desolation Valley Wilderness. The Middle Fork American River Designated Beneficial Uses apply to Buck Island, Loon Lake, Gerle Creek and Robbs Peak reservoirs and the surface waters in the vicinity of these reservoirs since they occur in the Middle Fork American River watershed. The uses in the SFAR, from its source to Folsom Reservoir, apply to Union Valley, Ice House, Junction and Camino reservoirs and the surface waters in their vicinity. The SFAR from Placerville to Folsom Reservoir Designated Beneficial Uses apply to Brush Creek, Slab Creek and Chili Bar reservoirs and the surface waters in their vicinity.

Also, note that Section 303 of the CWA requires that every two years each state must submit to the USEPA a list of rivers, lakes and reservoirs in the state for which pollution control or requirements have failed to provide for water quality. No surface waters in the vicinity of the Projects are included on California's Revised 2002 CWA 303(d) List of Water Quality Limited Segments and TMDL Priority Schedule, as shown at the SWRCB's web page on February 23, 2005 (http://www.swrcb.ca.gov/tmdl/docs/2002_tmdl_comp_list_020403.pdf).

4.3 Basin Plan Water Quality Objectives

The Basin Plan (RWQCB 2004) includes 18 Water Quality Objective for the protection of various Designated Beneficial Uses. Seven of the 18 Objectives contain specific numerical criteria. These Objectives are:

- Bacteria
- Chemical Constituents
- Dissolved Oxygen
- pH
- Salinity
- Temperature
- Turbidity

Each of the remaining 11 Water Quality Objectives in the Basin Plan are narrative in nature in that the objective does not include a specific numerical criteria. These objectives are:

- Biostimulatory Substances
- Color
- Floating Material
- Oil and Grease
- Pesticides
- Radioactivity
- Sediment

- Settleable Material
- Suspended Material
- Tastes and Odors
- Toxicity

For the purpose of the discussion below, the Licensees have presented data for each UARP reservoir and the Chili Bar Reservoir, and have combined stream-reach information into upper elevation reaches (Rubicon, Rockbound, Buck Island, Loon Lake and Gerle Creek reaches), middle elevation reaches (Union Valley, Ice House, Junction and Camino reaches), lower elevation reaches (Brush and Slab creek reaches) and the Reach Downstream of Chili Bar. Where appropriate, reservoir data are also presented for combined reservoir areas defined as the upper reservoirs (Rubicon, Buck Island and Loon Lake reservoirs), middle reservoirs (Gerle Creek, Union Valley, Ice House and Junction reservoirs), lower reservoirs (Camino, Brush Creek and Slab Creek reservoirs) and Chili Bar Reservoir. More detailed information is presented, where appropriate.

In addition, since the Licensees collected numerous water quality samples and analyzed each for a wide range of parameters, the range of values for each reservoir and reach is presented in this section. While ranges, rather than the mean or median, were considered more appropriate to report water quality data, SMUD realizes that ranges can sometimes distort the distribution and/or severity of water quality data. For this reason, detailed values are provided in Appendix A, with analytical results organized in chronological order of sampling events (i.e., 2002 Fall Turnover, 2002 First Major Rain, 2003 Spring Runoff, etc.). In cases of an isolated and abnormally high value (well above the range in which the majority of the values occurs), the range of values is given followed by the high value (e.g., <1-22, 44 mg/l). Additionally, it is possible that all samples were below the reporting limit, but the reporting limit varied during the four sampling events. In this case, the high range value is also listed to the reporting limit (e.g. <0.2 - <1.0 µg/l).

4.3.1 Numerical Water Quality Objectives

4.3.1.1 Bacteria

The Basin Plan (RWQCB 2004) includes one Water Quality Objective for Bacteria. The portion of the objective that pertains to surface waters in the vicinity of the Projects is:

> In waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples in any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than 10 percent of the total number of samples taken during the 30-day period exceed 400/100 ml.

Bacteria are normally present in large numbers in the intestinal tracts of humans and other animals. When humans ingest water containing these bacteria, illness can result. Since ingestion is most likely during water contact recreation, bacteria levels in water are of interest primarily during high recreational periods; however, human activity during high recreational periods are

the primary contributory source of bacteria (citation). Natural sources of bacteria in water include wildlife-related sources such as goose droppings, which have caused a large increase in bacterial contamination particularly at parks and beaches (reference). Anthropomorphic sources of bacteria can include human activity and sewage effluent. Increased water temperature can increase the concentration of bacteria.

The Licensees are unaware of any historical data for fecal coliform sampling. The Licensees did, however, obtain historical bacteria data from El Dorado County for *E. coli* during the 5-year period of August 1997 to September 2002. These historical *E. coli* data are presented later in this section along with the results of sampling by the Licensees for *E. coli*.

The Licensees collected 5 fecal coliform samples within a 30-day period at 21 different locations in 2003, for a total of 105 samples. All of the Licensee's 2003 fecal coliform samples were taken from June 23 through July 22, 2003, except at four sites. At Buck Island Reservoir (1 site), Loon Lake Reservoir (2 sites) and in Loon Lake Dam Reach below the dam (1 site), five samples were taken from August 19 through September 23, 2003. Table 4.3.1-1 summarizes the results of this sampling effort by location and includes a list of fecal coliform values that were equal to or greater than the Basin Plan 10 percent criterion (since five samples were taken at each site, an exceedence of the 400/100 ml criterion in any one sample was considered an exceedence of the 10 percent criterion). Note that for the purpose of calculating the geometric mean of the five samples, a value of one was assumed where the value was less than the reporting limit of one organism/100 ml.

Table 4.3.1-1. Range of fecal coliform in UARP reservoirs and reaches and in the Reach Downstream of Chili Bar based on five samples collected during a 30-day period in summer 2003. The sampling period included samples on either the Independence Day or Labor Day weekends.

Location	Site	Number of Samples	Range (#/100 ml)	Geometric Mean (#/100 ml)	Samples in Excess of 10% / 400/100 ml Criterion (#/100 ml)
RESERVOIRS					
Buck Island	Buck Island near Dam, dispersed campsite	5	2-27	7	None
Loon Lake	Loon Lake Reservoir at Ellis Creek Inflow on west side of creek	5	<1-24	5	None
	Loon Lake Res. near Northshore Campground near dam and in dispersed recreation area	5	2-40	7	None
Gerle Creek	Gerle Ck. Res. between dock and day-use area	5	<1-350	10	None

Table 4.3.1-1. Range of fecal coliform in UARP reservoirs and reaches and in the Reach Downstream of Chili Bar based on five samples collected during a 30-day period in summer 2003. The sampling period included samples on either the Independence Day or Labor Day weekends.

Location	Site	Number of Samples	Range (#/100 ml)	Geometric Mean (#/100 ml)	Samples in Excess of 10% / 400/100 ml Criterion (#/100 ml)
Union Valley	Union Valley Reservoir at Camino Cove	5	<1-3,180	38	3,180 (6/23) 1,200 (7/1)
	Union Valley Reservoir at Fashoda Beach	5	<1-600	10	600 (6/23)
	Union Valley Reservoir at Jones Fork Campground	5	<1-2,900	17	550 (6/23) 2,900 (7/1)
Ice House	Ice House Res. at east end near day-use area	5	4-110	10	None
	Ice House Res near youth camp boat storage	5	<1-170	6	None
	Ice House Res. west end near day-use area	5	<1-200	19	None
Brush Creek	Brush Creek Boat Ramp	5	<1-9	2	None
REACHES					
Gerle Creek	Gerle Creek below Loon Lake gaging station at USFS property boundary.	5	<1 – 26	7	None
Upstream of Junction	Jones Fork Silver Creek at Ice House Road	5	165 – 1,500	468	730 (6/23) 400 (7/15) 1,500 (7/22)
	Big Silver Creek at Bike Bridge	5	37 – 1,160	133	1,160 (7/22)
Camino Dam	SFAR below Bridge at Camino Powerhouse	5	<1 – 44	8	None

Table 4.3.1-1. Range of fecal coliform in UARP reservoirs and reaches and in the Reach Downstream of Chili Bar based on five samples collected during a 30-day period in summer 2003. The sampling period included samples on either the Independence Day or Labor Day weekends.

Location	Site	Number of Samples	Range (#/100 ml)	Geometric Mean (#/100 ml)	Samples in Excess of 10% / 400/100 ml Criterion (#/100 ml)
Reach Downstream of Chili Bar	SFAR at Coloma Gage, below dam	5	<1 – 195	8	None
	SFAR downstream of Miner's Cabin	5	<1 – 6,100	159	6,100 (7/1) 438 (7/8)
	SFAR at County Park parking lot	5	<1 – 368	34	None
	SFAR downstream of Greenwood Creek	5	<1 – 728	31	578 (7/1) 728 (7/8)
	SFAR upstream of Hastings Creek	5	28 – 3,900	322	3,900 (7/1) 462 (7/8)
	SFAR downstream of Weber Creek	5	<1 – 9,300	327	660 (6/25) 9,300 (7/1) 1,350 (7/8) 450 (7/22)

The 5-day geometric mean of the fecal coliform concentrations were less than the Basin Plan Bacteria Water Quality Objective regarding the geometric mean criterion (less than 200 organisms/100ml) at 18 of the 21 sites sampled. Two of the three sites that contained fecal coliform concentrations greater than the 5-day geometric mean Water Quality Objective of 200 organisms/100ml were in the lower portion of the Reach Downstream of Chili Bar: one site located upstream of Hastings Creek and the other site located downstream of Weber Creek had geometric means of 322 and 327 organisms/100ml, respectively. The third site was located at a non-UARP affected reach, on the Jones Fork of Silver Creek upstream from Union Valley Reservoir near Ice House Road. The geometric mean at this site was 468 organisms/100ml, the highest geometric mean value recorded during the Licensees' study (Table 4.3.1-1.).

Of the 105 fecal coliform samples collected during a 30-day period, 86 samples contained less than the Basin Plan Bacteria Water Quality Objective requiring that no more than ten percent of the total number of samples taken during the 30-day period may exceed 400 organisms/100 ml (82% of the samples). Of the remaining 19 samples, five samples (4.8%) were in a UARP–affected reservoir, four samples (3.8%) were in non-UARP affected reaches, and 10 samples (9.5%) were in the Reach Downstream of Chili Bar, as described below.

Five of the samples with concentrations greater than 400 organisms/100 ml occurred on two of the five sampling days at the three Union Valley Reservoir sites. On June 23, 2003 the fecal coliform concentrations at the Camino Cove, Fashoda Beach and Jones Fork Campgrounds were

3,180, 600 and 550 organisms/100 ml, respectively, and on July 1, 2003 the concentrations at Camino Cove and Jones Fork campgrounds were 1,200 and 2,900 organisms/100 ml, respectively. Fecal coliform concentrations at these three sites in the other 10 samples collected were generally low (<1 to 172 organisms/100 ml).

Four samples with concentrations greater than 400 organisms/100 ml occurred on tributaries upstream of Union Valley Reservoir (i.e., above UARP reservoirs and reaches), as follows: Three of the four samples were collected from Jones Fork of Silver Creek at Ice House Road, with fecal coliform concentrations of 730, 400 and 1,500 organisms/100 ml on June 23, July 15 and July 22, 2003, respectively (Table 4.3.1-1). The fourth sample from this area was collected from Big Silver Creek at Bike Bridge, with a fecal coliform concentration of 1,160 organisms/100 ml on July 22, 2003.

The remaining 10 samples with concentrations greater than 400 organisms/100 ml occurred at four sites in the Reach Downstream of Chili Bar (Table 4.3.1-1). However, the concentrations did not follow an upstream to downstream pattern each day. For example, on July 1, 2003, from upstream to downstream in the Reach Downstream of Chili Bar, fecal coliform concentrations were: 195 organisms/100 ml at the Coloma gage; 6,100 downstream of Miners Cabin, 83 at the County Park; 578 downstream of Greenwood Creek; 3,900 upstream of Hastings Creek and 9,300 downstream of Weber Creek. The other three sampling days where a sample result was greater than 400 organisms/100 ml at one or more sampling locations on the Reach Downstream of Chili Bar, the concentrations varied considerably; however, the trend was similar from upstream to downstream as described above for July 1, 2003 (Table 4.3.1-1).

While not formally adopted in the Basin Plan, SWRCB staff has proposed an amendment to the Basin Plan for bacteria (Staff Report and Functional Equivalent Document dated May 2002) to "…better protect human health by using a more reliable indicator to reflect the risk of illness associated with exposure to water containing disease-causing bacteria." Staff recommended that the current fecal coliform Water Quality Objective be replaced (except in Folsom Lake) with the USEPA Ambient Water Quality Criteria for Bacteria – 1986 (USEPA 1986), which is based on concentrations of *E. coli*. Specifically, the objective would be:

> In waters designated for contact recreation (REC-1), the *E. coli* concentration, based on a minimum of not less than five samples equally spaced over a 30-day period, shall not exceed a geometric mean of 126/100 ml and shall not exceed 235/100 ml in any single sample.
>
> If any single samples are exceeded for *E. coli*, the Regional Water Board may require repeat sampling on a daily basis until the sample falls below the single sample limit or for 5 days, whichever is less, in order to determine the persistence of the exceedence.
>
> When repeat sampling is required because of an exceedence of any one single sample limit, values from all samples collected during the 30-day sampling period will be used to calculate the geometric mean.

As mentioned previously, the Licensees obtained historical coliform data from El Dorado County for *E. coli* sampling during the 5-year period of August 1997 to September 2002. Five sampling locations, all located in the Reach Downstream of Chili Bar, were generally sampled monthly during October to March and bi-weekly during May to September with a total of 731 samples analyzed. Historical *E. coli* sampling locations are listed below from upstream to downstream on the SFAR.

- Nugget: located below the Chili Bar Dam (same as sampling location 48)
- State Park
- County Park
- Turtle Pond (same as sampling location 51)
- Salmon Falls: (same as sampling location 54)

The data were not collected such that a 5-day geometric mean can be calculated, but one can compare the results to the 235 organisms/100 ml single sample criterion. Twenty-one of the 731 historical samples collected (2.9%) had concentrations above this criterion at the following locations, listed from upstream to downstream in the Reach Downstream of Chili Bar:

- State Park: four samples with *E. coli* concentrations of 1,553/100 ml (September 16, 1999), 344/100 ml (October 30, 2001), 325/100 ml (June 7, 2001) and 236/100 ml (August 1, 2002).
- County Park: four samples with *E. coli* concentrations of 548/100 ml and 461/100 ml (July 14, 2001), 361/100 ml (August 18, 2001) and 228/100 ml (August 11, 2002).
- Turtle Pond (also known as Greenwood Creek): five samples with *E. coli* concentrations of 980 /100 ml and 410/100 ml (October 30, 2001), 441/100 ml and 276/100 ml (January 19, 1999) and 308/100 ml (November 22, 1999).
- Salmon Falls (also known as Skunk Hollow): eight samples with *E. coli* concentrations of 1,986/100 ml (May 7, 1998), 1,553/100 ml (May 24, 2001), 649/100 ml (May 23, 2002), 548/100 ml (January 19, 1999), 435/100 ml and 270/100 ml (March 5, 2001), 378/100 ml (June 7, 2001) and 260/100 ml (June 3, 1998).

The historical *E. coli* data are included in Appendix C.
The Licensees performed *E. coli* screening (one sample collected) throughout the study area during the Fall 2002 Turnover, 2002 First Rain, Spring 2003 Runoff and Summer 2003 Low Flow sampling events (Table 4.3.1-2). The Summer 2003 samples were collected near shore adjacent to high-use recreation areas, per Attachment 5 of the Water Quality Sampling Plan, to evaluate the highest risk conditions associated with contact recreation areas during the summer season.

Table 4.3.1-2. Range of *E. coli* concentrations in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the 2002 Fall Turnover, 2002 First Major Rain, 2003 Spring Runoff and 2003 Summer Low Flow events.

Location	Number of Samples	Range of *E. coli* Values (# of Organisms/100 ml)			
		Fall 2002 Turnover	2002 First Rain	Spring 2003	Summer 2003[1]
RESERVOIRS					
Upper Reservoirs	24	0 – 1	0 – 38	0 - 3	0
Middle Reservoirs	47	0-2	0 – 34	0 – 2	0 - 4
Lower Reservoirs	14	0 – 11	44 – 172	1 – 6	0
REACHES					
Upper Elevation	30	0- 6	4 – 68	0 – 6	6
Middle Elevation	15	0-1	0-31	0 – 2	1 - 6
Lower Elevation	15	0 – 3	96 – 172	0 – 4	*
Reach Downstream of Chili Bar	12	3– 21	142 – 236	0 - 26	0

[1] Sampling sites differed from the previous three sampling periods.
* Not sampled

As noted above, the data were not collected so that a 5-day organisms/100 ml geometric mean can be calculated, but one can compare the results to the 235 organisms/100 ml single sample criterion. As observed in Table 4.3.1-2, only one of the 157 samples collected by the Licensees (0.6%) had a concentration above this criterion: in the Reach Downstream of Chili Bar on November 12, 2002, an *E. coli* concentration of 236/100 ml was recorded below Chili Bar Dam.

The Licensees also measured total coliform concentration throughout the study area during the Fall 2002 Turnover, 2002 First Rain, Spring 2003 Runoff and Summer 2003 Low Flow sampling events. There are no water quality objectives for total coliform; however, at the request of the SWRCB, total coliform data are presented by sampling event and location in Table 4.3.1-3. Total coliform concentrations range from 0 organisms/100ml to greater than 2,419 organisms/100 ml, with the highest concentrations occurring during the First Rain sampling event. There are no clear trends in total coliform concentrations from upstream to downstream locations.

Table 4.3.1-3. Range of Total Coliform concentrations in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the 2002 Fall Turnover, 2002 First Major Rain, 2003 Spring Runoff and 2003 Summer Low Flow events.

Location	Number of Samples	Range of Total Coliform Values (# of Organisms/100 ml)			
		Fall Turnover 2002	First Rain 2002	Spring 2003	Summer 2003
RESERVOIRS					
Upper Reservoirs	26	3-1046	6 - >2419	1-192	0-130
Middle Reservoirs	43	180-290	200 - >2419	0-261	0 - >2419
Lower Reservoirs	12	142-1299	1119 - >2419	135-290	0

Table 4.3.1-3. Range of Total Coliform concentrations in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the 2002 Fall Turnover, 2002 First Major Rain, 2003 Spring Runoff and 2003 Summer Low Flow events.

Location	Number of Samples	Range of Total Coliform Values (# of Organisms/100 ml)			
		Fall Turnover 2002	First Rain 2002	Spring 2003	Summer 2003
REACHES					
Upper Elevation	30	10-1426	60 - >2419	31-307	866
Middle Elevation	31	130-220	130 - >2419	5-248	345-387
Lower Elevation	13	461-1733	613 - >2419	51-866	*
Reach Downstream of Chili Bar	9	461-866	>2419	218 - >2419	0

* Not sampled

4.3.1.2 Chemical Constituents

The Basin Plan (RWQCB 2004) contains one Water Quality Objective for Chemical Constituents. The portion of the Objective that pertains to surface waters in the vicinity of the Projects is:

> Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.
>
> At a minimum, water designated for use as domestic or municipal supply shall not contain concentrations of chemical constituents in excess of the maximum containment levels (MCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Tables 64449-A (Secondary Maximum Containment Levels-consumer Acceptance Limits) and 64449-B (Secondary Maximum Containment Levels-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. At a minimum, water designated for use as domestic or municipal supply (MUN) shall not contain lead in excess of 0.015 mg/l. The Regional Water Board acknowledges that specific treatment requirements are imposed by state and federal drinking water regulations on the consumption of surface waters under specific circumstances. To protect all beneficial uses the Regional Water Board may apply limits more stringent than MCLs.

The MCLs in Title 22 were adopted by the California Department of Health Services (DHS) pursuant to the California Safe Drinking Water Act and are established for the protection of public water systems (*i.e.*, water suppliers) and drinking water at the tap or point-of-use (see 22 Cal, Code. Regs. §§64431 and 64444). Primary MCLs are derived from health-based criteria by the DHS from Public Health Goals, or from a one-in-a-million incremental cancer risk estimate for carcinogens and threshold toxicity levels for non-carcinogens. Secondary MCLs are adopted for constituents that may adversely affect the taste, odor, or appearance of drinking water, and

are directly related to consumer "acceptance" or "dissatisfaction" with supplied drinking water (see 22 Cal, Code. Regs. §64449). Secondary MCLs do not imply a human health risk.

Reporting of both Primary and Secondary MCLs are in total recoverable concentrations, which are expressed in this *Water Quality Technical Report* in micrograms per liter, or µg/l, unless otherwise indicated. For information purposes, one million µg equals one thousand mg, which equals one gram. Table 64431-A of Title 22 provides Primary MCLs for the following seven metals that were sampled by the Licensees: aluminum (Primary MCL of 1,000 µg/l), arsenic (50 µg/l), barium (1,000 µg/), cadmium (5 µg/l), mercury (2 µg/l), nickel (100 µg/l) and selenium (50 µg//l). The table also provides a Primary MCL for total cyanide (200 µg//l), which includes free cyanide (CN^-) and hydrogen cyanide (HCN) as well as metal-cyanide complexes. Table 64672.3 of Title 22 provides a Primary MCL for lead (15 µg/l). Table 64449-A of Title 22 provides Secondary MCLs for the following five metals that were sampled by the Licensees: aluminum (Secondary MCL of 200 µg//l), copper (1,000 µg//l), iron (300 µg//l), manganese (50 µg//l), silver (100 µg//l) and zinc (5,000 µg//l).

The Licensees are aware of two instances of historic water quality sampling for metals in the surface waters in the vicinity of the Projects. The first was performed by the SWRCB over about a 2-year period (1959-1961) during the initial construction of the UARP. The SWRCB collected monthly samples and analyzed them for a number of parameters including metals directly downstream of Ice House and Union Valley dams as they were under construction. The data are available in the USEPA STORET system and the Licensees downloaded the data from the USEPA web page for presentation in Table 4.3.1-4. No information is available regarding specific sampling locations or dates, conditions during sampling, quality control/quality assurance, laboratory analysis, chain-of-custody, cause of elevated values or if the SWRCB considered the values to be a problem and initiated corrective actions. Note that in 1960, MCLs had not been established.

Table 4.3.1-4. Values for aluminum (Al), arsenic (As), boron (B), copper (Cu), iron (Fe), lead (Pb), manganese (Mn) and zinc (Zn) reported by the State Water Resources Control Board during initial construction of Union Valley and Ice House dams from 1959 through 1961. A dash indicates that no data are available. (SOURCE: USEPA STORET.)

Date	Al (µg/l)	As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Pb (µg/l)	Mn (µg/l)	Zn (µg/l)
SILVER CREEK DOWNSTREAM OF UNION VALLEY DAM CONSTRUCTION								
August 1959	0	0	0	0	50	0	0	0
September 1959	0	0	30	10	0	0	0	0
October 1959	0	0	10	0	0	20	0	30
November 1959	0	0	0	0	100	0	0	0
May 1960	0	0	10	0	30	0	0	0
June 1960	0	0	0	0	10	0	0	0
July 1960	-----	-----	170	-----	-----	-----	-----	-----
August 1960	-----	-----	40	-----	-----	-----	-----	-----
September 1960	-----	-----	20	-----	-----	-----	-----	-----
October 1960	-----	-----	0	-----	-----	-----	-----	-----
November 1960	-----	-----	0	-----	-----	-----	-----	-----
January 1961	-----	-----	0	-----	-----	-----	-----	-----

Table 4.3.1-4. Values for aluminum (Al), arsenic (As), boron (B), copper (Cu), iron (Fe), lead (Pb), manganese (Mn) and zinc (Zn) reported by the State Water Resources Control Board during initial construction of Union Valley and Ice House dams from 1959 through 1961. A dash indicates that no data are available. (SOURCE: USEPA STORET.)

Date	Al (µg/l)	As (µg/l)	B (µg/l)	Cu (µg/l)	Fe (µg/l)	Pb (µg/l)	Mn (µg/l)	Zn (µg/l)
February 1961	-----	-----	40	-----	-----	-----	-----	-----
March 1961	-----	-----	10	-----	-----	-----	-----	-----
SOUTH FORK SILVER CREEK DOWNSTREAM OF ICE HOUSE DAM CONSTRUCTION								
August 1959	0	0	0	0	800	0	0	0
September 1959	140	-----	-----	-----	-----	0	0	0
October 1959	120	0	30	10	270	20	20	20
November 1959	100	0	0	50	130	0	100	10
December 1959	0	0	30	0	690	0	0	0
March 1960	0	0	30	0	80	10	40	0
April 1960	0	0	0	0	80	0	0	0
May 1960	0	0	10	10	60	0	0	0
June 1960	0	0	0	0	30	0	0	0
July 1960	-----	1,180	-----	-----	-----	-----	-----	-----
August 1960	-----	30	-----	-----	-----	-----	-----	-----
September 1960	-----	20	-----	-----	-----	-----	-----	-----
October 1960	-----	0	-----	-----	-----	-----	-----	-----
November 1960	-----	130	-----	-----	-----	-----	-----	-----
January 1961	-----	0	-----	-----	-----	-----	-----	-----
February 1961	-----	40	-----	-----	-----	-----	-----	-----
March 1961	-----	30	-----	-----	-----	-----	-----	-----

Information is not available at this time to indicate whether these values measured by the SWRCB in 1959 through 1961 represented natural conditions or caused by dam construction.

The second period of water quality sampling for metals (as well as other parameters) occurred on November 2, 1992, upstream and downstream of Slab Creek Reservoir. The purpose of this sampling program undertaken by SMUD was to assess the condition of the reservoir following two significant events. The first was the lowering of the reservoir to lower than typical water elevation levels in 1991, which mobilized sediment in the reservoir. The second was the Cleveland Fire in summer 1992. This fire resulted in a significant increase of sediment and increased turbidity in all waterways downstream of the fire, but particularly in Slab Creek Reservoir. Two sampling stations were used in the sampling program: one at the upstream end of Slab Creek Reservoir by the Forebay Road bridge and one downstream of Slab Creek Reservoir Dam. The results of the sampling for various elements, including metals, are presented in Table 4.3.1-5.

Table 4.3.1-5. Results of water quality sampling for various elements including metals by SMUD upstream and downstream of Slab Creek Reservoir on November 2, 1992.

Element	Upstream of Slab Creek Reservoir (µg/l)	Downstream of Slab Creek Dam (µg/l)
Aluminum	32	64
Arsenic	6	7

Table 4.3.1-5. Results of water quality sampling for various elements including metals by SMUD upstream and downstream of Slab Creek Reservoir on November 2, 1992.		
Element	**Upstream of Slab Creek Reservoir (µg/l)**	**Downstream of Slab Creek Dam (µg/l)**
Barium	10	14
Boron	<2	<250
Cadmium	<1	1
Calcium	2,808	5,033
Chromium	1	0
Cobalt	5	6
Copper	3	3
Iron	271	383
Lead	<5	<5
Magnesium	497	903
Manganese	9	2
Mercury	0.85	0.3
Molybdenum	3	5
Nickel	<2	<2
Selenium	7	<5
Silicon	2,815	4,308
Silver	4	3
Sodium	1,878	4,727
Strontium	36	75
Titanium	1	1
Vanadium	3	4
Zinc	8	1

None of the reported values were greater than Primary or Secondary MCLs.

The Licensees analyzed water quality samples for metals, total hardness and total cyanide in 2002, 2003 and 2004. The number of values for each metal, total hardness and total cyanide are shown by sampling period in Table 4.3.1-6.

Table 4.3.1-6. Number of water quality samples by metal, total cyanide, total hardness and sampling period analyzed by the Licensees in 2002, 2003 and 2004.								
Metal/ Total Cyanide	**2002 Fall Turnover**	**2002 First Major Rain**	**2003 Spring Runoff**	**2003 Summer Low Flow**	**2004 Spring Runoff***	**2004 Summer Low Flow***	**2004 First Rain/ Fall Turnover***	**Total**
	Number of Samples							
Aluminum	27	47	69	68	55	64	68	398
Arsenic	27	21	69	68	55	64	68	372
Barium	27	21	60	68	55	64	68	363
Cadmium	27	21	68	69	55	64	68	372
Copper	27	27	68	69	55	64	68	378
Iron	29	29	69	68	55	64	68	382
Lead	27	55	68	69	55	64	68	406
Manganese	29	29	0	67	0	64	68	257
Mercury	27	21	0	35	0	64	68	215
Nickel	27	21	68	69	55	64	68	372

Table 4.3.1-6. Number of water quality samples by metal, total cyanide, total hardness and sampling period analyzed by the Licensees in 2002, 2003 and 2004.

Metal/ Total Cyanide	2002 Fall Turnover	2002 First Major Rain	2003 Spring Runoff	2003 Summer Low Flow	2004 Spring Runoff*	2004 Summer Low Flow*	2004 First Rain/ Fall Turnover*	Total
	Number of Samples							
Selenium	27	21	0	68	0	64	68	248
Silver	27	55	68	69	55	64	68	406
Zinc	27	21	68	69	0	64	68	317
Total Cyanide	27	21	0	69	0	0	0	117
Total Hardness	27	48	70	70	55	64	68	402
Total	382	410	675	925	560	896	952	5,005

* Samples analyzed for total recoverable and dissolved metals

Table 4.3.1-7 provides the range of values (total recoverable) for each metal and for total cyanide by reservoir and by reach as measured by the Licensees in 2002, 2003 and 2004. Samples collected by the Licensees during 2004 Spring Runoff, Summer Low Flow and First Major Rain/Fall Turnover events were analyzed for dissolved and total recoverable metals; total recoverable concentrations are included in Table 4.3.1-7 and dissolved concentrations are shown by reservoir and by reach in Table 4.3.1.8.

Table 4.3.1-7. Range of aluminum (Al), arsenic (As), barium (Ba), cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag) and total cyanide (TC) expressed in total recoverable concentrations in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during: Fall Turnover and First Major Rain events in 2002; Spring Runoff and Summer Low Flow conditions in 2003; and Spring Runoff, Summer Low Flow, Fall Turnover and First Major Rain events in 2004.

Locations	Al (µg/l)	As (µg/l)	Ba (µg/l)	Cd (µg/l)	Cu (µg/l)	Fe (µg/l)	Pb (µg/l)	Mn (µg/l)	Hg (µg/l)	Ni (µg/l)	Se (µg/l)	Ag (µg/l)	Zn (µg/l)	TC (µg/l)[1]
RESERVOIRS														
Rubicon	<50-64, 48J	<1.0-1.1, 0.13J	1.9J-<20	0.015J-<0.05-<0.2	0.22-<1.0	<100-540	0.025J-0.31	7.2J-<10	0.0011-0.58	0.14J-<2	<2	0.018J-0.14	0.58J-1.3J	<5
Rockbound	<50-61 17J	0.035J-<1.0	1.5J-<20	0.011J-0.05-<0.2	0.34-<1.0	30-<100	<0.2-54	0.9J-<10	0.0028J-1.2	0.043J-<2	<2	0.0078J-0.15	0.39J-0.74J	<5
Buck Island	<50-80, 17J	0.011J-<1.0	1.9J-<20	0.012J-0.42	0.20-0.94	40-120	0.031J-97	4.2J-<10	0.0029J-1.7	0.13J-<2	<2	0.0068J - 0.052	0.41J-0.72J	<5
Loon Lake	<50-80, 7.7J	0.049J-<1.0	2.0J-<20	0.011J-<0.019-<0.05-<0.2	0.15-1.5	34-<100	0.014J-190	1.9J-40	<0.001-5.7	0.066J-<2	<2	0.026J -0.13	0.46J-3.7J	<5
Gerle Creek	<50-69, 13J	0.049J-<1.0	3.3J-<20	0.018J-<0.019-<0.05-0.27	0.23-0.39	60-<210	0.022J-59	2.7J-10	<0.001-0.92	0.13J-<2	<2	0.022J	0.50J-1.0J	<5
Union Valley	<50-56, 11J	0.044J-<1.0	4.4J-<20	0.014J-<0.019-<0.05-<0.1	0.18-6.8	<25-200	0.012J-150	3.4J-76J	<0.001-2.1	0.068J-<2	0.08J-<2.0	0.0090J-0.86	0.11J-2.5J	<5-16
Ice House	<50-160, 6.9J	0.048J-1.0	3.9J-<20	0.0056J-<0.04-<0.05-<0.1	0.12-2.2	<30-980	0.02J-120	3.1J-400J	<0.001-3.4	0.030J-<2,	0.08J-<2.0	0.012J-0.072	0.15J-7.8	<5
Junction	13J-<50	0.053J-1.0	7.0J-<20	0.019J-<0.04-<0.05-<0.1	0.2-1.9	88-120	0.014J-68	23J-43J	<0.005-0.7	0.12J-<2	<2	<0.04-0.1	0.84J-1.1J	<5
Camino	<50-53, 11J	<1.0	6.7J-<20	0.0097J-<0.05-<0.1	0.28-<1.0	30-110	0.031J-0.27	8J-75J	0.0020J	0.14J-<2	0.08J-<2.0	0.0098J-<0.04	0.43J-1.0J	<5
Brush Creek	0.99J-<50	<1.0	<20-31, 7.9J	<0.019-<0.05-<0.1	0.12-1.6	<25-200	0.044J-85	4.4J-140J	0.0012-1.7	0.10J-<2	<2	0.013J-0.15	0.67J-1.40J	<5
Slab Creek	<50-120 11J	0.12J-<1.0	6.9J-<20	0.012J-0.061	0.27-50	27-70	0.027J-110,	4.4J-39J	0.0016-5.6	0.052J-<2	<2	0.019J-0.16	0.53J-27	<5
Chili Bar	<50-130, 15J	0.051J-<1.0	7.0J-<20	<0.05-<0.2	0.32-<1.0	54-79	0.028J-46,	8.8J-21J	<0.0010-4.1	0.020J-<2	<2	0.014J-0.096	0.75J-30.J	<5
REACHES														
Upper Elevation	8.2J-230	0.03J-6.0	1.6J-20	<0.05-0.13	<0.10-2.3	5J-500	0.016J-0.37	0.9J-18	<0.001-0.016	0.066J-3.2	0.12J-<2.0	0.015J-0.28	0.5J -7	<5

Table 4.3.1-7. Range of aluminum (Al), arsenic (As), barium (Ba), cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), silver (Ag) and total cyanide (TC) expressed in total recoverable concentrations in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during: Fall Turnover and First Major Rain events in 2002; Spring Runoff and Summer Low Flow conditions in 2003; and Spring Runoff, Summer Low Flow, Fall Turnover and First Major Rain events in 2004.

Locations	Al (µg/l)	As (µg/l)	Ba (µg/l)	Cd (µg/l)	Cu (µg/l)	Fe (µg/l)	Pb (µg/l)	Mn (µg/l)	Hg (µg/l)	Ni (µg/l)	Se (µg/l)	Ag (µg/l)	Zn (µg/l)	TC (µg/l)[1]
Middle Elevation	1.5J-140	0.027J-0.16J	3.0J-28	0.0088J-0.12	<0.1-2.5	8.7J-990	0.014J-0.83	0.23J-290J	<0.005-0.79	0.014J-0.48J	0.067J-0.47J	0.0076J-0.24,	0.16J-9.3	<5
Lower Elevation	2.7J-230	0.11J-0.31J	6.3J-20	0.021J-0.66	<1.0, <0.1-1.4	22J-310	0.017J-0.29	0.47J-63J	<0.001-0.66	0.038J-0.46J	0.13J-0.24J	0.012J-0.096	0.229J-03.1J	<5
Reach Downstream of Chili Bar	13J-290	0.057J-1.3	6.3J-27	0.011J-0.12	0.26-3.4	<50-200	0.027J-1.4	5.7J-21J	0.0013J-0.0187	0.096J-2.5	<2.0	0.017J-0.12	0.48J-13	<5
Reporting Limits	50, 100, 1	1.0, 0.2	20, 0.04	0.05, 0.2, 0.04, 0.1	0.1, 1.0	25, 50, 100	0.05, 0.2, 0.1	500, 10	0.005, 0.001, 0.01	2.0, 0.2	2.0	0.04, 0.2, 0.008	5.0	5.0

[1] No TC samples were collected for 2004 Summer Low Flow or First Major Rain/Fall Turnover sampling events.

Table 4.3.1-8. Aluminum (Al), arsenic (As), barium (Ba), cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se) and silver (Ag) expressed in dissolved concentrations for UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the Spring Runoff, Summer Low Flow and First Major Rain/Fall Turnover events in 2004.

Locations	Al (µg/l)	As (µg/l)	Ba (µg/l)	Cd (µg/l)	Cu (µg/l)	Fe (µg/l)	Pb (µg/l)	Mn (ug/l)	Hg (ug/l)	Ni (µg/l)	Se (ug/l)	Ag (µg/l)	Zn (ug/l)
RESERVOIRS													
Rubicon[1]	22J-44J	0.13J-1.1	2.1J-2.6J	0.015J-0.034J	0.23-0.45	<50-180	0.13-0.15	7.8J	<0.001	0.07J-0.82J	<2.0	<0.04	1.5J
Rockbound	14J-49J	0.14J-0.27J	1.7J-2.6J	0.014J-0.019J, <0.05	0.14-0.50	19J, <50	1.1-26	0.6J-5.0J	0.001-0.003	0.12J, <2.0	0.20J, <2.0	<0.04	0.6J-1.7J
Buck Island	6.7J-48J	0.26J-0.29J	2.0J-2.9J	0.012J-0.034J	0.17-0.62	26J, <50	8.8-50	1.6J-5.1J	0.001-0.003	0.10J-0.15J, <2.0	0.13J, <2.0	0.012J, <0.04	1.3J-2.3J
Loon Lake	3.3J-31J	0.13J-0.35J	2.3J-2.9J	0.01J-0.063, <0.05	0.16-0.52	7.4J, <25, <50	17-98, 200	1.4J-2.0J	0.001-0.005	0.12J-0.45J, <2.0	0.08J, <2.0	<0.04	0.6J-1.0J
Gerle Creek	5.5J-28J	0.21J-0.27J, <1.0	3.5J-6.0J	<0.05-0.073	0.21-0.29	12J, <25, <50	<0.05-21, 200	2.6J-2.9J	0.001-0.005	0.13J-0.16J, <2.0	<2.0	<0.04	0.7J-1.3J

Table 4.3.1-8. Aluminum (Al), arsenic (As), barium (Ba), cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se) and silver (Ag) expressed in dissolved concentrations for UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the Spring Runoff, Summer Low Flow and First Major Rain/Fall Turnover events in 2004.

Locations	Al (µg/l)	As (µg/l)	Ba (µg/l)	Cd (µg/l)	Cu (µg/l)	Fe (µg/l)	Pb (µg/l)	Mn (ug/l)	Hg (ug/l)	Ni (µg/l)	Se (ug/l)	Ag (µg/l)	Zn (ug/l)
Union Valley	2J-18J	0.08J-0.20J, <1.0	4.4J-6.1J	0.018J-0.021J, <0.05	0.15-0.31,56	<25, <50	0.11-44	0.7J-43.0J	0.002-0.011	0.08J-0.16J, <2.0	0.11J, <2.0	<0.04	0.3J-1.7J
Ice House	1.8J-30J	0.063J-0.23J	3.7J-10.0J	0.006J-0.056, <0.05	0.12-0.49	6.2J-77J, <25, <50	0.27-52	0.8J-610.0	0.001-0.004	0.02J-0.11J, <2.0	0.08J-0.36J, <2.0	0.005J-0.016J, <0.04	0.3J-2.8J
Junction	4.2J-10J	0.09J-0.19J	5.7J-9.5J	<0.05	0.19-0.24	29, <25, <50	12-64	16J-26J	0.004-0.011	0.06J-0.14J	<2.0	<0.04	0.6J-0.7J
Camino	3J-10J	0.041J-0.098J, <1.0	5.8J-11.0J	0.034J, <0.05	0.22-0.50	74, <25, <50	0.012J-0.058, <0.05	6.4J-72.0J	0.004	0.13J, <2.0	0.1J, <2.0	<0.04	0.5J-1.3J
Brush Creek	3.7J-5.4J, <50	0.08J-0.17J, <1.0	7.3J-14.0J	<0.05	0.07J-0.17	<25, <50	0.09-28	0.06J-2.3J	0.001-0.003, <0.001	0.36J, <2.0	<2.0	<0.04	0.4J-1.9J
Slab Creek	6.8J-17J	0.12J-0.29J	6.8J-9.3J	0.011J-0.034J, <0.05	0.25-0.45	26-56, <25, <50	0.2-67	3.3J-35.0J	0.003-0.009	0.14J-0.26J, <2.0	<2.0	<0.04	0.7J-2.0J
Chili Bar	6.9J-14J	0.12J-0.25J	6.8J-10.0J	0.017J-0.078, <0.05	0.29-0.92	34-37, <25, <50	0.18-14	4.9J-10.0J	0.003-0.03	0.14J-0.27J	<2.0	0.011J, <0.04	0.5J-8.5
REACHES													
Upper Elevation	4.2J-87	0.03- 0.9J, <1.0	1.7J-22	0.005J-0.1, <0.5	0.13-1.6	5J-200, <25	0.016J-0.4, <0.05	0.8J-270J	0.001-0.015, <0.001	0.09J-1.3J, <2.0	0.08J-0.3J, <2.0	<0.005J-<0.018J	0.6J-8.1
Middle Elevation	0.2J-55.0J	0.029J-0.27J, <1.0	3.2J-22	0.01J-0.09, <0.05	0.08J-0.68	<25-240	<0.012J-0.35, <0.05	0.18J-270J	0.001-0.015, <0.001	0.03J-1.3J, <2.0	0.09J-0.3J	0.02J, <0.04	0.06J-7.1
Lower Elevation	0.027J-30J, <50	0.03J-0.41J, <1.0	6.3J-18J	<0.05-0.07	0.08J-0.52	<25-50	0.012J-0.048J, <0.05	0.4J-14J	0.001J-0.007J, <2.0	0.07J-0.55J, <2.0	0.097J, <2.0	<0.009, <0.04	0.38J-4.8J
Reach Downstream of Chili Bar	1.8J-10.0J	0.09J-0.21J	5.7J-11J	0.009J-0.11	0.28-1.4	28-33	0.016J-0.095	1.1J-8.8J	0.004J-0.008J	0.09J-0.51J	<2.0	0.01J, <0.04	0.98J-8.1
Reporting Limits	50	1.0, 0.2	20	0.05	0.10	25, 50	0.05	500	0.005, 0.001	2.0	2.0	0.04	5.0

[1] Rubicon Reservoir was not sampled during 2004 First Major Rain/Fall Turnover.

Of the 5,005 metals and total cyanide samples, 54 samples (1.1%) were equal to or greater than the Primary MCLs, 46 of which were for lead and the remaining 8 were for mercury. Three aluminum samples and 17 iron samples were found to be greater than the Secondary MCLs, as detailed below.

Lead

Forty-six of the 406 lead samples (11.3% of the lead samples) were greater than the Primary MCL for lead (15 µg/l). All 46 occurred in reservoirs during the 2004 sampling events - 2004 Spring Runoff, 2004 Summer Low Flow, and 2004 Fall Turnover and First Major Rain:

- On May 3, 2004 (during the Spring Runoff sampling event) in the Slab Creek Reservoir (65 and 86 µg/l) and in the Chili Bar Reservoir (20 µg/l).
- On May 5, 2004 (Spring Runoff) in the Union Valley Reservoir (15, 25 and 47 µg/l) and in the Junction Reservoir (15 µg/l).
- On May 6, 2004 (Spring Runoff) at Loon Lake Reservoir (47, 48 and 91 µg/l).
- On May 11, 2004 (Spring Runoff) at Ice House Reservoir (18 and 54 µg/l).
- On May 12, 2004 (Spring Runoff) at Rockbound Reservoir (19 µg/l) and Buck Island Reservoir (97 µg/l).
- On September 13, 2004 (Summer Low Flow) in Slab Creek Reservoir (66, 110 and 110 µg/l) and in Chili Bar Reservoir (33, 42, 42 and 46 µg/l).
- On September 14, 2004 (Summer Low Flow) in Union Valley Reservoir (24, 47 and 28 µg/l) and Junction Reservoir (68 µg/l).
- On September 15, 2004 (Summer Low Flow) in Gerle Creek Reservoir (59 µg/l).
- On September 20, 2004 (Summer Low Flow) in Brush Creek Reservoir (48 and 85 µg/l) and Ice House Reservoir (47, 33, 47, 36 and 120 µg/l).
- On September 21, 2004 (Summer Low Flow) in Rockbound Reservoir (39 and 54 µg/l) and Buck Island Reservoir (49 µg/l).
- On September 22, 2004 (Summer Low Flow) in Loon Lake Reservoir (51, 100, 140 and 190 µg/l).
- On October 25, 2004 (First Major Rain/Fall Turnover) in Slab Creek Reservoir (31 µg/l).
- On November 1, 2004 (First Major Rain/Fall Turnover) in Brush Creek Reservoir (53 µg/l) and Ice House Reservoir (47µg/l).
- On November 2, 2004 (First Major Rain/Fall Turnover) in Rockbound Reservoir (43 µg/l).
- On November 8, 2004 (First Major Rain/Fall Turnover) in Union Valley Reservoir (150 µg/l).
- On November 10, 2004 (First Major Rain/Fall Turnover) in Loon Lake Reservoir (41 µg/l).

Mercury

Eight of the 215 mercury samples (3.7% of the mercury samples) were equal to or exceeded the Primary MCL (2.0 µg/l). All eight occurred in reservoirs samples collected during 2003:

- On September 15, 2003 (Summer Low Flow) in Slab Creek Reservoir (2.4 and 5.6 µg/l) and Chili Bar Reservoir (3.3 and 4.1µg/l).
- On September 16, 2003 (Summer Low Flow) in Loon Lake Reservoir (5.7 and 2.2 µg/l).
- On September 18, 2003 (Summer Low Flow) in Union Valley Reservoir (2.1 µg/l) and Ice House Reservoir (3.4µg/l).

Aluminum

Three of the 398 aluminum samples (0.7 % of all aluminum samples) were greater than the Secondary MCL for aluminum (200 µg/l). All three occurred in stream reaches:

- On October 7, 2002 (Fall Turnover) in the Rubicon Dam Reach downstream from the dam (230 µg/l).
- On November 12, 2002 (First Rain) in the Reach Downstream of Chili Bar downstream from the dam (290 µg/l).
- On May 11, 2003 (Spring Runoff) in the Slab Creek Dam Reach downstream from the Rock Creek confluence (230 µg/l).

Iron

Seventeen of the 382 iron samples (4.4% of all iron samples) were equal to or greater than Secondary MCL for iron (300 µg/l). Ten of these occurred in river-reach samples and seven in reservoir samples:

- On September 17, 2003 (Summer Low Flow) in the Rubicon Reservoir and in the Rubicon Dam Reach downstream of the dam (390 and 340 µg/l, respectively).
- On September 18, 2003 (Summer Low Flow) in the South Fork Silver Creek reach downstream from Ice House dam (300 µg/l).
- On May 4, 2004 (Spring Runoff) in the SFAR upstream of the Camino Powerhouse and downstream of the Camino Powerhouse (500 and 460 µg/l, respectively).
- On May 5, 2004 (Spring Runoff) in the South Fork Silver Creek reach downstream from Junction dam (440 µg/l).
- On May 5, 2004 (Spring Runoff) at a non-project affected reach; in the SFAR at Highway 50 and Ice House Road (310 µg/l).
- On September 13, 2004 (Summer Low Flow) in Chili Bar Reservoir (380 µg/l).
- On September 14, 2004 (Summer Low Flow) in the South Fork Silver Creek outflow from Junction Dam (440 µg/l).
- On September 15 2004 (Summer Low Flow) in the South Fork Silver Creek outflow from Ice House Reservoir (380 µg/l).
- On September 20, 2004 (Summer Low Flow) in Ice House Reservoir (340 µg/l).

- On Spetember 21, 2004 (Summer Low Flow) in Rockbound Reservoir (330 µg/l), Rubicon Reservoir (540 µg/l) and in the Rubicon River outflow from Rubicon Reservoir (340 µg/l).
- On October 27, 2004 (First Major Rain) in the South Fork Silver Creek outflow from Ice House Reservoir (990 µg/l).
- On November 1, 2004 (First Major Rain) in Ice House Reservoir (980 and 570 µg/l

Elevated mercury concentrations in 2003 and elevated lead concentrations in 2004 appear to be related to the sampling equipment used to collect the reservoir samples. Reservoir samples were collected in 2002 using a rented Van Dorn sampler, and none of 2002 reservoir samples exceeded MCLs for any metal. For 2003, the Licensee decided to purchase, rather than rent, a Van Dorn sampler. Laboratory analysis of the 2003 reservoir samples resulted in a substantial increase in mercury concentrations compared to 2002. The Licensee evaluated the potential sources of increased mercury levels from 2002 to 2003, and contacted the supplier of the Van Dorn sampler to inquire about the sampler as a source of mercury. The supplier confirmed that the sampling cups sold for use with the Van Dorn sampler at that time were a source of mercury. To avoid further equipment-related contamination of reservoir samples, the Licensee then purchased a new Kemmerer sampler for use in collecting reservoir samples in 2004. Laboratory analysis of 2004 reservoir samples collected with the new sampler show that mercury concentrations decreased to background levels, however, lead concentrations increased significantly, exceeding the MCL for lead for the first time and only in reservoir samples, as discussed above. A quality-assurance sample collected in the field (i.e., deionized-water rinse of the new Kemmerer sampler) during the 2004 Spring sampling event yielded a lead concentration of 7.7 µg/l, which suggested the new Kemmerer sampler to be the source of elevated lead concentrations in 2004 reservoir samples. Laboratory testing of Kemmerer sampler during March 2005 confirmed this, and the laboratory report is attached in Appendix D. Additional evidence to support this conclusion is that all riverine samples collected below reservoirs have lead concentrations that range from non-detect to 0.3 µg/l. Collection of riverine sampling entails filling sample bottles directly from the stream and therefore does not require the use of the Kemmerer depth sampler. If lead concentrations were truly elevated in the reservoirs as suggested by the 2004 analytical data, then 2004 riverine samples collected below the dams should have similar lead concentrations as found in the reservoirs, but this is not the case (i.e., lead results for riverine samples are about four orders of magnitude less than the reservoir samples, and well below the MCL).

The Basin Plan also contains Water Quality Objectives for trace elements for Folsom Lake. Although the Folsom Lake objectives clearly do not apply to the waters in the vicinity of the Projects, at the request of the SWRCB, the Licensees agreed to analyze water samples for dissolved concentrations of trace elements during the 2004 Spring sampling event for comparison to the Water Quality Objectives at the downstream reservoir of Folsom Lake. According to the Basin Plan, Table III-1, the Water Quality Objectives for trace elements at Folsom Lake are not to exceed the following levels of dissolved concentrations:

Arsenic 0.01 mg/l (10 µg/l)

Barium	0.1 mg/l (100 µg/l)
Copper	0.01 mg/l (10 µg/l)
Cyanide	0.01 mg/l (10 µg/l)
Iron	0.3 mg/l (300 µg/l)
Manganese	0.05 mg/l (50 µg/l)
Silver	0.01 mg/l (10 µg/l)
Zinc	0.1 mg/l (100 µg/l)

None of the 275 samples analyzed for dissolved trace elements exceeded the Water Quality Objectives for Folsom Lake. Cyanide, manganese, and zinc were not analyzed for dissolved concentrations since there are no water quality objectives for these elements in the vicinity of the Project.

4.3.1.3 Dissolved Oxygen

The Basin Plan contains one Water Quality Objective for Dissolved Oxygen (DO). The portion of the Objective that pertains to the waters in the vicinity of the Projects is:

> For surface water bodies outside the legal boundaries of the Delta, the monthly median of the mean daily dissolved oxygen concentrations shall not fall below 85% of saturation in the main water mass, and the 95% concentration shall not fall below 75% of saturation. The dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time:
>
> Waters designated as WARM 5.0 mg/l
> Waters designated as COLD 7.0 mg/l
> Waters designated as SPWN 7.0 mg/l

Dissolved oxygen is measured in milligrams per liter (mg/l, which is equivalent to parts per million, or ppm) and percent saturation. The amount of oxygen that can be dissolved in water is a function of both water temperature (colder water holds more oxygen than warmer water) and atmospheric pressure (water at a lower elevation holds more oxygen than water at a higher elevation). Therefore, the least oxygen concentration is found in water in summer at the highest elevation and the greatest oxygen concentration is in winter at the lowest elevation. In reservoirs, DO is generally highest on the surface and decreases with depth, depending on primary plant production (which produces oxygen) and decomposition (which consumes oxygen). A reservoir can become locally anoxic (no dissolved oxygen); however, this condition was not found in any reservoir surveyed. Other natural conditions that affect DO include wind mixing and circulation.

The Licensees are unaware of any historic DO data in the vicinity of the Projects.

The Licensees measured DO *in situ* on 375 occasions, 227 of which were riverine measurements and 148 were reservoir profile measurements (Table 4.3.1-9). The reservoir profiles recorded DO measurements at sub-meter intervals from the surface to the bottom of the reservoir. Since

DO readings were not taken continuously over a month, the Basin Plan's percent saturation criteria cannot be directly tested. However, an inference can be made regarding the extent to which waters in the vicinity of the Projects compare to Basin Plan DO criteria.

Table 4.3.1-9. Range of dissolved oxygen (DO) concentrations in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during Fall Turnover and First Major Rain events in 2002, Spring Runoff and Summer Low Flow events in 2003, and Spring Runoff, Summer Low Flow, Fall Turnover and First Major Rain in 2004.

Location	Number of Samples	Range of DO Values	
		mg/l	% Saturation
RESERVOIRS			
Rubicon	4 Vertical Profiles with YSI meter	8.3-12.0	77.0-101.5
Rockbound	5 Vertical Profiles with YSI meter	4.1-12.9	41.8-110.3
Buck Island	6 Vertical Profiles with YSI meter	5.4-11.7	52.9-99.1
Loon Lake	21 Vertical Profiles with YSI meter	5.6-12.7	57.2-104.1
Gerle Creek	7 Vertical Profiles with YSI meter	7.6-12.1	71.5-124.9
Union Valley	33 Vertical Profiles with YSI meter	0.8-13.9	6.1-118.6
Ice House	29 Vertical Profiles with YSI meter	2.3-13.2	19.5-117.3
Junction	5 Vertical Profiles with YSI meter	3.4-12.6	29.4-110.3
Camino[1]	2 Vertical Profiles with YSI meter	9.4-41.0[1]	82.3-102.5[1]
Brush Creek	6 Vertical Profiles with YSI meter	1.6-10.4	13.6-103.0
Slab Creek	17 Vertical Profiles with YSI meter	4.8-14.0	46.4-116.4
Chili Bar	13 Vertical Profiles with YSI meter	4.9-14.3	50.7-122.7
REACHES			
Upper Elevation	75	3.7-13.1	31.8-113.6
Middle Elevation	88	7.5-14.7	61.4-127.0
Lower Elevation	42	4.7-13.5	45.1-123.8
Reach Downstream of Chili Bar	22	6.1-14.5	62.6-140.5

[1] Data available for fall turnover 2002 and summer low flow 2004 only.

Of the 227 riverine DO measurements, only five measurements (2%) were below 7 mg/l. Two of these were in a UARP–affected reach (5.5 mg/l on October 8, 2002 in the outflow from Loon Lake Dam, and 4.7 mg/l on September 13, 2004 in the South Fork American River outflow from Slab Creek Reservoir), and one was in a Chili Bar-affected reach (6.1 mg/l on September 13, 2004 on the South Fork American River downstream of Greenwood Creek). The other two occasions were in stream reaches not affected by the UARP or Chili Bar Project: 3.1 mg/l in Jerrett Creek on October 8, 2002 (although the sampler noted malfunction of the DO probe for this measurement) and 3.7 mg/l in Rocky Basin Creek on September 17, 2003.

Of the 148 reservoir profile measurements, DO was usually greater than 7 mg/l in the upper portions of all reservoirs. As expected, DO periodically dropped below 7 mg/l in 5 of the 12 reservoirs in the lower portions of the reservoir. At Rockbound Reservoir, DO values were below 7 mg/l on October 7, 2002, in the bottom five meters of the reservoir, with a lowest value of 4.1 mg/l at the bottom depth of 20.5 meters. At Loon Lake Reservoir, DO values were below 7 mg/l on September 16, 2003, at a depth interval of 13.2 to 16.7 meters with the lowest value of 5.6 mg/l (total depth was 18.2 meters). DO values were below 7 mg/l at another location on

Loon Lake Reservoir on September 16, 2003, at a depth interval of 16 to 17.8 meters with the lowest value of 6.0 mg/l (total depth was 21.3 meters).

At Union Valley Reservoir, DO values dropped below 7 mg/l only during October and November 2002, and September 2004. DO values below 7 mg/l started at depths of 20 to 38 meters in October 2002, 46 to 56 meters in November 2002, and 0 to 28 meters in September 2004. DO values were generally lowest near the bottom of the reservoir, with minimum values in October 2002 as follows: 3.6 mg/l at the total depth of 84 meters on October 1; 6.6 mg/l at 24 meters on October 8 (total depth was 41 meters); 0.8 mg/l at the total depth of 69 meters on October 16; 5.0 at 57 meters on October 24 (total depth was 69 meters); and 1.3 mg/l at 73.5 meters on October 31 (total depth was 75 meters). Minimum DO values during November 2002 were 1.0 mg/l at 57.2 meters (total depth of profile was 63 meters) on November 6; 1.5 mg/l at total depth of 49 meters on November 12; 2.5 mg/l at the total depth of 70.0 meters on November 14; 5.1 mg/l at at the total depth of 50 meters on November 14; 3.8 mg/l at the total depth of 68.8 meters on November 14; and 3.4 mg/l at the bottom depth of 23.7 meters on November 14. Minimum DO values in September 2004 were 5.8 mg/l at total depth of 43 meters; 5.9 mg/l at 6.7 meters (total depth was 11.0 meters); and 3.0 mg/l at the total depth of 29 meters on September 14.

Similar to Union Valley Reservoir, Ice House Reservoir DO values dropped below 7 mg/l only during October and November 2002 and September and November 2004. During these four months, DO values below 7 mg/l began at Ice House Reservoir at depths ranging from 10.5 to 20.8 meters. DO values were generally lowest near the bottom of the reservoir, with minimum values in October 2002 as follows: 3.2 mg/l at the total depth of 30.7 meters on October 16; 2.5 mg/l at 20.8 meters (total depth 30.8 meters) on October 8; and 3.6 mg/l at 20 meters (total depth 24 meters) on October 16. Minimum DO values in November 2002 were 4.1 mg/l at 21.8 meters (total depth 25.5 meters) on November 6; 3.7 mg/l at 30.3 meters (total depth 31.1 meters) on November 11; and 3.1 mg/l at 30.3 meters (total depth 31.4 meters) on November 14. Minimum DO values in September 2004 were 4.1 mg/l at 16.4 meters (total depth was 19.7 meters); and 3.86 mg/l at 26.3 meters (total depth was 28.4 meters). Minimum DO values in November 2004 were 3.2 mg/l at 19.4 meters (total depth was 24.2 meters); 2.3 mg/l at 19.7 meters (total depth was 25.8 meters).

Several reservoirs, including Brush Creek, Junction, Slab Creek and Chili Bar only had one or two occasions where DO dropped below 7 mg/l. At Brush Creek Reservoir a minimum DO value of 1.6 mg/l at the total depth of 29 meters was recorded on September 16, 2003; and 3.7 mg/l at 26.3 meters (total depth was 27.6 meters) on November 1, 2004. At Junction Reservoir, a minimum value of 3.4 mg/l was recorded at 30.2 meters (total depth was 31.0 meters) on September 14, 2004. At Slab Creek Reservoir, a minimum DO value of 4.8 mg/l was recorded at the total depth of 35.6 meters. Furthermore, at Chili Bar Reservoir, a minimum DO value of 4.9 mg/l was recorded at 0.8 meters (total depth was 24.9 meters); this profile had consistently low values in its entirety.

For more detailed information regarding the vertical profiles of DO in the twelve reservoirs, DO versus depth data tables are available in the *Water Temperature Technical Report* along with all

temperature data that was collected during the relicensing studies (*Water Temperature Technical Report*: DTA 2005a).

4.3.1.4 pH

The Basin Plan contains one Water Quality Objective for pH. The portion of the Objective that pertains to the waters in the vicinity of the Projects is:

> The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses. In determining appropriate averaging periods for pH, appropriate averaging periods may be applied, provided that beneficial uses will be fully protected.

The pH value is the logarithm of the reciprocal of the hydrogen ion concentration in water, and is usually expressed in pH units. The pH affects the solubility of metals in sediment and suspended material as well as toxicity of some compounds. A pH value of 7 is neutral while a low pH value is acidic and a high pH value is alkaline. Most aquatic biota require a pH range of 6.5 to 8.5. Natural conditions that affect pH include runoff and rainfall.

The Licensees are unaware of any historic pH data in the vicinity of the Projects other than those collected by the SWRCB from 1959 through 1961 during construction of the Union Valley and Ice House dams as described in Section 4.3.1.2. All the pH values measured by the SWRCB fell between 6.5 and 8.5 except for one value of 6.2 in the May 1960 sampling downstream of Union Valley Dam. As stated above, information is not available to determine if this low reading represented natural conditions in the river or was caused by construction activities.

The Licensees measured pH on 354 occasions, 221 of which were riverine measurements and 133 were reservoir profiles (Table 4.3.1-10). The reservoir profiles recorded pH measurements at sub-meter intervals from the surface to the bottom of the reservoir.

Table 4.3.1-10. Range of pH values in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during Fall Turnover and First Major Rain events in 2002, Spring Runoff and Summer Low Flow events in 2003, and Spring Runoff, Summer Low Flow, Fall Turnover and First Major Rain/Fall Turnover 2004.

Location	Number of Samples	Range of pH Values
RESERVOIRS		
Rubicon	4 Vertical Profiles with YSI meter	6.7-7.8
Rockbound	5 Vertical Profiles with YSI meter	6.1[1]-7.7
Buck Island	6 Vertical Profiles with YSI meter	6.5-7.9
Loon Lake	21 Vertical Profiles with YSI meter	5.8[1]-7.7
Gerle Creek	7 Vertical Profiles with YSI meter	6.3-7.4
Union Valley	33 Vertical Profiles with YSI meter	5.7-7.9
Ice House	29 Vertical Profiles with YSI meter	6.0[1]-8.5
Junction	5 Vertical Profiles with YSI meter	6.2-7.7

Table 4.3.1-10. Range of pH values in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during Fall Turnover and First Major Rain events in 2002, Spring Runoff and Summer Low Flow events in 2003, and Spring Runoff, Summer Low Flow, Fall Turnover and First Major Rain/Fall Turnover 2004.		
Location	**Number of Samples**	**Range of pH Values**
Camino	2 Vertical Profiles with YSI meter	6.8-7.2
Brush Creek	6 Vertical Profiles with YSI meter	6.1[1]-7.7
Slab Creek	17 Vertical Profiles with YSI meter	6.5-7.8
Chili Bar	13 Vertical Profiles with YSI meter	6.7-7.8
REACHES		
Upper Elevation	69	4.9-8.3
Middle Elevation	90	6.2-8.5
Lower Elevation	41	6.7-8.7
Reach Downstream of Chili Bar	21	6.8-7.7

[1] Value from the hypolimnion.

Of the 221 riverine pH measurements, 25 measurements (11%) were below 6.5 and two (<1%) were greater than 8.5. Of the 25 pH measurements below 6.5, 21 occurred at sites in the Upper Reaches and 4 occurred in the Middle Reaches. The lower pH values occurred in reaches not affected by either the UARP or Chili Bar Project. The lowest pH value was 5.0 on September 17, 2003 at South Fork Rubicon inflow to Robbs Peak Forebay. The sampler noted that flow on this occasion was very low, similar to flow from a 1-inch garden hose. The next two lowest pH values both occurred at Highland Creek inflow to Rockbound Reservoir on June 11, 2003 and May 12, 2004 (5.75 and 5.83, respectively). The remaining 21 values below 6.5 ranged from 6.02 to 6.49.

Of the 133 reservoir profile measurements, pH values were occasionally measured below 6.5 on six of the twelve reservoirs (Rockbound, Loon Lake, Union Valley, Ice House, Junction, and Brush Creek reservoirs), and pH values greater than 8.5 occurred at one reservoir (Ice House Reservoir).

At Rockbound Reservoir, pH values dropped below 6.5 on October 7, 2002 and May 12, 2004, with minimum pH values of 6.1 and 6.3, respectively. The trend for pH at Rockbound is pH greater than 6.5 at the reservoir surface and generally decreasing pH with increasing depth.

At Loon Lake, pH values dropped below 6.5 during September 2003 at two locations: Loon Lake west end near the boat ramp, with a pH of 6.45 at the surface of the reservoir and decreasing to 5.8 at the bottom five meters of the reservoir (total depth 21 meters); and at Loon Lake northeast water body with pH decreasing from 6.5 to 6.0 at a depth interval from 16.5 meters to total depth of 18.2 meters. In May 2003 pH dropped below 6.5 at three locations: at Loon Lake near the dam with pH of approximately 6.2 throughout the water column to a total depth of 19.5 meters;

at Loon Lake west end near the boat ramp, with a pH range of 6.3 at the surface and decreasing to approximately 6.0 at total depth of 24 meters; and at Loon Lake northeast water body with pH decreasing from 6.5 to 6.2 at a depth interval of 4.0 meters to total depth of 27 meters. In November 2004 pH values dropped below 6.5 at the northeast portion of the water body at a depth of 17.3 meters and continued to decrease to 6.4 at the bottom of the reservoir (20.5 meters).

At Union Valley Reservoir, pH values dropped below 6.5 during October 2002, September 2003, May 2004 and November 2004, with a minimum pH value of 5.7. The trend at Union Valley Reservoir is pH greater than 6.5 at the reservoir surface and generally decreasing pH with increasing depth.

At Ice House Reservoir, pH values dropped below 6.5 during October 2002, November 2002, September 2003, May 2004 and November 2005, with a minimum pH value of 6.0. The trend at Ice House Reservoir is pH greater than 6.5 at the reservoir surface and generally decreasing pH with increasing depth. In December 2004, a pH value of 8.51 was recorded at/near the reservoir surface and gradually decreased with depth.

At Junction Reservoir, pH values dropped below 6.5 during September 2003, May 2004 and November 2004, with a minimum pH value of 6.2. The trend at Junction Reservoir is pH greater than 6.5 at the reservoir surface and generally decreasing pH with increasing depth.

At Brush Creek Reservoir, pH values dropped below 6.5 in September 2003 at a depth interval of 15 to 29.6 meters (total depth), with a minimum pH value of 6.1. The trend at Brush Creek Reservoir is pH values greater than 6.5 at the reservoir surface and generally decreasing pH with increasing depth.

For more detailed information regarding the vertical profiles of pH in the twelve reservoirs, pH versus depth data tables are available in the Water Temperature Report along with all temperature data that was collected during the relicensing studies (*Water Temperature Technical Report*: DTA 2005a).

4.3.1.5 Salinity

The Basin Plan (RWQCB 2004) contains one Water Quality Objective for salinity. Specifically, the Objective states that Total Dissolved Solids (TDS) shall not exceed 125 mg/l in the South Fork of the American River from its source to Folsom Lake.

Salinity in freshwater is normally measured as TDS, which is a measure of the amount of material dissolved in water. This material is mostly inorganic salts (e.g. chlorides, sulfates, phosphates, calcium, magnesium, sodium, potassium), carbonates, bicarbonates, and other anions and cations, all of which are typically measured in mg/l. Calcium, magnesium and carbonate levels can be affected by pH extremes. Calcium is the fifth most common element on earth, an essential macronutrient, considered non-toxic, present in most natural systems and introduced into surface water as runoff passes over calcium-rich formations. Calcium contributes

considerably to hardness and may range from 0 to 200 mg/l naturally. Sodium is the sixth most abundant element on earth, present in most waters naturally and has low toxicity. Magnesium is the eighth most common element, an essential macronutrient and a primary component in photosynthetic pigments. Magnesium is present in most natural systems, contributes considerable to hardness and may range from 0 to several hundred mg/l naturally. The chloride ion, unlike free chlorine (which is toxic), is required by cells during photosynthesis. Potassium plays a minor role in aquatic plant growth and is needed for enzyme activation.

Total alkalinity (mg/l) is a measure of water's ability to neutralize acids (buffer capacity) and reduces the toxicity of some metals. Levels above 400-600 mg/l may be harmful to crops and humans. Alkalinity of natural waters is due primarily to the presence of hydroxides, bicarbonates, carbonates and occasionally borates, silicates and phosphates.

The Licensees are unaware of any historic salinity data in the vicinity of the Projects other than alkalinity data collected by the SWRCB from 1959 through 1961 during construction of the Union Valley and Ice House dams, as described in Section 4.3.1.2. Total alkalinity ranged from 4 to 31 mg/l during those measurements.

Table 4.3.1-11. Range of total dissolved solids (TDS), calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), chloride (Cl), sulfate (SO_4) and total alkalinity (TA) values in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the Fall Turnover and First Major Rain events in 2002 and Spring Runoff and Summer Low Flow events in 2003.

Locations	Number of Samples[1]	TDS (mg/l)	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	Cl (mg/l)	SO_4 (mg/l)	TA (mg/l)
RESERVOIRS									
Rubicon	3	<1-12	1.3-2.1	<0.5	<0.5	<0.5	<1.0	<0.4-0.6	4.7-9.1
Rockbound	4	<1-12	1-1.3	<0.5	<0.5	<0.5	<1.0	<0.4-0.5	4.2-6.0
Buck Island	3	<1-10	1.1-1.4	<0.5	<0.5	<0.5	<1.0	<0.4-1.3	3.2-6.7
Loon Lake	11-14	<1-22, 44	0.9-1.2	<0.5	<0.5	<0.5-0.6	<0.5	<1	3.6-6.0
Gerle Creek	3-4	<1-14	1.0-1.5	<0.5	<0.5	<0.5-0.7	<0.1-0.6	<1	4.5-6.7
Union Valley	15	<1-18	1.1-1.4	<0.5	<0.5	0.6-0.9	<0.3-0.9	<0.4-3.7	5.0-8.2
Ice House	17-23	<1-24	0.9-1.3	<0.5	<0.5	<0.5-1.0	<1	<0.4-<1.0	4.5-8.0
Junction	3	<1-18	1.2-1.4	<0.5	<0.5	0.8-1.0	0.3-0.9	<0.4-1.6	6.4-8.7
Camino	3	<1-8	1.4-1.5	<0.5	<0.5-0.5	0.7-1.0	0.4-1.1	0.5-1.6	6.4-9.2
Brush Creek	4	<1-22	1.7-2.3	0.6-0.8	<0.5-0.5	1.0-1.5	0.6-1.2	0.4-1.6	8.4-14.0
Slab Creek	6-8	10-28	1.5-3.0	<0.5-0.8	<0.5-0.5	1.3-1.9	1.2-2.5	<0.4-<1.2	5.6-12.0
Chili Bar	7-9	6-22	2.0-3.5	<0.5-1.0	<0.5-0.6	1.2-2.1	1.2-1.6	<0.4-1.1	1-13.0
REACHES									
Upper Elevation	30-36	<1-30	<0.5-3.0	<0.5-0.8	<0.5	<0.5-2.2	<0.1-0.7	<0.4-1.2	1.6-14.0
Middle Elevation	42-48	<1-66	0.8-5.4	<0.5-1.8	<0.5-1.1	0.6-3.9	<0.5-5.2	<0.4-2.1	5.1-26.0

Table 4.3.1-11. Range of total dissolved solids (TDS), calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), chloride (Cl), sulfate (SO_4) and total alkalinity (TA) values in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the Fall Turnover and First Major Rain events in 2002 and Spring Runoff and Summer Low Flow events in 2003.

Locations	Number of Samples[1]	TDS (mg/l)	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	Cl (mg/l)	SO_4 (mg/l)	TA (mg/l)
Lower Elevation	19-25	6-114	1.5-5.2	<0.5-2.4	<0.5-0.8	1.0-2.7	<0.1-1.8	<0.4-2.2	6.6-24.0
Reach Downstream of Chili Bar	9-13	<1-68	2.0-15.0	<0.5-9.9	<0.5-1.6	1.3-17.0	<0.1-14.0	<0.4-12.0	9.6-28.0, 110.0

[1] For a range of samples, the lower number indicates all parameters were analyzed and the higher number indicates the number of times a reduced set of parameters were analyzed for that sampling location.

As observed in Table 4.3.1-11, the concentration of TDS in the surface waters in the vicinity of the Projects is less than the Basin Plan Salinity Water Quality Objective of 125 mg/l.

4.3.1.6 Temperature

The Basin Plan contains one Water Quality Objective for Temperature. The portion of the Objective that pertains to the waters in the vicinity of the Projects is:

> The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses.
>
> At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5°F [3.1° C] above natural receiving water temperature.

In determining compliance with water quality objectives for temperature, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. Note that during the June 14, 2004, Aquatic TWG meeting, the SWRCB and CDFG said they normally do not apply this specific Temperature Water Quality Objective to hydro-relicensings. This may be due to the fact that comparison of the Temperature Water Quality Objective to surface water in the vicinity of the Projects is difficult for two reasons. First, in many instances and especially in summer, releases or spills from the dams may constitute all the flow in the "receiving water," limiting the ability to measure the effect of the dam release on the receiving water's temperature. Second, the Projects have already modified "natural receiving water temperature" throughout the basin, so it may be difficult, if not impossible, to measure quantitative changes to "natural receiving water." Similar regulatory challenges exist in low-flow or effluent-dependent water bodies. Thus, the SWRCB has endorsed evaluating qualitatively whether an activity has an adverse affect on existing beneficial uses, rather than rely on a quantitative analysis of temperature increases. SWRCB Order WQO 2002-0015 and 2002-0016.

For this reason, it is important to note that no federal or State of California threatened or endangered aquatic species occur in the UARP reaches or the Reach Downstream of Chili Bar. The only special-status aquatic species that occur besides trout (a Forest Service Management Indicator Species, or MIS) is hardhead and foothill yellow-legged frog. Both of these species are California species of concern (referred to as "CSC" in this technical report), an administrative term applied by the CDFG to special concern species because CDFG believes that the species are vulnerable to extinction due to declining populations, limited range and/or continued threats. The designation offers no legal protection to the species. In addition, the foothill yellow-legged frog is a federal species of concern (referred to as "FSC" in this technical report). This, too, is a term-of-art and offers no legal protection to the species. FSC species are established by the USFWS and may include species that were former category 2 candidates for listing under the ESA, are included on state list of protected species, and are identified as imperiled by State Natural Heritage Programs or one of many conservation organizations. Hardhead are found in the SFAR Reach and downstream portion of Slab Creek Dam reach (both warmwater sections) and in the Slab Creek and Chili Bar reservoirs (*Stream Fisheries Technical Report*, DTA and Stillwater 2005a). Foothill yellow-legged frogs were found in the SFAR (coolwater) and Camino Dam (coldwater/coolwater) reaches. (*Amphibian and Aquatic Reptiles Technical Report*, DTA and Stillwater 2005b.)

An explanation of water temperature data collected during the relicensing studies and corresponding analysis is set forth in *Water Temperature Technical Report* (DTA 2005a).

4.3.1.7 Turbidity

The Basin Plan contains one Water Quality Objective for Turbidity. The portion of the Objective that pertains to the waters in the vicinity of the Projects is:

> Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:
>
> - Where natural turbidity is between 0 and 5 NTUs, increases shall not exceed 1 NTU.
> - Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20%.

Turbidity is the inverse of water clarity (most often measured in NTUs) which is based on a logarithmic scale.

In this case, the Turbidity Objective is difficult to apply; therefore, the Licensees performed a more general evaluation.

Limited turbidity data has been recorded since the mid-1990s at three locations in the Slab Creek reach. The monitoring was established in response to the 1992 Cleveland Fire and low reservoir elevation that resulted in turbid water in the SFAR below Slab Creek Dam. Monitoring is not

recorded during the winter season (usually November 15 through July 1). Exceedences above 25 NTUs result in an alarm in the Energy Management System (EMS), which is followed by a field investigation to determine the cause of elevated turbidity. Annual reports of the monitoring are provided to California Department of Fish and Game following each reporting period. In a typical water year, the majority of days have turbidity readings of 0.1 to 1.0 NTUs; a dozen or so days have levels of not more than 2 NTUs. Occasionally levels may reach as high as 14-15 NTUs. Alarm situations are rare.

Turbidity monitoring was also done during SMUD's November 2, 1992 sampling at Slab Creek Reservoir when turbidity ranged from 1 to 3 NTUs.

During the water quality sampling effort conducted during 2002 and 2003, the Licensees measured turbidity on 248 occasions (Table 4.3.1-12).

Table 4.3.1-12. Range of turbidity values in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during 2002 Fall Turnover and First Major Rain events and 2003 Spring Runoff and 2003 Summer Low Flow events.

Location	Number of Samples	Range of Turbidity Values NTU
RESERVOIRS		
Rubicon	1	0.7
Rockbound	1	0.2
Buck Island	1	2.4
Loon Lake	11	0.3-0.5
Gerle Creek	3	0.4-0.6
Union Valley	15	0.5-1.2
Ice House	17	0.7-2.3
Junction	3	0.4-1.2
Camino	3	0.4-1.2
Brush Creek	4	0.5-0.9
Slab Creek	6	0.7-2.0
Chili Bar	7	0.8-2.4
REACHES		
Upper Elevation	22	0.1-0.7
Middle Elevation	42	0.1-2.0, 42.0
Lower Elevation	18	0.3-6.4
Reach Downstream of Chili Bar	9	0.7-5.4

Based on this sampling, the Licensees characterized turbidity as low for all reaches and reservoirs, as shown in Table 4.3.1-12. The single outlier value of 42 NTU occurred at South Fork Silver Creek upstream of Ice House Reservoir, a non-Project affected reach, on November 26, 2002 during the First Major Rain sampling event.

4.3.2 Narrative Water Quality Objectives

4.3.2.1 Biostimulatory Substances

The Basin Plan contains one Water Quality Objective for Biostimulatory Substances, which states:

> Water shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses.

Biostimulatory substances are primarily nitrogen, phosphorus and carbon in forms that can be utilized by aquatic life. Nitrogen is usually measured as nitrate-nitrite, ammonia and total Kjeldahl nitrogen (in mg/l). Nitrogen enters a watercourse naturally in rain. The nitrate form results from normal decomposition of organic matter and is a common form in which nitrogen is added to fertilizer. In rivers with little human activity, total nitrogen is around 0.12 mg/l with nitrate representing about 85 percent of the nitrogen. Ammonia, the form of nitrogen that can readily be utilized by plants, occurs as a result of organic decomposition. Ammonia is converted to nitrate in the presence of oxygen. Total Kjeldahl nitrogen is the total concentration of nitrogen present as ammonia or bound in organic compounds. In lakes and reservoirs, nitrogen form is closely related to redox potential (E_h). Where E_h is about 500 millivolts (mV), DO is at about 100 percent saturation, and nitrate predominates. As E_h falls to about 450-300 mV, ammonia is favored over nitrate or nitrite.
Phosphorus is usually measured as total phosphorus and dissolved ortho-phosphate (in mg/l). Phosphorus enters a watercourse naturally by runoff in the watershed and by release from sediments under anaerobic conditions (e.g., anoxic hypolimnions). Total phosphorus measures the total amount of phosphorus both biologically available and bound in organic compounds. In lakes, a nitrogen-to-phosphorus ratio greater than 16:1 indicates that phosphorous, rather than nitrogen, is limiting for production, which is typical in oligotrophic lakes in the Sierras. Phosphorus can be released from sediments under anaerobic conditions (e.g., anoxic hypolimnia), which could increase tailrace and reservoir production.

Carbon is usually measured as total organic carbon in mg/l, and enters the watershed due to runoff and primary production in the watercourse.

In addition, Secchi depth (normally measured in feet or meters) can be a useful indicator of biostimulation in reservoirs since algal blooms reduce water clarity. As a general rule, Secchi depth is about one-third the depth of the euphotic zone (the depth to which light dims to about 1% of the surface, and can be used by phytoplankton for primary production) (Horne and Goldman 1994).

The Licensees are unaware of any historic biostimulatory substances data in the vicinity of the Projects other than those collected by the SWRCB from 1959 through 1961 during construction of the Union Valley and Ice House dams and by SMUD in November 1992, as described in Section 4.3.1.2. All the nitrate values measured by the SWRCB fell between 0 and 1.2 mg/l except for values downstream of the Ice House Dam construction in August 1959 (8.5 mg/l),

September 1959 (16.0 mg/l) and October 1959 (7.2 mg/l). Nitrate and ammonia measurements by SMUD in November 1992 were less than 0.01 and 0.02 mg/l, respectively.

In 2002 and 2003, the Licensees collected 210 water quality samples from the UARP reservoirs and reaches and the Chili Bar Reservoir and Reach Downstream of Chili Bar and measured the concentrations of total phosphorus, ortho-phosphorus, total Kjeldahl nitrogen, nitrate-nitrite, ammonia and total organic carbon in each of these. In addition, the Licensees took Secchi depth readings in the UARP reservoirs and the Chili Bar Reservoir. These data are presented in Table 4.3.2-1.

Table 4.3.2-1. Range of total phosphorus (P), ortho-phosphorus (PO_4), total Kjeldahl nitrogen (TKN), nitrate-nitrite (NO_3-NO_2), ammonia (NH_3) and total organic carbon (TOC) in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the 2002 Fall Turnover and First Major Rain events and 2003 Spring Runoff and Summer Low Flow events. Mean Secchi depth is also provided. Numbers following a comma are abnormal values that were above the typical range for the parameter.

Location	Number of Samples[1]	P (mg/l)	PO_4 (mg/l)	TKN (mg/l)	NO_3-NO_2 (mg/l)	NH_3 (mg/l)	TOC (mg/l)	Mean Secchi (m)
RESERVOIRS								
Rubicon	2-3	<0.01-0.03	<0.01	0.39-0.51	<0.02	<0.05, <0.1	2.4-2.7	2.0
Rockbound	2-4	<0.01-0.01	<0.01	0.17-0.24	<0.02	<0.05, <0.1-0.08	1.3-1.5	9.2
Buck Island	2-3	<0.01-0.01	<0.01	0.24-0.32	<0.02	<0.05, <0.1-0.07	1.8-2.1	7.3
Loon Lake	8-14	<0.01-0.02	<0.01	0.12-0.27	<0.02-0.03	<0.05, <0.1-0.08	1.4-1.6	10.7
Gerle Creek	2-4	<0.01	<0.01	<0.10-0.27	<0.02	<0.05, <0.1-0.07	1.2-1.5	7.4
Union Valley	11-15	<0.10, <0.01-0.04	<0.01-0.07	0.12-0.30	<0.02-0.03	<0.05, <0.1-0.07	1.8-2.0	6.7
Ice House	8-23	<0.01-0.02	<0.01-0.29	<0.1-0.24	<0.03-0.13	<0.05, <0.1-0.12	1.6-2.1	6.0
Junction	2-3	<0.01, <0.10	<0.01, <0.1	0.11-0.19	<0.02-0.03	<0.05, <0.1	1.8-2.3	6.4
Camino	2-3	<0.01, <0.1	<0.01-0.02	<0.1-0.15	<0.02-0.14	<0.05, <0.1	1.3-2.8	3.3
Brush Creek	3-4	<0.10-0.05	<0.01-0.01	0.12-0.32	<0.02	<0.05, <0.1	<1.0-1.4	7.8
Slab Creek	4-8	<0.10, <0.01-0.05	<0.01-0.01	0.19-0.44	<0.02-0.11	<0.05, <0.10	1.1-1.6	4.9
Chili Bar	5-9	<0.10, <0.01-0.06	<0.01-0.03	0.16-0.33	<0.02-0.16	<0.05, <0.1	1.2-1.6	4.3
REACHES								
Upper Elevation	18-36	<0.01-0.03	<0.01-0.011	0.1-0.4	<0.02-0.28	<0.05, <0.1-0.07	1.1-2.7	-----
Middle Elevation	27-45	<0.01-0.04	<0.01-0.27	<0.1-0.39	<0.02-0.29, 3.0	<0.05-0.05, <0.10	<1.0-5.1	-----

Table 4.3.2-1. Range of total phosphorus (P), ortho-phosphorus (PO_4), total Kjeldahl nitrogen (TKN), nitrate-nitrite (NO_3-NO_2), ammonia (NH_3) and total organic carbon (TOC) in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during the 2002 Fall Turnover and First Major Rain events and 2003 Spring Runoff and Summer Low Flow events. Mean Secchi depth is also provided. Numbers following a comma are abnormal values that were above the typical range for the parameter.

Location	Number of Samples[1]	P (mg/l)	PO_4 (mg/l)	TKN (mg/l)	NO_3-NO_2 (mg/l)	NH_3 (mg/l)	TOC (mg/l)	Mean Secchi (m)
Lower Elevation	11-23	<0.01-0.03	<0.01-0.03	0.12-0.55	<0.02-0.17	<0.05-0.05 <0.1	<1-2	-----
Reach Downstream of Chili Bar	6-13	<0.01-0.22	<0.01-0.02	<0.1-0.29, 1.5	<0.02-0.05	<0.05, <0.1	1.0-1.7	-----

[1]For a range of samples, the lower number indicates all parameters were analyzed and the higher number indicates the number of times a reduced set of parameters were analyzed for that sampling location.

These data suggest that the concentration of these biostimulatory substances are generally low, with nitrate concentrations well below the 1.0 mg/l nitrate standard typically used to characterize source waters that can stimulate algae growth.

In addition, the Licensees are unaware of any instances of aquatic growths in the UARP reservoirs and reaches, Chili Bar Reservoir or Reach Downstream of Chili Bar that caused a nuisance or adversely affect beneficial uses, except for possibly in the Reach Downstream of Chili Bar. Bill Center from Camp Lotus and Stafford Lehr of CDFG have reported in the past that, prior to 1997, algal blooms were common in the summer in the Reach Downstream of Chili Bar and were perceived by many recreationists as a problem. The Licensees are unaware of any water quality sampling or narrative records related to this reported occurrence.

In addition, Stafford Lehr reported that there appeared to be an unusual amount of diatomaceous algae in the Junction Dam Reach.

Classification of the UARP reservoirs and the Chili Bar Reservoir by trophic status supports the finding that production is low in the reservoirs. Based on Secchi depth, nitrogen and phosphorus readings, the reservoirs range in trophic status from mesotrophic (moderate nutrient input and organic production) represented best by Chili Bar Reservoir, to oligotrophic (low in nutrient input with low organic production) represented best by Junction Reservoir (Table 4.3.2-2).

Table 4.3.2-2. Trophic Status Index (TSI) based on Secchi Disk, Total Phosphorus, and Total Nitrogen for UARP and Chili Bar Reservoirs, 2002-2003.

Reservoir	TSI Secchi Disk[1]	TSI Total Phosphorus	TSI Total Nitrogen
Rubicon	**[2]	Meso-Oligotrophic	Mesotrophic
Rockbound	Oligotrophic	Oligotrophic	Meso-Oligotrophic
Buck Island	Meso-Oligotrophic	Meso-Oligotrophic	Meso-Oligotrophic
Loon Lake	Oligotrophic	Meso-Oligotrophic	Meso-Oligotrophic
Gerle Creek	Meso-Oligotrophic	Oligotrophic	Oligotrophic
Ice House	Meso-Oligotrophic	Meso-Oligotrophic	Oligotrophic

Table 4.3.2-2. Trophic Status Index (TSI) based on Secchi Disk, Total Phosphorus, and Total Nitrogen for UARP and Chili Bar Reservoirs, 2002-2003.

Reservoir	TSI Secchi Disk[1]	TSI Total Phosphorus	TSI Total Nitrogen
Union Valley	Meso-Oligotrophic	Meso-Oligotrophic	Meso-Oligotrophic
Junction	Meso-Oligotrophic	Oligotrophic	Oligotrophic
Camino	**[3]	Oligotrophic	Oligotrophic
Brush Creek	Meso-Oligotrophic	Mesotrophic	Meso-Oligotrophic
Slab Creek	Meso-Oligotrophic	Mesotrophic	Meso-Oligotrophic
Chili Bar	Mesotrophic	Mesotrophic	Meso-Oligotrophic

1. It should be noted that Secchi depth readings are dependent on other conditions such as cloud cover, wind and rain.
2. Secchi disk was on bottom at Rubicon Reservoir during all sampling events (<3.0 m).
3. One sampling event for Secchi depth at Camino Reservoir.

4.3.2.2 Color

The Basin Plan contains one Water Quality Objective for Color, which states:

> Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses.

The Aquatic TWG did not require that the Licensees directly measure color, and the Licensees are unaware of any instances where the color of the water in the vicinity of the Projects has been reported as a potential problem.

4.3.2.3 Floating Material

The Basin Plan contains one Water Quality Objective for floating material, which states:

> Water shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses.

The Aquatic TWG did not require that the Licensees directly measure floating material, and the Licensees are unaware of any instances where floating material in the vicinity of the Projects has been reported as a potential problem. Note that, as required in the current FERC license for the Projects, the Licensees are required to keep all reservoirs free of floating material.

4.3.2.4 Oil and Grease/MTBE

The Basin Plan contains one Water Quality Objective for Oil and Grease, which states:

> Water shall not contain oils, greases, waxes or other material in concentrations that cause nuisance, result in visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.

Oils, greases, waxes or other material that can result in a visible film or coating of material in water can be measured as oil and grease (mg/l), gasoline range organics (mg/l), Methyl-t-butyl ether or MTBE (µg/l) and total petroleum hydrocarbons or TPH (µg/l).

The Licensees sampled for oil and grease in all reservoirs during fall turnover and spring sampling periods, and in all reservoirs and stream reaches in the summer. Although, sampling from the reservoir hypolimnia was excluded for oil and grease; as requested by the SWRCB, the hypolimnion was sampled for MTBE. During the sampling events, no evidence of surface sheens that might indicate the presence of oil or grease was observed. All 136 samples analyzed by the Licensees were below the reporting limit of 5 mg/l for oil and grease (Table 4.2.3-3).

Table 4.3.2-3. Summary of Selected Organic Compounds, UARP and Chili Bar, 2002-2003.

Reservoir & Stream	Oil & Grease (mg/l)	MTBE (μg/l)	Gasoline Range Organics (mg/l)	Total Petroleum Hydrocarbons (μg/l)
Number of Samples	136	84	70	14
Percent of Samples Below Reporting Limit	100%	100%	100%	100%
Reporting Limit	<5	<0.5	<0.05	<1

During the fall and spring sampling, the Licensees sampled MTBE from reservoirs on which the use of boat engines is permitted. These included Loon Lake, Union Valley, Ice House and Slab Creek reservoirs. During the summer low flow sampling, the Licensees obtained samples for MTBE from all sampling-sites (reservoir and stream reaches). All 84 samples analyzed by the Licensees were below the reporting limit of <0.5 μg/l for MTBE (Table 4.3.2-3). For comparison, present water quality goals for drinking water (primary maximum contaminant limit) is 13 μg/l (SWRCB 2003).

Total petroleum hydrocarbons were sampled at all reservoir-sites with boat use during the fall turnover and spring sampling events. Gasoline Range Organics were sampled at all sites during the summer sampling. All samples for both parameters were below the reporting limit set at 1.0 μg/l for TPH and 0.05 mg/l for Gasoline Range Organics (Table 4.3.2-3).

4.3.2.5 Pesticides

The Basin Plan includes a lengthy Water Quality Objective for pesticides. However, the Aquatic TWG did not require that the Licensees collect and analyze water quality samples for pesticides. The Licensees would not expect pesticides to be present in the surface waters upstream of Slab Creek Dam Reach since most of this watershed is remote, with little urbanization. The watershed from downstream portion of Slab Creek Dam Reach to Folsom Reservoir receives runoff from urban and commercial areas and pesticides may be present. However, the Licensees do not use pesticides in the operation and maintenance of the Projects, and it is unlikely that the operation of the Projects in any way contribute to pesticides concentration in surface waters.

4.3.2.6 Radioactivity

The Basin Plan includes a lengthy Water Quality Objective for Radioactivity. As with pesticides, the Aquatic TWG did not require that the Licensees collect and analyze water quality samples for radioactivity. The Licensees would not expect radioactivity to be present in the

surface waters in the vicinity of the Projects since there are no known sources of radioactivity in the watershed.

4.3.2.7 Sediment

The Basin Plan contains one Water Quality Objective for sediment, which states:

> The suspended sediment load and suspended sediment discharge of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.

In 2002 and 2003, the Licensees collected 208 water quality samples from the UARP reservoirs and reaches and the Chili Bar Reservoir and Reach Downstream of Chili Bar and measured the concentrations of total suspended sediment (TSS) in each of these. In addition, the Licensees recorded Secchi depth readings in the UARP reservoirs and the Chili Bar Reservoir. These data are presented in Table 4.3.2-4.

Table 4.3.2-4. Range of Total Suspended Sediment (TSS) values in UARP reservoirs and reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar based on sampling during 2002 Fall Turnover and First Major Rain events and 2003 Spring Runoff and Summer Low Flow events.

Location	Number of Samples	Range of Total Suspended Sediment Values mg/l
RESERVOIRS		
Rubicon	3	<1-2
Rockbound	4	<1
Buck Island	3	<1
Loon Lake	14	<1
Gerle Creek	4	<1
Union Valley	15	<1-2
Ice House	23	<1-4
Junction	3	<1-2
Camino	3	<1
Brush Creek	3	<1
Slab Creek	7	<1-2
Chili Bar	9	<1-4
REACHES		
Upper Elevation	36	<1-4,18[1]
Middle Elevation	45	<1-6
Lower Elevation	23	<1-2
Reach Downstream of Chili Bar	13	<1-6

[1] Value is above the typical range for the parameter.

Based on this sampling, the Licensees characterized turbidity as low for all reaches and reservoirs, as shown in Table 4.3.2-4. A single outlier value of 18 mg/l occurred on September 17, 2003 on the Rubicon River at the outflow from Rubicon Reservoir. The TSS data is available in Appendix A for each sampling event.

TSS is also related to turbidity, which was also characterized as low, as discussed in Section 4.2.1-7. The Licensees also evaluated project-related sources of sediment in a separate study which identified a limited number of road areas that may require more than normal maintenance to mitigate these areas as potential sources of sediment to project watercourses (Project Sources of Sediment Technical Report, DTA 2005b). Another sediment-related study conducted by the Licensees was a broad geomorphic characterization of the stream reaches affected by the two projects, including the Reach Downstream of Chili Bar (*Channel Morphology Technical Report,* DTA and Stillwater 2005c).

4.3.2.8 Settleable Material

The Basin Plan contains one Water Quality Objective for Settleable Material, which states:

> Waters shall not contain substances in concentrations that result in the deposition of material that causes a nuisance or adversely affects beneficial uses.

The Licensees are not aware of any settleable material in the project-related reaches or reservoirs or of any project-related operations that result in settleable material that could adversely affect beneficial uses. No samples were collected for settleable material.

4.3.2.9 Suspended Material

The Basin Plan contains one Water Quality Objective for Suspended Material, which states:

> Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.

The Licensees are not aware of any suspended material in the project-related reaches or reservoirs or of any project-related operations that result in suspended material that could adversely affect beneficial uses. No samples were collected for suspended material; however, the Licensees sampled for turbidity and TSS that are related to suspended material. Turbidity and TSS were both characterized as low in project-affected reservoirs and reaches. Turbidity is discussed in Section 4.2.1-7 and TSS is discussed above in this section.

4.3.2.10 Tastes and Odor

The Basin Plan contains one Water Quality Objective for Tastes and Odor, which states:

> Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.

While no specific criteria attach to this Water Quality Objective, taste and odor criteria are concurrently addressed by Secondary MCLs incorporated by reference via the Chemical

Constituents Water Quality Objective. As discussed in Section 4.3.1, the Licensees analyzed for 5,005 metal values and total cyanide values, of which only 20 of the sampling values (0.3%), three for aluminum and 17 for iron, were greater than the Secondary MCLs. Recall that an additional 46 lead values were above the Primary MCLs.

4.3.2.11 Toxicity

The Basin Plan contains one Water Quality Objective for Toxicity, which states, in part:

> All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analyses of indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests of appropriate duration or other methods as specified by the Regional Board. The Regional Board will also consider all material and relevant information submitted by the discharger and other interested parties and numerical criteria and guidelines for toxic substances developed by the State Water Board, the California Office of Environmental Health Hazard Assessment, the California Department of Health Services, the U.S. Food and Drug Administration, the National Academy of Sciences, and U.S. Environmental Protection Agency, and other appropriate organizations to evaluate compliance with this objective.

To examine whether surface water in the vicinity of the Projects is consistent with this objective, the Licensees examined potential toxicity to aquatic life, and bioaccumulation of metals in fish which could pose a human risk.

Toxicity to Aquatic Life

The USEPA, under 40 CFR § 131.38, has established Criterion Maximum Concentrations (CMC) and Criterion Continuous Concentrations (CCC) for freshwater aquatic life for 23 priority toxic pollutants for the State of California. While these criteria are not included into the Basin Plan directly, they might be inferred under the Toxicity Water Quality Objective. The USEPA (40 CFR § 131.38) defines CMC as the highest concentration to which aquatic life can be exposed for a short period of time without deleterious effects. In comparison, CCC is defined as the highest concentration to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. Both CMCs and CCCs are reported in micrograms per liter (µg/l) of dissolved metal concentrations. Ten of the 14 metals for which SMUD performed analyses have CMC and/or CCC values established under 40 CFR § 131.38. The criteria for six of the metals (cadmium, copper, lead, nickel, silver and zinc) are calculated values based on hardness of the water when the sample was collected since the concentration at which each of these metals is reportedly toxic to aquatic life is lower at lower hardness levels. CMC and CCC levels for these metals in 5 mg/l increments of hardness are presented in Table 4.3.2-5, calculated per 40 CFR § 131, to show the sensitivity of the CMC and CCC to variations in hardness for the six metals.

Table 4.3.2-5. USEPA CCC and CMC freshwater criteria for metals based on hardness. For further explanation and specific equations see 40 CFR §131.38 of the California Toxics Rule.			
Metal	**Hardness (mg/l)**	**Dissolved (µg/l)**	
		CCC	**CMC**
Cadmium	5	.21	0.15
	10	0.37	0.32
	15	0.50	0.50
	25	0.75	0.89
	50	1.30	1.95
Copper	5	0.69	0.80
	10	1.25	1.54
	15	1.77	2.25
	25	2.74	3.64
	50	4.95	6.99
Lead	5	0.06	1.43
	10	0.13	3.44
	15	0.22	5.77
	25	0.43	11.06
	50	1.04	26.72
Nickel	5	4.12	37.14
	10	7.41	66.75
	15	10.45	94.07
	25	16.10	144.92
	50	28.93	260.49
Silver[1]	5	NA	0.02
	10	NA	0.07
	15	NA	0.13
	25	NA	0.32
	50	NA	1.05
Zinc	5	9.33	9.26
	10	16.79	16.66
	15	23.68	23.48
	25	36.50	36.20
	50	65.66	65.13

1 Criterion for silver is based on the instantaneous maximum, not the CMC.

40 CFR § 131.38 provides absolute criteria (i.e., not calculated as a function of hardness) for arsenic, selenium and cyanide. The 40 CFR § 131.38 CCC and CMC values for mercury as well as CMC values for selenium are "reserved" (i.e., not established by 40 CFR § 131.38 at this time). These criteria are shown in Table 4.3.2-6.

Table 4.3.2-6. USEPA CCC and CMC freshwater criteria for metals and cyanide whose toxicity is not a function of hardness. SOURCE: 40 CFR § 131.38 of the California Toxics Rule.		
Parameter	**Dissolved (µg/l)**	
	CCC	**CMC**
Arsenic	150	340
Mercury	Reserved	Reserved

Table 4.3.2-6. USEPA CCC and CMC freshwater criteria for metals and cyanide whose toxicity is not a function of hardness. SOURCE: 40 CFR § 131.38 of the California Toxics Rule.		
	Dissolved (µg/l)	
Parameter	CCC	CMC
Selenium	5.0	Reserved
Cyanide	5.2	22.0

In 2004 water samples from UARP reservoirs, UARP project and non-Project reaches, Chili Bar Reservoir and Reach Downstream of Chili Bar were analyzed for six dissolved metal concentrations (cadmium, copper, lead, nickel, silver and zinc) and hardness. During the 2004 spring, summer and fall sampling events, SMUD collected 56, 64, and 65 water samples, respectively, and analyzed them for dissolved metals for comparison to CCC and CMC criteria. The percent of samples during 2004 measured as dissolved metal concentrations that exceeded the dissolved CCC/CMC criteria are summarized in Table 4.3.2-7. Hardness in UARP reservoirs and Chili Bar Reservoir ranged from approximately 1-9 mg/l. The percent of UARP reservoir samples that exceeded the CCC and/or CMC ranged from 21.7 percent of copper samples, 2.9 percent of cadmium and silver samples (CMC only for silver) to zero percent of nickel or zinc samples exceeding either criteria (Table 4.3.2-7). The percent of Chili Bar Reservoir samples that exceeded the CCC and/or CMC ranged from 50 percent of copper samples, 16.2 percent of zinc samples, 12.5 percent of cadmium samples to zero percent of nickel or silver samples. One snow sample was analyzed in 2004 and it exceeded the CCC and CMC for cadmium, copper, and lead.

Reservoir lead results are not included in Table 4.3.2-7 because the Kemmerer water sampler used to for reservoir sampling in 2004 was confirmed to be a source of lead contamination. The history regarding reservoir sampling devices is as follows. In 2002, reservoir samples were collected using a rented Van Dorn sampler and none of 2002 reservoir samples exceeded MCLs for any metals. In 2003, SMUD purchased, rather than rented, a Van Dorn sampler. Laboratory analysis of the 2003 reservoir samples resulted in a substantial increase in mercury concentrations compared to 2002. To evaluate the potential sources of increased mercury levels from 2002 to 2003, SMUD contacted the supplier of the Van Dorn sampler to inquire about the sampler as a possible source of mercury since elevated mercury levels were present only in 2003 reservoirs samples and not in any reaches. The supplier confirmed that the sampling cups sold for use with the Van Dorn sampler at that time were a source of mercury. To avoid further equipment-related contamination of reservoir samples, the Licensee purchased a new Kemmerer sampler for use in collecting reservoir samples during 2004. Laboratory analysis of 2004 reservoir samples collected with the new sampler show that mercury concentrations decreased to levels similar to that found in streams, however, lead concentrations increased significantly, exceeding the MCL for lead for the first time. A quality-assurance sample collected in the field (i.e., de-ionized-water rinse of the new Kemmerer sampler) during the 2004 spring sampling event yielded a lead concentration of 7.7 µg/l, which suggested the source of elevated lead concentrations in 2004 reservoir samples to be the new Kemmerer sampler. The Kemmerer sampler has since undergone laboratory testing and analysis to confirm this. The laboratory report is attached in Appendix D. Additional evidence to support this observation is that all

riverine samples collected below reservoirs have lead concentrations that range from non-detect to 0.3 µg/l, well below MCL limits. Collection of riverine sampling entails filling sample bottles directly from the stream and therefore does not require the use of the Kemmerer depth sampler. If lead concentrations were truly elevated in the reservoirs, as suggested by the 2004 analytical data, then 2004 riverine samples collected just below the dams should have similar lead concentrations as found in the reservoirs, but this is not the case (i.e., lead results for riverine samples are about four orders of magnitude less than the reservoir samples, and well below MCL limits).

Hardness in UARP Project-affected reaches and non-Project reaches ranged from approximately 1-20 mg/l. Hardness in the Reach Downstream of Chili Bar ranged from approximately 7.4 - 12 mg/l. The percent of UARP project reach samples that exceeded the CCC and/or CMC ranged from 33 percent of lead samples to 16.6 percent of copper, 4.5 percent of zinc, 1.5 percent of silver (CMC only), 1.5 percent of cadmium samples to zero percent of nickel samples exceeding either criteria (Table 4.3.2-7). The percent of non-Project reach samples exceeding the CCC and/or CMC ranged from 33 percent of lead samples (CCC only), 3.3 percent of copper, and 6.6 percent of silver (CMC only) samples to zero percent of cadmium, nickel and zinc samples (Table 4.3.2-7). One snow sample was anlyzed in 2004 and it exceeded the CCC and CMC for cadmium, copper, and lead. The percent of samples in the Reach Downstream of Chili Bar exceeding the CCC and/or CMC criteria ranged from 33.3 percent of copper samples and 11 percent of lead samples, to zero percent of cadmium, nickel and zinc samples.

Table 4.3.2-7. Total number of 2004 samples (measured as dissolved concentrations) that exceedthe CCC or CMC criteria for cadmium, copper, lead, nickel, silver, and zinc in UARP Reservoirs and Reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar.

Metal	Number of Samples Exceeding CCC	Number of Samples Exceeding CMC	Total Samples	Percent of Samples Exceeding CCC/CMC
Reservoirs				
UARP Reservoirs				
Cadmium	2	2	69	2.9/2.9
Copper	15	15	69	21.7/21.7
Lead[1]	--	--	69	
Nickel	0	0	69	0/0
Silver	NA	2	69	NA/2.9
Zinc	0	0	49	0/0
Chili Bar Reservoir				
Cadmium	1	1	8	12.5/12.5
Copper	4	4	8	50/50
Lead[1]	--	--	8	
Nickel	0	0	8	0/0
Silver	NA	0	8	NA/0
Zinc	1	1	6	16.2/16.2

Table 4.3.2-7. Total number of 2004 samples (measured as dissolved concentrations) that exceedthe CCC or CMC criteria for cadmium, copper, lead, nickel, silver, and zinc in UARP Reservoirs and Reaches and in Chili Bar Reservoir and the Reach Downstream of Chili Bar.				
Metal	**Number of Samples Exceeding CCC**	**Number of Samples Exceeding CMC**	**Total Samples**	**Percent of Samples Exceeding CCC/CMC**
Riverine				
UARP Project Affected Reaches				
Cadmium	1	3	66	1.5/4.5
Copper	11	11	66	16.6/16.6
Lead	22	0	66	33.3/0
Nickel	0	0	66	0/0
Silver	NA	1	66	NA/1.5
Zinc	3	3	44	4.5/4.5
Non-Project Affected Reaches				
Cadmium	0	0	30	0/0
Copper	1	1	30	3.3/3.3
Lead	10	0	30	33.3/0
Nickel	0	0	30	0/0
Silver	NA	2	30	NA/6.6
Zinc	0	0	20	0/0
Reach Downstream of Chili Bar				
Cadmium	0	0	9	0/0
Copper	3	3	9	33.3/33.3
Lead	1	0	9	11.1/0
Nickel	0	0	9	0/0
Silver	NA	0	9	NA/0
Zinc	0	0	6	0/0

[1] Reservoir samples were contaminated with lead from the Kemmerer sampler and thus lead results showing exceeded values are not valid.

A complete listing of sample dates and locations for exceedences of the CCC and CMC for dissolved metals data are shown in Appendix A-50a for cadmium, copper and lead, and in Appendix A-50b for nickel, silver and zinc.

During the 2002 Fall, 2003 Spring, and 2003 Summer sampling events, the Licensees collected 64, 62, and 66 water samples, respectively, and analyzed them for hardness and for total recoverable concentrations of cadmium, copper, lead, nickel, silver, and zinc. The resulting total recoverable metal concentrations for 2002 and 2003 are compared below to the CCC and CMC criteria which are based on dissolved concentration criteria. Concentrations reported as total recoverable include both the dissolved and particulate fractions of a given metal analyte, therefore, this comparison of total recoverable metal concentrations versus dissolved metal criteria is likely to represent an overestimate of exceedences but is provided here as a

conservative indicator of potential CCC and CMC exceedences since dissolved metals data are unavailable for 2002 and 2003.

The percent of samples during 2002 and 2003 measured as total recoverable metal concentrations that exceeded the dissolved CCC/CMC criteria are summarized in Table 4.3.2-8. Hardness in UARP reservoirs and Chili Bar Reservoir during the 2002 and 2003 sampling events ranged from approximately 1-15 mg/l. The percent of UARP reservoir samples exceeding the CCC and/or CMC ranged from 35 percent of lead samples, 21.4 percent of silver (CMC only), and 11 percent of copper samples to zero percent of cadmium, nickel or zinc samples exceeding either criteria. The percent of Chili Bar Reservoir samples exceeding either or both criteria ranged from 22 percent for lead to zero percent for cadmium, copper, nickel, silver or zinc samples (Table 4.3.2-8).

Hardness in UARP Project-affected reaches, non-Project reaches and the Reach Downstream of Chili Bar ranged from approximately 2-20 mg/l. The percent of UARP Project reach samples exceeding the CCC/CMC criteria ranged from 29.5 percent of lead samples to 9.8 percent of copper, 4.2 percent of silver (CMC only), 3.3 percent of cadmium to zero percent of nickel or zinc samples exceeding either criteria (Table 5.3.1-18). The percent of non-project reach samples exceeding criteria ranged from 31.5 percent of lead samples to 10.5 percent of copper, 5.3 percent of cadmium to zero percent of nickel, silver or zinc samples exceeding either criteria (Table 4.3.2-8). The percent of samples from the Reach Downstream of Chili Bar that exceeded the CCC/CMC ranges from 23 percent of lead samples, 20 percent of copper samples and 15.3 percent of silver (CMC only) samples, to zero percent of cadmium, nickel or zinc samples.

Table 4.3.2-8. Total number of 2002-2003 samples (measured as total recoverable concentrations) of cadmium, copper, lead, nickel, silver, and zinc from UARP reservoirs and reaches and Chili Bar Reservoir and Reach Downstream of Chili Bar that exceed CCC or CMC criteria.

Metal	Number of Samples Exceeding CCC[1]	Number of Samples Exceeding CMC[1]	Total Samples	Percent of Samples Exceeding CCC/CMC[1]
Reservoirs				
UARP Reservoirs				
Cadmium	0	0	72	0/0
Copper	8	7	72	11.1/9.7
Lead	29	2	83	35/2.4
Nickel	0	0	72	0/0
Silver	NA	18	84	NA/21.4
Zinc	0	0	47	0/0
Chili Bar Reservoir				
Cadmium	0	0	7	0
Copper	0	0	7	0
Lead	2	0	9	22/0
Nickel	0	0	7	0/0
Silver	NA	0	9	NA/0
Zinc	0	0	5	0/0

Table 4.3.2-8.	**Total number of 2002-2003 samples (measured as total recoverable concentrations) of cadmium, copper, lead, nickel, silver, and zinc from UARP reservoirs and reaches and Chili Bar Reservoir and Reach Downstream of Chili Bar that exceed CCC or CMC criteria.**			
Metal	**Number of Samples Exceeding CCC[1]**	**Number of Samples Exceeding CMC[1]**	**Total Samples**	**Percent of Samples Exceeding CCC/CMC[1]**
		Riverine		
UARP Project Affected Reaches				
Cadmium	0	2	61	0/3.3
Copper	6	5	61	9.8/8.2
Lead	21	0	71	29.5/0
Nickel	0	0	61	0/0
Silver	NA	3	71	NA/4.2
Zinc	0	0	39	0/0
Non-Project Affected Reaches				
Cadmium	0	1	19	0/5.3
Copper	2	1	19	10.5/5.3
Lead	6	0	19	31.5/0
Nickel	0	0	19	0/0
Silver	NA	0	19	0/0
Zinc	0	0	10	0/0
Reach Downstream of Chili Bar				
Cadmium	0	0	10	0
Copper	2	1	10	20/10
Lead	3	0	13	23/0
Nickel	0	0	10	0/0
Silver	NA	2	13	NA/15.3
Zinc	0	0	5	0/0

[1] Total recoverable metal concentrations are compared to the dissolved CCC and CMC.

The complete listing of exceedences of total recoverable metal concentrations compared to the dissolved CCC and CMC are shown in Appendix A-51a for cadmium, copper and lead, and in Appendix A-51b for nickel, silver and zinc.

Bioaccumulation of Metals in Fish

There is no definitive standard for levels of metals concentrations in fish tissue that would pose a human health risk. However, the USEPA and the SWRCB have developed some informal guidelines. The USEPA's guidelines are in the form of screening values (SVs) related to recreational fishing (the form of fishing that occurs throughout the Projects area). One SV is for Target Analytes and one for Defining Green Areas (USEPA 2000). Both are measured as total concentration of metal in fish tissue (filet). The SV for Target Analytes is the *"…concentration of target analytes (in fish or shellfish tissue) that are of potential public health concern and that are used as threshold values against which levels of contamination in similar tissue collected*

from the ambient environment can be compared. Exceedence of these SVs should be taken as an indication that more intensive site specific monitoring and /or evaluation of human health risk should be conducted." (USEPA 2000). The SV for Defining Green Areas are used to denote areas for unrestricted fish consumption (USEPA 2000). In addition, the National Recommended Water Quality Criteria (USEPA 2002) provides a recommended human health-based criterion for mercury in fish tissue.

The SWRCB's guideline, called Maximum Tissue Residue Levels (MTRL), is similar to the USEPA's Target Analyte SV. The SWRCB uses MTRL as *"…alert levels or guidelines indicating water bodies with potential human health concerns, and are an assessment tool and not compliance or enforcement criteria."* (TSMP 1995). Like SVs, MTRLs are used for comparison to filet (edible tissue) samples only. Criteria for the USEPA and SWRCB guidelines are shown in Table 4.3.2-9.

Table 4.3.2-9. Criteria for trace metals in fish tissue (filet) from USEPA 2000 and 2002, and TSMP 1995.

Constituent	Concentration (ppm)
Arsenic – SV Recreational	0.026 (inorganic)
Arsenic – SV Green Area Recreational	0.026 (inorganic)
Arsenic – MTRL	0.2
Aluminum[1]	
Cadmium – SV Recreational	4.0
Cadmium – MTRL	0.64
Chromium[1]	
Copper[1]	
Lead[1]	
Mercury[2] – SV Recreational	0.4
Mercury[2] – SV Green Area Recreational	0.4
Mercury – MTRL	1.0
Mercury[2] – USEPA 2002	0.3 mg/kg (300 ng/g)
Manganese1	
Nickel – MTRL	28
Selenium – SV Recreational	20
Selenium – SV Green Area Recreational	20
Zinc[1]	

[1] No guideline criteria available from selected literature sources.
[2] Mercury levels for the EPA screening values are for methylmercury.

At least a moderate level of recreational fishing occurs at 6 of the 13 reservoirs: Loon Lake, Gerle Creek, Union Valley, Ice House, Slab Creek and Chili Bar. SMUD collected fish from these reservoirs and analyzed filets for metals covered by the USEPA SVs for recreation (arsenic, cadmium, mercury and selenium) and/or by the SWRCB MTRLs (arsenic, cadmium, mercury, and nickel). Of the 30 filets examined, none had metal concentrations equal to or greater than the SWRCB MTRL values. Two samples exceeded the USEPA SV of 0.026 ppm for arsenic; at Union Valley Reservoir (0.06 ppm) and Ice House Reservoir (0.16 ppm). Two samples exceeded the USEPA SVs for both the Target Analytes and Green Areas of 0.4 ppm for mercury, and three samples exceeded the National Recommended Water Quality Criteria

(USEPA 2002) of 0.3 ppm for mercury: at Gerle Creek Reservoir (brown trout, 0.32 ppm), Union Valley Reservoir (smallmouth bass, 0.42 ppm) and Slab Creek Reservoir (brown trout, 0.59 ppm). However, none of the mercury samples exceeded the SWRCB's MTRL (a value of 1.0 ppm of total mercury). The results of fish tissue metals analysis for the six Project reservoirs are shown in Table 4.3.2-10.

Table 4.3.2-10. Concentration of trace metals in the fillet tissue of fish from selected project reservoirs[1]. Values are reported in parts per million (ppm).

	Silver	Aluminum	Arsenic	Cadmium	Chromium	Copper
Loon Lake	<0.002	0.37	<0.02	0.0080	0.094	0.48
Gerle Creek	<0.002	<0.02	0.028[2]	0.0008[2]	0.093	0.52
Union Valley	<0.002	<0.02	0.06	<0.0004	0.086	0.47
Ice House	<0.002	<0.02	0.16	<0.0004	0.080	0.46
Slab Creek	<0.002	<0.02	<0.02	<0.0004	0.089	0.44
Chili Bar	<0.002	<0.02	<0.02	0.0013	0.066	0.39
	Manganese	**Nickel**	**Lead**	**Selenium**	**Zinc**	**Mercury**
Loon Lake	0.037	<0.001	<0.0004	0.32	4.92	0.137
Gerle Creek	0.0009[2]	<0.001	<0.0004	0.39	3.53	0.321
Union Valley	0.13	0.009	<0.0004	0.21	4.19	0.419
Ice House	0.12	<0.001	<0.0004	0.19	4.32	0.036
Slab Creek	0.012	<0.001	<0.0004	0.086	3.60	0.595
Chili Bar	<0.0006	<0.001	0.0043	0.14	8.05	0.075

1. < denotes the value is below the method detection limit.
2. Value is below the reporting limit but above the method detection limit.

The are no USEPA or SWRCB guidelines for metal concentrations in fish liver tissue. However, the Licensee performed liver-metals analysis for the same fish collected from the six Project reservoirs, and the results are included in Table 4.3.2-11.

Table 4.3.2-11. Concentration of trace metals in the fish liver tissue from selected project reservoirs. Values are parts per million (ppm).

	Silver	Aluminum	Arsenic	Cadmium	Chromium	Copper
Loon Lake	1.74	<0.02	0.38	0.62	0.139	87.8
Gerle Creek	1.86	6.55	1.19	0.83	0.121	126
Union Valley	0.013	21.2	0.12	0.64	0.161	4.11
Ice House	0.22	<0.02	0.099	0.025	0.156	35.3
Slab Creek	0.17	<0.02	0.038	0.029	0.09	9.74
Chili Bar	<0.002	<0.02	0.051	0.019	0.118	2.12
	Manganese	**Nickel**	**Lead**	**Selenium**	**Zinc**	**Mercury**
Loon Lake	1.11	0.015	<0.0024	9.14	25.0	No data
Gerle Creek	0.43	0.034	0.012	30.6	52.6	No data
Union Valley	0.97	<0.001	0.015	0.99	17.8	No data
Ice House	1.47	<0.001	0.0018	0.91	22.9	No data
Slab Creek	1.17	0.007	<0.0004	1.31	27.8	No data
Chili Bar	0.41	0.006	<0.0004	0.72	12.0	No data

5.0 OTHER RELATED STUDIES

5.1 Whitewater Boating Studies

The Licensee conducted three whitewater boating studies for relicensing purposes: on the Slab Creek Reach of the SFAR; on the Ice House Reach of the South Fork Silver Creek; and on the Camino Reach of the South Fork Silver Creek. During the three studies, water temperature, turbidity, and total suspended solids (TSS) were monitored before, during and after the whitewater boating releases. In addition, dissolved oxygen (mg/L) was monitored during the Camino Reach study. The results of water quality monitoring during the whitewater boating studies are summarized below.

5.1.1 Slab Creek Reach Whitewater Boating Flow Study

The 3-day study on the Slab Creek Reach was conducted on October 31, November 1 and 2, 2003, with whitewater flows set at three different levels: 616, 1,068 and 1,597 cfs. Four water quality monitoring sites were selected along the 8.0-mile long Slab Creek Reach. Increases in turbidity, TSS, and temperature were observed as the flows increased, and were followed by a decrease in turbidity and TSS as the flow stabilized at the peak daily flow. Temperature was observed to increase with increasing distance downstream during the study, ranging from an increase of approximately 3ºF at the upstream-most monitoring site to an increase of 4.7ºF at the downstream-most monitoring site. Turbidity, TSS and temperature decreased as the whitewater flows receded to normal base flows. However a rainstorm occurring the evening prior to and the first day of the study may have influenced the results of the study

The complete water quality results are available in Appendix I of the *Slab Creek Reach Whitewater Boating Flow Study Technical Report* (DTA and LBG, 2005a).

5.1.2 Ice House Dam Reach Whitewater Boating Flow Study

The Ice House Dam Reach study was conducted on May 1, 2004, and whitewater flows were set at approximately 400 cfs. Four water quality monitoring sites were selected along the 11.2-mile Ice House Reach. The monitoring sites located nearest to Ice House Dam experienced a small increase in turbidity and total suspended solids while the lower monitoring sites (i.e., in the Cleveland Fire burn area) showed significant increases in these two parameters. However, the total suspended solids and turbidity decreased as the whitewater flows peaked and as flows receded to normal base flows. Water temperature initially decreased as the test flows began (due to cold water releases from the low-level outlet) but temperature then slowly increased throughout the day with the elevated flows and with increasing distance from Ice House Dam increased due to the effects of diurnal solar heating.

The complete water quality results are available in Appendix I of the *Ice House Reach Whitewater Boating Flow Study Technical Report* (DTA and LBG, 2004).

5.1.3 Camino Reach Whitewater Boating Flow Study

The Camino Reach study was conducted between September 8th and 20th 2004, and whitewater flows were set at approximately 650 cfs during the whitewater boating flow study on September 15th. Three water quality monitoring sites were selected along the 9.0-mile Camino Reach. Samples collected directly below Camino Dam showed that the release did not greatly influence the turbidity near the dam. However, samples taken further downstream just below the Camino Adit and just above the SFAR and SFSC confluence did show significant increases in turbidity. With regards to total suspended solids, samples were taken at two of the three locations (i.e., below Camino Dam and at the Camino Adit site). The total suspended solids measured at the Camino Adit site were 1461% greater than those measured below the dam. Once the flows decreased after peak flows turbidity and total suspended solids returned to pre-boating flow values. There was little difference in the dissolved oxygen concentrations measured before, during, and after the boating flows. During the elevated flows the average water temperature dropped between 4 and 5ºF at the Camino Adit and SFAR and SFSC sample sites when compared to the average daily temperatures recorded before and after the study. At the Camino Dam site the average temperature remained consistent with the average temperatures recorded before and after the study. Upon the return of normal flows to the reach, the water temperature within the reach resumed its diurnal pattern.

The complete water quality results are available in Appendix G of the *Camino Reach Whitewater Boating Flow Study Technical Report* (DTA and LBG, 2005b).

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APPENDIX A

RAW LABORATORY DATA FOR THE WATER QUALITY STUDIES & MISCELLANEOUS RIVERINE DATA

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Appendix A-1. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Hydrolab and YSI Data							
Date	**Site Number**	**Site Name**	**Water Temperature (^{o}C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen (% Saturation)**	**pH**	**Specific Conductance (uS/cm)**
Riverine Sites							
10/7/02	2	Rubicon R. outflow from Rubicon Res	12.9	9.6	104.0	8.0	27.0
10/7/02	5	Rubicon Outflow from Rockbound Lake	13.2	9.8	107.0	7.1	18.0
10/7/02	6	Little Rubicon outflow from Buck Island Lake	13.9	9.5	104.0	7.2	19.0
10/8/02	7	Gerle Creek outflow from Loon Lake	13.1	Failed QA/QC		6.9	17.0
10/8/02	14	Gerle Creek inflow to Gerle Creek Reservoir	12.1	8.4	98.0	6.9	22.0
10/8/02	15	Gerle Creek outflow from Gerle Creek Reservoir	12.8	8.2	98.1	6.8	24.0
10/8/02	16	Gerle Creek Canal inflow to Robb's Forebay	14.3	7.9	98.3	6.9	27.0
10/8/02	20	South Fork Rubicon upstream of Rubicon River.	11.8	8.9	98.7	7.0	28.0
10/9/02	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	11.4	10.3	99.1	7.0	18.5
10/9/02	46	South Fork American River below Rock Creek	12.2	10.8	100.0	7.9	49.0
10/10/02	47	South Fork American River downstream of White Rock Powerhouse	11.1	11.9	108.0	7.7	32.0
10/9/02	48	SFAR below Chili Bar Dam	11.4	11.3	103.3	7.6	39.0
10/9/02	51	South Fork American River at Coloma Gage Stn.	12.7	11.4	107.5	7.3	45.0
10/10/02	54	South Fork American River downstream of Hiway 49 Bridge	13.7	11.2	108.2	7.4	45.0
Triage Sites							
10/7/02	1	Rubicon River Inflow to Rubicon Reservoir	No Sampling, river dry				
10/7/02	3a	Fox Lake reach flow from Rubicon Reservoir	No Sampling, river dry				
10/7/02	4	Highland inflow to Rockbound Res.	No Sampling, river dry				
10/8/02	17	South Fork Rubicon R. inflow to Robb's Forebay	16.3			6.7	55.0
10/9/02	42	Slab Creek Inflow to Slab Creek Reservoir	12.5	9.7	97.1	7.6	35.5
10/8/02	13	Gerle Creek downstream of Rocky Basin Creek	In situ samples not obtained, as Rocky Basin Creek was dry.				
10/8/02	9	Gerle Creek upstream of Jerrett Creek	12.8	Failed QA/QC		7.3	18.0

*%Dissolved oxygen subject to further review based on elevation.

Appendix A-2. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Reservoir Secchi Disk Depth			
Date	**Site Number**	**Site Name**	**Secchi Disk Depth (m)**
Reservoir Sites			
10/7/02	R-1	Rubicon Reservoir	2.8 on bottom
10/7/02	R-2	Rockbound Reservoir	8.8
10/7/02	R-3	Buck Island Reservoir	7.2
10/8/02	R-4a	Loon Lake Reservoir near Dam	13.3
10/8/02	R-4b	Loon Lake West End	13.0
10/8/02	R-4c	Loon Lake NE Waterbody	13.0
10/8/02	R-5	Gerle Creek Reservoir	8.3 on bottom
10/7/02	R-11A	Slab Creek Reservoir - Middle (nr. Boat Launch)	7.0
10/9/02	R-11B	Slab Creek Reservoir-Uppersite	5.0 on bottom
10/9/02	R-12A	Chili Bar near Dam	6.3
10/9/02	R-12B	Chili Bar; mid-reservoir site	6.5 on bottom

Appendix A3. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Nutrients, Total Organic Carbon, and Total Alkalinity.									
Date	**Site Number**	**Site Name**	**Nitrite-Nitrate**	**Ammonia**	**TKN**	**Ortho-Phosphorus**	**Total Phosphorus**	**TOC**	**Total Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites									
10/7/02	2	Rubicon R. outflow from Rubicon Res	0.015 J	<0.1	0.34	<0.01	<0.01	2.7	7.8
10/7/02	5	Rubicon Outflow from Rockbound Lake	0.023	<0.1	0.4	<0.01	<0.01	1.7	5.6
10/7/02	6	Little Rubicon outflow from Buck Island Lake	0.014 J	<0.1	0.33	<0.01	<0.01	1.8	6.1
10/8/02	7	Gerle Creek outflow from Loon Lake	0.014 J	<0.1	0.26	<0.01	<0.01	1.4	5.5
10/8/02	14	Gerle Creek inflow to Gerle Creek Reservoir	0.013 J	<0.1	0.26	<0.01	<0.01	1.1	6.4
10/8/02	15	Gerle Creek outflow from Gerle Creek Reservoir	0.013 J	<0.1	0.43	<0.01	<0.01	1.3	6.6
10/8/02	16	Gerle Creek Canal inflow to Robb's Forebay	0.025	<0.1	0.31	<0.01	<0.01	1.2	7.2
10/8/02	20	South Fork Rubicon upstream of Rubicon River.	0.016 J	<0.1	0.24	<0.01	<0.01	1.1	8.3
10/9/02	43	SFAR / Slab Ck Res, upstrm Iowa-Brushy Cnyn Ck confl.	0.018 J	<0.1	0.26	<0.01	<0.01	1.2	7.1
10/9/02	46	South Fork American River below Rock Creek	0.023	<0.1	0.25	<0.01	<0.01	<1	8.2
10/10/02	47	SFAR downstream of White Rock Powerhouse	0.010 J	<0.1	0.55	<0.01	<0.01	1.1	9.6
10/9/02	48	SFAR below Chili Bar Dam	0.0088 J	<0.1	0.29	<0.01	<0.01	1.2	9.7
10/9/02	51	SFAR dowstream of Greenwood Creek	0.031	<0.1	0.3	0.1	<0.01	1.1	10
10/10/02	54	SFAR downstream of Hiway 49 Bridge	0.010 J	<0.1	0.29	<0.01	<0.01	1.1	11
Reservoir Sites									
10/7/02	R-1	Rubicon Reservoir	<0.005	<0.1	0.51	<0.01	<0.01	2.7	10
10/7/02	R-2	Rockbound Reservoir	0.014 J	<0.1	0.23	<0.01	<0.01	1.3	11
10/7/02	R-3	Buck Island Reservoir	0.013 J	<0.1	0.32	<0.01	<0.01	2.1	7.4
10/8/02	R-4a	Loon Lake Reservoir near Dam	0.012 J	<0.1	0.27	<0.01	<0.01	1.5	13
10/8/02	R-4b	Loon Lake West End	0.013 J	<0.1	0.25	<0.01	<0.01	1.5	4.9
10/8/02	R-4c	Loon Lake NE Waterbody	0.012 J	<0.1	0.26	<0.01	<0.01	1.5	8.4
10/8/02	R-5	Gerle Creek Reservoir	0.014 J	<0.1	0.27	<0.01	<0.01	1.2	7.4
10/7/02	R-11A	Slab Creek Reservoir - Middle (nr. Boat Launch)	0.0085 J	<0.1	0.44	<0.01	<0.01	1.5	6.9
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite		<0.1	0.42	<0.01	<0.01	1.3	7.4
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite		<0.1	0.28	<0.01	<0.01	1.1	8.4
10/9/02	R-12A	Chili Bar near Dam	0.014 J	<0.1	0.33	<0.01	<0.01	1.2	12
10/9/02	R-12B	Chili Bar; mid-reservoir site	0.015 J	<0.1	0.27	<0.01	<0.01	1.2	12
Triage Sites/ Sites Not Sampled									
10/7/02	1	Rubicon River Inflow to Rubicon Reservoir							
10/7/02	3a	Fox Lake reach flow from Rubicon Reservoir							
10/7/02	4	Highland inflow to Rockbound Res.							
10/8/02	17	South Fork Rubicon R. inflow to Robb's Forebay	0.012 J		0.22	<0.01	<0.01	0.8	
10/9/02	42	Slab Creek Inflow to Slab Creek Reservoir	0.018 J		0.28	<0.01	<0.01	0.53	

J = value is an estimate, value obtained is below the method reporting limit but above the method detection limit.

Appendix A-4. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Suspended and Dissolved Solids										
Date	**Site Number**	**Site Name**	**TSS**	**TDS**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites										
10/7/02	2	Rubicon R. outflow from Rubicon Res	<1	6	2.2	<0.5	<0.5	<0.5	<0.1	<0.4
10/7/02	5	Rubicon Outflow from Rockbound Lake	<1	<1	1.3	<0.5	<0.5	<0.5	<0.1	<0.4
10/7/02	6	Little Rubicon outflow from Buck Island Lake	<1	8	1.4	<0.5	<0.5	<0.5	<0.1	<0.4
10/8/02	7	Gerle Creek outflow from Loon Lake	<1	<1	1.2	<0.5	<0.5	<0.5	<0.1	<0.4
10/8/02	14	Gerle Creek inflow to Gerle Creek Reservoir	<1	<1	1.3	<0.5	<0.5	0.5	<0.1	<0.4
10/8/02	15	Gerle Creek outflow from Gerle Creek Reservoir	<1	2	1.4	<0.5	<0.5	0.5	<0.1	<0.4
10/8/02	16	Gerle Creek Canal inflow to Robb's Forebay	<1	4	1.7	<0.5	<0.5	0.7	<0.1	<0.4
10/8/02	20	South Fork Rubicon upstream of Rubicon River.	<1	8	1.7	<0.5	<0.5	0.7	<0.1	<0.4
10/9/02	43	SFAR / Slab Ck Res, upstrm Iowa-Brushy Cnyn Ck confl.	<1	20	1.9	<0.5	<0.5	1.1	<0.1	<0.4
10/9/02	46	South Fork American River below Rock Creek	<1	34	4.3	1.6	0.6	2.2	1.5	<0.4
10/10/02	47	SFAR downstream of White Rock Powerhouse	<1	18	1.9	<0.5	<0.5	1.2	<0.1	<0.4
10/9/02	48	SFAR below Chili Bar Dam	<1	10	2.0	<0.5	0.6	1.3	<0.1	<0.4
10/9/02	51	SFAR downstream of Greenwood Creek	<1	17	2.3	0.6	<0.5	1.4	1.3	<0.4
10/10/02	54	SFAR downstream of Hiway 49 Bridge	2	18	2.2	0.6	<0.5	1.5	1.4	<0.4
Reservoir Sites										
10/7/02	R-1	Rubicon Reservoir	<1	<1	2.1	<0.5	<0.5	<0.5	<0.1	<0.4
10/7/02	R-2	Rockbound Reservoir	<1	<1	1.3	<0.5	<0.5	<0.5	<0.1	<0.4
10/7/02	R-3	Buck Island Reservoir	<1	<1	1.4	<0.5	<0.5	<0.5	<0.1	<0.4
10/8/02	R-4a	Loon Lake Reservoir near Dam	<1	<1	1.1	<0.5	<0.5	<0.5	<0.1	<0.4
10/8/02	R-4b	Loon Lake West End	<1	<1	1.1	<0.5	<0.5	<0.5	<0.1	<0.4
10/8/02	R-4c	Loon Lake NE Waterbody	<1	<1	1.1	<0.5	<0.5	<0.5	<0.1	<0.4
10/8/02	R-5	Gerle Creek Reservoir	<1	<1	1.5	<0.5	<0.5	0.6	<0.1	<0.4
10/7/02	R-11A	Slab Creek Reservoir - Middle (nr. Boat Launch)	<1	10	2.0	<0.5	<0.5	1.3	1.4	<0.4
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	<1	18	2.6	0.6	0.5	1.8	2.5	<0.4
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	2	20	2.6	0.6	0.5	1.8	2.5	<0.4
10/9/02	R-12A	Chili Bar near Dam	<1	22	2.0	<0.5	<0.5	1.2	1.3	<0.4
10/9/02	R-12B	Chili Bar; mid-reservoir site	<1	14	2.1	<0.5	<0.5	1.2	<0.1	<0.4

Appendix A-5. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Organics					
Date	**Site Number**	**Site Name**	**Oil and Grease**	**MTBE**	**Total Petroleum Hydrocarbons**
			mg/L	**ug/L**	**ug/L**
Riverine Sites					
10/7/02	2	Rubicon R. outflow from Rubicon Res	<5		
10/7/02	5	Rubicon Outflow from Rockbound Lake	<5		
10/7/02	6	Little Rubicon outflow from Buck Island Lake	<5		
10/8/02	7	Gerle Creek outflow from Loon Lake	<5		
10/8/02	14	Gerle Creek inflow to Gerle Creek Reservoir	<5		
10/8/02	15	Gerle Creek outflow from Gerle Creek Reservoir	<5		
10/8/02	16	Gerle Creek Canal inflow to Robb's Forebay	<5		
10/8/02	20	South Fork Rubicon upstream of Rubicon River.	<5		
10/9/02	43	SFAR / Slab Ck Res, upstrm Iowa-Brushy Cnyn Ck confl.	<5		
10/9/02	46	South Fork American River below Rock Creek	<5		
10/10/02	47	SFAR downstream of White Rock Powerhouse	<5		
10/9/02	48	SFAR below Chili Bar Dam	<5		
10/9/02	51	SFAR downstream of Greenwood Creek	<5		
10/10/02	54	SFAR downstream of Hiway 49 Bridge	<5		
Reservoir Sites					
10/7/02	R-1	Rubicon Reservoir	<5		
10/7/02	R-2	Rockbound Reservoir	<5		
10/7/02	R-3	Buck Island Reservoir	<5		
10/8/02	R-4a	Loon Lake Reservoir near Dam	<5	<1	<1
10/8/02	R-4b	Loon Lake West End	<5	<1	<1
10/8/02	R-4c	Loon Lake NE Waterbody	<5		
10/8/02	R-5	Gerle Creek Reservoir	<5	<1	<1
10/7/02	R-11A	Slab Creek Reservoir - Middle (nr. Boat Launch)	<5	<1	<1
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	<5		
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	<5		
10/9/02	R-12A	Chili Bar near Dam	<5		
10/9/02	R-12B	Chili Bar; mid-reservoir site	<5		
Triage Sites/ Sites Not Sampled					
10/7/02	1	Rubicon River Inflow to Rubicon Reservoir			
10/7/02	3a	Fox Lake reach flow from Rubicon Reservoir			
10/7/02	4	Highland inflow to Rockbound Res.			
10/8/02	17	South Fork Rubicon R. inflow to Robb's Forebay			
10/9/02	42	Slab Creek Inflow to Slab Creek Reservoir			

Appendix A-6. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Various Metals and Cyanide (Total Recoverable).										
Date	**Site Number**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites										
10/7/02	2	Rubicon R. outflow from Rubicon Res	230	6	<20	0.22	<0.01	<0.005	<2	<5
10/7/02	5	Rubicon Outflow from Rockbound Lake	<50	<1	20	<0.05	<0.01	<0.005	<2	<5
10/7/02	6	Little Rubicon outflow from Buck Island Lake	<50	<1	<20	0.07	<0.01	<0.005	<2	<5
10/8/02	7	Gerle Creek outflow from Loon Lake	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/8/02	14	Gerle Creek inflow to Gerle Creek Reservoir	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/8/02	15	Gerle Creek outflow from Gerle Creek Reservoir	<50	<1	<20	0.09	0.01	<0.005	<2	<5
10/8/02	16	Gerle Creek Canal inflow to Robb's Forebay	<50	<1	<20	0.07	<0.01	<0.005	<2	<5
10/8/02	20	South Fork Rubicon upstream of Rubicon River.	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/9/02	43	SFAR / Slab Ck Res, upstrm Iowa-Brushy Cnyn Ck confl.	<50	<1	<20	0.07	0.02	<0.005	<2	<5
10/9/02	46	South Fork American River below Rock Creek	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/10/02	47	SFAR downstream of White Rock Powerhouse	<50	<1	<20	0.05	0.01	<0.005	<2	<5
10/9/02	48	SFAR below Chili Bar Dam	<50	<1	<20	0.06	0.01	<0.005	<2	<5
10/9/02	51	SFAR downstream of Greenwood Creek	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/10/02	54	SFAR downstream of Hiway 49 Bridge	<50	<1	<20	0.06	<0.01	<0.005	<2	<5
Reservoir Sites										
10/7/02	R-1	Rubicon Reservoir	<50	1.1	<20	0.26	<0.01	<0.005	<2	<5
10/7/02	R-2	Rockbound Reservoir	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/7/02	R-3	Buck Island Reservoir	<50	<1	<20	0.07	<0.01	<0.005	<2	<5
10/8/02	R-4a	Loon Lake Reservoir near Dam	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/8/02	R-4b	Loon Lake West End	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/8/02	R-4c	Loon Lake NE Waterbody	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/8/02	R-5	Gerle Creek Reservoir	<50	<1	<20	0.06	0.01	<0.005	<2	<5
10/7/02	R-11A	Slab Creek Reservoir - Middle (nr. Boat Launch)	<50	<1	<20	<0.05	<0.01	<0.005	<2	<5
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	<50	<1	<20	0.05	0.01	<0.005	<2	<5
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	<50	<1	<20	<0.05	0.01	<0.005	<2	<5
10/9/02	R-12A	Chili Bar near Dam	<50	<1	<20	0.06	0.01	<0.005	<2	<5
10/9/02	R-12B	Chili Bar; mid-reservoir site	<50	<1	<20	0.06	0.01	<0.005	<2	<5
Triage Sites/Sites not sampled										
	1	Rubicon River Inflow to Rubicon Reservoir								
	3a	Fox Lake reach flow from Rubicon Reservoir								
	4	Highland inflow to Rockbound Res.								
10/8/02	17	South Fork Rubicon R. inflow to Robb's Forebay				0.06	<0.01			
10/9/02	42	Slab Creek Inflow to Slab Creek Reservoir				<0.05	<0.01			

Appendix A-7. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Various Metals (Total Recoverable) and Total Hardness.									
Date	**Site Number**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
				ug/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites									
10/7/02	2	Rubicon R. outflow from Rubicon Res	11.0	<0.50	2.3	<0.50	<2	<0.5	7
10/7/02	5	Rubicon Outflow from Rockbound Lake	3.9	0.12	0.4	0.09	<2	<0.04	<5
10/7/02	6	Little Rubicon outflow from Buck Island Lake	7.4	<0.05	0.3	0.06	<2	<0.04	<5
10/8/02	7	Gerle Creek outflow from Loon Lake	6.9	<0.05	0.3	0.05	<2	<0.04	<5
10/8/02	14	Gerle Creek inflow to Gerle Creek Reservoir	8.9	<0.05	0.8	0.07	3.2	<0.04	<5
10/8/02	15	Gerle Creek outflow from Gerle Creek Reservoir	4.4	<0.05	0.3	<0.05	<2	<0.04	<5
10/8/02	16	Gerle Creek Canal inflow to Robb's Forebay	7.4	<0.05	0.3	<0.05	<2	<0.04	<5
10/8/02	20	South Fork Rubicon upstream of Rubicon River.	6.9	<0.05	0.3	0.06	<2	<0.04	<5
10/9/02	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	12.0	<0.50	<1.0	<0.50	<2	<0.5	<5
10/9/02	46	South Fork American River below Rock Creek	16.0	<0.50	<1.0	<0.50	<2	<0.5	<5
10/10/02	47	South Fork American River downstream of White Rock Powerhouse	11.0	<0.50	<1.0	<0.50	<2	<0.5	<5
10/9/02	48	SFAR below Chili Bar Dam	8.4	<0.05	0.5	0.08	<2	<0.04	<5
10/9/02	51	SFAR downstream of Greenwood Creek	9.5	<0.05	0.6	0.06	<2	<0.04	<5
10/10/02	54	South Fork American River downstream of Hiway 49 Bridge	12.0	<0.50	3.4	<0.50	<2	<0.5	<5
Reservoir Sites									
10/7/02	R-1	Rubicon Reservoir	10.0	<0.50	<1.0	<0.50	<2	<0.5	<5
10/7/02	R-2	Rockbound Reservoir	11.0	<0.50	<1.0	<0.50	<2	<0.5	<5
10/7/02	R-3	Buck Island Reservoir	7.4	<0.05	0.3	<0.05	<2	<0.04	<5
10/8/02	R-4a	Loon Lake Reservoir near Dam	13.0	<0.50	<1.0	<0.05	<2	<0.5	<5
10/8/02	R-4b	Loon Lake West End	4.9	0.05	0.4	0.13	<2	<0.04	<5
10/8/02	R-4c	Loon Lake NE Waterbody	8.4	<0.05	0.4	0.06	<2	<0.04	<5
10/8/02	R-5	Gerle Creek Reservoir	7.4	<0.05	0.4	0.08	<2	<0.04	<5
10/7/02	R-11A	Slab Creek Reservoir - Middle (nr. Boat Launch)	6.9	<0.05	0.3	0.06	<2	<0.04	<5
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	7.4	<0.05	0.4	0.08	<2	0.052	<5
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	8.4	<0.05	0.4	0.08	<2	0.053	<5
10/9/02	R-12A	Chili Bar near Dam	12.0	<0.20	<1.0	<0.20	<2	<0.20	<5
10/9/02	R-12B	Chili Bar; mid-reservoir site	12.0	<0.20	<1.0	<0.20	<2	<0.20	<5

Appendix A-8. UARP & Chili Bar 2002 Fall Turnover Sampling Results: Coliform					
Date	**Site Number**	**Site Name**	**Coliform Holding Time**	**Total Coliform**	**E. Coli**
			Hours	**MPN/100 ml**	**MPN/100 ml**
Riverine Sites					
10/7/02	2_dup	Rubicon R. outflow from Rubicon Res	8	1553.1	0
10/7/02	2_dup	Rubicon R. outflow from Rubicon Res	24	1299.7	1
10/7/02	5	Rubicon Outflow from Rockbound Lake	8	248.1	0
10/7/02	6	Little Rubicon outflow from Buck Island Lake	24	96	0
10/8/02	7	Gerle Creek outflow from Loon Lake	8	9.8	0
10/8/02	15	Gerle Creek outflow from Gerle Creek Reservoir	8	816.4	1
10/8/02	16	Gerle Creek Canal inflow to Robb's Forebay	8	110.6	6.3
10/8/02	17	South Fork Rubicon R. inflow to Robb's Forebay	24	77.6	0
10/8/02	20	South Fork Rubicon upstream of Rubicon River.	24	231	0
10/9/02	42	Slab Creek Inflow to Slab Creek Reservoir	8	1732.9	3.1
10/9/02	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	8	461.1	0
10/9/02	46	South Fork American River below Rock Creek	8	1986.2	2
10/10/02	47	SFAR downstream of White Rock Powerhouse	8	517.2	2.1
10/9/02	48	SFAR below Chili Bar Dam	8	461.1	3.1
10/9/02	48	SFAR below Chili Bar Dam	8	461.1	3.1
10/9/02	51	SFAR downstream of Greenwood Creek	8&24	630.95	11.15
10/10/02	54	SFAR downstream of Hiway 49 Bridge	8	866.4	12.1
Reservoir Sites					
10/7/02	R-1_dup	Rubicon Reservoir	8	1046.2	0
10/7/02	R-1_dup	Rubicon Reservoir	24	1046.2	1
10/7/02	R-2	Rockbound Reservoir	8	21.3	0
10/7/02	R-3	Buck Island Reservoir	24	39.5	0
10/8/02	R-4a	Loon Lake Reservoir near Dam	8	7.4	0
10/8/02	R-4b	Loon Lake West End	8	6.3	0
10/8/02	R-4c	Loon Lake NE Waterbody	8	3.1	0
10/8/02	R-5	Gerle Creek Reservoir	8	85.5	0
10/7/02	R-11A_dup	Slab Creek Reservoir - Middle (nr. Boat Launch)	8	261.3	0
10/8/02	R-11A_dup	Slab Creek Reservoir - Middle (nr. Boat Launch)	24	142.1	1
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	8	1203.3	1
10/9/02	R-11B_dup	Slab Creek Reservoir-Uppersite	24	1299.7	4.1
10/9/02	R-12A	Chili Bar near Dam	8	613.1	9.7
10/9/02	R-12B	Chili Bar; mid-reservoir site	8	727	10.9
Triage Sites/Sites not sampled					
10/7/02	1	Rubicon River Inflow to Rubicon Reservoir		No flow	
10/7/02	3a	Fox Lake reach flow from Rubicon Reservoir		No flow	
10/7/02	4	Highland inflow to Rockbound Res.		No flow	
10/8/02	14	Gerle Creek inflow to Gerle Creek Reservoir		Cracked sample bottle	

Appendix A-9. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Hydrolab and YSI Data							
Date	**Site #**	**Site Name**	**Water Temperature (^{o}C)**	**Dissolved Oxygen (mg/L)**	**pH**	**Specific Conductance (uS/cm)**	**Conductivity (uS/cm)**
Riverine Sites							
First Rain							
11/11/02	7	Gerle Creek Outflow from Loon Lake	7.8	10.0	7.8		
11/11/02	14	Gerle Creek Inflow from Gerle Creek Reservoir	3.5	12.7	8.3		
11/11/02	15	Gerle Creek Outflow from Gerle Creek Reservoir	7.7	10.5	6.9		
11/11/02	16	Gerle Creek Canal inflow to Robb's Forebay	7.7	10.5	7.1		
11/11/02	20	S.F. Rubicon upstream of Rubicon River	5.7	11.3	7.0		
11/14/02	25	SF Silver Creek outflow from Ice House Res.	8.6	10.2	7.0	11	8
11/14/02	27	SF Silver Creek inflow to Junction Res.	8.5	10.3	7.3	17	10
11/12/02	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	9.7	10.0	7.1	25	
11/12/02	46	SFAR downstream of Rock Ck. Confluence	9.4	11.1	7.5	43	30
11/12/02	47	SFAR downstream of White Rock Powerhouse	9.7	11.2	6.7	21	15
11/12/02	48	SFAR below Chili Bar Dam	10.0	10.3	6.8	26	19
11/12/02	51	SFAR downstream of Lotus/Uniontown C	10.3	11.2	7.3	33	22
11/12/02	54	SFAR downstream of Hiway 49 Bridge	10.5	11.6	7.5	34	23
First Rain/Fall Turnover							
11/13/02	32	Jay Bird Creek inflow to Camino Reservoir	8.4	10.8	7.6	36	24
11/14/02	29	SF Silver Creek ds of Junction Dam	7.5	10.2	7.0	14	9
11/13/02	34	Silver Creek outflow from Camino Reservoir	8.9	10.6	7.0	14	10
11/13/02	40	Brush Creek Outflow from Brush Ck. Reservoir	10.9	10.1	7.3	20	15
11/13/02	41	SFAR downstream of Camino Powerhouse	9.2	10.9	7.1	26	18
Profiles obtained for in the reservoirs.							
Fall Turnover - Post First Rain: Reservoir/Riverine Sites							
11/26/02	24	SF Silver Creek Upstream of Ice House Reservoir	0.7	11.2	6.9	11	
11/26/02	25	SF Silver Creek outflow from Ice House Res.	6.3	10.4	6.8	6	
11/26/02	27	SF Silver Creek inflow to Junction Res.	1.9	12.8	7.3	9	
11/26/02	R7a	Ice House Reservoir					
11/26/02	R7b	Ice House Reservoir- Mid					
11/26/02	R7c	Ice House Reservoir - Upper Lake					
Triage Samping Sites							
First Rain							
11/11/02	17	S.F. Rubicon inflow to Robb's Forebay	3.2	11.6	6.6		
11/14/02	24	SF Silver Creek Upstream of Ice House Reservoir	1.9	11.9	6.8	12	7
11/12/02	42	Slab Creek Inflow to Slab Creek Reservoir	8.0	11.2	7.5	28	
First Rain / Fall Turnover							
11/14/02	21	Tells Creek Upstream of Union Valley Reservoir	2.5	11.9	7.4	23	13
11/14/02	22	Big Silver Creek upstream of Union Valley Reservoir	2.1	12.1	6.9	15	8
11/14/02	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	3.1	11.5	6.7	15	9
11/14/02	28	Little Silver Creek inflow to Junction Res.	5.3	10.6	7.0	9	15
11/13/02	33	Silver Creek inflow to Camino Reservoir	8.0	11.6	7.3	17	11
11/13/02	38	SFAR upstream of Camino Powerhouse	8.2	11.4	7.5	40	27
11/13/02	39	Brush Creek Inflow to Brush Ck. Reservoir	8.8	11.3	7.6	24	

Appendix A-10. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Reservoir Secchi Disk Depth			
Date	**Site Number**	**Site Name**	**Secchi Disk Depth (m)**
Reservoir Sites			
11/11/02	R-4a	Loon Lake Reservoir near Dam	14.5
11/11/02	R-4b	Loon Lake West End	15.0
11/11/02	R-4c	Loon Lake NE Waterbody	13.8
11/11/02	R-5	Gerle Creek Reservoir	4.5
11/12/02	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	5.8
11/12/02	R-11b	Slab Creek Reservoir - Upper Site	2.8
11/13/02	R-12a	Chili Bar near Dam	1.5
11/13/02	R-12b	Chil Bar, mid-reservoir site	1.8
11/14/02	R-7a	Ice House Reservoir	5.3
11/14/02	R-7b	Ice House Reservoir - Mid	5.8
11/14/02	R-7c	Ice House Reservoir - Upper Lake	6.0
11/14/02	R-6b	Union Valley Res - Mid	6.0
11/14/02	R-6c	Union Valley Robbs Tailrace	5.8
11/14/02	R-6d	Union Valley Res - Jones Fork Arm	6.5
11/14/02	R-8	Junction Reservoir	3.3
11/14/02	R-6a	Union Valley Dam	5.5
11/13/02	R-9	Camino Reservoir - mid reservoir	3.3
11/13/02	R-10	Brush Creek Reservoir	7.5
11/26/02	R7a	Ice House Reservoir	3.8
11/26/02	R7b	Ice House Reservoir- Mid	4.8
11/26/02	R7c	Ice House Reservoir - Upper Lake	6.8

Appendix A-11. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Nutrients, Total Organic Carbon, and Total Alkalinity									
Date	**Site #**	**Site Name**	**Nitrite-Nitrate**	**Ammonia**	**TKN**	**Total Phosphorus**	**Ortho-Phosphorus**	**TOC**	**Total Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites									
First Rain									
11/11/02	7	Gerle Creek Outflow from Loon Lake	0.0065			0.010			5.7
11/11/02	14	Gerle Creek Inflow from Gerle Creek Reservoir	0.086			0.011			6.5
11/11/02	15	Gerle Creek Outflow from Gerle Creek Reservoir	0.026			<0.010			6.0
11/11/02	16	Gerle Creek Canal inflow to Robb's Forebay	0.019 J			<0.010			5.6
11/11/02	20	S.F. Rubicon upstream of Rubicon River	<0.0045			0.011			11.0
11/14/02	25	SF Silver Creek outflow from Ice House Res.	<0.0045			0.011			8.4
11/14/02	27	SF Silver Creek inflow to Junction Res.	0.015 J			<0.010			9.8
11/12/02	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	0.0056			0.024			13.0
11/12/02	46	SFAR downstream of Rock Ck. Confluence	<0.0045			0.018			10.0
11/12/02	47	SFAR downstream of White Rock Powerhouse	<0.0045			0.018			8.0
11/12/02	48	SFAR below Chili Bar Dam	<0.0045			0.022			12.0
11/12/02	51	SFAR downstream of Lotus/Uniontown C	0.011			0.031			16.0
11/12/02	54	SFAR downstream of Hiway 49 Bridge	0.02			0.032			17.0
First Rain/Fall Turnover									
11/13/02	32	Jay Bird Creek inflow to Camino Reservoir	0.0079	<0.1	0.18	0.011	<0.0027	2.0	10.0
11/14/02	29	SF Silver Creek ds of Junction Dam	0.05	<0.1	0.14	0.024	<0.0027	2.5	9.2
11/13/02	34	Silver Creek outflow from Camino Reservoir	0.057	<0.1	0.18	0.011	<0.0027	3.1	9.1
11/13/02	40	Brush Creek Outflow from Brush Ck. Reservoir	0.01	<0.1	0.14	0.012		2.0	14.0
11/13/03	41	SFAR downstream of Camino Powerhouse	0.0119	<0.1	0.21	0.010		3.3	14.0
11/13/03	41-dup	SFAR downstream of Camino Powerhouse	0.0088	<0.1	0.2	<0.010		3.3	14.0
11/13/03	41-dup	SFAR downstream of Camino Powerhouse	0.015	<0.1	0.22	0.020		3.3	14.0
Reservoir Sites									
First Rain			0						
11/11/02	R-4a	Loon Lake Reservoir near Dam	<0.023			0.021			5.7
11/11/02	R-4b	Loon Lake West End	<0.023			<0.010			5.8
11/11/02	R-4c	Loon Lake NE Waterbody	0.016 J			0.010			5.9
11/11/02	R-5	Gerle Creek Reservoir	0.0099 J			<0.010			6.1
11/12/02	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)				0.018			10.0
11/12/02	R-11b	Slab Creek Reservoir - Upper Site				0.020			12.0
11/13/02	R-12a	Chili Bar near Dam	0.041			0.024			11.0
11/13/02	R-12b	Chil Bar, mid-reservoir site	0.042			0.022			11.0
11/14/02	R-7a	Ice House Reservoir (Epilimnion)	<0.023			0.017			7.0
11/14/02	R-7a	Ice House Reservoir (Hypolimnion)	<0.023			0.017			8.0
11/14/02	R-7b	Ice House Reservoir - Mid (Epilimnion)	0.0077			0.015			6.8

Appendix A-11. (continued)

Date	Site #	Site Name	Nitrite-Nitrate	Ammonia	TKN	Total Phosphorus	Ortho-Phosphorus	TOC	Total Alkalinity
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reservoir Sites									
First Rain			0						
11/14/02	R-7b	Ice House Reservoir - Mid (Hypolimnion)	0.0059			0.012			7.0
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Epilimnion)	0.015			<0.010			6.8
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Hypolimnion)	<0.023			0.016			6.8
First Rain / Fall Turnover									
11/14/02	R-6a	Union Valley Dam	<0.023	<0.1	0.25	<0.010	<0.0027	2.0	5.1
11/14/02	R-6b	Union Valley Res - Mid	0.0056	<0.1	0.18	<0.010	<0.0027	1.8	8.2
11/14/02	R-6c	Union Valley Robbs Tailrace	0.019	<0.1	0.21	0.010	0.0072 J	1.9	8.0
11/14/02	R-6d	Union Valley Res - Jones Fork Arm	0.03	<0.1	0.16	0.016	<0.0027	1.9	8.1
11/14/02	R-8	Junction Reservoir	0.018	<0.1	0.19	<0.010	<0.0027	2.3	8.7
11/13/02	R-9	Camino Reservoir - mid reservoir	0.027	<0.1	0.15	<0.010	<0.0027	2.8	8.9
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	0.021	<0.1	0.15	<0.010	<0.0027	2.7	8.5
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	0.033	<0.1	0.15	<0.010	<0.0027	2.8	9.2
11/13/02	R-10	Brush Creek Reservoir	0.011	<0.1	0.12	0.013	<0.0027	1.4	14.0
Fall Turnover - Post First Rain: Reservoir/Riverine Sites									
11/26/02	24	SF Silver Creek Upstream of Ice House Reservoir	0.11	<0.1	0.14	0.021	<0.024	2.9	6.5
11/26/02	25	SF Silver Creek outflow from Ice House Res.	0.061	<0.1	0.13	0.013	**	1.5	7.4
11/26/02	27	SF Silver Creek inflow to Junction Res.	0.13	<0.1	<0.10	0.014	<0.024	<1.0	11.0
11/26/02	R7a	Ice House Reservoir	0.089	<0.1	0.15	0.014	<0.024	1.6	7.2
11/26/02	R7b	Ice House Reservoir- Mid	0.13	0.12	0.12	0.017	**	1.7	7.3
11/26/02	R7c	Ice House Reservoir - Upper Lake	0.1	0.1	0.11	0.021	**	1.6	7.4
Triage Samping Sites									
First Rain									
11/11/02	17	S.F. Rubicon inflow to Robb's Forebay	0.28			0.018			12.0
11/14/02	24	SF Silver Creek Upstream of Ice House Reservoir	0.21			0.019			5.6
11/12/02	42	Slab Creek Inflow to Slab Creek Reservoir	<0.0045			0.024			16.0
First Rain / Fall Turnover			0						
11/14/02	21	Tells Creek Upstream of Union Valley Reservoir	0.0059 J	<0.1	0.25	0.013	0.0092	4.8	16.0
11/14/02	22	Big Silver Creek upstream of Union Valley Reservoir	0.14	<0.1	0.25	<0.010	0.003	5.1	7.4
11/14/02	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	0.14	<0.1	0.27	0.011	0.0051	4.9	7.8
11/14/02	28	Little Silver Creek inflow to Junction Res.	<0.0045	<0.1	0.12	<0.010	0.003	1.6	
11/13/02	33	Silver Creek inflow to Camino Reservoir	<0.0045	<0.1	0.17	<0.010	<0.0027	2.4	23.0
11/13/02	38	SFAR upstream of Camino Powerhouse	<0.0045	<0.1	0.2	0.012	<0.0027	3.2	18.0
11/13/02	39	Brush Creek Inflow to Brush Ck. Reservoir	<0.0045	<0.1	0.18	<0.010		1.7	15.0

**Failed QA/QC

Appendix A-12. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Suspended and Dissolved Solids											
Date	**Site#**	**Site Name**	**TSS**	**TDS**	**Turbidity**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites											
First Rain											
11/11/02	7	Gerle Creek Outflow from Loon Lake	<1		0.33	1.5					
11/11/02	14	Gerle Creek Inflow from Gerle Creek Reservoir	2		0.65	1.7					
11/11/02	15	Gerle Creek Outflow from Gerle Creek Reservoir	<1		0.63	1.3					
11/11/02	16	Gerle Creek Canal inflow to Robb's Forebay	<1		0.70	1.4					
11/11/02	20	S.F. Rubicon upstream of Rubicon River	<1		0.60	2.8					
11/14/02	25	SF Silver Creek outflow from Ice House Res.	<1		1.20	1.2					
11/14/02	27	SF Silver Creek inflow to Junction Res.	<1		0.44	1.7					
11/12/02	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	<1		2.60	2.0					
11/12/02	46	SFAR downstream of Rock Ck. Confluence	<1		1.90	2.3					
11/12/02	47	SFAR downstream of White Rock Powerhouse	<1		2.80	2.1					
11/12/02	48	SFAR below Chili Bar Dam	6		5.40	2.6					
11/12/02	51	SFAR downstream of Lotus/Uniontown C	<1		3.30	2.7					
11/12/02	54	SFAR downstream of Hiway 49 Bridge	<1		3.00	3.1					
First Rain/Fall Turnover											
11/13/02	32	Jay Bird Creek inflow to Camino Reservoir	<1	8	0.23	1.9	0.5	0.6	1.1	1.4	1.7
11/14/02	29	SF Silver Creek ds of Junction Dam	<1	30	0.00	1.6	<0.5	0.6	1.1	1.1	1.5
11/13/02	34	Silver Creek outflow from Camino Reservoir	<1	16	0.88	1.6	<0.5	0.7	1.0	1.2	1.7
11/13/02	40	Brush Creek Outflow from Brush Ck. Reservoir	2	10	0.87	2.4	0.7	0.7	1.5	1.2	1.5
11/13/03	41	SFAR downstream of Camino Powerhouse	<1	19	0.77	3.0	0.7	0.8	2.2	2.9	1.7
11/13/03	41-dup	SFAR downstream of Camino Powerhouse	<1	14	1.00	3.0	0.7	0.8	2.2	2.9	1.7
11/13/03	41-dup	SFAR downstream of Camino Powerhouse	<1	24	0.54	3.0	0.7	0.8	2.2	2.9	1.6
Reservoir Sites											
First Rain											
11/11/02	R-4a	Loon Lake Reservoir near Dam	<1		0.38	1.0					
11/11/02	R-4b	Loon Lake West End	<1		0.39	1.2					
11/11/02	R-4c	Loon Lake NE Waterbody	<1		0.43	1.1					
11/11/02	R-5	Gerle Creek Reservoir	<1		0.63	1.0					
11/12/02	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<1		0.96	1.5					
11/12/02	R-11b	Slab Creek Reservoir - Upper Site	<1		1.50	2.7					
11/13/02	R-12a	Chili Bar near Dam	4		2.10	2.4					
11/13/02	R-12b	Chil Bar, mid-reservoir site	<1		2.40	2.3					
11/14/02	R-7a	Ice House Reservoir (Epilimnion)	<1		0.99	1.1					
11/14/02	R-7a	Ice House Reservoir (Hypolimnion)	<1		1.00	0.9					
11/14/02	R-7b	Ice House Reservoir - Mid (Epilimnion)	<1		0.96	1.0					

Appendix A-12. (continued)

Date	Site#	Site Name	TSS	TDS	Turbidity	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulfate
			mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reservoir Sites											
First Rain											
11/14/02	R-7b	Ice House Reservoir - Mid (Hypolimnion)	<1		0.98	1.2					
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Epilimnion)	<1		1.00	1.0					
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Hypolimnion)	<1		0.96	1.3					
First Rain / Fall Turnover											
11/14/02	R-6a	Union Valley Dam	<1	<1	1.20	1.4	<0.5	<0.5	0.9	0.9	3.7
11/14/02	R-6b	Union Valley Res - Mid	2	2	0.98	1.3	<0.5	<0.5	0.9	0.7	<0.4
11/14/02	R-6c	Union Valley Robbs Tailrace	<1	<1	1.20	1.3	<0.5	<0.5	0.9	0.7	<0.4
11/14/02	R-6d	Union Valley Res - Jones Fork Arm	<1	<1	1.00	1.3	<0.5	<0.5	0.9	0.7	1.3
11/14/02	R-8	Junction Reservoir	2	<1	1.20	1.4	<0.5	<0.5	0.9	0.9	1.6
11/13/02	R-9	Camino Reservoir - mid reservoir	<1	4	0.99	1.5	<0.5	0.5	1.0	1.1	1.6
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	<1	<1	0.99	1.5	<0.5	0.5	1.0	1.1	1.6
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	<1	8	1.20	1.5	<0.5	0.5	1.0	1.0	1.5
11/13/02	R-10	Brush Creek Reservoir	<1	8	0.51	2.2	0.7	0.5	1.5	1.2	1.6
Fall Turnover - Post First Rain: Reservoir/Riverine Sites											
11/26/02	24	SF Silver Creek Upstream of Ice House Reservoir	<1		42.00**	1.2	<0.5	<0.5	1.1	0.9	0.4
11/26/02	25	SF Silver Creek outflow from Ice House Res.	<1		1.40	1.2	<0.5	<0.5	1.0	0.2	<0.4
11/26/02	27	SF Silver Creek inflow to Junction Res.	<1		0.58	1.7	<0.5	0.6	1.4	0.5	0.5
11/26/02	R7a	Ice House Reservoir	<1		2.30	1.1	<0.5	<0.5	0.9	0.2	<0.4
11/26/02	R7b	Ice House Reservoir- Mid	<1		1.60	1.0	<0.5	<0.5	0.9	0.2	<0.4
11/26/02	R7c	Ice House Reservoir - Upper Lake	<1		0.98	1.1	<0.5	<0.5	0.9	0.3	<0.4
Triage Samping Sites											
First Rain											
11/11/02	17	S.F. Rubicon inflow to Robb's Forebay	<1		0.52	2.1					
11/14/02	24	SF Silver Creek Upstream of Ice House Reservoir	<1		0.70	1.4					
11/12/02	42	Slab Creek Inflow to Slab Creek Reservoir	<1		0.86	2.0					
First Rain / Fall Turnover											
11/14/02	21	Tells Creek Upstream of Union Valley Reservoir	<1	22	0.50	2.6	0.8	0.8	2.2	1.6	<0.4
11/14/02	22	Big Silver Creek upstream of Union Valley Reserv	<1	38	0.38	1.6	<0.5	0.5	1.3	1.6	1.4
11/14/02	23	Jones Fork Silver Ck. Inflow to Union Valley Res	<1	32	0.49	1.7	<0.5	0.6	1.3	1.6	1.5
11/14/02	28	Little Silver Creek inflow to Junction Res.	<1	10		1.1	<0.5	0.5	0.8	1.0	1.4
11/13/02	33	Silver Creek inflow to Camino Reservoir	<1	26	0.12	4.3	1.5	1.1	2.3	1.7	2.1
11/13/02	38	SFAR upstream of Camino Powerhouse	<1	30	0.54	4.4	1.0	1.0	3.5	4.7	1.8
11/13/02	39	Brush Creek Inflow to Brush Ck. Reservoir	<1	8	0.28	2.1	0.8	0.8	1.8	1.4	1.5

Appendix A-13. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Organics					
Date	**Site #**	**Site Name**	**Oil and Grease**	**MTBE**	**Total Petroleum Hydrocarbons**
Riverine Sites					
First Rain					
11/11/02	7	Gerle Creek Outflow from Loon Lake	<5		
11/11/02	14	Gerle Creek Inflow from Gerle Creek Reservoir	<5		
11/11/02	15	Gerle Creek Outflow from Gerle Creek Reservoir	<5		
11/11/02	16	Gerle Creek Canal inflow to Robb's Forebay	<5		
11/11/02	20	S.F. Rubicon upstream of Rubicon River	<5		
11/14/02	25	SF Silver Creek outflow from Ice House Res.	<5		
11/14/02	27	SF Silver Creek inflow to Junction Res.	<5		
11/12/02	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	<5		
11/12/02	46	SFAR downstream of Rock Ck. Confluence	<5		
11/12/02	47	SFAR downstream of White Rock Powerhouse	<5		
11/12/02	48	SFAR below Chili Bar Dam	<5		
11/12/02	51	SFAR downstream of Lotus/Uniontown C	<5		
11/12/02	54	SFAR downstream of Hiway 49 Bridge	<5		
First Rain/Fall Turnover					
11/13/02	32	Jay Bird Creek inflow to Camino Reservoir	<5		
11/14/02	29	SF Silver Creek ds of Junction Dam	<5		
11/13/02	34	Silver Creek outflow from Camino Reservoir	<5		
11/13/02	40	Brush Creek Outflow from Brush Ck. Reservoir	<5		
11/13/02	41	SFAR downstream of Camino Powerhouse	<5		
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	<5		
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	<5		
Reservoir Sites					
First Rain					
11/11/02	R-4a	Loon Lake Reservoir near Dam	<5		
11/11/02	R-4b	Loon Lake West End	<5		
11/11/02	R-4c	Loon Lake NE Waterbody	<5		
11/11/02	R-5	Gerle Creek Reservoir	<5		
11/12/02	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<5		
11/12/02	R-11b	Slab Creek Reservoir - Upper Site	<5		
11/13/02	R-12a	Chili Bar near Dam	<5		
11/13/02	R-12b	Chil Bar, mid-reservoir site	<5		
11/14/02	R-7a	Ice House Reservoir (Epilimnion)	<5		
11/14/02	R-7a	Ice House Reservoir (Hypolimnion)	<5		
11/14/02	R-7b	Ice House Reservoir - Mid (Epilimnion)	<5		

Appendix A-13. (continued)					
Date	**Site #**	**Site Name**	**Oil and Grease**	**MTBE**	**Total Petroleum Hydrocarbons**
			mg/L	**ug/L**	**ug/L**
Reservoir Sites					
First Rain					
11/14/02	R-7b	Ice House Reservoir - Mid (Hypolimnion)	<5		
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Epilimnion)	<5		
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Hypolimnion)	<5		
First Rain / Fall Turnover					
11/14/02	R-6a	Union Valley Dam	<5	<1	<1
11/14/02	R-6b	Union Valley Res - Mid	<5	<1	<1
11/14/02	R-6c	Union Valley Robbs Tailrace	<5	<1	<1
11/14/02	R-6d	Union Valley Res - Jones Fork Arm	<5	<1	<1
11/14/02	R-8	Junction Reservoir	<5	<1	<1
11/13/02	R-9	Camino Reservoir - mid reservoir	<5		
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	<5		
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	<5		
11/13/02	R-10	Brush Creek Reservoir	<5	<1	<1
Fall Turnover - Post First Rain: Reservoir/Riverine Sites					
11/26/02	24	SF Silver Creek Upstream of Ice House Reservoir			
11/26/02	25	SF Silver Creek outflow from Ice House Res.	<5		
11/26/02	27	SF Silver Creek inflow to Junction Res.	<5		
11/26	R7a	Ice House Reservoir	<5	<1	<1
11/26	R7b	Ice House Reservoir- Mid	<5	<1	<1
11/26	R7c	Ice House Reservoir - Upper Lake	<5	<1	<1
Triage Samping Sites					
First Rain					
11/11	17	S.F. Rubicon inflow to Robb's Forebay			
11/14	24	SF Silver Creek Upstream of Ice House Reservoir			
11/12	42	Slab Creek Inflow to Slab Creek Reservoir			
First Rain / Fall Turnover					
11/14	21	Tells Creek Upstream of Union Valley Reservoir			
11/14	22	Big Silver Creek upstream of Union Valley Reservoir			
11/14	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir			
11/14	28	Little Silver Creek inflow to Junction Res.			
11/13	33	Silver Creek inflow to Camino Reservoir			
11/13	38	SFAR upstream of Camino Powerhouse			
11/13	39	Brush Creek Inflow to Brush Ck. Reservoir			

Appendix A-14. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Various Metals and Cyanide (Total Recoverable).										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites										
First Rain										
11/11/02	7	Gerle Creek Outflow from Loon Lake	<50							
11/11/02	14	Gerle Creek Inflow from Gerle Creek Reservoir	58							
11/11/02	15	Gerle Creek Outflow from Gerle Creek Reservoir	52							
11/11/02	16	Gerle Creek Canal inflow to Robb's Forebay	58							
11/11/02	20	S.F. Rubicon upstream of Rubicon River	<50							
11/14/02	25	SF Silver Creek outflow from Ice House Res.	<50							
11/14/02	27	SF Silver Creek inflow to Junction Res.	<50							
11/12/02	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	110							
11/12/02	46	SFAR downstream of Rock Ck. Confluence	71							
11/12/02	47	SFAR downstream of White Rock Powerhouse	120							
11/12/02	48	SFAR below Chili Bar Dam	290							
11/12/02	51	SFAR downstream of Lotus/Uniontown C	170							
11/12/02	54	SFAR downstream of Hiway 49 Bridge	110							
First Rain/Fall Turnover										
11/13/02	32	Jay Bird Creek inflow to Camino Reservoir	<50	<1.0	<20.0	<0.05	<0.01	<0.005	<2	<5
11/14/02	29	SF Silver Creek ds of Junction Dam	<50	<1.0	<20.0	0.16	0.018	<0.005	<2	<5
11/13/02	34	Silver Creek outflow from Camino Reservoir	61	<1.0	<20.0	0.1	0.031	<0.005	<2	<5
11/13/02	40	Brush Creek Outflow from Brush Ck. Reservoir	<50	<1.0	<20.0	0.072	0.03	<0.005	<2	<5
11/13/02	41	SFAR downstream of Camino Powerhouse	63.5	<1.0	<20.0	0.087	0.013	<0.005	<2	<5
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	54	<1.0	<20.0	0.09	0.013	<0.005	<2	<5
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	73	<1.0	<20.0	0.084	0.013	<0.005	<2	<5
Reservoir Sites										
First Rain										
11/11/02	R-4a	Loon Lake Reservoir near Dam	<50							
11/11/02	R-4b	Loon Lake West End	80							
11/11/02	R-4c	Loon Lake NE Waterbody	<50							
11/11/02	R-5	Gerle Creek Reservoir	58							
11/12/02	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<50							
11/12/02	R-11b	Slab Creek Reservoir - Upper Site	64							
11/13/02	R-12a	Chili Bar near Dam	130							
11/13/02	R-12b	Chil Bar, mid-reservoir site	90							
11/14/02	R-7a	Ice House Reservoir (Epilimnion)	68							
11/14/02	R-7a	Ice House Reservoir (Hypolimnion)	<50							

Appendix A-14. (continued)										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Reservoir Sites										
First Rain										
11/14/02	R-7b	Ice House Reservoir - Mid (Epilimnion)	<50							
11/14/02	R-7b	Ice House Reservoir - Mid (Hypolimnion)	<50							
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Epilimnion)	67							
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Hypolimnion)	56							
First Rain / Fall Turnover										
11/14/02	R-6a	Union Valley Dam	<50	<1.0	<20.0	<0.05	0.019	<0.005	<2	7.10
11/14/02	R-6b	Union Valley Res - Mid	<50	<1.0	<20.0	<0.05	0.016	<0.005	<2	16.00
11/14/02	R-6c	Union Valley Robbs Tailrace	<50	<1.0	<20.0	<0.05	0.015	0.0084	<2	<5
11/14/02	R-6d	Union Valley Res - Jones Fork Arm	<50	<1.0	<20.0	<0.05	0.016	<0.005	<2	<5
11/14/02	R-8	Junction Reservoir	<50	<1.0	<20.0	0.12	0.038	<0.005	<2	<5
11/13/02	R-9	Camino Reservoir - mid reservoir	50	<1.0	<20.0	0.11	0.03	<0.005	<2	<5
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	50	<1.0	<20.0	0.11	0.03	<0.005	<2	<5
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	50	<1.0	<20.0	0.11	0.03	<0.005	<2	<5
11/13/02	R-10	Brush Creek Reservoir	<50	<1.0	<20.0	<0.05	<0.01	<0.005	<2	<5
Fall Turnover - Post First Rain: Reservoir/Riverine Sites										
11/26/02	24	SF Silver Creek Upstream of Ice House Reservoir				<0.05	<0.01			
11/26/02	25	SF Silver Creek outflow from Ice House Res.	71	<1.0	<20.0	0.15	0.037	0.0051	<2	<5
11/26/02	27	SF Silver Creek inflow to Junction Res.	<50	<1.0	<20.0	0.19	<0.01	<0.005	<2	<5
11/26/02	R7a	Ice House Reservoir	160	1	<20.0	0.094	0.056	0.0054	<2	<5
11/26/02	R7b	Ice House Reservoir- Mid	92	<1.0	<20.0	0.11	0.069	<0.005	<2	<5
11/26/02	R7c	Ice House Reservoir - Upper Lake	<50	<1.0	<20.0	0.093	0.048	<0.005	<2	<5
Triage Samping Sites										
First Rain										
11/11/02	17	S.F. Rubicon inflow to Robb's Forebay								
11/14/02	24	SF Silver Creek Upstream of Ice House Reservoir								
11/12/02	42	Slab Creek Inflow to Slab Creek Reservoir								
First Rain / Fall Turnover										
11/14/02	21	Tells Creek Upstream of Union Valley Reservoir				0.052	<0.01			
11/14/02	22	Big Silver Creek upstream of Union Valley Reservoir				<0.05	<0.01			
11/14/02	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir				<0.05	<0.01			
11/14/02	28	Little Silver Creek inflow to Junction Res.				<0.05	<0.01			
11/13/02	33	Silver Creek inflow to Camino Reservoir				<0.05	<0.01			
11/13/02	38	SFAR upstream of Camino Powerhouse				0.06	<0.01			
11/13/02	39	Brush Creek Inflow to Brush Ck. Reservoir				<0.05	<0.01			

Appendix A-15. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Various Metals (Total Recoverable) and Total Hardness.

Date	Site #	Site Name	Total Hardness	Cadmium	Copper	Lead	Nickel	Silver	Zinc
			mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Riverine Sites									
First Rain									
11/11/02	7	Gerle Creek Outflow from Loon Lake	4.8			<0.05		<0.04	
11/11/02	14	Gerle Creek Inflow from Gerle Creek Reservoir	4.8			0.064		<0.04	
11/11/02	15	Gerle Creek Outflow from Gerle Creek Reservoir	8.6			0.16		0.086	
11/11/02	16	Gerle Creek Canal inflow to Robb's Forebay	11			0.16		<0.04	
11/11/02	20	S.F. Rubicon upstream of Rubicon River	6.7			<0.05		<0.04	
11/14/02	25	SF Silver Creek outflow from Ice House Res.	8.6			0.064		<0.04	
11/14/02	27	SF Silver Creek inflow to Junction Res.	8.6			<0.05		<0.04	
11/12/02	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	13			<0.05		<0.04	
11/12/02	46	SFAR downstream of Rock Ck. Confluence	16			<0.05		<0.04	
11/12/02	47	SFAR downstream of White Rock Powerhouse	11			0.13		<0.04	
11/12/02	48	SFAR below Chili Bar Dam	8.6			0.24		<0.04	
11/12/02	51	SFAR downstream of Lotus/Uniontown C	11			0.18		0.12	
11/12/02	54	SFAR downstream of Hiway 49 Bridge	11			0.14		0.041	
First Rain/Fall Turnover									
11/13/02	32	Jay Bird Creek inflow to Camino Reservoir	8.1	<0.1	<1.0	0.32	<2	0.046	<5
11/14/02	29	SF Silver Creek ds of Junction Dam	5.3	<0.1	<1.0	0.061	<2	<0.04	<5
11/13/02	34	Silver Creek outflow from Camino Reservoir	5.3	<0.1	<1.0	0.071	<2	<0.04	<5
11/13/02	40	Brush Creek Outflow from Brush Ck. Reservoir	8.1	<0.1	1.3	0.11	<2	0.096	<5
11/13/02	41	SFAR downstream of Camino Powerhouse	9.8	<0.1	1.5	0.0875	<2	<0.04	<5
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	8.6	<0.1	2.5	0.11	<2	<0.04	<5
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	11	<0.1	<1.0	0.065	<2	<0.04	<5
Reservoir Sites									
First Rain									
11/11/02	R-4a	Loon Lake Reservoir near Dam	3.8			0.22		0.045	
11/11/02	R-4b	Loon Lake West End	6.7			0.22		<0.04	
11/11/02	R-4c	Loon Lake NE Waterbody	4.8			0.31		<0.04	
11/11/02	R-5	Gerle Creek Reservoir	1.9			0.57		<0.04	
11/12/02	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	8.6			0.17		0.16	
11/12/02	R-11b	Slab Creek Reservoir - Upper Site	13			0.9		0.086	
11/13/02	R-12a	Chili Bar near Dam	6.7			1.1		0.042	
11/13/02	R-12b	Chil Bar, mid-reservoir site	11			0.54		<0.04	
11/14/02	R-7a	Ice House Reservoir (Epilimnion)	4.8			0.074		<0.04	

Appendix A-15. (continued)									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
Reservoir Sites									
First Rain									
11/14/02	R-7a	Ice House Reservoir (Hypolimnion)	6.7			0.13		<0.04	
11/14/02	R-7b	Ice House Reservoir - Mid (Epilimnion)	6.7			0.064		<0.04	
11/14/02	R-7b	Ice House Reservoir - Mid (Hypolimnion)	5.7			<0.05		<0.04	
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Epilimnion)	4.8			0.13		<0.04	
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Hypolimnion)	11			0.11		<0.04	
First Rain / Fall Turnover									
11/14/02	R-6a	Union Valley Dam	15	<0.1	<1.0	0.26	<2	0.86	<5
11/14/02	R-6b	Union Valley Res - Mid	12	<0.1	<1.0	0.099	<2	0.52	<5
11/14/02	R-6c	Union Valley Robbs Tailrace	8.1	<0.1	<1.0	0.064	<2	<0.04	<5
11/14/02	R-6d	Union Valley Res - Jones Fork Arm	10	<0.1	<1.0	0.2	<2	0.15	<5
11/14/02	R-8	Junction Reservoir	5.7	<0.1	1.9	1.2	<2	0.1	<5
11/13/02	R-9	Camino Reservoir - mid reservoir	6.7	<0.1	<1.0	0.185	<2	<0.04	<5
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	6.2	<0.1	<1.0	0.24	<2	<0.04	<5
11/13/02	R-9_dup	Camino Reservoir - mid reservoir	7.2	<0.1	<1.0	0.13	<2	<0.04	<5
11/13/02	R-10	Brush Creek Reservoir	8.1	<0.1	1.6	0.46	<2	0.15	<5
Fall Turnover - Post First Rain: Reservoir/Riverine Sites									
11/26/02	24	SF Silver Creek Upstream of Ice House Reservoir			<1.0	<0.20		<0.04	
11/26/02	25	SF Silver Creek outflow from Ice House Res.	9.1	<0.05	0.16	0.054	<2	<0.04	<5
11/26/02	27	SF Silver Creek inflow to Junction Res.	10	<0.05	<1.0	<0.05	<2	<0.04	<5
11/26/02	R7a	Ice House Reservoir	13	<0.1	<1.0	0.22	<2	<0.04	7.8
11/26/02	R7b	Ice House Reservoir- Mid	12	<0.1	<1.0	0.12	<2	<0.04	<5
11/26/02	R7c	Ice House Reservoir - Upper Lake	10	<0.1	<1.0	0.065	<2	<0.04	<5
Triage Samping Sites									
First Rain									
11/11/02	17	S.F. Rubicon inflow to Robb's Forebay							
11/14/02	24	SF Silver Creek Upstream of Ice House Reservoir							
11/12/02	42	Slab Creek Inflow to Slab Creek Reservoir							
First Rain / Fall Turnover									
11/14/02	21	Tells Creek Upstream of Union Valley Reservoir			<1.0	0.05		<0.040	
11/14/02	22	Big Silver Creek upstream of Union Valley Reservoir			<1.0	0.076		<0.040	
11/14/02	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir			<1.0	0.076		<0.040	
11/14/02	28	Little Silver Creek inflow to Junction Res.			<1.0	0.059		<0.040	
11/13/02	33	Silver Creek inflow to Camino Reservoir			1.1	<0.20		<0.040	
11/13/02	38	SFAR upstream of Camino Powerhouse			<1.0	0.083		<0.040	
11/13/02	39	Brush Creek Inflow to Brush Ck. Reservoir			1.1	<0.20		<0.040	

Appendix A-16. UARP & Chili Bar First Major Rain and 2002 Fall Turnover Sampling Results: Coliform					
Date	**Site #**	**Site Name**	**Holding Time**	**Total Coliform**	***E. coli***
			Hours	**MPN/100 ml**	**MPN/100 ml**
Riverine Sites					
First Rain/Fall Turnover					
11/11/02	7	Gerle Creek Outflow from Loon Lake	24	60.1	4.1
11/11/02	14	Gerle Creek Inflow from Gerle Creek Reservoir	24	>2419.2	33.1
11/11/02	15	Gerle Creek Outflow from from Gerle Creek Reservoir	24	>2419.2	33.1
11/11/02	16	Gerle Creek Canal inflow to Robb's Forebay	24	2419.2	23.1
11/11/02	20	S.F. Rubicon upstream of Rubicon River	24	920.8	16
11/14/02	25	SF Silver Creek outflow from Ice House Res.	24	130	0
11/14/02	27	SF Silver Creek inflow to Junction Res.	24	280	0
11/12/02	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	24	>2419.2	172.3
11/12/02	46	SFAR downstream of Rock Ck. Confluence	8	1986.3	63.7
11/12/02	47	SFAR downstream of White Rock Powerhouse	8	>2419.2	156.5
11/12/02	48	SFAR below Chili Bar Dam	8	>2419.2	235.9
11/12/02	51	SFAR downstream of Lotus/Uniontown C	8	>2419.2	143
11/12/02	54	SFAR downstream of Hiway 49 Bridge	8	>2419.2	142.1
11/13/02	32	Jay Bird Creek inflow to Camino Reservoir	24	365.4	6.3
11/14/02	29	SF Silver Creek ds of Junction Dam	24	240	6.3
11/13/02	34	Silver Creek outflow from Camino Reservoir	24	1299.7	21.6
11/13/02	40	Brush Creek Outflow from Brush Ck. Reservoir	24	1046.2	96
11/13/02	41	SFAR downstream of Camino Powerhouse	24	>2079.2	30.3
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	24	>2419.2	29.5
11/13/02	41-dup	SFAR downstream of Camino Powerhouse	24	1739.2	31.1
Reservoir Sites					
First Rain / Fall Turnover					
11/11/02	R-4a	Loon Lake Reservoir near Dam	24	6.3	0
11/11/02	R-4b	Loon Lake West End	24	8.5	0
11/11/02	R-4c	Loon Lake NE Waterbody	24	48.8	11
11/11/02	R-5	Gerle Creek Reservoir	24	>2419.2	38.2
11/14/02	R-6a	Union Valley Dam	24	1200	4.1
11/14/02	R-6b	Union Valley Res - Mid	24	410	2
11/14/02	R-6c	Union Valley Robbs Tailrace	24	370	0
11/14/02	R-6d	Union Valley Res - Jones Fork Arm	24	640	2
11/14/02	R-7a	Ice House Reservoir (Epilimnion)	24	250	0
11/14/02	R-7a	Ice House Reservoir (Hypolimnion)	24	200	5.2
11/14/02	R-7b	Ice House Reservoir - Mid (Epilimnion)	24	440	2
11/14/02	R-7b	Ice House Reservoir - Mid (Hypolimnion)	24	770	0
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Epilimnion)	24	870	1
11/14/02	R-7c	Ice House Reservoir - Upper Lake (Hypolimnion)	24	1200	5.2
11/14/02	R-8	Junction Reservoir	24	920	21

11/13/02	R-9	Camino Reservoir - mid reservoir	24	>2419.2	30.95
Appendix A-16. (continued)					
Triage Samping Sites					
11/13/02	R-10	Brush Creek Reservoir	24	727	21.3
11/12/02	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	24	1119.9	44.1
11/12/02	R-11b	Slab Creek Reservoir - Upper Site	24	>2419.2	81.6
11/13/02	R-12a	Chili Bar near Dam	24	>2419.2	172.3
11/13/02	R-12b	Chil Bar, mid-reservoir site	24	>2419.2	123.6
Fall Turnover - Post First Rain: Reservoir/Riverine Sites					
11/26/02	24	SF Silver Creek Upstream of Ice House Reservoir	8	130	1
11/26/02	25	SF Silver Creek outflow from Ice House Res.	8	150	1
11/26/02	27	SF Silver Creek inflow to Junction Res.	8	220	0
11/26/02	R7a	Ice House Reservoir	8	290	0
11/26/02	R7b	Ice House Reservoir- Mid	8	250	0
11/26/02	R7c	Ice House Reservoir - Upper Lake	8	180	2
First Rain					
11/11/02	17	S.F. Rubicon inflow to Robb's Forebay	24	1986.3	67.7
11/14/02	24	SF Silver Creek Upstream of Ice House Reservoir	24	980	26
11/12/02	42	Slab Creek Inflow to Slab Creek Reservoir	24	>2419.2	98.8
First Rain / Fall Turnover					
11/14/02	21	Tells Creek Upstream of Union Valley Reservoir	24	980	20
11/14/02	22	Big Silver Creek upstream of Union Valley Reservoir	24	270	31
11/14/02	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	24	820	23
11/14/02	28	Little Silver Creek inflow to Junction Res.	24	170	4.1
First Rain / Fall Turnover					
11/13/02	33	Silver Creek inflow to Camino Reservoir	24	980.4	8.5
11/13/02	38	SFAR upstream of Camino Powerhouse	24	>2419.2	14.8
11/13/02	39	Brush Creek Inflow to Brush Ck. Reservoir	24	613.1	37.3

Appendix A-17. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Hydrolab and YSI Data							
Date	**Site #**	**Site Name**	**Water Temperature (^{o}C)**	**Dissolved Oxygen (mg/L)**	**pH**	**Specific Conductance (uS/cm)**	**Conductivity (uS/cm)**
6/11/03	1	Rubicon River Inflow to Rubicon Reservoir	8.46	9.73	6.84	10	7
6/11/03	2	Rubicon R. outflow from Rubicon Res	5.49	11.17	6.79	8	5
6/11/03	3a	Fox Lake reach flow from Rubicon Reservoir	6.29	10.88	6.34	8	5
6/11/03	4	Highland inflow to Rockbound Res.	6.08	10.7	5.75	3	2
6/11/03	5	Rubicon Outflow from Rockbound Lake	8.02	9.86	6.43	7	5
6/11/03	6	Little Rubicon outflow from Buck Island Lake	9.15	10.01	6.44	7	5
5/12/03	7	Gerle Creek outflow from Loon Lake	5.8	12.18	6.49	7	4
5/12/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	7.08	12.31	6.25	10	7
5/12/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	5.6	13.1	6.45	10	6
5/12/03	16	Gerle Creek Canal inflow to Robb's Forebay	5.48	13.1	6.37	10	6
5/12/03	17	S.F. Rubicon inflow to Robb's Forebay	8.24	11.89	6.6	15	10
5/8/03	20	S.F. Rubicon upstream of Rubicon River	3.96	12.56	6.82	17	10
5/8/03	21	Tells Creek Upstream of Union Valley Reservoir	0.97	13.87	6.9	14	8
5/8/03	22	Big Silver Creek upstream of Union Valley Reservoir	0.91	13.99	6.7	12	6
5/8/03	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	1.8	13.18	6.67	14	8
5/11/03	24	SF Silver Creek Upstream of Ice House Reservoir	1.08	14.7	6.53	13	7
5/11/03	25	SF Silver Creek outflow from Ice House Res.	5.35	11.6	6.18	11	7
5/11/03	27	SF Silver Creek inflow to Junction Res.	8.9	11.95	6.87	19	13
5/13/03	28	Little Silver Creek inflow to Junction Res.	6.25	11.05	7.56	11	7
5/8/03	29	SF Silver Creek ds of Junction Dam	3.99	13.28	6.65	14	8
5/7/03	32	Silver Creek outflow upstream of Camino Reservoir	7.6	11.89	6.91	18	12
5/6/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	7.6		7.08	22	15
5/5/03	34	Silver Creek outflow from Camino Reservoir	7.6		6.82	19	13
5/11/03	38	SFAR upstream of Camino Powerhouse	8.7	13.34	7.4	43	29
5/5/03	39	Brush Creek Inflow to Brush Ck. Reservoir	6.6		7.01	17	11
5/5/03	40	Brush Creek Outflow from Brush Ck. Reservoir	7.35		7.18	19	12
5/11/03	41	SFAR downstream of Camino Powerhouse	7.12	12.84	6.85	21	14
5/5/03	42	Slab Creek Inflow to Slab Creek Reservoir	7.6		7.52	19	
5/11/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brush	7.64	12.54	7.04	30	20

Appendix A-17. (continued)							
Date	**Site #**	**Site Name**	**Water**	**Dissolved**	**pH**	**Specific**	**Conductivity**
5/11/03	46	SFAR downstream of Rock Ck. Confluence	11.9	11.2	7.5	53	40
5/11/03	47	SFAR downstream of White Rock Powerhouse	6.94	13.5	6.86	29	19
5/11/03	48	SFAR below Chili Bar Dam	7.8	13	7.17	32	22
5/12/03	51	SFAR downstream of Lotus/Uniontown C	8.6	12.56	7.47	40	30
5/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of sa	15.2	7.4	7.05	68	55
5/14/03	12a	Rocky Basin Creek (in situ only)	4.3	11.6	6.55	0.01	6
5/11/03	26a	South Fork Silver Creek (in situ only)	5.78	12.9	6.64	16	10
Reservoir Sites							
Vertical profiles for temperature, dissolved oxygen, pH, and specific conductance obtained for reservoir sites.							

Appendix A-18. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Reservoir Secchi Disk Depth			
Date	**Site #**	**Site Name**	**Secchi Disk Depth (m)**
Reservoir Sites			
6/11/03	R-1	Rubicon Reservoir	2.3
6/11/03	R-2	Rockbound Reservoir	11.3
6/11/03	R-3a	Buck Island	11
6/12/03	R-7a	Ice House Reservoir	6.6
6/12/03	R-7b	Ice House Reservoir- Mid	6
5/14/03	R-4a	Loon Lake Reservoir near Dam	>11.0
5/14/03	R-4b	Loon Lake West End	12
5/14/03	R-4c	Loon Lake NE Waterbody	>9.5
5/14/03	R-5	Gerle Creek Reservoir	9
5/7/03	R-6a	Union Valley Res - at Dam	7
5/7/03	R-6b	Union Valley Res - Mid	6
5/7/03	R-6c	Union Valley Robbs Tailrace	9
5/7/03	R-6d	Union Valley Res - Jones Fork Arm	>6
5/13/03	R-7a	Ice House Reservoir	9
5/13/03	R-7b	Ice House Reservoir- Mid	7
5/13/03	R-7c	Ice House Reservoir - Upper Lake	6
6/12/03	R-7c	Ice House Reservoir - Upper Lake	6.6
5/13/03	R-8a	Junction Reservoir	11
5/6/03	R-9a	Camino Reservoir - mid reservoir	**
5/6/03	R-10a	Brush Creek Reservoir	7
5/5/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	3.4
5/5/03	R-11b	Slab Creek Reservoir - Upper Site	>3.2
5/5/03	R-12a	Chili Bar near Dam	3.5
5/5/03	R-12b	Chil Bar, mid-reservoir site	4.1

**No sample obtained due to safety restrictions - samples obtained from shore.

> denotes that secchi disk was visible on the bottom of the reservoir.

Appendix A-19. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Nutrients, Total Organic Carbon, and Total Alkalinity									
Date	**Site #**	**Site Name**	**Nitrite-Nitrate**	**Ammonia**	**TKN**	**Total Phosphorus**	**Ortho-Phosphorus**	**TOC**	**Total Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites									
6/11/03	1	Rubicon River Inflow to Rubicon Reservoir	**	<0.05	**	<0.01	*	*	5.7
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	**	<0.05	*	<0.01	*	*	7.1
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	**	<0.05	*	<0.01	*	*	4.6
6/11/03	2-Mean	Rubicon R. outflow from Rubicon Res	**	<0.05	*	<0.01	*	*	5.9
6/11/03	3a	Fox Lake reach flow from Rubicon Reservoir	**	<0.05	*	<0.01	*	*	4.4
6/11/03	4	Highland inflow to Rockbound Res.	**	<0.05	*	<0.01	*	*	1.6
6/11/03	5	Rubicon Outflow from Rockbound Lake	**	<0.05	*	<0.01	*	*	4.1
6/11/03	6	Little Rubicon outflow from Buck Island Lake	**	<0.05	*	<0.01	*	*	4.1
5/12/03	7	Gerle Creek outflow from Loon Lake	0.037	<0.05	*	<0.01	*	*	4.1
5/12/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	0.019 J	<0.05	*	<0.01	*	*	3.8
5/12/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	0.021 J	<0.05	*	<0.01	*	*	4.5
5/12/03	16	Gerle Creek Canal inflow to Robb's Forebay	0.022 J	0.052	*	<0.01	*	*	4.2
5/12/03	17	S.F. Rubicon inflow to Robb's Forebay	0.024	<0.05	*	<0.01	*	*	7.5
5/8/03	20	S.F. Rubicon upstream of Rubicon River	0.043	<0.05	*	0.029	*	*	7.4
5/8/03	21	Tells Creek Upstream of Union Valley Reservoir	0.014 J	<0.05	*	0.038	*	*	7.0
5/8/03	22	Big Silver Creek upstream of Union Valley Res	0.014 J	<0.05	*	<0.01	*	*	5.6
5/8/03	23	Jones Fork Silver Ck. Inflow to Union Valley Res	0.0059 J	<0.05	*	0.015	*	*	7.2
5/11/03	24	SF Silver Creek Upstream of Ice House Reservoir	0.29	<0.05	*	0.024	*	*	6.1
5/11/03	25	SF Silver Creek outflow from Ice House Res.	0.11	<0.05	*	0.023	*	*	5.5
5/11/03	27	SF Silver Creek inflow to Junction Res.	FAIL	<0.05	*	0.025	*	*	7.9
5/13/03	28	Little Silver Creek inflow to Junction Res.	0.015	<0.05	*	0.016	*	*	5.1
5/8/03	29	SF Silver Creek ds of Junction Dam	0.05	<0.05	*	0.015	*	*	5.8
5/7/03	32	Silver Creek outflow upstream of Camino Reservoir	1.6	<0.05	*	0.017	*	*	7.6
5/6/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	<0.0045	<0.05	*	<0.01	*	*	11.0
5/5/03	34	Silver Creek outflow from Camino Reservoir	0.14	<0.05	*	0.015	*	*	8.0
5/11/03	38	SFAR upstream of Camino Powerhouse	<0.0045	<0.05	*	0.024	*	*	18.0
5/5/03	39	Brush Creek Inflow to Brush Ck. Reservoir	0.0057	<0.05	*	0.024	*	*	8.0
5/5/03	40	Brush Creek Outflow from Brush Ck. Reservoir	0.0056	<0.05	*	0.025	*	*	9.4
5/11/03	41	SFAR downstream of Camino Powerhouse	0.049	<0.05	*	<0.01	*	*	9.0
5/5/03	42	Slab Creek Inflow to Slab Creek Reservoir	0.062	<0.05	*	0.033	*	*	8.5

Appendix A-19. (continued)									
Date	**Site #**	**Site Name**	**Nitrate**	**Ammonia**	**TKN**	**Phosphorus**	**Phosphorus**	**TOC**	**Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites									
5/11/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	0.046	11.6	*	<0.01	*	*	12.0
5/11/03	46	SFAR downstream of Rock Ck. Confluence	0.17	<0.05	*	0.023	*	*	24.0
5/11/03	47	SFAR downstream of White Rock Powerhouse	0.043	<0.05	*	0.016	*	*	12.0
5/11/03	48	SFAR below Chili Bar Dam	0.048	<0.05	*	0.016	*	*	14.0
5/12/03	51	SFAR downstream of Lotus/Uniontown C	0.037	<0.05	*	<0.01	*	*	20.0
5/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	0.011 J	<0.05	*	0.024	*	*	28.0
6/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls		<0.05	*	0.22	*	*	110.0
Reservoir Sites									
6/11/03	R-1	Rubicon Reservoir	**	<0.05	*	<0.01	*	*	4.7
6/11/03	R-2	Rockbound Reservoir	**	<0.05	*	<0.01	*	*	4.3
6/11/03	R-3a	Buck Island	**	<0.05	*	<0.01	*	*	3.2
5/14/03	R-4a	Loon Lake Reservoir near Dam	0.031	<0.05	*	<0.01	*	*	3.6
5/14/03	R-4b	Loon Lake West End	0.03	<0.05	*	<0.01	*	*	3.8
5/14/03	R-4c	Loon Lake NE Waterbody	0.03	<0.05	*	0.011	*	*	4.0
5/14/03	R-5	Gerle Creek Reservoir	0.021	*	*	<0.01	*	*	4.5
5/7/03	R-6a	Union Valley Res - at Dam	0.089 J	<0.05	*	0.031	*	*	5.0
5/7/03	R-6b	Union Valley Res - Mid	0.094 J	<0.05	*	0.023	*	*	5.8
5/7/03	R-6c	Union Valley Robbs Tailrace	0.17 J	<0.05	*	0.025	*	*	5.2
5/7/03	R-6d	Union Valley Res - Jones Fork Arm	0.20 J	<0.05	*	0.036	*	*	6.0
5/13/03	R-7a	Ice House Reservoir	<0.0045	*	*	0.024	*	*	5.5
6/12/03	R-7a-1	Ice House Reservoir	**	<0.05	*	0.015	*	*	5.8
6/12/03	R-7a-2	Ice House Reservoir	**	<0.05	*	0.012	*	*	6.2
5/13/03	R-7b	Ice House Reservoir- Mid	<0.0045	*	*	0.016	*	*	6.0
6/12/03	R-7b-1	Ice House Reservoir- Mid	**	<0.05	*	0.017	*	*	5.7
6/12/03	R-7b-2	Ice House Reservoir- Mid	**	<0.05	*	0.013	*	*	5.9
5/13/03	R-7c	Ice House Reservoir - Upper Lake	<0.0045	*	*	0.016	*	*	6.0
6/12/03	R-7c-1	Ice House Reservoir - Upper Lake	**	<0.05	*	0.012	*	*	5.4
6/12/03	R-7c-2	Ice House Reservoir - Upper Lake	**	<0.05	*	0.012	*	*	5.1

Appendix A-19. (continued)									
Date	**Site #**	**Site Name**	**Nitrate**	**Ammonia**	**TKN**	**Phosphorus**	**Phosphorus**	**TOC**	**Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Reservoir Sites									
5/13/03	R-8a	Junction Reservoir	0.027	*	*	<0.01	*	*	6.4
5/6/03	R-9a	Camino Reservoir - mid reservoir	0.14	<0.05	*	<0.01	*	*	6.4
5/6/03	R-10a: Mean	Brush Creek Reservoir	<0.0045	<0.05	*	0.037	*	*	8.5
5/6/03	R-10a - dup	Brush Creek Reservoir	<0.0045	<0.05	*	0.048	*	*	8.4
5/6/03	R-10a - dup	Brush Creek Reservoir	<0.0045	<0.05	*	0.026	*	*	8.6
5/5/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	0.092	<0.05	*	0.049	*	*	12.0
5/5/03	R-11b: Mean	Slab Creek Reservoir - Upper Site	0.105	<0.05	*	0.0365	*	*	11.5
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	0.11	<0.05	*	0.041	*	*	11.0
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	0.1	<0.05	*	0.032	*	*	12.0
5/5/03	R-12a-Mean	Chili Bar near Dam	0.119	<0.05	*	0.045	*	*	13.0
5/5/03	R-12b	Chil Bar, mid-reservoir site	0.078	<0.05	*	0.056	*	*	12.0

**No sample obtained for this parameter.

Appendix A-20. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Suspended and Dissolved Solids											
Date	**Site#**	**Site Name**	**TSS**	**TDS**	**Turbidity**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites											
6/11/03	1	Rubicon River Inflow to Rubicon Reservoir	<1	24	**	1.5	<0.5	<0.5	<0.5	<1	0.78
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	<1	18	**	1.3	<0.5	<0.5	<0.5	<1	<0.4
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	<1	16	**	1.3	<0.5	<0.5	<0.5	<1	0.61
6/11/03	2-Mean	Rubicon R. outflow from Rubicon Res	<1	17	**	1.3	<0.5	<0.5	<0.5	<1	<0.4
6/11/03	3a	Fox Lake reach flow from Rubicon Reservoir	4	18	**	1.4	<0.5	<0.5	<0.5	<1	0.58
6/11/03	4	Highland inflow to Rockbound Res.	2	12	**	<0.5	<0.5	<0.5	<0.5	<1	<0.4
6/11/03	5	Rubicon Outflow from Rockbound Lake	<1	18	**	1.1	<0.5	<0.5	<0.5	<1	0.53
6/11/03	6	Little Rubicon outflow from Buck Island Lake	2	6	**	1.1	<0.5	<0.5	<0.5	<1	0.54
5/12/03	7	Gerle Creek outflow from Loon Lake	<1	12	0.22	1.2	<0.5	<0.5	0.51	<0.5	1.2
5/12/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	<1	30	0.15	0.9	<0.5	<0.5	0.83	0.63	<1
5/12/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	<1	12	0.22	1.1	<0.5	<0.5	0.69	0.52	<1
5/12/03	16	Gerle Creek Canal inflow to Robb's Forebay	<1	18	0.21	1.1	<0.5	<0.5	0.67	0.55	<1
5/12/03	17	S.F. Rubicon inflow to Robb's Forebay	<1	18	0.13	1.4	<0.5	<0.5	1.1	<0.5	<1
5/8/03	20	S.F. Rubicon upstream of Rubicon River	<1	6	0.37	1.9	<0.5	<0.5	0.78	<0.5	<1
5/8/03	21	Tells Creek Upstream of Union Valley Reservoir	<1	12	0.35	1.4	<0.5	<0.5	0.84	<0.5	<1
5/8/03	22	Big Silver Creek upstream of Union Valley Res.	<1	4	0.8	1.2	<0.5	<0.5	0.92	<0.5	<1
5/8/03	23	Jones Fork Silver Ck. Inflow to Union Valley Res.	<1	8	0.24	1.4	<0.5	<0.5	1.1	<0.5	<1
5/11/03	24	SF Silver Creek Upstream of Ice House Reservoir	<1	16	0.21	1.2	<0.5	<0.5	1.1	0.5	<1
5/11/03	25	SF Silver Creek outflow from Ice House Res.	<1	12	0.49	1.1	<0.5	<0.5	0.96	0.51	<1
5/11/03	27	SF Silver Creek inflow to Junction Res.	<1	24	0.89	1.7	<0.5	0.57	1.2	0.64	<1
5/13/03	28	Little Silver Creek inflow to Junction Res.	<1	14	0.49	0.78	<0.5	<0.5	0.56	0.54	<1
5/8/03	29	SF Silver Creek ds of Junction Dam	<1	<1	0.7	1.4	<0.5	<0.5	0.63	<0.5	<1
5/7/03	32	Silver Creek outflow upstream of Camino Reservoir	<1	4	0.38	1.8	0.51	<0.5	0.76	0.6	<1
5/6/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	<1	4	0.26	2.1	0.73	<0.5	1.2	0.62	<1
5/5/03	34	Silver Creek outflow from Camino Reservoir	<1	4	0.63	1.9	<0.5	<0.5	0.87	0.52	<1
5/11/03	38	SFAR upstream of Camino Powerhouse	<1	54	2	4.1	1	0.8	3.4	2.5	<1
5/5/03	39	Brush Creek Inflow to Brush Ck. Reservoir	<1	<1	0.38	1.5	0.64	<0.5	0.96	0.83	<1
5/5/03	40	Brush Creek Outflow from Brush Ck. Reservoir	<1	6	0.83	1.9	0.67	<0.5	1	0.81	<1
5/11/03	41	SFAR downstream of Camino Powerhouse	<1	28	0.83	2	<0.5	<0.5	1.6	0.96	<1
5/5/03	42	Slab Creek Inflow to Slab Creek Reservoir	<1	*	0.52	1.7	0.66	<0.5	1.1	0.76	<1

Appendix A-20. (continued)											
Date	**Site#**	**Site Name**	**TSS**	**TDS**	**Turbidity**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites											
5/11/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	<1	11.6	1.2	2.9	0.74	0.63	2.2	1.5	<1
5/11/03	46	SFAR downstream of Rock Ck. Confluence	2	28	6.4	5.2	2.4	0.67	2.7	1.8	2.2
5/11/03	47	SFAR downstream of White Rock Powerhouse	<1	26	1.6	2.8	0.73	0.58	2.1	1.5	<1
5/11/03	48	SFAR below Chili Bar Dam	<1	32	1.4	3	0.9	0.58	2.1	1.5	<1
5/12/03	51	SFAR downstream of Lotus/Uniontown C	<1	46	1.2	4.4	2.1	0.6	2.5	1.7	2.5
5/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	<1	42	0.99	6.4	2.9	0.71	3	2.3	2.6
6/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	2	**	**	15	9.9	1.6	17	14	12
Reservoir Sites											
6/11/03	R-1	Rubicon Reservoir	<1	12	**	1.3	<0.5	<0.5	<0.5	<1	0.61
6/11/03	R-2	Rockbound Reservoir	<1	12	**	1.1	<0.5	<0.5	<0.5	<1	0.51
6/11/03	R-3a	Buck Island	<1	10	**	1.1	<0.5	<0.5	<0.5	<1	1.3
5/14/03	R-4a	Loon Lake Reservoir near Dam	<1	44	0.35	1	<0.5	<0.5	<0.5	<	<1
5/14/03	R-4b	Loon Lake West End	<1	14	0.39	1	<0.5	<0.5	0.51	<	<1
5/14/03	R-4c	Loon Lake NE Waterbody	<1	22	0.53	1	<0.5	<0.5	0.6	<	<1
5/14/03	R-5	Gerle Creek Reservoir	<1	14	0.4	0.99	<0.5	<0.5	0.73	0.57	<1
5/7/03	R-6a	Union Valley Res - at Dam	<1	<1	0.72	1.4	<0.5	<0.5	0.73	<0.5	1.1
5/7/03	R-6b	Union Valley Res - Mid	<1	6	0.59	1.3	<0.5	<0.5	0.7	0.61	1.4
5/7/03	R-6c	Union Valley Robbs Tailrace	<1	6	0.51	1.3	<0.5	<0.5	0.6	0.59	<1
5/7/03	R-6d	Union Valley Res - Jones Fork Arm	<1	18	0.47	1.2	<0.5	<0.5	0.83	<0.5	<1
5/13/03	R-7a	Ice House Reservoir	<1	24	0.86	1.1	<0.5	<0.5	0.94	0.53	<1
6/12/03	R-7a-1	Ice House Reservoir	<1	22	**	0.94	<0.5	<0.5	0.86	<1	<0.4
6/12/03	R-7a-2	Ice House Reservoir	<1	24	**	1.1	<0.5	<0.5	<0.5	<1	<0.4
5/13/03	R-7b	Ice House Reservoir- Mid	2	22	0.78	1.1	<0.5	<0.5	0.94	0.52	<1
6/12/03	R-7b-1	Ice House Reservoir- Mid	<1	24	**	1	<0.5	<0.5	0.92	<1	<0.4
6/12/03	R-7b-2	Ice House Reservoir- Mid	<1	22	**	1.1	<0.5	<0.5	0.97	<1	<0.4
5/13/03	R-7c	Ice House Reservoir - Upper Lake	2	20	0.91	1.2	<0.5	<0.5	1	<	<1
6/12/03	R-7c-1	Ice House Reservoir - Upper Lake	<1	18	**	0.92	<0.5	<0.5	0.83	<1	<0.4

Appendix A-20. (continued)											
Date	**Site#**	**Site Name**	**TSS**	**TDS**	**Turbidity**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Reservoir Sites											
6/12/03	R-7c-2	Ice House Reservoir - Upper Lake	4	16	**	0.86	<0.5	<0.5	0.78	<1	<0.4
5/13/03	R-8a	Junction Reservoir	<1	18	0.53	1.3	<0.5	<0.5	0.96	0.58	<1
5/6/03	R-9a	Camino Reservoir - mid reservoir	<1	4	0.6	1.4	<0.5	<0.5	0.69	0.51	<1
5/6/03	R-10a Mean	Brush Creek Reservoir	<1	2	0.7	1.7	0.66	<0.5	1	0.84	<1
5/6/03	R-10a - dup	Brush Creek Reservoir	<1	<1	0.67	1.7	0.66	<0.5	1	0.84	<1
5/6/03	R-10a - dup	Brush Creek Reservoir	<1	2	0.73	1.7	0.66	<0.5	1	0.84	<1
5/5/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<1	12	2	3	0.78	0.53	1.9	1.4	<1
5/5/03	R-11b: Mean	Slab Creek Reservoir - Upper Site	<1	20	1.7	2.8	0.74	0.535	1.75	1.2	1.2
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	<1	12	1.8	2.7	0.72	0.54	1.7	1.2	<1
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	<1	28	1.6	2.9	0.76	0.53	1.8	1.2	1.2
5/5/03	R-12a-Mean	Chili Bar near Dam	<1	19	1.95	3.4	1	0.6	2.1	1.5	1.1
5/5/03	R-12b	Chil Bar, mid-reservoir site	<1	20	2.3	3.5	1	0.6	2.1	1.6	1.1

**No sample obtained for this parameter.

Appendix A-21. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Organics

No Organics were sampled during the spring sampling event.

Appendix A-22. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Various Metals and Cyanide (Total Recoverable).										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites										
6/11/03	1	Rubicon River Inflow to Rubicon Reservoir	62	<0.2	1.8	<0.1	**	**	**	**
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	60	<0.2	1.8	<0.1	**	**	**	**
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	57	<1	<20	<0.1	**	**	**	**
6/11/03	2-Mean	Rubicon R. outflow from Rubicon Res	58.5	<0.2 & <1	<20	<0.1	**	**	**	**
6/11/03	3a	Fox Lake reach flow from Rubicon Reservoir	160	<1	<20	<0.1	**	**	**	**
6/11/03	4	Highland inflow to Rockbound Res.	61	<1	<20	<0.1	**	**	**	**
6/11/03	5	Rubicon Outflow from Rockbound Lake	60	<1	<20	<0.1	**	**	**	**
6/11/03	6	Little Rubicon outflow from Buck Island Lake	61	<1	<20	<0.1	**	**	**	**
5/12/03	7	Gerle Creek outflow from Loon Lake	52	<1	<20	<0.1	**	**	**	**
5/12/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	58	<1	<20	<0.1	**	**	**	**
5/12/03	15	Gerle Creek Outflow from from Gerle Creek Reservoir	<50	<1	<20	<0.1	**	**	**	**
5/12/03	16	Gerle Creek Canal inflow to Robb's Forebay	57	<1	<20	<0.1	**	**	**	**
5/12/03	17	S.F. Rubicon inflow to Robb's Forebay	51	<1	<20	<0.1	**	**	**	**
5/8/03	20	S.F. Rubicon upstream of Rubicon River	<50	<1	<20	0.032	**	**	**	**
5/8/03	21	Tells Creek Upstream of Union Valley Reservoir	<50	<1	<20	<0.025	**	**	**	**
5/8/03	22	Big Silver Creek upstream of Union Valley Reservoir	64	<1	<20	<0.025	**	**	**	**
5/8/03	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	72	<1	<20	<0.025	**	**	**	**
5/11/03	24	SF Silver Creek Upstream of Ice House Reservoir	70	<1	<20	<0.1	**	**	**	**
5/11/03	25	SF Silver Creek outflow from Ice House Res.	<50	<1	<20	<0.1	**	**	**	**
5/11/03	27	SF Silver Creek inflow to Junction Res.	57	<1	<20	<0.1	**	**	**	**
5/13/03	28	Little Silver Creek inflow to Junction Res.	45	<0.2	20	<0.1	**	**	**	**
5/8/03	29	SF Silver Creek ds of Junction Dam	63	<1	<20	0.12	**	**	**	**
5/7/03	32	Silver Creek outflow upstream of Camino Reservoir	<50	<1	<20	<0.025	**	**	**	**
5/6/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	<50	<1	<20	<0.025	**	**	**	**
5/5/03	34	Silver Creek outflow from Camino Reservoir	<50	<1	<20	0.056	**	**	**	**
5/11/03	38	SFAR upstream of Camino Powerhouse	140	<1	<20	<0.1	**	**	**	**
5/5/03	39	Brush Creek Inflow to Brush Ck. Reservoir	<50	<1	<20	<0.025	**	**	**	**
5/5/03	40	Brush Creek Outflow from Brush Ck. Reservoir	<50	<1	<20	0.045	**	**	**	**
5/11/03	41	SFAR downstream of Camino Powerhouse	<50	<1	<20	<0.1	**	**	**	**
5/5/03	42	Slab Creek Inflow to Slab Creek Reservoir	51	<1	<20	<0.025	**	**	**	**
5/11/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	95	<1	<20	<0.1	**	**	**	**
5/11/03	46	SFAR downstream of Rock Ck. Confluence	230	<1	20	0.12	**	**	**	**

Appendix A-22. (continued)										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**11.6**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites										
5/11/03	47	SFAR downstream of White Rock Powerhouse	100	<1	<20	<0.1	**	**	**	**
5/11/03	48	SFAR below Chili Bar Dam	64	<1	<20	<0.1	**	**	**	**
5/12/03	51	SFAR downstream of Lotus/Uniontown C	86	<1	<20	<0.1	**	**	**	**
5/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	<50	<1	<20	<0.1	**	**	**	**
6/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	<50	1.3	27	<0.1	**	**	**	**
Reservoir Sites										
6/11/03	R-1	Rubicon Reservoir	64	<1	<20	<0.1	**	**	**	**
6/11/03	R-2	Rockbound Reservoir	61	<1	<20	<0.1	**	**	**	**
6/11/03	R-3a	Buck Island	80	<1	<20	<0.1	**	**	**	**
5/14/03	R-4a	Loon Lake Reservoir near Dam	51	<1	<20	<0.1	**	**	**	**
5/14/03	R-4b	Loon Lake West End	<50	<1	<20	<0.1	**	**	**	**
5/14/03	R-4c	Loon Lake NE Waterbody	55	<1	<20	<0.1	**	**	**	**
5/14/03	R-5	Gerle Creek Reservoir	69	<1	<20	<0.1	**	**	**	**
5/7/03	R-6a	Union Valley Res - at Dam	56	<1	<20	<0.025	**	**	**	**
5/7/03	R-6b	Union Valley Res - Mid	51	<1	<20	<0.025	**	**	**	**
5/7/03	R-6c	Union Valley Robbs Tailrace	<50	<1	<20	<0.025	**	**	**	**
5/7/03	R-6d	Union Valley Res - Jones Fork Arm	54	<1	<20	0.025	**	**	**	**
5/13/03	R-7a	Ice House Reservoir	44	<0.2	6.3	<0.1	**	**	**	**
6/12/03	R-7a-1	Ice House Reservoir	85	<1	<20	<0.1	**	**	**	**
6/12/03	R-7a-2	Ice House Reservoir	64	<1	<20	<0.1	**	**	**	**
5/13/03	R-7b	Ice House Reservoir- Mid	44	<0.2	6.1	<0.1	**	**	**	**
6/12/03	R-7b-1	Ice House Reservoir- Mid	64	<1	<20	<0.1	**	**	**	**
6/12/03	R-7b-2	Ice House Reservoir- Mid	51	<1	<20	<0.1	**	**	**	**
5/13/03	R-7c	Ice House Reservoir - Upper Lake	47	<0.2	6.2	<0.1	**	**	**	**
6/12/03	R-7c-1	Ice House Reservoir - Upper Lake	82	<1	<20	<0.1	**	**	**	**
6/12/03	R-7c-2	Ice House Reservoir - Upper Lake	92	<1	<20	<0.1	**	**	**	**
5/13/03	R-8a	Junction Reservoir	38	<0.2	8.4	<0.1	**	**	**	**
5/6/03	R-9a	Camino Reservoir - mid reservoir	53	<1	<20	0.029	**	**	**	**
5/6/03	R-10a	Brush Creek Reservoir	<50	<1	<20	<0.025	**	**	**	**
5/5/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	110	<1	<20	0.067	**	**	**	**
5/5/03	R-11b: Mean	Slab Creek Reservoir - Upper Site	120	<1	<20	<0.1	**	**	**	**
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	120	<1	<20	0.07	**	**	**	**

Appendix A-22. (continued)

Date	Site #	Site Name	Aluminum	Arsenic	Barium	Iron	Manganese	Mercury	Selenium	Cyanide
			ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	ug/L	ug/L
Reservoir Sites										
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	120	<1	<20	0.039	**	**	**	**
5/5/03	R-12a-Mean	Chili Bar near Dam	78	<1	<20	0.07	**	**	**	**
5/5/03	R-12b	Chil Bar, mid-reservoir site	92	<1	<20	0.07	**	**	**	**

**No sample obtained for this parameter.

Appendix A-23. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Various Metals (Total Recoverable) and Total Hardness.									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites									
6/11/03	1	Rubicon River Inflow to Rubicon Reservoir	5.5	<0.05	0.39	<0.05	<1	0.023	**
6/11/03	2-Mean	Rubicon R. outflow from Rubicon Res	9.3	<0.05	0.46	<0.05	<1	0.04	**
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	7.5	<0.05	0.30	<0.05	<1	0.046	**
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	11.0	<0.05	0.61	<0.05	<2	<0.04	**
6/11/03	3a	Fox Lake reach flow from Rubicon Reservoir	6.5	<0.05	0.64	0.15	<2	<0.04	**
6/11/03	4	Highland inflow to Rockbound Res.	<1	<0.05	<0.1	<0.05	<2	<0.04	**
6/11/03	5	Rubicon Outflow from Rockbound Lake	4.5	<0.05	0.29	0.06	<2	<0.04	**
6/11/03	6	Little Rubicon outflow from Buck Island Lake	7.5	<0.05	0.30	<0.05	<2	<0.04	**
5/12/03	7	Gerle Creek outflow from Loon Lake	3.6	0.12	1.20	<0.05	2.1	<0.04	**
5/12/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	2.6	<0.05	0.24	<0.05	<2	<0.04	**
5/12/03	15	Gerle Creek Outflow from from Gerle Creek Reservoir	3.1	<0.05	0.20	0.06	<2	<0.04	**
5/12/03	16	Gerle Creek Canal inflow to Robb's Forebay	2.6	<0.05	0.55	0.08	<2	<0.04	**
5/12/03	17	S.F. Rubicon inflow to Robb's Forebay	4.6	<0.05	0.22	<0.05	<2	<0.04	**
5/8/03	20	S.F. Rubicon upstream of Rubicon River	5.2	<0.05	0.20	<0.05	<2	<0.04	**
5/8/03	21	Tells Creek Upstream of Union Valley Reservoir	5.2	<0.05	0.11	<0.05	<2	<0.04	**
5/8/03	22	Big Silver Creek upstream of Union Valley Reservoir	3.1	<0.05	0.26	0.07	<2	<0.04	**
5/8/03	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	3.1	<0.05	0.13	0.05	<2	<0.04	**
5/11/03	24	SF Silver Creek Upstream of Ice House Reservoir	4.1	<0.05	0.27	0.05	<2	<0.04	**
5/11/03	25	SF Silver Creek outflow from Ice House Res.	3.6	<0.05	0.20	<0.05	<2	<0.04	**
5/11/03	27	SF Silver Creek inflow to Junction Res.	5.1	<0.05	0.24	0.06	<2	<0.04	**
5/13/03	28	Little Silver Creek inflow to Junction Res.	3.1	<0.04	1.20	<0.1	0.4	<0.04	**
5/8/03	29	SF Silver Creek ds of Junction Dam	3.6	<0.05	0.26	0.10	<2	<0.04	**
5/7/03	32	Silver Creek outflow upstream of Camino Reservoir	7.2	<0.05	0.12	0.08	<2	<0.04	**
5/6/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	5.7	<0.05	0.19	0.07	<2	<0.04	**
5/5/03	34	Silver Creek outflow from Camino Reservoir	6.2	<0.05	0.31	0.06	<2	<0.04	**
5/11/03	38	SFAR upstream of Camino Powerhouse	13.8	<0.05	0.42	0.08	<2	<0.04	**
5/5/03	39	Brush Creek Inflow to Brush Ck. Reservoir	5.7	<0.05	0.11	0.06	<2	<0.04	**
5/5/03	40	Brush Creek Outflow from Brush Ck. Reservoir	6.2	<0.05	0.34	0.06	<2	<0.04	**
5/11/03	41	SFAR downstream of Camino Powerhouse	8.2	<0.05	0.20	<0.05	<2	<0.04	**
5/5/03	42	Slab Creek Inflow to Slab Creek Reservoir	6.7	<0.05	0.29	0.10	<2	<0.04	**

Appendix A-23. (continued)									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites				**11.6**					
5/11/03	43	SFAR outflow -Slb Ck.Res-up of Iowa-Brushy Canyon. Ck.	9.2	<0.05	0.59	0.11	<2	<0.04	**
5/11/03	47	SFAR downstream of White Rock Powerhouse	9.7	<0.05	0.29	0.08	<2	<0.04	**
5/11/03	48	SFAR below Chili Bar Dam	10.2	<0.05	0.26	0.08	<2	<0.04	**
5/12/03	51	SFAR downstream of Lotus/Uniontown C	18.9	<0.1	<1	<0.2	<2	<0.2	**
5/12/03	54	SFAR dnstrm of Hiway 49 Bridge / dnstrm of salmon falls	27.6	<0.1	<1	<0.2	<2	<0.2	**
6/12/03	54	SFAR dnstrm of Hiway 49 Bridge / dnstrm of salmon falls	87.9	<0.1	1.60	<0.2	2.5	<0.2	**
Reservoir Sites									
6/11/03	R-1	Rubicon Reservoir	5.5	<0.05	0.44	<0.05	<2	<0.04	**
6/11/03	R-2	Rockbound Reservoir	5.0	<0.05	0.56	0.08	<2	0.15	**
6/11/03	R-3a	Buck Island	5.5	<0.05	0.94	0.08	<2	0.052	**
5/14/03	R-4a	Loon Lake Reservoir near Dam	3.1	<0.05	0.20	<0.05	<2	0.13	**
5/14/03	R-4b	Loon Lake West End	3.1	<0.05	0.25	<0.05	<2	<0.04	**
5/14/03	R-4c	Loon Lake NE Waterbody	2.6	<0.05	0.23	0.06	<2	<0.04	**
5/14/03	R-5	Gerle Creek Reservoir	3.1	<0.05	0.29	0.06	<2	<0.04	**
5/7/03	R-6a	Union Valley Res - at Dam	3.6	<0.05	0.20	<0.05	<2	<0.04	**
5/7/03	R-6b	Union Valley Res - Mid	4.6	<0.05	0.36	<0.05	<2	0.23	**
5/7/03	R-6c	Union Valley Robbs Tailrace	3.6	<0.05	0.24	<0.05	<2	<0.04	**
5/7/03	R-6d	Union Valley Res - Jones Fork Arm	2.6	<0.05	0.40	0.10	<2	0.52	**
5/13/03	R-7a	Ice House Reservoir	3.1	<0.04	0.15	<0.1	<0.2	<0.04	**
6/12/03	R-7a-1	Ice House Reservoir	5.5	<0.05	0.29	<0.05	<2	<0.04	**
6/12/03	R-7a-2	Ice House Reservoir	6.5	<0.05	0.39	<0.05	<2	<0.04	**
5/13/03	R-7b	Ice House Reservoir- Mid	2.6	<0.04	0.17	<0.1	<0.2	0.042	**
6/12/03	R-7b-1	Ice House Reservoir- Mid	5.5	<0.05	0.44	<0.05	<2	<0.04	**
6/12/03	R-7b-2	Ice House Reservoir- Mid	4.5	<0.05	0.18	<0.05	<2	<0.04	**
5/13/03	R-7c	Ice House Reservoir - Upper Lake	2.6	<0.04	0.16	<0.1	<0.2	0.072	**
6/12/03	R-7c-1	Ice House Reservoir - Upper Lake	7.5	<0.05	0.27	0.05	<2	<0.04	**
6/12/03	R-7c-2	Ice House Reservoir - Upper Lake	8.5	<0.05	0.22	0.06	<2	<0.04	**
5/13/03	R-8a	Junction Reservoir	4.1	<0.04	0.19	<0.1	0.22	0.059	**
5/6/03	R-9a	Camino Reservoir - mid reservoir	7.7	<0.05	0.33	0.27	<2	<0.04	**
5/6/03	R-10a - dup	Brush Creek Reservoir	5.7	<0.05	0.19	0.05	<2	<0.04	**

Appendix A-23. (continued)									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/L	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
Reservoir Sites									
5/6/03	R-10a - dup	Brush Creek Reservoir	5.2	**	**	**	**	**	**
5/5/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	9.3	<0.05	0.33	0.10	<2	<0.04	**
5/5/03	R-11b: Mean	Slab Creek Reservoir - Upper Site	8.0	<0.05	0.57	0.14	<2	0.14	**
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	8.3	<0.05	0.38	0.11	<2	<0.04	**
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	7.7	<0.05	0.76	0.16	<2	0.14	**
5/5/03	R-12a dup	Chili Bar near Dam	10.3	<0.05	0.42	0.08	<2	0.077	**
5/5/03	R-12a dup	Chili Bar near Dam	10.3	<0.05	0.39	0.08	<2	<0.04	**
5/5/03	R-12a-Mean	Chili Bar near Dam	10.3	<0.05	0.41	0.08	<2	0.077	**
5/5/03	R-12b	Chil Bar, mid-reservoir site	10.8	<0.05	0.59	0.13	<2	0.096	**

**No sample obtained for this parameter.

Appendix A-24. UARP & Chili Bar 2003 Spring Runoff Sampling Results: Coliform and *E. Coli*					
Date	**Site #**	**Site Name**	**Holding Time**	**Total Coliform**	***E. coli***
			Hours	**MPN/100 ml**	**MPN/100 ml**
Riverine Sites					
6/11/03	1	Rubicon River Inflow to Rubicon Reservoir	24	30.9	0
6/11/03	2-Mean	Rubicon R. outflow from Rubicon Res	24	209.4	0
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	24	260.2	0
6/11/03	2-dup	Rubicon R. outflow from Rubicon Res	24	158.5	0
6/11/03	3a	Fox Lake reach flow from Rubicon Reservoir	24	307.6	0
6/11/03	4	Highland inflow to Rockbound Res.	24	35.0	0
6/11/03	5	Rubicon Outflow from Rockbound Lake	24	39.3	0
6/11/03	6	Little Rubicon outflow from Buck Island Lake	24	85.5	1
5/12/03	7	Gerle Creek outflow from Loon Lake	8	115.3	0
5/12/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	8	119.8	1
5/12/03	15	Gerle Creek Outflow from from Gerle Creek Reservoir	8	53.7	0
5/12/03	16	Gerle Creek Canal inflow to Robb's Forebay	8	83.6	1
5/12/03	17	S.F. Rubicon inflow to Robb's Forebay	8	107.6	0
5/8/03	20	S.F. Rubicon upstream of Rubicon River	8	131.3	0
5/8/03	21	Tells Creek Upstream of Union Valley Reservoir	8	104.6	0
5/8/03	22	Big Silver Creek upstream of Union Valley Reservoir	8	85.7	0
5/8/03	23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	8	156.5	2
5/11/03	24	SF Silver Creek Upstream of Ice House Reservoir	24	41.3	0
5/11/03	25	SF Silver Creek outflow from Ice House Res.	24	5.2	0
5/11/03	27	SF Silver Creek inflow to Junction Res.	24	248.9	0
5/13/03	28	Little Silver Creek inflow to Junction Res.	8	101.2	2
5/8/03	29	SF Silver Creek ds of Junction Dam	8	20.1	0
5/7/03	32	Silver Creek outflow upstream of Camino Reservoir	8	101.9	2
5/6/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	8	75.4	1
5/5/03	34	Silver Creek outflow from Camino Reservoir	8	111.9	0
5/11/03	38	SFAR upstream of Camino Powerhouse	24	95.9	0
5/5/03	39	Brush Creek Inflow to Brush Ck. Reservoir	8	93.2	2
5/5/03	40	Brush Creek Outflow from Brush Ck. Reservoir	8	51.2	1
5/11/03	41	SFAR downstream of Camino Powerhouse	24	57.6	1
5/5/03	42	Slab Creek Inflow to Slab Creek Reservoir	8	160.7	4.1
5/11/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	24	77.1	0

Appendix A-24. (continued)					
Date	**Site #**	**Site Name**	**Holding Time**	**Total Coliform**	***E. coli***
			Hours	**MPN**	**MPN**
Riverine Sites				**11.6**	
5/11/03	46	SFAR downstream of Rock Ck. Confluence	24	866.4	1
5/11/03	47	SFAR downstream of White Rock Powerhouse	24	114.5	1
5/11/03	48	SFAR below Chili Bar Dam	24	290.9	23.8
5/12/03	51	SFAR downstream of Lotus/Uniontown C	8	2419.2	25.9
5/12/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	8	218.7	0
5/14/03	13a	Gerle Creek	8	272.3	6.3
5/11/03	26a	South Fork Silver Creek (in situ only)	24	235.9	0
Reservoir Sites					
6/11/03	R-1	Rubicon Reservoir	24	19.3	0
6/11/03	R-2	Rockbound Reservoir	24	28.5	0
6/11/03	R-3a	Buck Island	24	49.5	0
5/14/03	R-4a	Loon Lake Reservoir near Dam	8	1.0	0
5/14/03	R-4b	Loon Lake West End	8	3.1	0
5/14/03	R-4c	Loon Lake NE Waterbody	8	4.1	0
5/14/03	R-4d	Loon Lake near Pleasant Camp ground	8	172.2	0
5/14/03	R-4e	Loon Lake near west of Main Dam	8	1.0	0
5/14/03	R-4f	Loon Lake East of Loon Lake Campground	8	5.2	0
5/14/03	R-5	Gerle Creek Reservoir	8	191.8	3
5/7/03	R-6a	Union Valley Res - at Dam	8	8.6	0
5/7/03	R-6b	Union Valley Res - Mid	8	10.9	0
5/7/03	R-6c	Union Valley Robbs Tailrace	8	24.3	1
5/7/03	R-6d	Union Valley Res - Jones Fork Arm	8	29.5	2
5/7/03	R-6e	Union Valley Res near Wench Creek	8	24.3	0
5/7/03	R-6f	Union Valley Res. Near Yellow Jacket Campground	8	16.1	0
5/13/03	R-6g	Union Valley Res near West Point Boat Launch	8	13.2	0
5/13/03	R-6h	Union Valley Res. Near Fashoda Beach?	8	146.7	1
5/13/03	R-6i	Union Valley Coliform Site	8	218.7	0
5/13/03	R-7a	Ice House Reservoir	8	0.0	0
5/13/03	R-7b	Ice House Reservoir- Mid	8	0.0	0
5/13/03	R-7c	Ice House Reservoir - Upper Lake	8	17.5	0

Appendix A-24. (continued)					
Date	**Site #**	**Site Name**	**Holding Time**	**Total Coliform**	***E. coli***
			Hours	**MPN**	**MPN**
Reservoir Sites					
5/11/03	R-7d	Ice House Reservoir - Coliform Site	24	0.0	0
5/11/03	R-7e	Ice House Reservoir Coliform Site	24	0.0	0
5/13/03	R-8a	Junction Reservoir	8	22.3	0
5/11/03	R-8b	Junction Reservoir - Coliform Site	24	261.3	0
5/6/03	R-9a	Camino Reservoir - mid reservoir	8	146.7	1
5/6/03	R-9b	Camino Reservoir- near boat launch	8	172.3	1
5/6/03	R-10a: Mean	Brush Creek Reservoir	8	35.8	0
5/6/03	R-10a - dup	Brush Creek Reservoir	8	58.3	0
5/6/03	R-10a - dup	Brush Creek Reservoir	8	13.2	0
5/5/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	8	135.4	1
5/5/03	R-11b: Mean	Slab Creek Reservoir - Upper Site	8	197.3	3.6
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	8	198.9	5.2
5/5/03	R-11b-dup	Slab Creek Reservoir - Upper Site	8	195.6	2
5/5/03	R-12a-Mean	Chili Bar near Dam	8	257.8	4.7
5/5/03	R-12b	Chil Bar, mid-reservoir site	8	204.6	6.3

Appendix A-25. UARP & Chili Bar Summer 2003 Sampling Results: YSI Data							
Date	**Site #**	**Site Name**	**Water Temperature (^{o}C)**	**Dissolved Oxygen (mg/L)**	**pH**	**Specific Conductance (uS/cm)**	**Conductivity (uS/cm)**
9/17/03	1	Rubicon River Inflow to Rubicon Reservoir	17.77	9.47	7.23	15	13
9/17/03	2	Rubicon R. outflow from Rubicon Res	15.59	9.25	6.85	13	11
9/17/03	5	Rubicon Outflow from Rockbound Lake	17.26	9.64	6.96	8	9
9/17/03	6	Little Rubicon Outflow from Buck Island	15.68	9.39	6.83	10	8
9/17/03	7	Gerle Creek outflow from Loon Lake	16.36	8.67	6.38	9	7
9/17/03	9	Gerle Ck. Downstream of Jerrett Creek	10.99	10.34	6.26	9	7
9/17/03	13	Rocky Basin Ck.	8.57	3.7	6.02	40	27
9/17/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	8.6	11.27	6.56	12	8
9/17/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	16.65	9.36	6.53	9	7
9/17/03	16	Gerle Creek Canal inflow to Robb's Forebay	16.77	9.38	6.58	9	7
9/17/03	17	S.F. Rubicon inflow to Robb's Forebay	12.31	8.79	4.95	32	24
9/17/03	20	S.F. Rubicon upstream of Rubicon River	13.53	10.29	6.69	12	10
9/17/03	21	Tells Creek Upstream of Union Valley Reservoir	11.47	10.24	7	34	24
9/17/03	22	Big Silver Ck.	14.35	10.52	7.4	31	25
9/18/03	23	Jones Fork / Silver Ck. Inflow to UVR.	10.22	9.95	6.91	44	32
9/18/03	24	SF Silver Upstrm of Ice House Res.	9.39	10.98	6.94	24	17
9/18/03	25	SF Silver Outflow from Ice House Res.	6.52	12.03	6.82	12	8
9/18/03	26a	SF Silver dnstream of Ice Hse. Rd.	6.47	12.22	7.05	14	9
9/16/03	27	SF Silver Creek inflow to Junction Res.	14.93	**	7.27	14	11
9/16/03	28	Little Silver Creek inflow to Junction Res.	11.55	11.75	6.95	13	9
9/16/03	29	SF Silver Creek ds of Junction Dam	9.15	10.79	6.54	13	9
9/16/03	32	Silver Creek outflow upstream of Camino Reservoir	14.02	10.09	7.15	16	13
9/16/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	13.97	10.56	7.57	49	39
9/16/03	34	Silver Creek outflow from Camino Reservoir	9.86	11.21	7.39	14	10
9/17/03	36	Silver Ck. Upstream of SFAR	14.94	11.43	7.06	18	14
9/16/03	38	SFAR upstream of Camino Powerhouse	15.39	9.81	7.33	43	37
9/16/03	39	Brush Creek Inflow to Brush Ck. Reservoir	13.3	11.44	7.26	26	20
9/16/03	40	Brush Creek Outflow from Brush Ck. Reservoir	15.7	9.2	7.13	27	21

Appendix A-25. (continued)							
Date	**Site #**	**Site Name**	**Water**	**Dissolved**	**pH**	**Specific**	**Conductivity**
9/16/03	41	SFAR downstream of Camino Powerhouse	11.58	11.38	7.19	21	15
9/15/03	42	Slab Creek Inflow to Slab Creek Reservoir	15.98	11.09	7.52	35	29
9/15/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	13.08	10.24	6.91	20	15
9/15/03	46	SFAR downstream of Rock Ck. Confluence	15.94	10.02	7.51	44	36
9/16/03	47	SFAR downstream of White Rock Powerhouse	13.55	10.26	6.84	17	13
9/15/03	48	SFAR below Chili Bar Dam	14.15	10.46	6.81	16	20
9/15/03	51	SFAR downstream of Lotus/Uniontown C	16.02	10.61	7.66	28	24
9/15/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	19.1	9.57	7.46	25	22
Reservoir Sites							
Vertical profiles for temperature, dissolved oxygen, pH, and specific conductance obtained for reservoir sites.							

Appendix A-26. UARP & Chili Bar Summer 2003 Sampling Results: Reservoir Secchi Disk Depth			
Date	**Site #**	**Site Name**	**Secchi Disk Depth (m)**
Reservoir Sites			
9/17/03	R-1	Rubicon Reservoir	>2.3
9/17/03	R-2	Rockbound Reservoir	8.7
9/17/03	R-3a	Buck Island	5.7
9/16/03	R-4a	Loon Lake Reservoir near Dam	8
9/16/03	R-4b	Loon Lake West End	8.5
9/16/03	R-4c	Loon Lake NE Waterbody	7
9/19/03	R-5	Gerle Ck. Reservoir	8.4
9/18/03	R-6a	Union Valley Res - at Dam	8.45
9/18/03	R-6b	Union Valley Res - Mid	8.4
9/18/03	R-6c	Union Valley Robbs Tailrace	8.1
9/18/03	R-6d	Union Valley Res - Jones Fork Arm	9.1
9/18/03	R-7a	Ice House Reservoir	7.6
9/18/03	R-7b	Ice House Reservoir- Mid	6.7
9/18/03	R-7c	Ice House Reservoir - Upper Lake	7.4
9/16/03	R-8a	Junction Reservoir	7.8
9/16/03	R-9a	Camino Reservoir	**
9/16/03	R-10a	Brush Ck. Reservoir	8.2
9/15/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	7.3
9/15/03	R-11b	Slab Creek Reservoir - Upper Site	6
9/15/03	R-12a	Chili Bar-Near Dam	5.4
9/15/03	R-12b	Chili Bar - Mid Reservoir	5.35

**No sample obtained due to safety restrictions - samples obtained from shore.

> denotes that secchi disk was visible on the bottom of the reservoir.

Appendix A-27. UARP & Chili Bar Summer 2003 Sampling Results: Nutrients, Total Organic Carbon, and Total Alkalinity									
Date	**Site #**	**Site Name**	**Nitrite-Nitrate**	**Ammonia**	**TKN**	**Total Phosphorus**	**Ortho-Phosphorus**	**TOC**	**Total Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites									
9/17/03	1	Rubicon River Inflow to Rubicon Reservoir	0.011	<0.05	0.13	<0.01	0.0029	1.2	7.3
9/17/03	2	Rubicon R. outflow from Rubicon Res	0.058	<0.05	0.18	<0.01	<0.0027	2.6	6.9
9/17/03	5	Rubicon Outflow from Rockbound Lake	<0.0045	<0.05	0.16	<0.01	0.0029	1.5	4.9
9/17/03	6	Little Rubicon Outflow from Buck Island	0.0045	<0.05	0.29	<0.01	0.0029	1.9	5.4
9/17/03	7	Gerle Creek outflow from Loon Lake	0.006	<0.05	0.12	<0.01	0.0092	1.5	4.7
9/17/03	9	Gerle Ck. Downstream of Jerrett Creek	*	*	*	*	*	*	*
9/17/03	13	Rocky Basin Ck.	*	*	*	*	*	*	*
9/17/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	0.0079	<0.05	0.1	<0.01	0.0029	1.4	5.9
9/17/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	<0.0045	<0.05	0.18	<0.01	0.0071	1.6	4.87
9/17/03	16	Gerle Creek Canal inflow to Robb's Forebay	<0.0045	0.069	0.17	<0.01	0.005	1.5	4.7
9/17/03	17	S.F. Rubicon inflow to Robb's Forebay	0.014	<0.05	0.15	<0.01	0.011	<1	14
9/17/03	20	S.F. Rubicon upstream of Rubicon River	0.0064	<0.05	0.2	<0.01	0.0071	1.3	7.2
9/17/03	21	Tells Creek Upstream of Union Valley Reservoir	0.013	<0.05	0.32	0.019	<0.0027	<1	20
9/17/03	22	Big Silver Ck.	*	<0.05	0.39	0.014	**	<1	16
9/18/03	23-mean	Jones Fork / Silver Ck. Inflow to UVR.	<0.023	<0.05	0.11	<0.01	0.042	1	24
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	<0.0045	<0.05	0.26	<0.01	0.04	1	24
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	0.0061	0.05	<0.1	0.014	0.043	1	24
9/18/03	24-mean	SF Silver Upstrm of Ice House Res.	0.098	<0.05	0.14	<0.01	0.028	<1	13
9/18/03	24	SF Silver Upstrm of Ice House Res.	0.099	<0.05	0.13	<0.01	0.011	<1	13
9/18/03	24	SF Silver Upstrm of Ice House Res.	0.096	<0.05	0.14	0.01	0.045	<1	13
9/18/03	25	SF Silver Outflow from Ice House Res.	<0.0045	<0.05	<0.1	<0.01	0.0071	1.8	6.65
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	<0.0045	<0.05	0.17	<0.01	0.0071	1.8	6.6
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	<0.0045	<0.05	<0.1	<0.01	0.0071	1.8	6.7
9/18/03	26a	SF Silver dnstream of Ice Hse. Rd.	*	*	*	*	*	*	*
9/16/03	27	SF Silver Creek inflow to Junction Res.	0.014	<0.05	0.32	<0.01	0.0071	1.7	7.6
9/16/03	28	Little Silver Creek inflow to Junction Res.	0.0045	<0.05	0.13	<0.01	0.005	<1	6.6
9/16/03	29	SF Silver Creek ds of Junction Dam	0.0072	<0.05	0.14	<0.01	0.013	1.8	6.8

Appendix A-27. (continued)									
Date	**Site #**	**Site Name**	**Nitrate**	**Ammonia**	**TKN**	**Phosphorus**	**Phosphorus**	**TOC**	**Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites									
9/16/03	32	Silver Creek outflow upstream of Camino Reservoir	0.016	<0.05	<0.1	<0.01	0.078	1.1	7.9
9/16/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	0.018	<0.05	<0.1	0.01	0.026	<1	26
9/16/03	34	Silver Creek outflow from Camino Reservoir	0.011	<0.05	0.14	<0.01	0.024	1.7	6.7
9/17/03	36	Silver Ck. Upstream of SFAR	0.0061	<0.05	0.12	<0.01	0.0071	1.4	8.2
9/16/03	38	SFAR upstream of Camino Powerhouse	<0.0045	<0.05	0.24	<0.01	<0.0027	1.1	16
9/16/03	39	Brush Creek Inflow to Brush Ck. Reservoir	0.0065	<0.05	0.14	<0.01	0.005	<1	12
9/16/03	40	Brush Creek Outflow from Brush Ck. Reservoir	0.012	<0.05	0.13	<0.01	0.0027	<1	13
9/16/03	41	SFAR downstream of Camino Powerhouse	0.0085	<0.05	<0.1	<0.01	<0.0027	1.6	9.3
9/15/03	42	Slab Creek Inflow to Slab Creek Reservoir	0.011	<0.05	0.14	<0.01	0.034	ND	16
9/15/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	0.02	0.052	0.13	<0.01	0.011	1.5	9.3
9/15/03	46	SFAR downstream of Rock Ck. Confluence	0.02	<0.05	0.16	<0.01	0.015	<1	21
9/16/03	47	SFAR downstream of White Rock Powerhouse	0.0062	<0.05	0.12	<0.01	<0.0027	1.5	9.1
9/15/03	48	SFAR below Chili Bar Dam	0.011	<0.05	0.18	<0.01	0.005	1.6	9.6
9/15/03	51	SFAR downstream of Lotus/Uniontown C	0.029	<0.05	1.5	<0.01	0.022	1	12
9/15/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	0.0064	<0.05	<0.1	0.012	0.005	1.7	11
Reservoir Sites									
9/17/03	R-1	Rubicon Reservoir	<0.0045	<0.05	0.39	0.026	0.0029	2.4	7.3
9/17/03	R-2	Rockbound Reservoir	*	0.079	0.24	<0.1	*	1.3	5.2
9/17/03	R-2H	Rockbound Reservoir	0.0073	0.056	0.17	0.01	<0.0027	1.5	4.2
9/17/03	R-3a	Buck Island	<0.01	0.066	0.24	0.012	*	1.8	5.3
9/16/03	R-4a	Loon Lake Reservoir near Dam	<0.0045	0.069	0.17	<0.1	<0.0027	1.4	4.7
9/16/03	R-4b	Loon Lake West End	<0.0045	0.081	0.16	0.01	0.0029	1.5	4.5
9/16/03	R-4bH	Loon Lake NE Waterbody	0.03	0.056	0.12	<0.1	<0.0027	1.5	4.4
9/16/03	R-4c	Loon Lake NE Waterbody	<0.0045	0.051	0.22	<0.1	<0.0027	1.6	4.6
9/16/03	R-4cH	Loon Lake NE Waterbody	0.032	0.053	0.15	<0.1	<0.0027	1.5	4.6
9/19/03	R-5	Gerle Ck. Reservoir	<0.0045	0.066	<0.1	<0.1	<0.0027	1.5	4.7

Appendix A-27. (continued)									
Date	**Site #**	**Site Name**	**Nitrate**	**Ammonia**	**TKN**	**Phosphorus**	**Phosphorus**	**TOC**	**Alkalinity**
			mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Reservoir Sites									
9/18/03	R-6a	Union Valley Res - at Dam	<0.0045	0.067	0.15	0.013	0.0071 J	1.8	6.4
9/18/03	R-6a H	Union Valley Res - at Dam	<0.0045	<0.05	0.12	<0.1	0.013	1.9	6.6
9/18/03	R-6b	Union Valley Res - Mid	<0.0045	<0.05	0.2	<0.1	0.02	1.8	6.4
9/18/03	R-6bH	Union Valley Res - Mid	<0.0045	<0.05	0.3	<0.1	0.068	1.9	6.8
9/18/03	R-6c	Union Valley Robbs Tailrace	<0.0045	0.06	0.15	0.016	0.005 J	1.8	6.2
9/18/03	R-6d	Union Valley Res - Jones Fork Arm	<0.0045	<0.05	0.16	<0.1	0.0029 J	1.9	6.3
9/18/03	R-6d H	Union Valley Res - Jones Fork Arm	<0.0045	0.059	0.18	<0.1	0.015	2	6.8
9/18/03	R-7a	Ice House Reservoir	<0.0045	<0.05	0.1	<0.1	0.0092 J	1.8	6
9/18/03	R-7aH	Ice House Reservoir	<0.0045	<0.05	<0.1	<0.1	0.0071 J	2.1	4.5
9/18/03	R-7b	Ice House Reservoir- Mid	<0.0045	0.094	0.24	<0.1	0.0092 J	1.8	5.9
9/18/03	R-7bH	Ice House Reservoir- Mid	<0.0045	0.056	0.16	<0.1	0.011	2	6.4
9/18/03	R-7c	Ice House Reservoir - Upper Lake	<0.0045	0.07	0.18	<0.1	0.005	1.8	6.1
9/16/03	R-8a	Junction Reservoir	<0.0045	<0.05	0.11	<0.1	0.02	1.8	6.8
9/16/03	R-9a	Camino Reservoir	0.015	<0.05	<0.1	<0.1	0.024	1.3	7.6
9/16/03	R-10a	Brush Ck. Reservoir	<0.0045	<0.05	0.19	<0.1	0.011	<1	11
9/16/03	R-10aH	Brush Ck. Reservoir	0.007	<0.05	0.32	<0.1	0.011	1.2	11
9/15/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<0.0045	<0.05	0.25	0.011	<0.0027	1.5	9.1
9/15/03	R-11b	Slab Creek Reservoir - Upper Site	<0.0045	<0.05	0.19	<0.1	0.011	1.6	9.5
9/15/03	R-12a	Chili Bar-Near Dam	0.0087	<0.05	0.16	<0.1	0.032	1.5	1
9/15/03	R-12aH	Chili Bar-Near Dam	0.0094	<0.05	0.22	<0.1	0.011	1.6	9.4
9/15/03	R-12b	Chili Bar - Mid Reservoir	0.007	<0.05	0.18	<0.1	0.011	1.6	10

**No sample obtained for this parameter.

Appendix A-28. UARP & Chili Bar Summer 2003 Sampling Results: Suspended and Dissolved Solids												
Date	**Site#**	**Site Name**	**TSS**	**TDS**	**Turbidity**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites											
9/17/03	1	Rubicon River Inflow to Rubicon Reservoir	<1	<1	0.27	2.1	<0.5	<0.5	<0.5	0.15	0.71
9/17/03	2	Rubicon R. outflow from Rubicon Res	18	<1	0.68	1.9	<0.5	<0.5	<0.5	0.12	0.45
9/17/03	5	Rubicon Outflow from Rockbound Lake	<1	2	0.29	1.2	<0.5	<0.5	<0.5	0.14	0.47
9/17/03	6	Little Rubicon Outflow from Buck Island	<1	<1	0.65	1.3	<0.5	<0.5	<0.5	0.69	0.47
9/17/03	7	Gerle Creek outflow from Loon Lake	<1	<1	0.6	1	<0.5	<0.5	<0.5	0.14	0.56
9/17/03	9	Gerle Ck. Downstream of Jerrett Creek	*	*	*	*	*	*	*	*	*
9/17/03	13	Rocky Basin Ck.	*	*	*	*	*	*	*	*	*
9/17/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	<1	<1	0.35	1.3	<0.5	<0.5	0.51	0.4	0.61
9/17/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	<1	<1	0.43	1	<0.5	<0.5	<0.5	0.18	0.49
9/17/03	16	Gerle Creek Canal inflow to Robb's Forebay	<1	<1	0.61	1.1	<0.5	<0.5	<0.5	0.19	0.48
9/17/03	17	S.F. Rubicon inflow to Robb's Forebay	<1	30	0.46	3	0.83	<0.5	2.2	0.34	<0.4
9/17/03	20	S.F. Rubicon upstream of Rubicon River	<1	<1	0.23	1.4	<0.5	<0.5	<0.5	0.2	0.55
9/17/03	21	Tells Creek Upstream of Union Valley Reservoir	<1	24	0.22	3.3	0.86	0.54	3	0.31	<0.4
9/17/03	22	Big Silver Ck.	<1	36	**	2.5	0.52	<0.5	3.8	1.1	<0.4
9/18/03	23-mean	Jones Fork / Silver Ck. Inflow to UVR.	<1	56	0.54	3.25	1	0.635	3.85	0.585	<0.4
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	<1	58	0.54	4.3	1	0.64	3.9	0.6	<0.4
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	<1	54	0.54	2.2	1	0.63	3.8	0.57	<0.4
9/18/03	24-mean	SF Silver Upstrm of Ice House Res.	<1	31	<0.2	2.2	<0.5	<0.5	2.3	0.29	<0.4
9/18/03	24	SF Silver Upstrm of Ice House Res.	<1	26	<0.2	2.2	<0.5	<0.5	2.3	0.32	<0.4
9/18/03	24	SF Silver Upstrm of Ice House Res.	<1	36	0.2	2.2	<0.5	<0.5	2.3	0.26	<0.4
9/18/03	25	SF Silver Outflow from Ice House Res.	<1	10	1.05	1.15	<0.5	<0.5	0.925	0.24	<0.4
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	<1	<1	1	1.2	<0.5	<0.5	0.91	0.24	<0.4
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	<1	10	1.1	1.1	<0.5	<0.5	0.94	0.24	<0.4
9/18/03	26a	SF Silver dnstream of Ice Hse. Rd.	*	*	*	*	*	*	*	*	*
9/16/03	27	SF Silver Creek inflow to Junction Res.	<1	10	0.84	1.3	<0.5	<0.5	1	0.35	<0.4
9/16/03	28	Little Silver Creek inflow to Junction Res.	<1	2	0.3	0.9	<0.5	<0.5	0.78	0.36	<0.4
9/16/03	29	SF Silver Creek ds of Junction Dam	<1	8	0.46	1.2	<0.5	<0.5	0.97	0.3	<0.4
9/16/03	32	Silver Creek outflow upstream of Camino Reservoir	<1	22	0.35	1.5	<0.5	<0.5	1	0.39	0.59

Appendix A-28. (continued)												
Date	**Site#**	**Site Name**	**TSS**	**TDS**	**Turbidity**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Riverine Sites											
9/16/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	<1	66	0.19 J	5.4	1.8	0.94	2.7	0.71	0.8
9/16/03	34	Silver Creek outflow from Camino Reservoir	6	14	0.47	1.4	<0.5	<0.5	0.98	0.32	<0.4
9/17/03	36	Silver Ck. Upstream of SFAR	<1	22	<0.2	1.8	<0.5	<0.5	1.1	0.42	0.58
9/16/03	38	SFAR upstream of Camino Powerhouse	4	46	0.51	4.1	0.91	0.72	3.3	5.2	0.62
9/16/03	39	Brush Creek Inflow to Brush Ck. Reservoir	2	44	0.4	2.1	0.79	<0.5	1.8	0.86	0.47
9/16/03	40	Brush Creek Outflow from Brush Ck. Reservoir	<1	34	0.58	2.7	0.78	<0.5	1.6	0.81	0.43
9/16/03	41	SFAR downstream of Camino Powerhouse	<1	30	0.42	2	<0.5	<0.5	1.4	1.4	0.44
9/15/03	42	Slab Creek Inflow to Slab Creek Reservoir	<1	10	0.62	3.2	1	0.64	2.2	0.98	0.66
9/15/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	<1	<1	0.64	2	<0.5	<0.5	1.4	1.2	0.43
9/15/03	46	SFAR downstream of Rock Ck. Confluence	<1	28	0.37	4.4	1.7	<0.5	2.4	1.3	1.8
9/16/03	47	SFAR downstream of White Rock Powerhouse	<1	114	0.68	2	<0.5	<0.5	1.4	1.2	0.44
9/15/03	48	SFAR below Chili Bar Dam	<1	68	1.1	2.1	<0.5	<0.5	1.5	1.2	0.49
9/15/03	51	SFAR downstream of Lotus/Uniontown C	<1	12	0.68	2.5	0.83	<0.5	1.7	1.3	0.65
9/15/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	<1	<1	0.85	2.3	0.64	<0.5	1.6	1.3	0.57
Reservoir Sites											
9/17/03	R-1	Rubicon Reservoir	<1	<1	0.72	1.8	<0.5	<0.5	<0.5	0.19	0.49
9/17/03	R-2	Rockbound Reservoir	<1	<1	**	1.2	<0.5	<0.5	<0.5	0.12	0.5
9/17/03	R-2H	Rockbound Reservoir	<1	<1	0.22	1	<0.5	<0.5	<0.5	0.16	0.48
9/17/03	R-3a	Buck Island	<1	<1	2.4	1.3	<0.5	<0.5	<0.5	0.18	0.46
9/16/03	R-4a	Loon Lake Reservoir near Dam	<1	<1	0.3	1	<0.5	<0.5	<0.5	0.17	0.51
9/16/03	R-4b	Loon Lake West End	<1	<1	0.33	1	<0.5	<0.5	<0.5	0.15	0.5
9/16/03	R-4bH	Loon Lake NE Waterbody	<1	<1	0.36	1	<0.5	<0.5	<0.5	0.17	0.51
9/16/03	R-4c	Loon Lake NE Waterbody	<1	<1	0.33	1	<0.5	<0.5	<0.5	0.16	0.48
9/16/03	R-4cH	Loon Lake NE Waterbody	<1	<1	0.45	1	<0.5	<0.5	<0.5	0.18	0.47
9/19/03	R-5	Gerle Ck. Reservoir	<1	<1	0.51	1.1	<0.5	<0.5	<0.5	0.23	0.53
9/18/03	R-6a	Union Valley Res - at Dam	<1	<1	0.75	1.2	<0.5	<0.5	0.72	0.27	<0.4

Appendix A-28. (continued)												
Date	**Site#**	**Site Name**	**TSS**	**TDS**	**Turbidity**	**Calcium**	**Magnesium**	**Potassium**	**Sodium**	**Chloride**	**Sulfate**
			mg/L	**mg/L**	**NTU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Reservoir Sites											
9/18/03	R-6a H	Union Valley Res - at Dam	<1	<1	0.55	1.2	<0.5	<0.5	0.81	0.71	<0.4
9/18/03	R-6b	Union Valley Res - Mid	<1	<1	0.74	1.1	<0.5	<0.5	0.67	0.31	<0.4
9/18/03	R-6bH	Union Valley Res - Mid	<1	<1	0.62	1.2	<0.5	<0.5	0.77	0.33	<0.4
9/18/03	R-6c	Union Valley Robbs Tailrace	<1	<1	0.64	1.2	<0.5	<0.5	0.67	0.3	<0.4
9/18/03	R-6d	Union Valley Res - Jones Fork Arm	<1	<1	0.77	1.2	<0.5	<0.5	0.71	0.28	<0.4
9/18/03	R-6d H	Union Valley Res - Jones Fork Arm	<1	<1	0.94	1.2	<0.5	<0.5	0.76	0.31	<0.4
9/18/03	R-7a	Ice House Reservoir	<1	<1	0.89	0.92	<0.5	<0.5	0.69	0.25	<0.4
9/18/03	R-7aH	Ice House Reservoir	<1	2	1	0.88	<0.5	<0.5	0.62	0.19	<0.4
9/18/03	R-7b	Ice House Reservoir- Mid	<1	<1	0.67	0.93	<0.5	<0.5	0.7	0.22	<0.4
9/18/03	R-7bH	Ice House Reservoir- Mid	<1	<1	0.88	0.96	<0.5	<0.5	0.65	0.24	<0.4
9/18/03	R-7c	Ice House Reservoir - Upper Lake	<1	<1	0.85	0.97	<0.5	<0.5	0.71	0.22	<0.4
9/16/03	R-8a	Junction Reservoir	<1	4	0.41	1.2	<0.5	<0.5	0.78	0.34	<0.4
9/16/03	R-9a	Camino Reservoir	<1	6	0.37	1.4	<0.5	<0.5	0.85	0.38	0.52
9/16/03	R-10a	Brush Ck. Reservoir	<1	22	0.46	2.1	0.79	<0.5	1.4	0.91	0.43
9/16/03	R-10aH	Brush Ck. Reservoir	<1	22	0.95	2.3	0.6	<0.5	1	0.63	0.43
9/15/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<1	14	0.73	1.9	<0.5	<0.5	1.3	1.2	0.41
9/15/03	R-11b	Slab Creek Reservoir - Upper Site	<1	16	0.99	2	<0.5	<0.5	1.3	1.3	0.42
9/15/03	R-12a	Chili Bar-Near Dam	<1	16	0.79	2.2	0.55	<0.5	1.3	1.2	0.51
9/15/03	R-12aH	Chili Bar-Near Dam	<1	10	1	2	<0.5	<0.5	1.3	1.2	0.62
9/15/03	R-12b	Chili Bar - Mid Reservoir	<1	6	0.89	2.2	0.51	<0.5	1.5	1.2	0.5

**No sample obtained for this parameter.

Appendix A-29. UARP & Chili Bar Summer 2003 Sampling Results: Organics					
Date	**Site Number**	**Site Name**	**Oil and Grease**	**MTBE**	**Gasoline Range Organics (EPA 8015B)**
			mg/L	**ug/L**	**ug/L**
Riverine Sites					
9/17/03	1	Rubicon River Inflow to Rubicon Reservoir	<5	<0.5	<0.05
9/17/03	2	Rubicon R. outflow from Rubicon Res	<5	<0.5	<0.05
9/17/03	5	Rubicon Outflow from Rockbound Lake	<5	<0.5	<0.05
9/17/03	6	Little Rubicon Outflow from Buck Island	<5	<0.5	<0.05
9/17/03	7	Gerle Creek outflow from Loon Lake	<5	<0.5	<0.05
9/17/03	9	Gerle Ck. Downstream of Jerrett Creek	*	*	*
9/17/03	13	Rocky Basin Ck.	*	*	*
9/17/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	<5	<0.5	<0.05
9/17/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	<5	<0.5	<0.05
9/17/03	16	Gerle Creek Canal inflow to Robb's Forebay	<5	<0.5	<0.05
9/17/03	17	S.F. Rubicon inflow to Robb's Forebay	<5	<0.5	<0.05
9/17/03	20	S.F. Rubicon upstream of Rubicon River	<5	<0.5	<0.05
9/17/03	21	Tells Creek Upstream of Union Valley Reservoir	<5	<0.5	<0.05
9/17/03	22	Big Silver Ck.	<5	<0.5	<0.05
9/18/03	23-mean	Jones Fork / Silver Ck. Inflow to UVR.	<5	<0.5	<0.05
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	<5	<0.5	<0.05
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	<5	<0.5	<0.05
9/18/03	24-mean	SF Silver Upstrm of Ice House Res.	<5	<0.5	<0.05
9/18/03	24	SF Silver Upstrm of Ice House Res.	<5	<0.5	<0.05
9/18/03	24	SF Silver Upstrm of Ice House Res.	<5	<0.5	<0.05
9/18/03	25	SF Silver Outflow from Ice House Res.	<5	<0.5	<0.05
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	<5	<0.5	<0.05
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	<5	<0.5	<0.05
9/18/03	26a	SF Silver dnstream of Ice Hse. Rd.	*	*	*
9/16/03	27	SF Silver Creek inflow to Junction Res.	<5	<0.5	<0.05
9/16/03	28	Little Silver Creek inflow to Junction Res.	<5	<0.5	<0.05
9/16/03	29	SF Silver Creek ds of Junction Dam	<5	<0.5	<0.05
9/16/03	32	Silver Creek outflow upstream of Camino Reservoir	<5	<0.5	<0.05
9/16/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	<5	<0.5	<0.05
9/16/03	34	Silver Creek outflow from Camino Reservoir	<5	<0.5	<0.05
9/17/03	36	Silver Ck. Upstream of SFAR	<5	<0.5	<0.05
9/16/03	38	SFAR upstream of Camino Powerhouse	<5	<0.5	<0.05
9/16/03	39	Brush Creek Inflow to Brush Ck. Reservoir	<5	<0.5	<0.05
9/16/03	40	Brush Creek Outflow from Brush Ck. Reservoir	<5	<0.5	<0.05
9/16/03	41	SFAR downstream of Camino Powerhouse	<5	<0.5	<0.05
9/15/03	42	Slab Creek Inflow to Slab Creek Reservoir	<5	<0.5	<0.05
9/15/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-E	<5	<0.5	<0.05
9/15/03	46	SFAR downstream of Rock Ck. Confluence	<5	<0.5	<0.05
9/16/03	47	SFAR downstream of White Rock Powerhouse	<5	<0.5	<0.05
9/15/03	48	SFAR below Chili Bar Dam	<5	<0.5	<0.05
9/15/03	51	SFAR downstream of Lotus/Uniontown C	<5	<0.5	<0.05
9/15/03	54	SFAR downstream of Hiway 49 Bridge / downstream	<5	<0.5	<0.05

Appendix A-29. (continued)					
Date	**Site Number**	**Site Name**	**Oil and Grease**	**MTBE**	**Gasoline Range Organics (EPA 8015B)**
			mg/L	**ug/L**	**ug/L**
Reservoir Sites					
9/17/03	R-1	Rubicon Reservoir	<5	<0.5	<0.05
9/17/03	R-2	Rockbound Reservoir	<5	<0.5	<0.05
9/17/03	R-2H	Rockbound Reservoir	*	<0.5	<0.05
9/17/03	R-3a	Buck Island	<5	<0.5	<0.05
9/16/03	R-4a	Loon Lake Reservoir near Dam	<5	<0.5	<0.05
9/16/03	R-4b	Loon Lake West End	<5	<0.5	<0.05
9/16/03	R-4bH	Loon Lake NE Waterbody	*	<0.5	<0.05
9/16/03	R-4c	Loon Lake NE Waterbody	<5	<0.5	<0.05
9/16/03	R-4cH	Loon Lake NE Waterbody	*	<0.5	<0.05
9/19/03	R-5	Gerle Ck. Reservoir	<5	<0.5	<0.05
9/18/03	R-6a	Union Valley Res - at Dam	<5	<0.5	<0.05
9/18/03	R-6a H	Union Valley Res - at Dam	*	<0.5	<0.05
9/18/03	R-6b	Union Valley Res - Mid	<5	<0.5	<0.05
9/18/03	R-6bH	Union Valley Res - Mid	*	<0.5	<0.05
9/18/03	R-6c	Union Valley Robbs Tailrace	<5	<0.5	<0.05
9/18/03	R-6d	Union Valley Res - Jones Fork Arm	<5	<0.5	<0.05
9/18/03	R-6d H	Union Valley Res - Jones Fork Arm	*	<0.5	<0.05
9/18/03	R-7a	Ice House Reservoir	<5	<0.5	<0.05
9/18/03	R-7aH	Ice House Reservoir	*	<0.5	<0.05
9/18/03	R-7b	Ice House Reservoir- Mid	<5	<0.5	<0.05
9/18/03	R-7bH	Ice House Reservoir- Mid	*	<0.5	<0.05
9/18/03	R-7c	Ice House Reservoir - Upper Lake	<5	<0.5	<0.05
9/16/03	R-8a	Junction Reservoir	<5	<0.5	<0.05
9/16/03	R-9a	Camino Reservoir	<5	<0.5	<0.05
9/16/03	R-10a	Brush Ck. Reservoir	<5	<0.5	<0.05
9/16/03	R-10aH	Brush Ck. Reservoir	*	<0.5	<0.05
9/15/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<5	<0.5	<0.05
9/15/03	R-11b	Slab Creek Reservoir - Upper Site	<5	<0.5	<0.05
9/15/03	R-12a	Chili Bar-Near Dam	<5	<0.5	<0.05
9/15/03	R-12aH	Chili Bar-Near Dam	*	<0.5	<0.05
9/15/03	R-12b	Chili Bar - Mid Reservoir	*	<0.5	<0.05

Appendix A-30. UARP & Chili Bar Summer 2003 Sampling Results: Various Metals and Cyanide (Total Recoverable).										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites										
9/17/03	1	Rubicon River Inflow to Rubicon Reservoir	31 J	0.51 J	2.9 J	0.058	0.0021 J	0.015	<2	<5
9/17/03	2	Rubicon R. outflow from Rubicon Res	**	**	**	0.34	**	**	**	<5
9/17/03	5	Rubicon Outflow from Rockbound Lake	28 J	<1	2.2 J	<0.03	0.0029 J	0.0032 J	<2	<5
9/17/03	6	Little Rubicon Outflow from Buck Island	25 J	<1	2.9 J	0.054	0.0076 J	0.016 J	<2	<5
9/17/03	7	Gerle Creek outflow from Loon Lake	39 J	<1	2.9 J	<0.03	0.018 J	0.01	<2	<5
9/17/03	9	Gerle Ck. Downstream of Jerrett Creek	*	*	*	*	*	*	*	*
9/17/03	13	Rocky Basin Ck.	*	*	*	*	*	*	*	*
9/17/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	16 J	<1	5.5 J	0.037	0.0037 J	0.01	<2	<5
9/17/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	27 J	<1	2.9 J	<0.03	0.0077 J	0.0046 J	<2	<5
9/17/03	16	Gerle Creek Canal inflow to Robb's Forebay	26 J	<1	2.7 J	<0.03	0.0064 J	0.0044 J	<2	<5
9/17/03	17	S.F. Rubicon inflow to Robb's Forebay	15 J	<1	11 J	0.044	0.0067 J	0.01	<2	<5
9/17/03	20	S.F. Rubicon upstream of Rubicon River	15 J	<1	5.4 J	<0.03	0.0025 J	0.0036 J	<2	<5
9/17/03	21	Tells Creek Upstream of Union Valley Reservoir	13 J	<1	12 J	<0.03	0.0018 J	0.0026 J	<2	<5
9/17/03	22	Big Silver Ck.	13 J	<1	10 J	0.029	0.0017 J	*	<2	<5
9/18/03	23-mean	Jones Fork / Silver Ck. Inflow to UVR.	25 J	<1	20	0.2	0.0088 J	0.0084 J	<2	<5
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	22 J	<1	19 J	0.2	0.0083 J	0.011	<2	<5
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	27 J	<1	21	0.21	0.0093 J	0.0058	<2	<5
9/18/03	24-mean	SF Silver Upstrm of Ice House Res.	9.2 J	<1	8.9 J	<0.03	0.000425 J	0.0046 J	<2	<5
9/18/03	24	SF Silver Upstrm of Ice House Res.	9.3 J	<1	8.6 J	<0.03	0.00045 J	0.0043 J	<2	<5
9/18/03	24	SF Silver Upstrm of Ice House Res.	9.0 J	<1	9.2 J	<0.03	0.0004 J	0.0048 J	<2	<5
9/18/03	25	SF Silver Outflow from Ice House Res.	41J	<1	6.9 J	0.3	0.11 J	0.012	<2	<5
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	43 J	<1	6.7 J	0.3	0.11 J	0.011	<2	<5
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	38 J	<1	6.9 J	0.3	0.11 J	0.013	<2	<5
9/18/03	26a	SF Silver dnstream of Ice Hse. Rd.	*	*	*	*	*	*	*	*
9/16/03	27	SF Silver Creek inflow to Junction Res.	47 J	<1	9 J	0.16	0.015 J	0.01	<2	<5
9/16/03	28	Little Silver Creek inflow to Junction Res.	13 J	<1	19 J	<0.03	0.0018 J	FAIL	<2	<5
9/16/03	29	SF Silver Creek ds of Junction Dam	35 J	<1	6.7 J	0.23	0.036 J	0.01	<2	<5
9/16/03	32	Silver Creek outflow upstream of Camino Reservoir	16 J	<1	10 J	<0.03	0.002 J	0.0037 J	<2	<5

Appendix A-30. (continued)										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Riverine Sites										
9/16/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	6.8 J	<1	28	<0.03	0.00055 J	0.0030 J	<2	<5
9/16/03	34	Silver Creek outflow from Camino Reservoir	24 J	0.093 J	7.7 J	0.14	0.032 J	0.0035 J	0.093 J	<5
9/17/03	36	Silver Ck. Upstream of SFAR	13 J	0.067 J	7.0 J	0.028	0.002 J	0.0038 J	0.067 J	<5
9/16/03	38	SFAR upstream of Camino Powerhouse	14 J	0.14 J	12 J	<0.03	0.0024 J	0.0027 J	0.14 J	<5
9/16/03	39	Brush Creek Inflow to Brush Ck. Reservoir	9.3 J	<1	15 J	<0.03	0.0015 J	FAIL	<2	<5
9/16/03	40	Brush Creek Outflow from Brush Ck. Reservoir	12 J	<1	14 J	0.081	0.063 J	0.0043 J	<2	<5
9/16/03	41	SFAR downstream of Camino Powerhouse	29 J	<1	8.5 J	0.09	0.021 J	0.0047 J	<2	<5
9/15/03	42	Slab Creek Inflow to Slab Creek Reservoir	8.1 J	0.13 J	15 J	<0.03	0.0018 J	FAIL	0.13 J	<5
9/15/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	29 J	<1	16 J	0.086	0.017 J	0.0040 J	<2	<5
9/15/03	46	SFAR downstream of Rock Ck. Confluence	10 J	<1	11 J	0.04	0.0023 J	0.0034 J	<2	<5
9/16/03	47	SFAR downstream of White Rock Powerhouse	24 J	<1	8.6 J	0.074	0.015 J	0.01	<2	<5
9/15/03	48	SFAR below Chili Bar Dam	32 J	<1	8.9 J	0.089	0.021 J	0.01	<2	<5
9/15/03	51	SFAR downstream of Lotus/Uniontown C	25 J	<1	9.5 J	0.06	0.012 J	0.0041 J	<2	<5
9/15/03	54	SFAR dnstrm of Hiway 49 Bridge & Salmon falls	20 J	<1	8.2 J	0.051	0.009 J	0.0045 J	<2	<5
Reservoir Sites										
9/17/03	R-1	Rubicon Reservoir	40 J	0.38 J	4.1 J	0.39	0.0072 J	FAIL	<2	<5
9/17/03	R-2	Rockbound Reservoir	22 J	<1	2	0.031	0.0014 J	FAIL	<2	<5
9/17/03	R-2H	Rockbound Reservoir	42 J	<1	1.9 J	0.031	0.0029 J	FAIL	<2	<5
9/17/03	R-3a	Buck Island	22 J	<1	3.1 J	0.092	0.008 J	FAIL	<2	<5
9/16/03	R-4a	Loon Lake Reservoir near Dam	33 J	<1	2.7 J	0.041	0.0062 J	FAIL	<2	<5
9/16/03	R-4b	Loon Lake West End	33 J	0.083	2.7 J	<0.03	0.0062 J	FAIL	<2	<5
9/16/03	R-4bH	Loon Lake NE Waterbody	31 J	<1	3.7 J	0.051	0.011 J	FAIL	<2	<5
9/16/03	R-4c	Loon Lake NE Waterbody	32 J	<1	2.9 J	0.066	0.0064 J	FAIL	<2	<5
9/16/03	R-4cH	Loon Lake NE Waterbody	34 J	<1	4.1 J	0.041	0.04 J	FAIL	<2	<5
9/19/03	R-5	Gerle Ck. Reservoir	27 J	<1	2.9 J	0.058	0.0071 J	FAIL	<2	<5
9/18/03	R-6a	Union Valley Res - at Dam	30 J	<1	5.3 J	0.028	0.0044 J	FAIL	<2	<5
9/18/03	R-6a H	Union Valley Res - at Dam	31 J	<1	6.0 J	0.079	0.026 J	FAIL	<2	<5
9/18/03	R-6b	Union Valley Res - Mid	33 j	<1	5.4 J	<0.03	0.0038 J	FAIL	<2	<5

Appendix A-30. (continued)										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/L	**ug/L**	**ug/L**	**mg/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**
Reservoir Sites										
9/18/03	R-6bH	Union Valley Res - Mid	26 J	<1	6.4 J	0.2	0.071 J	FAIL	<2	<5
9/18/03	R-6c	Union Valley Robbs Tailrace	36 J	<1	5.1 J	0.037	0.0038 J	FAIL	<2	<5
9/18/03	R-6d	Union Valley Res - Jones Fork Arm	28 J	<1	5.5 J	0.037	0.0035 J	FAIL	<2	<5
9/18/03	R-6d H	Union Valley Res - Jones Fork Arm	35 J	<1	6.8 J	0.17	0.076 J	FAIL	<2	<5
9/18/03	R-7a	Ice House Reservoir	41 J	<1	4.4 J	<0.03	0.0031 J	FAIL	<2	<5
9/18/03	R-7aH	Ice House Reservoir	35 J	<1	5.0 J	<0.03	0.014 J	FAIL	<2	<5
9/18/03	R-7b	Ice House Reservoir- Mid	34 J	<1	4.4 J	0.035	0.0034 J	FAIL	<2	<5
9/18/03	R-7bH	Ice House Reservoir- Mid	63	<1	7 J	0.076	0.11 J	FAIL	<2	<5
9/18/03	R-7c	Ice House Reservoir - Upper Lake	34 J	<1	4.4 J	0.047	0.0054 J	FAIL	<2	<5
9/16/03	R-8a	Junction Reservoir	26 J	<1	7.2 J	0.088	0.023 J	FAIL	<2	<5
9/16/03	R-9a	Camino Reservoir	17 J	<1	8.8 J	0.028	0.008 J	0.0033 J	<2	<5
9/16/03	R-10a	Brush Ck. Reservoir	23 J	<1	31	<0.03	0.0087 J	FAIL	<2	<5
9/16/03	R-10aH	Brush Ck. Reservoir	12 J	<1	13 J	0.2	0.14 J	FAIL	<2	<5
9/15/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	22 J	<1	8.0 J	0.047	0.011 J	FAIL	<2	<5
9/15/03	R-11b	Slab Creek Reservoir - Upper Site	14 J	0.25 J	8.4 J	0.027	0.0051 J	FAIL	<2	<5
9/15/03	R-12a	Chili Bar-Near Dam	21 J	<1	9.1	0.054	0.015 J	FAIL	<2	<5
9/15/03	R-12aH	Chili Bar-Near Dam	35 J	<1	8.7	0.079	0.021 J	FAIL	<2	<5
9/15/03	R-12b	Chili Bar - Mid Reservoir	22 J	<1	8.7	0.07	0.016 J	FAIL	<2	**

* in situ samples only

** samples lost.

FAIL = samples failed qa/qc.

Appendix A-31. UARP & Chili Bar Summer 2003 Sampling Results: Various Metals (Total Recoverable) and Total Hardness.

Date	Site #	Site Name	Total Hardness	Cadmium	Copper	Lead	Nickel	Silver	Zinc
			mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Riverine Sites									
9/17/03	1	Rubicon River Inflow to Rubicon Reservoir	3.89	0.12 J	0.24	0.03 J	0.20 J	<0.04	0.5 J
9/17/03	2	Rubicon R. outflow from Rubicon Res	4.44	**	**	**	**	**	**
9/17/03	5	Rubicon Outflow from Rockbound Lake	2.22	0.014 J	0.27	0.032 J	0.2 J	<0.04	0.99 J
9/17/03	6	Little Rubicon Outflow from Buck Island	7.78	<0.05	0.4	0.062	0.15 J	<0.04	1.5 J
9/17/03	7	Gerle Creek outflow from Loon Lake	5.56	0.02 J	0.32	0.032 J	0.37 J	<0.04	1.3 J
9/17/03	9	Gerle Ck. Downstream of Jerrett Creek	*	*	*	*	*	*	*
9/17/03	13	Rocky Basin Ck.	*	*	*	*	*	*	*
9/17/03	14	Gerle Creek Inflow to Gerle Creek Reservoir	3.33	0.0080 J	0.6	0.052	0.34 J	<0.04	1.1 J
9/17/03	15	Gerle Creek Outflow from Gerle Creek Reservoir	2.78	0.0099 J	0.27	0.03 J	0.22 J	<0.04	0.56 J
9/17/03	16	Gerle Creek Canal inflow to Robb's Forebay	2.22	0.010 J	0.27	0.03 J	0.2 J	<0.04	1.4 J
9/17/03	17	S.F. Rubicon inflow to Robb's Forebay	10	0.013 J	0.23	0.047 J	0.24 J	<0.04	1.6 J
9/17/03	20	S.F. Rubicon upstream of Rubicon River	2.78	<0.05	0.27	0.037 J	0.19 J	<0.04	1.3 J
9/17/03	21	Tells Creek Upstream of Union Valley Reservoir	10	<0.05	0.16	0.03	0.2 J	0.033 J	0.28 J
9/17/03	22	Big Silver Ck.	8.33	0.0088 J	0.21	0.16	0.089 J	0.022 J	0.24 J
9/18/03	23-mean	Jones Fork / Silver Ck. Inflow to UVR.	15.55	<0.05	0.2	0.229	<2	<0.04	0.7 J
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	17.8	<0.05	0.2	0.39	<2	0.13 J	0.55 J
9/18/03	23-dup	Jones Fork / Silver Ck. Inflow to UVR.	13.3	<0.05	0.19	0.068	0.13 J	<0.04	0.84 J
9/18/03	24-mean	SF Silver Upstrm of Ice House Res.	7.22	<0.05	0.665	0.0265 J	<2	<0.04	0.19 J
9/18/03	24	SF Silver Upstrm of Ice House Res.	7.22	<0.05	1.1	0.03 J	<2	0.0086 J	0.21 J
9/18/03	24	SF Silver Upstrm of Ice House Res.	7.22	<0.05	0.23	0.023 J	0.16 J	<0.04	0.16 J
9/18/03	25	SF Silver Outflow from Ice House Res.	5.275	<0.05	0.235	0.043 J	0.16 J	0.036 J	0.5 J
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	4.44	<0.05	0.24	0.039 J	0.19 J	0.051	0.77 J
9/18/03	25-dup	SF Silver Outflow from Ice House Res.	6.11	<0.05	0.23	0.045 J	0.13 J	0.021 J	0.23 J
9/18/03	26a	SF Silver dnstream of Ice Hse. Rd.	*	*	*	*	*	*	*
9/16/03	27	SF Silver Creek inflow to Junction Res.	5	<0.05	0.21	0.056	0.13 J	0.017 J	0.31 J
9/16/03	28	Little Silver Creek inflow to Junction Res.	8.33	<0.05	0.17	0.019 J	0.42 J	0.011 J	1.3 J
9/16/03	29	SF Silver Creek ds of Junction Dam	6.67	<0.05	0.22	0.043 J	0.043 J	0.0076 J	0.31 J

Appendix A-31. (continued)

Date	Site #	Site Name	Total Hardness	Cadmium	Copper	Lead	Nickel	Silver	Zinc
			mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Riverine Sites									
9/16/03	32	Silver Creek outflow upstream of Camino Reservoir	5	<0.05	0.3	0.029 J	0.17 J	<0.04	0.24 J
9/16/03	33	Jaybird Canyon Creek inflow to Camino Reservoir	19.4	<0.05	0.58	0.039 J	0.17 J	<0.04	0.65 J
9/16/03	34	Silver Creek outflow from Camino Reservoir	4.44	<0.05	0.33	0.044 J	0.17 J	<0.04	0.64 J
9/17/03	36	Silver Ck. Upstream of SFAR	6.67	<0.05	0.27	0.035 J	0.058 J	<0.04	0.4 J
9/16/03	38	SFAR upstream of Camino Powerhouse	15	<0.05	0.26	0.068	0.23 J	<0.04	0.47 J
9/16/03	39	Brush Creek Inflow to Brush Ck. Reservoir	12.2	<0.05	0.28	0.035 J	0.087 J	<0.04	0.229 J
9/16/03	40	Brush Creek Outflow from Brush Ck. Reservoir	8.89	<0.05	0.21	0.079	0.28 J	0.030 J	0.51 J
9/16/03	41	SFAR downstream of Camino Powerhouse	8.33	<0.05	0.66	0.058	0.38 J	0.0088 J	0.94 J
9/15/03	42	Slab Creek Inflow to Slab Creek Reservoir	12.2	<0.05	0.17	0.017 J	0.2 J	<0.04	0.33 J
9/15/03	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	5.56	<0.05	0.36	0.049 J	0.28 J	<0.04	0.31 J
9/15/03	46	SFAR downstream of Rock Ck. Confluence	16.7	<0.05	0.29	0.033 J	0.46 J	<0.04	0.83 J
9/16/03	47	SFAR downstream of White Rock Powerhouse	5	<0.05	0.39	0.032 J	0.29 J	<0.04	0.27 J
9/15/03	48	SFAR below Chili Bar Dam	8.89	<0.05	0.38	0.055	0.22 J	<0.04	0.49 J
9/15/03	51	SFAR downstream of Lotus/Uniontown C	11.7	<0.05	1.5	0.065	0.63 J	<0.04	0.86 J
9/15/03	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	6.67	<0.05	0.45	1.4	0.31 J	<0.04	0.48 J
Reservoir Sites									
9/17/03	R-1	Rubicon Reservoir	8.89	<0.05	0.31	0.057	0.17 J	0.018 J	0.58 J
9/17/03	R-2	Rockbound Reservoir	10	<0.05	0.44	**	0.18 J	0.0078 J	0.72 J
9/17/03	R-2H	Rockbound Reservoir	2.78	0.0081 J	0.19	0.018 J	0.17 J	<0.04	0.50 J
9/17/03	R-3a	Buck Island	8.89	<0.05	0.22	0.031 J	0.13 J	0.0099 J	0.41 J
9/16/03	R-4a	Loon Lake Reservoir near Dam	2.22	0.012 J	0.3	0.018 J	0.24 J	<0.04	0.87 J
9/16/03	R-4b	Loon Lake West End	2.78	0.015 J	0.65	0.1 J	0.32 J	0.026 J	2.2 J
9/16/03	R-4bH	Loon Lake NE Waterbody	2.78	0.0089 J	0.21	0.014 J	0.20 J	<0.04	0.64 J
9/16/03	R-4c	Loon Lake NE Waterbody	3.89	0.0083 J	0.28	0.019 J	0.19 J	<0.04	0.75 J
9/16/03	R-4cH	Loon Lake NE Waterbody	2.22	0.0096 J	0.19	0.028 J	0.15 J	<0.04	1.2 J
9/19/03	R-5	Gerle Ck. Reservoir	1.67	0.0084 J	0.25	0.022 J	0.19 J	<0.04	0.50 J
9/18/03	R-6a	Union Valley Res - at Dam	3.33	<0.05	0.22	0.012 J	0.14 J	<0.04	1.5 J
9/18/03	R-6a H	Union Valley Res - at Dam	3.33	<0.05	0.3	0.016 J	0.11 J	<0.04	0.34 J

Appendix A-31. (continued)

Date	Site #	Site Name	Total Hardness	Cadmium	Copper	Lead	Nickel	Silver	Zinc
			mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reservoir Sites									
9/18/03	R-6b	Union Valley Res - Mid	5.56	<0.05	0.21	0.012 J	0.15 J	<0.04	0.28 J
9/18/03	R-6bH	Union Valley Res - Mid	6.11	<0.05	0.18	0.018 J	0.83 J	0.011 J	1.8 J
9/18/03	R-6c	Union Valley Robbs Tailrace	6.11	<0.05	6.8	3	0.74 J	<0.04	2.5 J
9/18/03	R-6d	Union Valley Res - Jones Fork Arm	7.78	<0.05	0.19	0.058	0.13 J	<0.04	0.11 J
9/18/03	R-6d H	Union Valley Res - Jones Fork Arm	5	<0.05	0.21	0.016 J	0.19 J	<0.04	0.53 J
9/18/03	R-7a	Ice House Reservoir	1.11	<0.05	0.15	0.032 J	0.14 J	<0.04	0.23 J
9/18/03	R-7aH	Ice House Reservoir	2.22	<0.05	2.2	0.13	0.16 J	<0.04	1.3 J
9/18/03	R-7b	Ice House Reservoir- Mid	5	<0.05	0.21	0.02 J	0.13	<0.04	0.25 J
9/18/03	R-7bH	Ice House Reservoir- Mid	5	<0.05	0.23	0.1	0.098 J	<0.04	0.63 J
9/18/03	R-7c	Ice House Reservoir - Upper Lake	5.56	<0.05	0.18	0.021 J	0.21 J	<0.04	0.15 J
9/16/03	R-8a	Junction Reservoir	6.11	<0.05	0.2	0.014 J	0.28 J	<0.04	0.84 J
9/16/03	R-9a	Camino Reservoir	3.89	<0.05	0.35	0.031 J	0.21 J	<0.04	0.43 J
9/16/03	R-10a	Brush Ck. Reservoir	6.11	<0.05	0.42	0.066	0.71 J	<0.04	0.73 J
9/16/03	R-10aH	Brush Ck. Reservoir	8.89	<0.05	0.21	0.044	0.32 J	<0.04	0.67 J
9/15/03	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	6.11	<0.05	50	3	0.27 J	<0.04	27
9/15/03	R-11b	Slab Creek Reservoir - Upper Site	6.11	<0.05	0.3	0.027 J	0.17 J	<0.04	0.53 J
9/15/03	R-12a	Chili Bar-Near Dam	6.11	<0.05	0.37	0.028 J	0.26 J	<0.04	0.75 J
9/15/03	R-12aH	Chili Bar-Near Dam	5.56	<0.05	0.46	0.052 J	0.26 J	<0.04	1.4 J
9/15/03	R-12b	Chili Bar - Mid Reservoir	7.22	<0.05	0.81	0.058	0.32 J	<0.04	0.93 J

**No sample obtained for this parameter.

Appendix A-32. UARP & Chili Bar Summer 2003 Sampling Results: Coliform and *E. coli*					
Date	**Site #**	**Site Name**	**Holding Time**	**Total Coliform**	***E. coli***
			Hours	**MPN/100 ml**	**MPN/100 ml**
Riverine Sites					
9/17/03	13a	Gerle Ck. Below Ice Hse Road	24	866.4	6.3
9/18/03	24	S.F. Silver Ck. Upstream of Ice House Res.	8	344.8	1
9/18/03	26a	S.F Silver Ck. Dnstream of Ice House Road.	8	387.3	6.3
9/15/03	48	SFAR below Chili Bar Dam	8	0	0
9/15/03	51	SFAR downstream of Greenwood Ck.	8	0	0
9/15/03	54	SFAR downstream of Weber Ck. Confluence	8	0	0
Reservoir Sites					
9/17/03	R-3b	Buck Island Res. North Shore	24	121.8	0
9/16/03	R-4d	Loon Lake Res. Near shore at NE end of Point Pleasant Campground	>24*	130	0
9/16/03	R-4e	Loon Lake near shore west of main dam	8	0	0
9/16/03	R-4f	Loon Lake Res. Near shore east of Loon Lake Campgroudn	8	0	0
9/18/03	R-6e	Union Valley Res. Near Wench Ck. Campground	8	866.4	0
9/18/03	R-6f	Union Valley Res. Near Yellowjacket Campground	8	1046.2	0
9/18/03	R-6g	Union Valley Res. Near West Point Boat Ramp	8	2419.2	0
9/18/03	R-6h	Union Valley Res. Near Fashoda Beach	8	1986.3	0
9/18/03	R-7d	Ice House Res. At penisula cove on north shore	8	1046.2	4.1
9/18/03	R-7e	Ice House Res. West of boat launch	8	686.7	0
9/16/03	R-8b	Junction Res. Near boat ramp	8	0	0
9/16/03	R-9b	Camino Res. Near Boat Ramp	8	0	0
9/16/03	R-10b	Brush Ck. Near boat ramp	8	248.9	1
9/15/03	R-11c	Slab Ck. Near boat ramp	8	0	0
9/15/03	R-12c	Chili Bar Near boat ramp	8	0	0

* Sample processed beyond the hold time.

Appendix A-33. UARP & Chili Bar Summer Sampling Results: 2003 Summer Fecal Coliform: 5 in 30 Regulatory Sampling							
Site	**Site Name**	**Sampling Date and Results (MPN/100 ml)**					**Geometric**
		6/23/03*	**7/1/03**	**7/8/03**	**7/15/03**	**7/22/03**	**Mean**
FC-1	Gerle Creek Res Nearshore b/w dock & day use area	ND (<1)	350	ND (<1)	ND (<1)	330	10
FC-2	Union Valley Res. Nearshore at Camino Cove	3180	1200	ND (<1)	ND (<1)	20	38
FC-3	Union Valley Res. Nearshore at Fashoda beach (peninsula)	600	ND	ND (<1)	ND (<1)	172	10
FC-4	Union Valley Res. Neashore at Jones Fork Campground	550	2900	ND (<1)	ND (<1)	ND (<1)	17
FC-5	Jones Fork Silver Creek at Ice House Rd.	730	165	310	400	1500	468
FC-6	Big Silver Creek at Bike Bridge	91	215	50	37	1160	133
FC-7	Ice House Res. Nearshore on west end of res. Near day-use area	110	12	20	4	ND (<1)	10
FC-8	Ice House Res. Nearshore near youth camp boat storage area	170	5.6	ND (<1)	6	ND (<1)	6
FC-9	Ice House Res. Near-shore on west end of Resrvoir near dayuse area	200	5.6	ND (<1)	23	98	19
FC-10	Brush Creek boat Ramp	ND (<1)	9	ND (<1)	4	ND (<1)	2
FC-11	SFAR below bridge at Camino Powerhouse	ND (<1)	25	44	ND (<1)	30	8
FC-12	SFAR at gage station below Chili Bar Dam	ND (<1)	195	170	ND (<1)	ND (<1)	8
FC-13	SFAR downstream of Miner's Cabin	350	6100	438	ND (<1)	107	159
FC-14	SFAR at County Park parking lot	ND (<1)	83	368	49	30	34
FC-15	SFAR downstream of Greenwood Ck.	ND (<1)	578	728	ND (<1)	70	31
FC-16	SFAR upstream of Hastings Creek	238	3900	462	28	290	322
FC-17	SFAR downstream of Webber Creek	660	9300	1350	ND (<1)	450	327
		8/19/04	8/26/04	9/2/04	9/19/04	9/23/04	
FC-18	Buck Island Res. Near Dam at Dispersed Camping Site	8	12	27	4	2	7
FC-19	Loon Lake Res. At Ellis Creek inflow	10	16	1	24	1	5
FC-20	Loon Lake Res. At Northshore campground in dispersed RV/ camping area	6	8	40	2	6	7
FC-21	Gerle Creek below Loon Lake gaging station @USFS property boundary.	8	14	26	6	1	7

*Sites FC-13, FC-16, FC-17 sampled on 6/25.

Appendix A-34. Fish Tissue Sampling for Metals - Laboratory Results

Moss Landing Marine Laboratories
Marine Pollution Studies Laboratories
7544 Sandholdt Road
Moss Landing, CA 95039
Project Manager: **Autumn Bonnema**
Phone: **831-771-4175**
Fax: **831-633-0805**
Email: bonnema@mlml.calstate.edu

Trace Metal Results

Project Name: **SMUD** **Report #: TM04-0021**
Project Number: **140**
Analyst: Jon Goetzl Report Date: 1/20/2004

Lab Number	Station Name	Sample Type	Date Collected	Date Received	Batch Number	Ag ppm	Al ppm	As ppm	Cd ppm	Cr ppm	Cu ppm	Mn ppm	Ni ppm	Pb ppm	Se ppm	Zn ppm	Hg ppm	Flag
5106	Union Valley	TISSUE	no date	12/16/2003	1/7/2004	<.002	<.02	0.06	<.0004	0.086	0.47	0.13	0.009	<.0004	0.21	4.19	0.419	
5107	Union Valley	LIVER	no date	12/16/2003	1/7/2004	0.013	21.2	0.12	0.64	0.161	4.11	0.97	<.001	0.015	0.99	17.8		
5108	Ice house	TISSUE	no date	12/16/2003	1/7/2004	<.002	<.02	0.16	<.0004	0.080	0.46	0.12	<.001	<.0004	0.19	4.32	0.036	
5109	Ice house	LIVER	no date	12/16/2003	1/7/2004	0.22	<.02	0.099	0.025	0.156	35.3	1.47	<.001	0.0018	0.91	22.9		
5110	Lab Creek	TISSUE	no date	12/16/2003	1/7/2004	<.002	<.02	<.02	<.0004	0.089	0.44	0.012	<.001	<.0004	0.086	3.60	0.595	
5111	Lab Creek	LIVER	no date	12/16/2003	1/7/2004	0.17	<.02	0.038	0.029	0.09	9.74	1.17	0.007	<.0004	1.31	27.8		
5112	Loon Lake	TISSUE	no date	12/16/2003	1/7/2004	<.002	0.37	<.02	0.0080	0.094	0.48	0.037	<.001	<.0004	0.32	4.92	0.137	
5113	Loon Lake	LIVER	no date	12/16/2003	1/7/2004	1.74	<.02	0.38	0.62	0.139	87.8	1.11	0.015	0.0024	9.14	25.0		
5114	Gerle Creek	TISSUE	no date	12/16/2003	1/7/2004	<.002	<.02	0.028	0.0008	0.093	0.52	0.0009	<.001	<.0004	0.39	3.53	0.321	
5115	Gerle Creek	LIVER	no date	12/16/2003	1/7/2004	1.86	6.55	1.19	0.83	0.121	126	0.43	0.034	0.012	30.6	52.6		
5116	Chilli Bar	TISSUE	no date	12/16/2003	1/7/2004	<.002	3.88	<.02	0.0013	0.066	0.39	<.0006	<.001	0.0043	0.14	8.05	0.075	
5117	Chilli Bar	LIVER	no date	12/16/2003	1/7/2004	<.002	<.02	0.051	0.019	0.118	2.12	0.41	0.006	<.0004	0.72	12.0		
					MDL	0.002	0.02	0.02	0.0004	0.006	0.0006	0.0006	0.001	0.0004	0.02	0.004	0.001	
					RL	0.006	0.06	0.06	0.0012	0.018	0.0018	0.0018	0.003	0.0012	0.06	0.012	0.003	

Method: modified EPA 1638

<value: sample value below given detection limit.
Sample value between detection limit and reporting limit in red
values listed are in wet weight

Appendix A-34. (continued)

Sample No	Station Name	Species		Fork Length	Weight
				mm	g
L-323-03 - 1	Union Valley Reservoir	Smallmouth Bass		340	620.7
				325	618.4
				300	414.4
				400	903.6
			Averages:	341	639.3
L-323-03 - 2	Ice House Reservoir	Rainbow Trout		340	400.8
				335	377.8
				278	281.4
				285	312.4
				308	301.1
				272	260
				214	144.4
			Averages:	290	296.8
L-403-03 - 2	Slab Creek Reservoir	Brown Trout		485	1297.2
L-466-03 - 1	Loon Lake	Brown Trout		374	564.9
				342	475.8
				368	562.4
				350	453.1
				350	442.2
				350	442.7
			Averages:	356	490.2
L-469-03 - 1	Gerle Creek Reservoir	Brown Trout		510	1716.9
L-477-03 - 1	Chili Bar Reservoir	Sacramento Pike Minnow		325	357.9
				303	254.7
				301	276.9
				280	250.4
				275	220.8
				277	245.2
				257	193.0
				238	148.7
			Averages:	282	243.5
ARCHIVED:					
L-323-03 - 3	Union Valley Reservoir	Rainbown Trout		380	550.9
				320	386.5
				270	192.4
			Averages:	323	376.6
L-403-03 - 1	Slab Creek Reservoir	Sacramento Pike Minnow		540	2334.9
				520	1658.8
				402	873.2
			Averages:	487	1622.3

Appendix A-35. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Hydrolab and YSI Data							
Date	**Site #**	**Site Name**	**Water Temperature (^{o}C)**	**Dissolved Oxygen (mg/L)**	**pH**	**Specific Conductance (uS/cm)**	**Conductivity (uS/cm)**
05/12/04	1	Rubicon River Inflow to Rubicon Reservoir	7.58	10.49	6.27	0.011	8
05/12/04	2	Rubicon R. outflow from Rubicon Res	5.19	10.86	6.23	0.01	6
05/12/04	4	Highland Creek	6.88	10.23	5.83	0.003	2
05/12/04	5	Rubicon Outflow from Rockbound Lake	6.82	11.25	6.34	0.008	5
05/12/04	6	Little Rubicon Outflow from Buck Island	7.59	11.25	6.31	0.008	5
05/10/04	7	Gerle Creek outflow from Loon Lake	6.71	9.27	6.98	0.009	6
05/10/04	9	Gerle Ck. Downstream of Jerrett Creek	3.9	10.78	6.28	0.01	5
05/10/04	13	Rocky Basin Ck.	6.8	10.05	6.71	0.011	7
05/10/04	14	Gerle Creek Inflow to Gerle Creek Reservoir	7.48	10.21	6.62	0.012	8
05/10/04	15	Gerle Creek Outflow from Gerle Creek Reservoir	8.23	9.43	6.06	0.01	6
05/10/04	16	Gerle Creek Canal inflow to Robb's Forebay	8.34	9.66	6.3	0.009	6
05/10/04	17	S.F. Rubicon inflow to Robb's Forebay	5.94	10.3	6.59	0.014	9
05/11/04	20	S.F. Rubicon upstream of Rubicon River	7.1	10.62	6.28	0.013	9
05/11/04	21	Tells Creek Upstream of Union Valley Reservoir	4.98	10.92	6.54	0.018	11
05/11/04	22	Big Silver Ck.	3.7	11.54	6.25	0.009	5
05/11/04	23	Jones Fork / Silver Ck. Inflow to UVR.	5.49	10.93	6.39	0.012	8
05/11/04	24	SF Silver Upstrm of Ice House Res.	5.74	10.63	6.51	0.008	5
05/12/04	25	SF Silver Outflow from Ice House Res.	6.91	10.68	6.83	0.012	8
05/12/04	26a	SF Silver dnstream of Ice Hse. Rd.	6.18	11.12	6.67	0.017	11
05/12/04	27	SF Silver Creek inflow to Junction Res.	6.85	11.4	6.82	0.018	12
05/05/04	28	Little Silver Creek inflow to Junction Res.	11.44	10.07	7.08	0.011	8
05/05/04	29	SF Silver Creek ds of Junction Dam	5.69	10.77	6.99	0.014	9
05/04/04	32	Silver Creek outflow upstream of Camino Reservoir	15.57	10.16	7.01	0.016	13
05/04/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	12.47	10.57	7.18	0.021	16
05/04/04	34	Silver Creek outflow from Camino Reservoir	10.85	10.98	6.96	0.015	11
N/A	36	Silver Ck. Upstream of SFAR[a]	N/A	N/A	N/A	N/A	N/A
05/04/04	38	SFAR upstream of Camino Powerhouse	10.84	11.37	6.88	0.022	16
05/04/04	39	Brush Creek Inflow to Brush Ck. Reservoir	10.68	10.49	7.13	0.024	17
05/04/04	40	Brush Creek Outflow from Brush Ck. Reservoir	8.73	10.79	6.97	0.022	15

Appendix A-35. (continued)							
Date	**Site #**	**Site Name**	**Water**	**Dissolved**	**pH**	**Specific**	**Conductivity**
05/04/04	41	SFAR downstream of Camino Powerhouse	10.92	11.26	6.9	0.022	16
05/03/04	42	Slab Creek Inflow to Slab Creek Reservoir	15.17	10.5	6.75	0.027	21
05/03/04	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	12.17	11.51	6.92	0.027	20
05/06/04	46	SFAR downstream of Rock Ck. Confluence	13.82	10.32	7.48	0.053	42
05/06/04	47	SFAR downstream of White Rock Powerhouse	11.79	11.09	6.81	0.023	17
05/03/04	48	SFAR below Chili Bar Dam	11.84	11.22	7.14	0.028	21
05/03/04	51	SFAR downstream of Lotus/Uniontown C	11.93	10.73	7.24	0.038	25
05/03/04	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	12.44	11.01	7.69	0.031	24
05/05/04	SFAR-1	SFAR at Riverton	8.06	11.76	6.83	0.007	4
Reservoir Sites							
Vertical profiles for temperature, dissolved oxygen, pH, and specific conductance obtained for reservoir sites.							
[a] Sample not taken due to high flows and inability of helicopter to land safely							

Appendix A-36. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Reservoir Secchi Disk Depth			
Date	**Site #**	**Site Name**	**Secchi Disk Depth (m)**
Reservoir Sites			
05/12/04	R-1	Rubicon Reservoir	>1
05/12/04	R-2	Rockbound Reservoir	10
05/12/04	R-3a	Buck Island	10
05/06/04	R-4a	Loon Lake Reservoir near Dam	8
05/06/04	R-4b	Loon Lake West End	8
05/06/04	R-4c	Loon Lake NE Waterbody	8
05/06/04	R-5	Gerle Ck. Reservoir	>4
05/05/04	R-6a	Union Valley Res - at Dam	6.6
05/05/04	R-6b	Union Valley Res - Mid	6
05/05/04	R-6c	Union Valley Robbs Tailrace	5.5
05/05/04	R-6d	Union Valley Res - Jones Fork Arm	6
05/11/04	R-7a	Ice House Reservoir	6
05/11/04	R-7b	Ice House Reservoir- Mid	5
05/11/04	R-7c	Ice House Reservoir - Upper Lake	5.5
05/05/04	R-8a	Junction Reservoir	3.3
	R-9a	Camino Reservoir	**
05/04/04	R-10a	Brush Ck. Reservoir	12
05/03/04	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	3
05/03/04	R-11b	Slab Creek Reservoir - Upper Site	2
05/03/04	R-12a	Chili Bar-Near Dam	3.7
05/03/04	R-12b	Chili Bar - Mid Reservoir	3.6

**No sample obtained due to safety restrictions - samples obtained from shore.

> denotes that secchi disk was visible on the bottom of the reservoir.

Appendix A-37. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Various Metals (Total Recoverable).										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/l	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**	**mg/l**
Riverine Sites										
5/12/04	1	Rubicon River Inflow to Rubicon Reservoir	55	0.14J	2.0J	<0.05	***	***	***	***
5/12/04	2	Rubicon R. outflow from Rubicon Res	52	0.13J	2.1J	<0.05	***	***	***	***
5/12/04	4	Rubicon Outflow from Rockbound Lake	64	0.035J	2.0J	<0.05	***	***	***	***
5/12/04	5	Little Rubicon Outflow from Buck Island	58	0.11J	2.0J	<0.05	***	***	***	***
5/12/04	6	Gerle Creek outflow from Loon Lake	58	0.11J	1.9J	<0.05	***	***	***	***
5/10/04	7	Gerle Ck. Downstream of Jerrett Creek	38J	0.075J	2.7J	<0.05	***	***	***	***
5/10/04	14	Gerle Creek Inflow to Gerle Creek Reservoir	38J	0.062J	6.8J	0.07	***	***	***	***
5/10/04	15	Gerle Creek Outflow from Gerle Creek Reservoir	41J	0.090J	4.1J	0.05	***	***	***	***
5/10/04	16	Gerle Creek Canal inflow to Robb's Forebay	39J	0.087J	4.3J	0.053	***	***	***	***
5/10/04	17	S.F. Rubicon inflow to Robb's Forebay	78	0.035J	3.8J	<0.05	***	***	***	***
5/11/04	20	S.F. Rubicon upstream of Rubicon River	23J	0.080J	6.0J	0.054	***	***	***	***
5/11/04	21	Tells Creek Upstream of Union Valley Reservoir	29J	0.036J	5.8J	<0.05	***	***	***	***
5/11/04	22	Big Silver Ck.	62	0.052J	3.5J	<0.05	***	***	***	***
5/11/04	23	Jones Fork / Silver Ck. Inflow to UVR.	48J	0.064J	5.3J	0.059	***	***	***	***
5/11/04	24	SF Silver Upstrm of Ice House Res.	56	0.040J	3.0J	<0.04	***	***	***	***
5/12/04	25	SF Silver Outflow from Ice House Res.	25J	0.039J	4.9J	0.064	***	***	***	***
5/12/04	27	SF Silver Creek inflow to Junction Res.	13J	0.027J	11J	<0.05	***	***	***	***
5/5/04	28	Little Silver Creek inflow to Junction Res.	8.7J	<0.055	16J	<0.05	***	***	***	***
5/5/04	29	SF Silver Creek ds of Junction Dam	8.0J	<0.055	6.2J	0.44	***	***	***	***
5/4/04	32	Silver Creek outflow upstream of Camino Reservoir	7.8J	<0.055	11J	<0.05	***	***	***	***
5/4/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	1.5J	<0.055	17J	<0.05	***	***	***	***
5/4/04	34	Silver Creek outflow from Camino Reservoir	11J	<0.055	8.8J	0.096	***	***	***	***
5/4/04	38	SFAR upstream of Camino Powerhouse	99	0.14J	9.2J	0.50	***	***	***	***
5/4/04	39	Brush Creek Inflow to Brush Ck. Reservoir	2.7J	<0.055	15J	<0.05	***	***	***	***
5/4/04	40	Brush Creek Outflow from Brush Ck. Reservoir	2.9J	<0.055	11J	0.064	***	***	***	***
5/4/04	41	SFAR downstream of Camino Powerhouse	49J	0.13J	7.3J	0.46	***	***	***	***
5/3/04	42	Slab Creek Inflow to Slab Creek Reservoir	13J	0.11J	16J	<0.05	***	***	***	***
5/3/04	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	39J	0.22J	11J	0.096	***	***	***	***
5/6/04	46	SFAR downstream of Rock Ck. Confluence	4.0J	0.14J	11J	0.064	***	***	***	***
5/6/04	47	SFAR downstream of White Rock Powerhouse	29J	0.11J	7.8J	0.096	***	***	***	***
5/3/04	48	SFAR below Chili Bar Dam	36J	0.19J	10J	0.084	***	***	***	***
5/3/04	51	SFAR downstream of Greenwood Creek near, ex USGS 1145500	26J	0.24J	11J	0.071	***	***	***	***
5/3/04	54	SFAR below Weber Creek confluence in a riverine environment	25J	0.21J	10J	0.100	***	***	***	***
Reservoir Sites										
5/12/04	R-1	Rubicon Reservoir	48J	0.13J	1.9J	<0.05	***	***	***	***

Appendix A-37. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Various Metals (Total Recoverable).										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/l	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**	**mg/l**
5/12/04	R-2	Rockbound Reservoir	58	0.19J	1.9J	<0.05	***	***	***	***
5/12/04	R-3a	Buck Island	62	0.57J	2.1J	<0.05	***	***	***	***
5/6/04	R-4a	Loon Lake Reservoir near Dam	34J	0.29J	2.9J	<0.05	***	***	***	***
5/6/04	R-4b	Loon Lake West End	26J	0.58J	2.7J	0.059	***	***	***	***
5/6/04	R-4c	Loon Lake NE Waterbody	39J	0.29J	2.7J	<0.05	***	***	***	***
5/6/04	R-5	Gerle Ck. Reservoir	35J	<0.055	6.0J	0.062	***	***	***	***
5/5/04	R-6a	Union Valley Res - at Dam	17J	0.18J	4.9J	<0.05	***	***	***	***
5/5/04	R-6b	Union Valley Res - Mid	18J	0.068J	5.0J	<0.05	***	***	***	***
5/5/04	R-6c	Union Valley Robbs Tailrace	23J	0.12J	4.4J	<0.05	***	***	***	***
5/5/04	R-6d	Union Valley Res - Jones Fork Arm	24J	0.26J	4.9J	<0.05	***	***	***	***
5/11/04	R-7a	Ice House Reservoir	23J	0.37J	5.0J	0.072	***	***	***	***
5/11/04	R-7b	Ice House Reservoir- Mid	28J	0.14J	4.1J	<0.05	***	***	***	***
5/11/04	R-7c	Ice House Reservoir - Upper Lake	40J	0.10J	3.9J	<0.05	***	***	***	***
5/5/04	R-8	Junction Reservoir	13J	0.13J	8.8J	0.072	***	***	***	***
5/4/04	R-9	Camino Reservoir	13J	<0.055	9.9J	0.12	***	***	***	***
5/4/04	R-10	Brush Ck. Reservoir	0.99J	<0.055	12J	<0.05	***	***	***	***
5/3/04	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	65J	0.39J	9.9J	0.11	***	***	***	***
5/3/04	R-11b	Slab Creek Reservoir - Upper Site	110	0.41J	11J	0.17	***	***	***	***
5/3/04	R-12a	Chili Bar-Near Dam	19J	0.21J	8.6J	0.076	***	***	***	***
5/3/04	R-12b	Chili Bar - Mid Reservoir	24J	0.27J	9.5J	0.084	***	***	***	***
5/5/04	SFAR-1	SFAR at HWY 50 & Ice House Road	48J	0.13J	6.3J	0.310	***	***	***	***

*** not analyzed for

Appendix A-38. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Various Metals (Total Recoverable), and Total Hardness									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/L**
Riverine Sites									
5/12/04	1	Rubicon River Inflow to Rubicon Reservoir	3.7	0.016J	0.22	0.028J	0.15J	<0.0045	***
5/12/04	2	Rubicon R. outflow from Rubicon Res	3.6	0.019J	0.25	0.054	0.14J	<0.0045	***
5/12/04	4	Rubicon Outflow from Rockbound Lake	<1.0	<0.0048	0.16	0.058	0.066J	<0.0045	***
5/12/04	5	Little Rubicon Outflow from Buck Island	2.2	0.0097J	0.19	0.026J	0.11J	<0.0045	***
5/12/04	6	Gerle Creek outflow from Loon Lake	2.2	0.0097J	0.6	0.049J	0.16J	<0.0045	***
5/10/04	7	Gerle Ck. Downstream of Jerrett Creek	4	0.045J	0.53	0.053	0.71J	<0.0045	***
5/10/04	14	Gerle Creek Inflow to Gerle Creek Reservoir	3.5	0.012J	0.27	0.032J	0.34J	<0.0045	***
5/10/04	15	Gerle Creek Outflow from Gerle Creek Reservoir	2.6	0.0099J	0.36	0.054	0.24J	<0.0045	***
5/10/04	16	Gerle Creek Canal inflow to Robb's Forebay	4	0.011J	0.29	0.044J	0.23J	<0.0045	***
5/10/04	17	S.F. Rubicon inflow to Robb's Forebay	5.3	0.0089J	0.38	0.036J	0.61J	<0.0045	***
5/11/04	20	S.F. Rubicon upstream of Rubicon River	4.6	<0.0048	0.22	0.020J	0.17J	<0.0045	***
5/11/04	21	Tells Creek Upstream of Union Valley Reservoir	6	<0.0048	0.12	0.014J	0.17J	<0.0045	***
5/11/04	22	Big Silver Ck.	2.6	0.12	0.15	0.028J	0.096J	<0.0045	***
5/11/04	23	Jones Fork / Silver Ck. Inflow to UVR.	4	<0.0048	0.48	0.031J	0.24J	<0.0045	***
5/11/04	24	SF Silver Upstrm of Ice House Res.	2	0.0091J	0.19	0.058	0.48J	<0.0045	***
5/12/04	25	SF Silver Outflow from Ice House Res.	2.7	<0.0048	0.28	0.026J	0.085J	<0.0045	***
5/12/04	27	SF Silver Creek inflow to Junction Res.	5.1	<0.0048	0.14	0.024J	0.12J	<0.0045	***
5/5/04	28	Little Silver Creek inflow to Junction Res.	2.9	<0.019	0.15	<0.024	0.25J	<0.018	***
5/5/04	29	SF Silver Creek ds of Junction Dam	4.4	0.021J	0.29	<0.024	0.072J	<0.018	***
5/4/04	32	Silver Creek outflow upstream of Camino Reservoir	5.9	<0.019	0.2	<0.024	0.047J	<0.018	***
5/4/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	12	<0.019	0.14	<0.024	<0.037	<0.018	***
5/4/04	34	Silver Creek outflow from Camino Reservoir	5.9	<0.019	0.24	<0.024	0.064J	<0.018	***
5/4/04	38	SFAR upstream of Camino Powerhouse	6.5	0.029J	1.5	0.094	0.16J	<0.018	***
5/4/04	39	Brush Creek Inflow to Brush Ck. Reservoir	7.2	<0.019	0.12	<0.024	0.097J	<0.018	***
5/4/04	40	Brush Creek Outflow from Brush Ck. Reservoir	7.2	<0.019	0.14	<0.024	0.081J	<0.018	***
5/4/04	41	SFAR downstream of Camino Powerhouse	7.8	<0.019	0.31	0.034J	<0.037	<0.018	***
5/3/04	42	Slab Creek Inflow to Slab Creek Reservoir	8.5	<0.0095	0.26	0.052	0.092J	<0.0090	***
5/3/04	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	9.2	<0.0095	0.37	0.072	0.11J	<0.0090	***
5/6/04	46	SFAR downstream of Rock Ck. Confluence	21	<0.019	0.26	<0.024	0.45J	<0.018	***
5/6/04	47	SFAR downstream of White Rock Powerhouse	9.8	<0.019	0.24	<0.024	0.038J	<0.018	***
5/3/04	48	SFAR below Chili Bar Dam	7.8	<0.0095	0.37	0.054	0.096J	<0.0090	***
5/3/04	51	SFAR downstream of Greenwood Creek near, ex USGS 1145500	12	<0.0095	0.36	0.040J	0.18J	<0.0090	***

Appendix A-38. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Various Metals (Total Recoverable), and Total Hardness									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/L**
5/3/04	54	SFAR below Weber Creek confluence in a riverine environment	9.8	0.078	0.41	0.058	0.49J	<0.0090	***
Reservoir Sites									
5/12/04	R-1	Rubicon Reservoir	3.6	0.015J	0.22	0.025J	0.14J	<0.0045	***
5/12/04	R-2	Rockbound Reservoir	2	0.022J	0.7	19	0.15J	<0.0045	***
5/12/04	R-3a	Buck Island	1.9	0.42	0.47	97	0.22J	0.0068J	***
5/6/04	R-4a	Loon Lake Reservoir near Dam	2.9	0.033J	0.42	47	0.066J	<0.018	***
5/6/04	R-4b	Loon Lake West End	3.4	0.020J	0.3	91	<0.037	0.020J	***
5/6/04	R-4c	Loon Lake NE Waterbody	2	<0.019	0.29	48	<0.037	<0.018	***
5/6/04	R-5	Gerle Ck. Reservoir	2.4	<0.019	0.23	<0.024	0.20J	<0.018	***
5/5/04	R-6a	Union Valley Res - at Dam	3.9	<0.019	0.29	25	0.081J	<0.018	***
5/5/04	R-6b	Union Valley Res - Mid	3.9	0.027J	0.34	6.9	0.078J	<0.018	***
5/5/04	R-6c	Union Valley Robbs Tailrace	3.4	<0.019	0.18	15	0.083J	<0.018	***
5/5/04	R-6d	Union Valley Res - Jones Fork Arm	3.4	<0.019	0.26	47	0.068J	<0.018	***
5/11/04	R-7a	Ice House Reservoir	2.6	0.029J	0.57	54	0.14J	0.012J	***
5/11/04	R-7b	Ice House Reservoir- Mid	2	0.016J	0.64	18	0.28J	<0.0045	***
5/11/04	R-7c	Ice House Reservoir - Upper Lake	2	0.0056J	0.18	12	0.063J	<0.0045	***
5/5/04	R-8	Junction Reservoir	3.9	<0.019	0.24	19	0.12J	<0.018	***
5/4/04	R-9	Camino Reservoir	4.9	0.037J	0.61	0.064	0.14J	<0.018	***
5/4/04	R-10	Brush Ck. Reservoir	7.8	<0.019	0.12	6.2	0.10J	<0.018	***
5/3/04	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	7.2	0.012J	0.35	65	0.052J	<0.0090	***
5/3/04	R-11b	Slab Creek Reservoir - Upper Site	5.9	0.061	0.68	86	0.063J	<0.0090	***
5/3/04	R-12a	Chili Bar-Near Dam	9.2	<0.0095	0.38	4	<0.018	<0.0090	***
5/3/04	R-12b	Chili Bar - Mid Reservoir	9.2	<0.0095	0.34	20	<0.018	<0.0090	***
5/5/04	SFAR-1	SFAR at HWY 50 & Ice House Road	4.9	<0.019	0.21	0.029J	<0.037	<0.018	***

*** not analyzed for

Appendix A-39. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Various Metals (Dissolved)											
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Cadmium**	**Copper**	**Iron**	**Lead**	**Nickel**	**Silver**
			ug/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**
Riverine Sites											
5/12/04	1	Rubicon River Inflow to Rubicon Reservoir	40J	0.12J	2.0J	0.011J	0.23	<0.05	0.13	0.16J	<0.0045
5/12/04	2	Rubicon R. outflow from Rubicon Res	43J	0.12J	2.3J	0.016J	0.23	<0.05	0.039J	0.14J	<0.0045
5/12/04	4	Rubicon Outflow from Rockbound Lake	59	0.030J	1.7J	0.0053J	0.13	<0.05	0.025J	0.095J	<0.0045
5/12/04	5	Little Rubicon Outflow from Buck Island	48J	0.10J	1.8J	0.0075J	0.17	<0.05	0.018J	0.11J	<0.0045
5/12/04	6	Gerle Creek outflow from Loon Lake	50	0.096J	2.0J	0.0076J	0.19	<0.05	0.028J	0.11J	<0.0045
5/10/04	7	Gerle Ck. Downstream of Jerrett Creek	21J	0.077J	2.7J	0.041J	0.43	<0.05	0.016J	0.68J	<0.0045
5/10/04	14	Gerle Creek Inflow to Gerle Creek Reservoir	34J	0.056J	6.6J	0.011J	0.27	<0.05	0.024J	0.35J	<0.0045
5/10/04	15	Gerle Creek Outflow from Gerle Creek Reservoir	23J	0.084J	4.0J	0.0093J	0.26	<0.05	0.016J	0.23J	<0.0045
5/10/04	16	Gerle Creek Canal inflow to Robb's Forebay	22J	0.087J	4.0J	0.011J	0.24	<0.05	0.019J	0.96J	<0.0045
5/10/04	17	S.F. Rubicon inflow to Robb's Forebay	45J	0.027J	3.3J	0.0070J	0.30	<0.05	0.022J	0.17J	<0.0045
5/11/04	20	S.F. Rubicon upstream of Rubicon River	20J	0.058J	6.3J	0.0053J	0.51	<0.05	0.019J	0.60J	0.0046J
5/11/04	21	Tells Creek Upstream of Union Valley Reservoir	27J	0.030J	6.4J	<0.0048	0.28	<0.05	0.022J	0.20J	<0.0045
5/11/04	22	Big Silver Ck.	55	0.044J	3.4J	<0.0048	0.13	<0.05	0.021J	0.40J	<0.0045
5/11/04	23	Jones Fork / Silver Ck. Inflow to UVR.	44J	0.066J	5.4J	<0.0048	0.16	<0.05	0.037J	0.11J	<0.0045
5/11/04	24	SF Silver Upstrm of Ice House Res.	52	0.045J	3.2J	0.010J	0.17	<0.05	0.039J	0.12J	<0.0045
5/12/04	25	SF Silver Outflow from Ice House Res.	17J	0.040J	5.2J	<0.0048	0.31	<0.05	0.053	0.074J	<0.0045
5/12/04	27	SF Silver Creek inflow to Junction Res.	7.7J	0.029J	11J	<0.0048	0.19	<0.05	0.35	0.16J	<0.0045
5/5/04	28	Little Silver Creek inflow to Junction Res.	5.0J	<0.055	17J	<0.019	0.079J	<0.05	<0.024	0.13J	<0.018
5/5/04	29	SF Silver Creek ds of Junction Dam	3.4J	<0.055	6.7J	0.022J	0.24	<0.05	<0.024	<0.037	<0.018
5/4/04	32	Silver Creek outflow upstream of Camino Reservoir	3.8J	<0.055	12J	<0.019	0.19	<0.05	<0.024	<0.037	<0.018
5/4/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	0.20J	<0.055	19J	<0.019	0.14	<0.05	<0.024	<0.037	<0.018
5/4/04	34	Silver Creek outflow from Camino Reservoir	4.0J	<0.055	9.4J	<0.019	0.21	<0.05	<0.024	<0.037	<0.018
5/4/04	38	SFAR upstream of Camino Powerhouse	25J	<0.055	6.9J	<0.019	0.22	<0.05	0.036J	<0.037	<0.018
5/4/04	39	Brush Creek Inflow to Brush Ck. Reservoir	0.27J	<0.055	16J	<0.019	0.080J	<0.05	<0.024	<0.037	<0.018
5/4/04	40	Brush Creek Outflow from Brush Ck. Reservoir	<0.17	<0.055	12J	<0.019	0.10	<0.05	<0.024	<0.037	<0.018
5/4/04	41	SFAR downstream of Camino Powerhouse	23J	<0.055	7.2J	<0.019	0.22	<0.05	<0.024	<0.037	<0.018
5/3/04	42	Slab Creek Inflow to Slab Creek Reservoir	3.1J	0.11J	15J	<0.0095	0.21	<0.05	0.019J	<0.018	<0.0090
5/3/04	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	10J	0.18J	9.3J	<0.0095	0.28	<0.05	0.013J	<0.018	<0.0090
5/6/04	46	SFAR downstream of Rock Ck. Confluence	<0.17	0.078J	12J	<0.019	0.20	<0.05	<0.024	0.35J	<0.018
5/6/04	47	SFAR downstream of White Rock Powerhouse	14J	<0.055	7.9J	<0.019	0.20	<0.05	<0.024	<0.037	<0.018
5/3/04	48	SFAR below Chili Bar Dam	8.2J	0.19J	9.4J	<0.019	0.46	<0.05	<0.024	0.12J	<0.018
5/3/04	51	SFAR downstream of Greenwood Creek near, ex USGS 1145500	5.9J	0.19J	11J	<0.0095	0.34	<0.05	0.017J	0.087J	<0.0090
5/3/04	54	SFAR below Weber Creek confluence in a riverine environment	1.8J	0.19J	9.8J	<0.019	0.37	<0.05	<0.024	0.12J	<0.018
Reservoir Sites											
5/12/04	R-1	Rubicon Reservoir	44J	0.13J	2.1J	0.015J	0.23	<0.05	0.13J	0.82J	<0.0045
5/12/04	R-2	Rockbound Reservoir	49J	0.14J	2.0J	0.019J	0.50	<0.05	13	0.12J	<0.0045
5/12/04	R-3a	Buck Island	48J	0.27J	2.0J	0.034J	0.62	<0.05	50	0.15J	<0.0045
5/6/04	R-4a	Loon Lake Reservoir near Dam	23J	0.13J	2.9J	0.029J	0.33	<0.05	24	<0.037	<0.018
5/6/04	R-4b	Loon Lake West End	19J	0.35J	2.9J	0.020J	0.24	<0.05	67	<0.037	<0.018
5/6/04	R-4c	Loon Lake NE Waterbody	31J	0.13J	2.8J	<0.019	0.31	<0.05	33	<0.037	<0.018
5/6/04	R-5	Gerle Ck. Reservoir	28J	<0.055	6.0J	<0.019	0.21	<0.05	<0.024	0.13J	<0.018
5/5/04	R-6a	Union Valley Res - at Dam	11J	0.10J	5.3J	<0.019	0.25	<0.05	24	<0.037	<0.018

Appendix A-39. UARP & Chili Bar 2004 Spring Runoff Sampling Results: Various Metals (Dissolved)											
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Cadmium**	**Copper**	**Iron**	**Lead**	**Nickel**	**Silver**
			ug/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**
5/5/04	R-6b	Union Valley Res - Mid	12J	<0.055	5.3J	0.021J	0.25	<0.05	5.8	<0.037	<0.018
5/5/04	R-6c	Union Valley Robbs Tailrace	18J	0.070J	5.0J	<0.019	0.16	<0.05	14	<0.037	<0.018
5/5/04	R-6d	Union Valley Res - Jones Fork Arm	16J	0.12J	5.2J	<0.019	0.25	<0.05	31	<0.037	<0.018
5/11/04	R-7a	Ice House Reservoir	18J	0.23J	5.1J	0.031J	0.49	<0.05	26	0.11J	0.0048J
5/11/04	R-7b	Ice House Reservoir- Mid	24J	0.093J	4.4J	0.013J	0.29	<0.05	10	0.099J	<0.0045
5/11/04	R-7c	Ice House Reservoir - Upper Lake	30J	0.078J	4.2J	0.0063J	0.19	<0.05	8.3	0.094J	<0.0045
5/5/04	R-8	Junction Reservoir	5.3J	0.092J	9.5J	<0.019	0.19	<0.05	12	0.062J	<0.018
5/4/04	R-9	Camino Reservoir	3.0J	<0.055	11J	0.034J	0.50	<0.05	0.058	<0.037	<0.018
5/4/04	R-10	Brush Ck. Reservoir	<0.17	<0.055	14J	<0.019	0.072J	<0.05	3.9	<0.037	<0.018
5/3/04	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	16J	0.23J	8.3J	0.011J	0.25	<0.05	14	<0.018	<0.0090
5/3/04	R-11b	Slab Creek Reservoir - Upper Site	17J	0.20J	8.8J	0.034J	0.45	<0.05	11	<0.018	<0.0090
5/3/04	R-12a	Chili Bar-Near Dam	12J	0.19J	9.1J	<0.0095	0.35	<0.05	1.4	0.27J	0.011J
5/3/04	R-12b	Chili Bar - Mid Reservoir	14J	0.20J	9.3J	<0.0095	0.33	<0.05	6.9	0.19J	<0.0090
5/5/04	SFAR-1	SFAR at HWY 50 & Ice House Road	30J	0.093J	6.5J	<0.019	0.21	<0.05	<0.024	<0.037	<0.018

Appendix A-40. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Hydrolab and YSI Data							
Date	**Site #**	**Site Name**	**Water Temperature (^{o}C)**	**Dissolved Oxygen (mg/L)**	**pH**	**Specific Conductance (uS/cm)**	**Conductivity (uS/cm)**
9/21/04	1	Rubicon River Inflow to Rubicon Reservoir	15.10	8.36	7.59	18	15
9/21/04	2	Rubicon R. outflow from Rubicon Res	13.37	7.94	7.69	15	12
9/21/04	5	Rubicon Outflow from Rockbound Lake	13.95	8.57	7.84	9	7
9/21/04	6	Little Rubicon Outflow from Buck Island	13.31	7.28	7.74	10	8
9/22/04	7	Gerle Creek outflow from Loon Lake	14.78	7.43	7.73	9	8
9/20/04	9	Gerle Ck. Downstream of Jerrett Creek	12.64	8.99	8.12	10	8
9/19/04	13	Rocky Basin Ck.	9.50	9.69	8.10	12	8
9/19/04	14	Gerle Creek Inflow to Gerle Creek Reservoir	9.49	9.55	7.99	14	10
9/19/04	15	Gerle Creek Outflow from Gerle Creek Reservoir	14.9	8.43	7.96	12	9
9/22/04	16	Gerle Creek Canal inflow to Robb's Forebay	17.20	8.92	7.84	13	11
9/22/04	17	S.F. Rubicon inflow to Robb's Forebay	12.30	8.59	7.56	34	26
9/20/04	20	S.F. Rubicon upstream of Rubicon River	12.83	9.37	7.78	14	11
9/20/04	21	Tells Creek Upstream of Union Valley Reservoir	9.39	9.50	7.92	42	30
9/20/04	22	Big Silver Ck.	12.45	9.22	7.99	39	30
9/20/04	23	Jones Fork / Silver Ck. Inflow to UVR.	9.57	8.80	7.89	47	33
9/15/04	24	SF Silver Upstrm of Ice House Res.	10.86	10.45	7.28	26	20
9/15/04	25	SF Silver Outflow from Ice House Res.	6.80	7.49	7.4	12	8
9/23/04	27	SF Silver Creek inflow to Junction Res.	9.09	9.84	6.98	14	10
9/14/04	28	Little Silver Creek inflow to Junction Res.	12.81	21.93	7.08	13	10
9/14/04	29	SF Silver Creek ds of Junction Dam	10.6	2.47	7.16	14	10
9/12/04	32	Silver Creek outflow upstream of Camino Reservoir	12.64	10.51	6.82	20	10
9/12/04	34	Silver Creek outflow from Camino Reservoir	9.41	11.33	7.06	14	10
9/21/04	36	Silver Ck. Upstream of SFAR	24.17	10.73	*	*	1
9/12/04	38	SFAR upstream of Camino Powerhouse	17.07	10.23	7.30	53	45
9/20/04	39	Brush Creek Inflow to Brush Ck. Reservoir	8.05	10.65	7.91	31	21
9/20/04	40	Brush Creek Outflow from Brush Ck. Reservoir	10.20	10.13	7.79	21	15

Appendix A-40. (continued)

Date	Site #	Site Name	Water	Dissolved	pH	Specific	Conductivity
9/12/04	41	SFAR downstream of Camino Powerhouse	10.73	11.86	6.88	16	12
9/13/04	42	Slab Creek Inflow to Slab Creek Reservoir	17.08	10.36	7.28	40	34
9/13/04	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	12.11	4.69	7.19	17	13
9/23/04	46	SFAR downstream of Rock Ck. Confluence	14.67	10.23	6.92	26	21
9/15/04	47	SFAR downstream of White Rock Powerhouse	11.47	97.7	6.8	17	13
9/13/04	48	SFAR below Chili Bar Dam	12.39	14.53	6.98	17	13
9/13/04	51	SFAR downstream of Lotus/Uniontown C	15.35	6.07	7.31	19	16
9/13/04	54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	14.93	9.74	7.31	37	30
9/23/04	SFAR-1	SFAR at Riverton	11.06	9.83	7.06	59	43
Reservoir Sites							
Vertical profiles for temperature, dissolved oxygen, pH, and specific conductance obtained for reservoir sites.							

* Parameter not sampled

Appendix A-41. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Secchi Disk Depth			
Date	**Site #**	**Site Name**	**Secchi Disk Depth (m)**
Reservoir Sites			
9/21/04	R-1	Rubicon Reservoir	1.7
9/21/04	R-2	Rockbound Reservoir	9.0
9/21/04	R-3a	Buck Island	5.0
9/22/04	R-4a	Loon Lake Reservoir near Dam	13.0
9/22/04	R-4b	Loon Lake West End	11.0
9/22/04	R-4c	Loon Lake NE Waterbody	12.0
9/15/04	R-5	Gerle Ck. Reservoir	8.0
9/14/04	R-6a	Union Valley Res - at Dam	6.0
9/14/04	R-6b	Union Valley Res - Mid	6.6
9/14/04	R-6c	Union Valley Robbs Tailrace	5.0
9/14/04	R-6d	Union Valley Res - Jones Fork Arm	5.9
9/20/04	R-7a	Ice House Reservoir	4.4
9/20/04	R-7b	Ice House Reservoir- Mid	4.4
9/20/04	R-7c	Ice House Reservoir - Upper Lake	4.5
9/14/04	R-8a	Junction Reservoir	7.0
	R-9a	Camino Reservoir	**
9/20/04	R-10a	Brush Ck. Reservoir	8.6
9/13/04	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	8.5
9/13/04	R-11b	Slab Creek Reservoir - Upper Site	7.9
9/13/04	R-12a	Chili Bar-Near Dam	6.0
9/13/04	R-12b	Chili Bar - Mid Reservoir	6.5

**No sample obtained due to safety restrictions - samples obtained from shore.

Appendix A-42. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Various Metals (Total Recoverable)										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/l	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**	**mg/l**
Riverine Sites										
9/21/04	1	Rubicon River Inflow to Rubicon Reservoir	23J	0.22J	3.3J	0.100	0.0015J	0.0018	<2.0	***
9/21/04	2	Rubicon R. outflow from Rubicon Res	46J	0.98J	2.4J	0.500	0.0083J	0.0017	<2.0	***
9/21/04	5	Little Rubicon Outflow from Buck Island	18J	<1.0	1.6J	0.032	0.0011J	0.0017	<2.0	***
9/21/04	6	Gerle Creek outflow from Loon Lake	17J	0.04J	2.1J	0.110	0.0041J	<0.001	<2.0	***
9/22/04	7	Gerle Ck. Downstream of Jerrett Creek	14J	<1.0	2.0J	0.048	0.0044J	<0.001	<2.0	***
9/19/04	14	Gerle Creek Inflow to Gerle Creek Reservoir	13J	<1.0	4.9J	0.092	0.0031J	0.0012	<2.0	***
9/19/04	15	Gerle Creek Outflow from Gerle Creek Reservoir	15J	<1.0	4.1J	0.130	0.0080J	0.0019	<2.0	***
9/22/04	16	Gerle Creek Canal inflow to Robb's Forebay	15J	<1.0	2.3J	0.069	0.0031J	0.0011	<2.0	***
9/22/04	17	S.F. Rubicon inflow to Robb's Forebay	8.4J	<1.0	7.7J	0.130	0.0074J	0.0019	<2.0	***
9/20/04	20	S.F. Rubicon upstream of Rubicon River	8.2J	<1.0	5.4J	0.140	0.0020J	0.0014	<2.0	***
9/20/04	21	Tells Creek Upstream of Union Valley Reservoir	7J	<1.0	13J	0.065	0.0027J	0.0052	<2.0	***
9/20/04	22	Big Silver Ck.	8.3J	<1.0	11J	0.060	0.0017J	0.0026	<2.0	***
9/20/04	23	Jones Fork / Silver Ck. Inflow to UVR.	11J	<1.0	16J	0.270	0.0063J	<0.001	<2.0	***
9/15/04	24	SF Silver Upstrm of Ice House Res.	17J	<1.0	8.8J	0.030	0.00060J	0.0013	<2.0	***
9/15/04	25	SF Silver Outflow from Ice House Res.	23J	<1.0	6.2J	0.380	0.120J	0.0013	<2.0	***
9/23/04	27	SF Silver Creek inflow to Junction Res.	20J	<1.0	7.9J	0.19	0.007J	0.0013	<2.0	***
9/14/04	28	Little Silver Creek inflow to Junction Res.	9.4J	<1.0	20	0.067	0.0010J	0.0097	<2.0	***
9/14/04	29	SF Silver Creek ds of Junction Dam	15J	<1.0	6.0J	0.440	0.0094J	0.0035	<2.0	***
9/12/04	32	Silver Creek outflow upstream of Camino Reservoir	7.4J	<1.0	11J	0.043	0.00080J	0.0036	<2.0	***
9/12/04	34	Silver Creek outflow from Camino Reservoir	18J	<1.0	6.5J	0.160	0.013J	0.0033	<2.0	***
9/21/04	36	Silver Ck. Upstream of SFAR	15J	<1.0	8.4J	0.058	0.0023J	0.0013	<2.0	***
9/12/04	38	SFAR upstream of Camino Powerhouse	6.4J	<1.0	12J	0.046	0.0018J	0.0020	<2.0	***
9/20/04	39	Brush Creek Inflow to Brush Ck. Reservoir	8.0J	<1.0	16J	0.052	0.00091J	0.0031	<2.0	***
9/20/04	40	Brush Creek Outflow from Brush Ck. Reservoir	4.7J	<1.0	8.5J	0.190	0.023J	<0.001	<2.0	***
9/12/04	41	SFAR downstream of Camino Powerhouse	20J	<1.0	6.8J	0.120	0.016J	0.0023	<2.0	***
9/13/04	42	Slab Creek Inflow to Slab Creek Reservoir	4.8J	<1.0	15J	0.048	0.0017J	0.0121	<2.0	***
9/13/04	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	36J	<1.0	7.3J	0.190	0.013J	0.0024	<2.0	***
9/23/04	46	SFAR downstream of Rock Ck. Confluence	27J	<1.0	7.1J	0.110	0.042J	0.0014	<2.0	***
9/15/04	47	SFAR downstream of White Rock Powerhouse	16J	<1.0	6.4J	0.180	0.012J	<0.001	<2.0	***
9/13/04	48	SFAR outflow from Chili Bar Res.	16J	<1.0	7.0J	0.170	0.0096J	0.0019	<2.0	***
9/13/04	51	SFAR downstream of Greenwood Creek near, ex USGS 1145500	23J	<1.0	6.3J	0.200	0.0071J	0.0187	<2.0	***
9/13/04	54	SFAR below Weber Creek confluence in a riverine environment	13J	<1.0	8.5J	0.120	0.012J	0.0013	<2.0	***
Reservoir Sites										
9/21/04	R-1	Rubicon Reservoir	50	0.96J	2.4J	0.540	0.0078J	0.0011	<2.0	***
9/21/04	R-2	Rockbound Reservoir	17J	0.057J	1.5J	0.032	0.0009J	<0.001	<2.0	***
9/21/04	R-3a	Buck Island	17J	0.11J	1.9J	0.120	0.0042J	0.0018	<2.0	***

Appendix A-42. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Various Metals (Total Recoverable)										
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**	**Cyanide**
			ug/l	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**	**mg/l**
9/22/04	R-4a	Loon Lake Reservoir near Dam	12J	<1.0	2.3J	0.044	0.0036J	<0.001	<2.0	***
9/22/04	R-4b	Loon Lake West End	12J	0.12J	2.0J	0.047	0.0030J	<0.001	<2.0	***
9/22/04	R-4c	Loon Lake NE Waterbody	14J	0.30J	2.8J	0.059	0.0039J	<0.001	<2.0	***
9/15/04	R-5	Gerle Ck. Reservoir	18J	0.15J	3.6J	0.097	0.0094J	<0.001	<2.0	***
9/14/04	R-6a	Union Valley Res - at Dam	23J	<1.0	5.0J	0.057	0.0040J	0.0011	<2.0	***
9/14/04	R-6b	Union Valley Res - Mid	23J	<1.0	4.8J	0.044	0.0034J	0.0025	<2.0	***
9/14/04	R-6c	Union Valley Robbs Tailrace	27J	<1.0	5.3J	0.180	0.0061J	<0.001	<2.0	***
9/14/04	R-6d	Union Valley Res - Jones Fork Arm	28J	<1.0	5.4J	0.059	0.0042J	0.0024	<2.0	***
9/20/04	R-7a	Ice House Reservoir	21J	0.055J	4.0J	0.041	0.0064J	<0.001	<2.0	***
9/20/04	R-7b	Ice House Reservoir- Mid	20J	<1.0	4.0J	0.048	0.0053J	0.0019	<2.0	***
9/20/04	R-7c	Ice House Reservoir - Upper Lake	18J	0.048J	4.2J	0.097	0.0066J	<0.001	<2.0	***
9/14/04	R-8	Junction Reservoir	19J	0.099J	7.0J	0.190	0.026J	0.0024	<2.0	***
9/12/04	R-9	Camino Reservoir	25J	<1.0	6.7J	0.130	0.029J	0.0036	<2.0	***
9/20/04	R-10	Brush Ck. Reservoir	6.4J	0.072J	12J	0.036	0.0044J	0.0049	<2.0	***
9/13/04	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	11J	0.21J	7.1J	0.059	0.0044J	0.0016	<2.0	***
9/13/04	R-11b	Slab Creek Reservoir - Upper Site	19J	0.28J	7.2J	0.160	0.017J	0.0024	<2.0	***
9/13/04	R-12a	Chili Bar-Near Dam	18J	0.071J	7.2J	0.130	0.011J	0.002	<2.0	***
9/13/04	R-12aH	Chili Bar-Near Dam	15J	0.099J	7.0J	1.180	0.0088J	0.002	<2.0	***
9/13/04	R-12b	Chili Bar - Mid Reservoir	20J	0.051J	7.9J	0.130	0.011J	0.0010	<2.0	***
9/13/04	R-12bH	Chili Bar - Mid Reservoir	18J	0.12J	7.1J	0.380	0.011J	0.0020	<2.0	***
9/23/04	SFAR-1	SFAR at HWY 50 & Ice House Road	6.9J	0.21J	8.3J	0.050	0.0023J	<0.001	<2.0	***

*** not analyzed for

Appendix A-43. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Various Metals (Total Recoverable), and Total Hardness									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/L**
Riverine Sites									
9/21/04	1	Rubicon River Inflow to Rubicon Reservoir	6.2	0.018J	0.27	0.051	<2.0	0.28	1.3J
9/21/04	2	Rubicon R. outflow from Rubicon Res	3.8	0.020J	0.45	0.16	<2.0	0.21	1.2J
9/21/04	5	Little Rubicon Outflow from Buck Island	1.6	0.011J	0.31	0.052	<2.0	0.28	0.82J
9/21/04	6	Gerle Creek outflow from Loon Lake	1.9	0.01J	0.35	0.053	<2.0	0.19	0.83J
9/22/04	7	Gerle Ck. Downstream of Jerrett Creek	1.0	0.13	0.51	0.087	<2.0	0.051	1.7J
9/19/04	14	Gerle Creek Inflow to Gerle Creek Reservoir	3.5	0.019J	0.31	0.054	<2.0	0.017J	1.4J
9/19/04	15	Gerle Creek Outflow from Gerle Creek Reservoir	3.0	0.015J	0.39	0.048J	<2.0	0.042	1.0J
9/22/04	16	Gerle Creek Canal inflow to Robb's Forebay	1.4	0.018J	0.31	0.027	<2.0	0.041	0.86J
9/22/04	17	S.F. Rubicon inflow to Robb's Forebay	8.6	0.034J	0.48	0.14	<2.0	0.068	1.7J
9/20/04	20	S.F. Rubicon upstream of Rubicon River	3.8	0.11	0.78	0.14	<2.0	0.022J	5.8
9/20/04	21	Tells Creek Upstream of Union Valley Reservoir	11.0	<0.050	0.19	0.072	<2.0	0.0095J	1.7J
9/20/04	22	Big Silver Ck.	8.6	0.023J	0.44	0.088	<2.0	0.0096J	2.4J
9/20/04	23	Jones Fork / Silver Ck. Inflow to UVR.	14.0	0.017J	0.39	0.13J	<2.0	<0.040	6.2
9/15/04	24	SF Silver Upstrm of Ice House Res.	5.8	<0.050	0.51	0.099	<2.0	0.015J	1.3J
9/15/04	25	SF Silver Outflow from Ice House Res.	2.5	<0.050	0.17	0.038J	<2.0	0.013J	0.79J
9/23/04	27	SF Silver Creek inflow to Junction Res.	1.8	<0.050	1.3	0.038J	<2.0	0.024J	1.9J
9/14/04	28	Little Silver Creek inflow to Junction Res.	3.0	<0.050	0.19	0.020J	<2.0	0.017J	2.2J
9/14/04	29	SF Silver Creek ds of Junction Dam	4.0	0.031J	0.74	0.29	<2.0	<0.040	4.1J
9/12/04	32	Silver Creek outflow upstream of Camino Reservoir	6.2	0.093	0.78	0.051	<2.0	0.013J	2.5J
9/12/04	34	Silver Creek outflow from Camino Reservoir	<1	<0.050	0.39	0.031J	<2.0	0.011J	<1.0
9/21/04	36	Silver Ck. Upstream of SFAR	4.1	0.081	1.2	0.16	<2.0	0.24	9.3
9/12/04	38	SFAR upstream of Camino Powerhouse	14	<0.050	0.37	0.022J	<2.0	0.031J	1.3J
9/20/04	39	Brush Creek Inflow to Brush Ck. Reservoir	8.8	<0.050	0.21	0.029J	<2.0	0.016J	2.0J
9/20/04	40	Brush Creek Outflow from Brush Ck. Reservoir	5.5	<0.050	0.15	0.031J	<2.0	0.016J	1.0J
9/12/04	41	SFAR downstream of Camino Powerhouse	<1	0.013J	0.41	0.037J	<2.0	0.015J	1.4J
9/13/04	42	Slab Creek Inflow to Slab Creek Reservoir	13	<0.050	0.41	0.054	<2.0	<0.040	1.8J
9/13/04	43	SFAR outflow from Slab Ck. Res- upstream of Iowa-Brushy Canyon. Ck. Confluence	<1	0.021J	0.51	0.21	<2.0	0.012J	1.6J
9/23/04	46	SFAR downstream of Rock Ck. Confluence	6.2	0.021J	0.42	0.039J	<2.0	0.017J	1.3J
9/15/04	47	SFAR downstream of White Rock Powerhouse	3.2	<0.050	0.31	0.040J	<2.0	<0.040	1.3J
9/13/04	48	SFAR below Chili Bar Dam	<1	<0.050	0.34	0.027J	<2.0	<0.040	1.1J
9/13/04	51	SFAR downstream of Greenwood Creek near, ex USGS 1145500	<1	0.016J	0.60	0.29	<2.0	<0.040	1.3J
9/13/04	54	SFAR below Weber Creek confluence in a riverine environment	8.0	0.12	1.5	0.065	<2.0	<0.040	4.0J
Reservoir Sites									

Appendix A-43. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Various Metals (Total Recoverable), and Total Hardness									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/L**
9/21/04	R-1	Rubicon Reservoir	3.6	0.038J	0.47	0.31	<2.0	0.14	1.3J
9/21/04	R-2	Rockbound Reservoir	1.9	<0.05	0.12	54	0.043J	0.15	0.39J
9/21/04	R-3a	Buck Island	2.1	0.013J	0.2	49	<2.0	0.16	0.57J
9/22/04	R-4a	Loon Lake Reservoir near Dam	1.0	0.0099J	0.25	51	<2.0	0.078	0.82J
9/22/04	R-4b	Loon Lake West End	<1	0.0099J	0.33	100	<2.0	0.1	1.4
9/22/04	R-4c	Loon Lake NE Waterbody	1.5	0.012J	0.24	190	<2.0	0.071	0.84J
9/15/04	R-5	Gerle Ck. Reservoir	3.2	0.018J	0.33	59	<2.0	0.022J	1.0J
9/14/04	R-6a	Union Valley Res - at Dam	3.0	<0.050	0.21	24	<2.0	<0.040	1.0J
9/14/04	R-6b	Union Valley Res - Mid	2.6	<0.050	0.22	13	<2.0	<0.040	1.2J
9/14/04	R-6c	Union Valley Robbs Tailrace	3.0	<0.050	0.29	28	<2.0	0.012J	0.74J
9/14/04	R-6d	Union Valley Res - Jones Fork Arm	2.8	<0.050	0.32	13	<2.0	0.0090J	0.70J
9/20/04	R-7a	Ice House Reservoir	2.2	<0.050	0.12	47	<2.0	0.025J	0.59J
9/20/04	R-7b	Ice House Reservoir- Mid	2.0	<0.051	0.13	47	<2.0	0.033J	1.0J
9/20/04	R-7c	Ice House Reservoir - Upper Lake	1.5	<0.050	0.20	120	<2.0	0.016J	0.97J
9/14/04	R-8	Junction Reservoir	3.4	<0.050	0.28	68	<2.0	0.011J	0.95J
9/12/04	R-9	Camino Reservoir	<1	0.0097J	0.72	0.032J	<2.0	0.0098J	1.0J
9/20/04	R-10	Brush Ck. Reservoir	7.0	<0.050	0.13	85	<2.0	0.088	1.4J
9/13/04	R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	<1	<0.050	0.30	110	<2.0	<0.040	1.2J
9/13/04	R-11b	Slab Creek Reservoir - Upper Site	<1	<0.050	0.71	110	<2.0	<0.040	1.1J
9/13/04	R-12a	Chili Bar-Near Dam	<1	0.071	0.98	33	<2.0	0.044	3.0J
9/13/04	R-12aH	Chili Bar-Near Dam	<1	<0.05	0.39	42	0.02J	0.019J	0.99J
9/13/04	R-12b	Chili Bar - Mid Reservoir	<1	<0.050	0.50	42	<2.0	0.014J	1.4J
9/13/04	R-12bH	Chili Bar - Mid Reservoir	<1	<0.050	0.32	46	<2.0	<0.040	0.88J
9/23/04	SFAR-1	SFAR at HWY 50 & Ice House Road	13	<0.050	0.21	0.024J	<2.0	0.016J	1.6J

Appendix A-44. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Various Metals (Dissolved)

Date	Site #	Site Name	Aluminum	Arsenic	Barium	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
			ug/l	ug/l	ug/l	ug/l	ug/l	mg/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Riverine Sites															
9/21/04	1	Rubicon River Inflow to Rubicon Reservoir	22J	0.48J	3.6J	0.015J	0.32	0.068	0.075	1.3J	0.0013	0.28J	<2.0	0.018J	0.60J
9/21/04	2	Rubicon R. outflow from Rubicon Res	14J	0.90J	2.9J	0.019J	0.50	0.082	0.31	8.6J	<0.001	0.17J	<2.0	<0.04	4.4J
9/21/04	5	Rubicon Outflow from Rockbound Lake	15J	0.21J	1.8J	<0.050	0.26	<0.025	0.035J	0.8J	<0.001	<2.0	<2.0	<0.04	0.94J
9/21/04	6	Little Rubicon outflow from Buck Island Lake	7.4J	0.24J	2.4J	<0.050	0.28	<0.025	0.025J	2.0J	<0.001	<2.0	<2.0	<0.04	3.1J
9/22/04	7	Gerle Creek outflow from Loon Lake	6.7J	0.11J	2.1J	0.14	0.42	<0.025	0.016J	1.2J	<0.001	<2.0	<2.0	<0.04	2.2J
9/19/04	14	Gerle Creek inflow to Gerle Creek Reservoir	11J	0.083J	4.7J	0.017J	0.32	0.035	0.039J	1.9J	0.0014	0.56J	<2.0	<0.04	1.6J
9/19/04	15	Gerle Creek outflow from Gerle Creek Reservoir	5.8J	0.13J	3.8J	0.014J	0.24	<0.025	0.030J	2.8J	0.0016	<2.0	<2.0	0.0090J	1.2J
9/22/04	16	Gerle Creek Canal inflow to Robb's Forebay	8.6J	0.14J	2.7J	0.019J	0.26	<0.025	<0.05	1.1J	<0.001	<2.0	<2.0	<0.04	3.9J
9/22/04	17	South Fork Rubicon R. inflow to Robb's Forebay	6.0J	0.083J	8.5J	0.031J	0.40	0.048	0.054	6.9J	0.0010	<2.0	<2.0	<0.04	1.8J
9/20/04	20	South Fork Rubicon upstream of Rubicon River.	8.7J	0.087J	4.8J	0.1	0.85	0.026	0.068	1.9J	<0.001	<2.0	<2.0	<0.04	7.4
9/20/04	21	Tells Ck. Upstream of UV Res	10J	0.062J	18J	<0.05	0.27	0.036	0.059	2.5J	0.0020	<2.0	<2.0	0.017J	1.3J
9/20/04	22	Big Silver Ck upstream of UV Res	8.3J	0.089J	10J	0.024J	0.47	0.031	0.047J	1.5J	0.0014	<2.0	<2.0	<0.04	1.9J
9/20/04	23	Jones Fork Silver Ck inflow to UV Res.	7.6J	0.10J	15J	0.011J	0.48	0.15	0.077	6.3J	0.0031	<2.0	<2.0	<0.04	7.0
9/15/04	24	SF Silver Ck upstream of Ice House Res.	7.0J	0.070J	8.9J	<0.05	0.093J	<0.025	0.071	0.24J	0.0029	<2.0	<2.0	<0.04	0.90J
9/15/04	25	SF Silver Ck outflow from Ice House	15J	0.055J	7.1J	<0.05	0.20	0.066	0.032J	140J	0.0026	<2.0	<2.0	<0.04	4.8J
9/23/04	27	SF Silver Ck us of Junction Res.	6.2J	0.042J	5.6J	<0.05	0.10	0.070	<0.05	2.1J	<0.001	<2.0	<2.0	<0.04	0.99J
9/14/04	28	Little Silver Creek inflow to Junction Res.	4.2J	<1	17J	<0.05	0.11	<0.025	<0.05	0.37J	0.0042	0.22J	<2.0	<0.04	1.5J
9/14/04	29	SF Silver Creek outflow of Junction Dam	7.3J	0.064J	5.4J	0.030J	0.53	0.051	0.098	5.4J	0.0044	0.14J	<2.0	<0.04	4.2J
9/12/04	32	Silver Creek upstream of Jaybird Ck (upstrem of Camino)	5.1J	0.041J	11J	0.092	0.64	<0.025	0.036J	0.45J	0.0050	0.23J	<2.0	<0.04	1.6J
9/12/04	34	Silver Creek outflow from Camino Dam	8.9J	0.060J	5.9J	<0.05	0.26	<0.025	<0.05	3.1J	0.0153	0.15J	<2.0	<0.04	0.57J
9/21/04	36	Silver Ck. Upstream of SFAR	8.5J	0.061J	6.5J	0.058	0.42	<0.025	0.088	1.2J	0.0010	<2.0	<2.0	<0.04	7.1
9/12/04	38	SFAR above Camino Powerhouse	4.2J	0.27J	13J	<0.05	0.31	<0.025	0.013J	1.2J	0.0024	0.20J	<2.0	<0.04	0.78J
9/20/04	39	Brush Ck Inflow	10J	.057J	18J	<0.05	0.3	<0.025	.026J	.82J	0.0014	.07J	<2.0	<0.04	0.87J
9/20/04	40	Brush Ck. Outflow from Brush Creek Res.	3.6J	0.076J	8.1J	<0.05	0.16	<0.025	<0.05	14J	0.0016	<2.0	<2.0	<0.04	0.38J
9/12/04	41	SFAR ds of Camino Powerhouse	9.3J	0.063J	6.3J	0.0095J	0.41	<0.025	0.012J	4.9J	0.0039	0.16J	<2.0	<0.04	0.84J
9/13/04	42	Slab Creek Inflow to Slab Creek Reservoir	2.9J	0.19J	16J	<0.05	0.17	<0.025	0.012J	1.2J	0.0047	0.17J	<2.0	<0.04	0.73J
9/13/04	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	7.3J	0.089J	6.3J	0.017J	0.52	<0.025	0.037J	3.2J	0.0067	0.16J	<2.0	<0.04	2.4J
9/23/04	46	SFAR downstream of Rock Ck. Confluence	5.4J	0.13J	7.3J	0.018J	0.37	<0.025	0.013J	1.4J	0.0026	<2.0	<2.0	<0.04	0.77J
9/15/04	47	South Fork American River downstream of White Rock Powerhouse	9.0J	0.11J	6.9J	<0.05	0.26	<0.025	0.021J	5.3J	0.0054	<2.0	<2.0	<0.04	4.8J
9/13/04	48	SFAR below Chili Bar Dam	6.8J	0.087J	6.6J	<0.05	0.28	<0.025	<0.05	4.8J	0.0075	0.14J	<2.0	<0.04	1.2J
9/13/04	51	South Fork American River at Coloma Gage Stn.	7.3J	0.090J	5.7J	0.018J	0.44	<0.025	0.062	2.4J	0.0078	0.15J	<2.0	<0.04	0.98J
9/13/04	54	South Fork American River @ Salmon Falls	5.3J	0.15J	8.4J	0.11	1.4	<0.025	0.032J	8.8J	0.0054	0.37J	<2.0	<0.04	3.8J
9/23/04	SFAR-1	SFAR at Riverton/Hwy 50	2.4J	0.41J	9.5J	<0.05	0.18	<0.025	0.012J	1.6J	<0.001	<2.0	<2.0	<0.04	3.2J
Reservoir Sites															
9/21/04	R-1	Rubicon Reservoir	22J	1.1	2.6J	0.034J	0.45	0.180	0.15	7.8J	<0.001	0.07J	<2.0	<0.04	1.5J
9/20/04	R-10a	Brush Ck. Reservoir	5.1J	0.12J	11J	<0.05	0.12	<0.025	19	0.71J	<0.001	<2.0	<2.0	<0.04	1.9J
9/20/04	R-10aH	Brush Ck. Reservoir	5.4J	0.17J	7.3J	<0.05	0.16	<0.025	28	2.3J	0.0012	<2.0	<2.0	<0.04	0.55J
9/13/04	R-11a	Slab Creek Middle Site	6.8J	0.28J	7.2J	<0.05	0.28	<0.025	67	3.3J	0.0055	0.14J	<2.0	<0.04	0.97J
9/13/04	R-11aH	Slab Creek Middle Site	8.4	0.25J	7.2J	<0.05	0.36	<0.025	39	4.4J	0.0028	0.18J	<2.0	<0.04	1.4J
9/13/04	R-11b	Slab Creek UpperSite	9.9J	0.29J	6.8J	<0.05	0.39	<0.025	57	11J	0.0089	0.19J	<2.0	<0.04	2.0J
9/13/04	R-12a	Chili Bar-near Dam	7.5J	0.19J	7.2J	0.078	0.92	<0.025	12	7.8J	0.0312	0.25J	<2.0	<0.04	3.4J
9/13/04	R-12aH	Chili Bar-near Dam	7.3J	0.25J	6.8J	<0.05	0.35	<0.025	14	4.9J	0.0035	0.14J	<2.0	<0.04	0.84J
9/13/04	R-12b	Chili Bar - Middle Reservoir	6.9J	0.16J	7.1J	<0.05	0.36	<0.025	7.3	5.7J	0.0081	0.24J	<2.0	<0.04	0.90J
9/13/04	R-12bH	Chili Bar - Middle Reservoir	7.6J	0.22J	7.9J	<0.05	0.29	<0.025	14	6.3J	0.0025	0.15J	<2.0	<0.04	0.51J
9/21/04	R-2	Rockbound Reservoir	14J	0.27J	1.7J	<0.05	0.14	<0.025	26	0.61J	0.0011	<2.0	<2.0	<0.04	0.61J
9/21/04	R-2H	Rockbound Reservoir	30J	0.18J	1.9J	0.014J	0.17	<0.025	13	3.8J	0.0012	<2.0	<2.0	<0.04	1.7J
9/21/04	R-3a	Buck Island	6.7J	0.29J	2.1J	0.012J	0.17	<0.025	8.8	1.6J	0.0012	<2.0	<2.0	0.012J	2.3J
9/22/04	R-4a	Loon Lake near Dam	7.3J	0.18J	2.3J	0.010J	0.30J	<0.025	17	1.7J	0.0011	<2.0	0.079J	<0.04	0.87J
9/22/04	R-4b	Loon Lake West End	7.5J	0.20J	2.4J	0.013J	0.52	<0.025	48	1.6J	0.0013	<2.0	<2.0	<0.04	0.82J
9/22/04	R-4c	Loon Lake NE Waterbody	7.4J	0.27J	2.7J	0.013J	0.29	<0.025	90	2.0J	0.001	<2.0	<2.0	<0.04	0.76J
9/15/04	R-5	Gerle Creek	6.2J	0.21J	3.5J	<0.05	0.29	<0.025	21	2.9J	0.0019	<2.0	<2.0	<0.04	0.71J
9/14/04	R-6a	Union Valley Res - at Dam	6.8J	0.12J	4.7J	<0.05	0.18	<0.025	5.8	0.80J	0.0021	0.097J	<2.0	<0.04	1.4J

Appendix A-44. UARP & Chili Bar 2004 Summer Low Flow Sampling Results: Various Metals (Dissolved)

Date	Site #	Site Name	Aluminum	Arsenic	Barium	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
			ug/l	ug/l	ug/l	ug/l	ug/l	mg/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
9/14/04	R-6aH	Union Valley Res - at Dam	7.1J	0.20J	6.1J	<0.05	0.27	<0.025	13	43J	0.0041	0.16J	<2.0	<0.04	0.55J
9/14/04	R-6b	Union Valley Res - Mid	5.8J	0.092J	4.4J	<0.05	0.23	<0.025	3.9	0.73J	0.0032	0.11J	<2.0	<0.04	1.4J
9/14/04	R-6bH	Union Valley Res - Mid	6.0J	0.084J	5.2J	<0.05	0.31	<0.025	0.53	20J	0.0028	0.13J	<2.0	<0.04	1.7
9/14/04	R-6c	Union Valley Robbs Tailrace	5.9J	0.13J	4.6J	<0.05	0.18	<0.025	6.3	3.0J	0.0080	0.091J	<2.0	<0.04	0.43J
9/14/04	R-6d	Union Valley Res - Jones Fork Arm	6.9J	0.10J	5.5J	<0.05	0.17	<0.025	3.1	1.4J	0.0044	0.086J	<2.0	<0.04	0.54J
9/14/04	R-6dH	Union Valley Res - Jones Fork Arm	6.4J	0.095J	5.4J	<0.05	0.25	<0.025	2.8	27J	0.0112	0.13J	<2.0	<0.04	1.1J
9/20/04	R-7a	Ice House Res. Nr. Dam	6.3J	0.12J	3.9	<0.05	0.13	<0.025	18	0.78J	0.0014	<2.0	<2.0	<0.04	0.8J
9/20/04	R-7aH	Ice House Res. Nr. Dam	15J	0.13J	6.2	<0.05	0.14	0.029	19	93J	0.0014	<2.0	<2.0	<0.04	1.6J
9/20/04	R-7b	Ice House Res. Mid	7.7J	0.11J	4.1	<0.05	0.12	<0.025	22	1.2J	0.0010	0.02J	<2.0	0.016J	1.2J
9/20/04	R-7bH	Ice House Res. Mid	13J	0.14J	6.6J	0.015J	0.18	0.042	15	130J	0.0012	<2.0	<2.0	<0.04	1.6J
9/20/04	R-7c	Ice House Res - Upper Lake	4.7J	0.18J	3.7J	<0.05	0.16	<0.025	39	2.1J	0.0013	<2.0	<2.0	<0.04	0.81J
9/14/04	R-8a	Junction Reservoir	10J	0.19J	5.7J	<0.05	0.24	<0.025	25	16J	0.0113	0.14J	<2.0	<0.04	0.71J
9/12/04	R-9a	Camino Reservoir	10J	0.041J	5.8J	<0.05	0.22	<0.025	<0.05	6.4J	0.0036	0.13J	<2.0	<0.04	0.51J

Appendix A-45. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Hydrolab and YSI Data							
Date	**Site #**	**Site Name**	**Water Temperature (^{o}C)**	**Dissolved Oxygen (mg/L)**	**pH**	**Specific Conductance (uS/cm)**	**Conductivity (uS/cm)**
11/2/04	1	Rubicon River Inflow to Rubicon Reservoir	0.59	11.32	7.07	10	5
11/2/04	2	Rubicon R. outflow from Rubicon Res	4.12	10.35	7.09	10	6
11/2/04	3a	Fox Lake reach flow from Rubicon Reservoir	4.31	10.45	7.10	10	6
11/2/04	4	Highland inflow to Rockbound Res.	0.60	11.43	6.83	5	3
11/2/04	5	Rubicon Outflow from Rockbound Lake	7.05	9.7	6.62	9	6
11/10/04	7	Gerle Creek outflow from Loon Lake	6.69	9.73	7.18	10	6
11/10/04	14	Gerle Creek inflow to Gerle Creek Reservoir	5.94	11.76	6.98	23	15
10/31/04	15	Gerle Creek outflow from Gerle Creek Reservoir	4.96	11.10	6.75	17	10
10/31/04	16	Gerle Creek Canal inflow to Robb's Forebay	6.45	9.95	7.37	17	11
10/31/04	17	South Fork Rubicon R. inflow to Robb's Forebay	1.09	12.19	7.25	24	13
11/1/04	20	South Fork Rubicon upstream of Rubicon River.	4.12	11.36	7.04	20	12
11/1/04	21	Tells Ck. Upstream of UV Res	2.35	11.77	7.40	28	16
11/1/04	22	Big Silver Ck upstream of UV Res	2.23	11.52	7.54	17	10
11/1/04	23	Jones Fork Silver Ck inflow to UV Res.	2.23	11.62	7.74	19	11
11/1/04	24	SF Silver Ck upstream of Ice House Res.	0.89	11.87	7.13	12	7
12/1/04	24	SF Silver Ck upstream of Ice House Res.	0.04	12.33	8.35	12	6
10/27/04	25	SF Silver Ck outflow from Ice Hosue	7.08	9.29	7.36	15	10
12/1/04	25	SF Silver Ck outflow from Ice House	6.53	10.04	8.54	11	7
10/27/04	27	SF Silver Ck us of Junction Res.	2.88	11.82	7.48	17	10
11/8/04	28	Little Silver Creek inflow to Junction Res.	5.77	10.75	6.71	13	8
11/8/04	29	SF Silver Creek outflow of Junction Dam	8.39	10.35	6.60	15	10
10/24/04	32	Silver Creek upstream of Jaybird Ck (upstrem of Camino)	8.46	11.3	7.01	23	16
10/24/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	9.61	10.86	6.96	44	31
10/24/04	34	Silver Creek outflow from Camino Dam	11.24	10.34	6.42	16	12
10/24/04	38	SFAR above Camino Powerhouse	9.05	11.19	7.52	54	38
11/1/04	39	Brush Ck Inflow	4.16	12.39	7.06	26	16

Appendix A-45. (continued)							
Date	**Site #**	**Site Name**	**Water**	**Dissolved**	**pH**	**Specific**	**Conductivity**
11/1/04	40	Brush Ck. Outflow from Brush Creek Res.	10.91	10.66	*	*	*
10/24/04	41	SFAR ds of Camino Powerhouse	11.94	11.00	7.21	24	18
10/25/04	42	Slab Creek Inflow to Slab Creek Reservoir	9.65	10.85	7.11	34	24
10/25/04	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	11.93	10.24	7.21	24	18
10/27/04	46	South Fork American River below Rock Creek	11	11.94	7.37	42	31
10/27/04	47	South Fork American River downstream of White Rock	12.03	11.30	6.99	26	20
10/25/04	48	SFAR below Chili Bar Dam	12.56	10.38	7.37	27	21
10/25/04	51	South Fork American River at Coloma Gage Stn.	13.31	10.64	7.40	37	28
10/25/04	54	South Fork American River @ Salmon Falls	13.52	10.65	7.34	58	46
12/1/04	SFAR-1	SFAR at Riverton/Hwy 50	0.03	12.50	8.74	59	31
Reservoir Sites							
Vertical profiles for temperature, dissolved oxygen, pH, and specific conductance obtained for reservoir sites.							

* Parameter not sampled

Appendix A-46. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Secchi Disk			
Date	**Site #**	**Site Name**	**Secchi Disk Depth (m)**
Reservoir Sites			
11/2/04	R-2	Rockbound Reservoir	8.1
11/2/04	R-3a	Buck Island Reservoir	5.2
11/10/04	R-4a	Loon Lake near Dam	10.2
11/10/04	R-4b	Loon Lake West End	10.3
11/10/04	R-4c	Loon Lake NE Waterbody	10.5
11/10/04	R-5	Gerle Ck. Reservoir	6.2
11/8/04	R-6a	Union Valley	5.4
11/8/04	R-6b	Union Valley - Mid	5.8
11/8/04	R-6c	Union Valley - Robbs TR	6
11/8/04	R-6d	Union Valley Res - Jones Fork Arm	6.1
11/1/04	R-7a	Ice House Res. Nr. Dam	7.0
11/1/04	R-7aH	Ice House Res. Nr. Dam	7.0
12/1/04	R-7a	Ice House Res. Nr. Dam	6.8
11/1/04	R-7b	Ice House Res. Mid	5.5
11/1/04	R-7bH	Ice House Res. Mid	5.5
12/1/04	R-7b	Ice House Res. Mid	5.1
11/1/04	R-7c	Ice House Res - Upper Lake	7.0
12/1/04	R-7c	Ice House Res - Upper Lake	5.7
	R-8a	Junction Reservoir	**
	R-9a	Camino Reservoir	**
11/1/04	R-10a	Brush Ck. Reservoir	3.7
10/25/04	R-11a	Slab Creek Middle Site	4.4
10/25/04	R-11a dup	Slab Creek Middle Site	4.4
10/25/04	R-11b	Slab Creek UpperSite	2.5
10/25/04	R-12a	Chili Bar-near Dam	2.7
10/25/04	R-12a dup	Chili Bar-near Dam	2.7
10/25/04	R-12b	Chili Bar - Middle Reservoir	3.4

**No sample obtained due to safety restrictions - samples obtained from shore.

Appendix A-47. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Various Metals (Total Recoverable)									
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**
			ug/l	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**
Riverine Sites									
11/2/04	1	Rubicon River Inflow to Rubicon Reservoir	61	<1.0	2.7J	0.014J	0.0032J	0.0078	<2.0
11/2/04	2	Rubicon R. outflow from Rubicon Res	72	0.056J	3.4J	0.044	0.0067J	0.011	<2.0
11/2/04	3a	Fox Lake reach flow from Rubicon Reservoir	68	0.087J	3.5J	0.040	0.0059J	0.0028J	<2.0
11/2/04	4	Highland inflow to Rockbound Res.	94	<1.0	2.5J	0.005J	0.0027J	0.0038J	<2.0
11/2/04	5	Rubicon Outflow from Rockbound Lake	37J	0.080J	2.6J	0.041	0.0052J	0.0016J	<2.0
11/2/04	6	Little Rubicon outflow from Buck Island Lake	32J	0.030	3.1J	0.068	0.0058J	0.0036J	<2.0
11/10/04	7	Gerle Creek outflow from Loon Lake	11J	0.075J	2.7J	0.036	0.0030J	0.0036J	<2.0
11/10/04	14	Gerle Creek inflow to Gerle Creek Reservoir	28J	0.063J	6.2J	0.072	0.0027J	0.0040J	<2.0
10/31/04	15	Gerle Creek outflow from Gerle Creek Reservoir	17J	<1.0	4.7J	0.087	0.0044J	0.0022J	<2.0
10/31/04	16	Gerle Creek Canal inflow to Robb's Forebay	17J	0.071J	4.2J	0.087	0.0045J	0.0024J	0.12J
10/31/04	17	South Fork Rubicon R. inflow to Robb's Forebay	22J	<1.0	4.3J	0.012J	0.00090J	0.0024J	<2.0
11/1/04	20	South Fork Rubicon upstream of Rubicon River	13J	<1.0	5.3J	0.060	0.0013J	0.0021J	<2.0
11/1/04	21	Tells Ck. Upstream of UV Res	21J	<1.0	7.3J	0.021J	0.00064J	0.0037J	<2.0
11/1/04	22	Big Silver Ck upstream of UV Res	38J	<1.0	4.7J	0.014J	0.00042J	0.011	<2.0
11/1/04	23	Jones Fork Silver Ck inflow to UV Res.	43J	<1.0	6.6J	0.057	0.0021J	0.0058	<2.0
11/1/04	24	SF Silver Ck upstream of Ice House Res.	31J	<1.0	4.0J	0.030	0.00092J	0.0034J	<2.0
12/1/04	24	SF Silver Ck upstream of Ice House Res.	24J	0.16J	4.0J	0.065	0.00046J	0.0033J	0.47J
10/27/04	25	SF Silver Ck outflow from Ice Hosue	53	<1.0	10J	0.990	0.290J	0.0024J	<2.0
12/1/04	25	SF Silver Ck outflow from Ice House	8.5J	0.10J	5.0J	0.160	0.024J	0.0028J	0.20J
10/27/04	27	SF Silver Ck us of Junction Res.	22J	<1.0	8.9J	0.26	0.0054J	0.0029J	<2.0
11/8/04	28	Little Silver Creek inflow to Junction Res.	16J	<1.0	19J	0.014J	0.0013	0.0033J	<2.0
11/8/04	29	SF Silver Creek outflow of Junction Dam	17J	0.038J	7.1J	0.150	0.028J	0.0046J	<2.0
10/24/04	32	Silver Creek upstream of Jaybird Ck (upstream of Camino)	25J	<1.0	11J	0.059	0.0012J	0.0033J	0.10J
10/24/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	21J	<1.0	22	0.0087J	0.00023J	0.0044J	<2.0
10/24/04	34	Silver Creek outflow from Camino Dam	10J	<1.0	7.2J	0.260	0.040J	0.0030J	0.08J
11/2/04	36	Silver Ck. Upstream of SFAR	7.2	<1.0	7.2J	0.035	0.0013J	0.0055	<2.0
10/24/04	38	SFAR above Camino Powerhouse	43J	0.13J	16J	0.065	0.0036J	0.0042J	<2.0
11/1/04	39	Brush Ck Inflow	11J	<1.0	13J	0.022J	0.00047J	0.0094	<2.0
11/1/04	40	Brush Ck. Outflow from Brush Creek Res.	11J	<1.0	10J	0.085	0.016J	0.0021J	<2.0
10/24/04	41	SFAR ds of Camino Powerhouse	17J	<1.0	9.6J	0.160	0.050J	0.0028J	<2.0
10/25/04	42	Slab Creek Inflow to Slab Creek Reservoir	74	<1.0	12J	0.086	0.0012J	0.0027J	<2.0
10/25/04	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	17J	<1.0	8.4J	0.120	0.0070J	0.0049J	<2.0
10/27/04	46	South Fork American River below Rock Creek	63	0.062J	13J	0.170	0.0032J	0.0039J	<2.0

Appendix A-47. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Various Metals (Total Recoverable)									
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Iron**	**Manganese**	**Mercury**	**Selenium**
			ug/l	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**
10/27/04	47	South Fork American River downstream of White Rock Powerhouse	28J	<1.0	10J	0.140	0.021J	0.0039J	<2.0
10/25/04	48	SFAR below Chili Bar Dam	25J	<1.0	9.3J	0.130	0.011J	0.0022J	<2.0
10/25/04	51	South Fork American River at Coloma Gage Stn.	28J	<1.0	8.5J	0.120	0.0057J	0.0048J	<2.0
10/25/04	54	South Fork American River @ Salmon Falls	26J	0.059J	9.6J	0.120	0.0057J	0.0037J	<2.0
12/1/04	SFAR-1	SFAR at Riverton/Hwy 50	13J	0.31J	11J	0.180	0.0023J	0.0033J	0.24J
Reservoir Sites									
11/2/04	R-2	Rockbound Reservoir	38J	0.12J	2.6J	0.042	0.0053J	0.0028J	<2.0
11/2/04	R-3a	Buck Island Reservoir	30J	0.096J	2.6J	0.040	0.0054J	0.0029J	<2.0
11/10/04	R-4a	Loon Lake near Dam	7.7J	0.11J	2.4J	0.035	0.0019J	0.0040J	<2.0
11/10/04	R-4b	Loon Lake West End	8.3J	0.049J	2.5J	0.034	0.0020J	0.0042J	<2.0
11/10/04	R-4c	Loon Lake NE Waterbody	11J	0.068J	2.7J	0.050	0.0025J	0.0028J	<2.0
11/10/04	R-5	Gerle Ck. Reservoir	13J	0.049J	3.3J	0.210	0.0027J	0.0041J	<2.0
11/8/04	R-6a	Union Valley	13J	0.28J	6.1J	0.041	0.024J	0.0041J	<2.0
11/8/04	R-6b	Union Valley - Mid	13J	0.091J	6.1J	0.041	0.024J	0.0040J	0.08J
11/8/04	R-6c	Union Valley - Robbs TR	13J	0.044J	5.9J	0.032	0.021J	0.0030J	<2.0
11/8/04	R-6d	Union Valley Res - Jones Fork Arm	11J	0.045J	6.0J	0.037	0.022J	0.0042J	<2.0
11/1/04	R-7a	Ice House Res. Nr. Dam	8.8J	<1.0	4.7J	0.062	0.021J	0.0020J	<2.0
11/1/04	R-7aH	Ice House Res. Nr. Dam	20J	<1.0	7.8J	0.570	0.300J	0.0021J	<2.0
12/1/04	R-7a	Ice House Res. Nr. Dam	7.8J	0.28J	4.6J	0.180	0.024J	0.0030J	0.88J
11/1/04	R-7b	Ice House Res. Mid	7.9J	<1.0	4.7J	0.077	0.021J	0.0021J	<2.0
11/1/04	R-7bH	Ice House Res. Mid	15J	<1.0	7.9J	0.980	0.400J	0.0041	<2.0
12/1/04	R-7b	Ice House Res. Mid	7.9J	0.075J	5.1J	0.160	0.024J	0.0039J	0.08J
11/1/04	R-7c	Ice House Res - Upper Lake	8.8J	<1.0	5.0J	0.070	0.018J	<0.005	<2.0
12/1/04	R-7c	Ice House Res - Upper Lake	6.9J	0.17J	4.7J	0.140	0.023J	0.0024J	0.48J
11/8/04	R-8a	Junction Reservoir	21J	0.053J	7.4J	0.110	0.043J	0.0032J	<2.0
10/24/04	R-9a	Camino Reservoir	11J	<1.0	7.1J	0.220	0.075J	0.0020J	0.08J
11/1/04	R-10a	Brush Ck. Reservoir	10J	0.76J	11J	0.045	0.0087J	0.005	<2.0
10/25/04	R-11a	Slab Creek Middle Site	16J	<1.0	8.6J	0.100	0.011J	0.0030J	<2.0
10/25/04	R-11b	Slab Creek UpperSite	25J	<1.0	9.3J	0.190	0.039J	0.0020J	<2.0
10/25/04	R-12a	Chili Bar-near Dam	25J	<1.0	9.6J	0.130	0.013J	0.0021J	<2.0
10/25/04	R-12b	Chili Bar - Middle Reservoir	23J	<1.0	9.3	0.120	0.012J	0.0025J	<2.0

*** not analyzed for

Appendix A-48. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Various Metals (Total Recoverable), and Total Hardness									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/L**
Riverine Sites									
11/2/04	1	Rubicon River Inflow to Rubicon Reservoir	2.0	0.011J	0.25	0.019J	0.20	0.015J	0.74J
11/2/04	2	Rubicon R. outflow from Rubicon Res	2.2	0.072	1.2	0.19	0.34	0.018J	3.4J
11/2/04	3a	Fox Lake reach flow from Rubicon Reservoir	2.2	0.046J	0.50	0.054	0.22J	0.023J	1.6J
11/2/04	5	Rubicon Outflow from Rockbound Lake	2.0	0.017J	0.20	0.032J	0.15	0.028J	0.72J
11/2/04	6	Little Rubicon outflow from Buck Island Lake	3.0	0.020	0.29	0.056	0.57J	0.054	1.2J
11/10/04	7	Gerle Creek outflow from Loon Lake	<1.0	0.049J	0.43	0.016J	1.1J	<0.040	3.9J
11/10/04	14	Gerle Creek inflow to Gerle Creek Reservoir	<1.0	0.037J	0.35	0.089	0.34J	<0.040	2.2J
10/31/04	15	Gerle Creek outflow from Gerle Creek Reservoir	3.0	0.010J	0.31	0.029J	0.25J	0.040	1.8J
10/31/04	16	Gerle Creek Canal inflow to Robb's Forebay	6.0	<0.050	0.33	0.029J	0.20J	0.10J	1.2J
10/31/04	17	South Fork Rubicon R. inflow to Robb's Forebay	7.0	<0.050	0.24	0.027J	0.11J	0.056	0.79J
11/1/04	20	South Fork Rubicon upstream of Rubicon River.	4.2	<0.050	0.22	0.028J	0.15J	0.024J	0.93
11/1/04	21	Tells Ck. Upstream of UV Res	8.0	<0.050	0.19	0.017J	0.12J	0.030J	1.1J
11/1/04	22	Big Silver Ck upstream of UV Res	2.8	<0.050	0.19	0.035J	0.046J	0.033J	0.68J
11/1/04	23	Jones Fork Silver Ck inflow to UV Res.	4.8	<0.050	0.29	0.037J	1.4J	0.038J	1.3J
11/1/04	24	SF Silver Ck upstream of Ice House Res.	2.8	<0.050	0.14	0.034J	0.053J	0.017J	0.64J
10/27/04	25	SF Silver Ck outflow from Ice Hosue	4.0	0.039J	0.30	0.091	0.29J	0.013J	3.2J
10/27/04	27	SF Silver Ck us of Junction Res.	4.2	0.017J	1.1	0.091	0.20J	0.012J	2.5J
11/8/04	28	Little Silver Creek inflow to Junction Res.	3.1	<0.050	0.18	0.025J	0.30J	<0.040	2.4J
11/8/04	29	SF Silver Creek outflow of Junction Dam	3.4	<0.050	0.20	0.038J	0.014J	<0.040	0.74J
10/24/04	32	Silver Creek upstream of Jaybird Ck (upstrem of Camino)	7.3	0.015J	0.46	0.033J	<2.0	0.021J	1.9J
10/24/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	14	<0.050	0.67	0.023J	<2.0	0.017J	2.0J
10/24/04	34	Silver Creek outflow from Camino Dam	3.7	0.050	0.44	0.030J	<2.0	0.011J	1.4J
11/2/04	36	Silver Ck. Upstream of SFAR	5.5	<0.050	0.25	0.028J	0.17J	0.064	0.92
10/24/04	38	SFAR above Camino Powerhouse	15	<0.050	0.35	0.10	<2.0	0.032J	1.4J
11/1/04	39	Brush Ck Inflow	6.8	<0.050	0.16	0.018J	0.20J	0.013J	1.6J
11/1/04	40	Brush Ck. Outflow from Brush Creek Res.	7.5	<0.050	0.16	0.024J	0.13J	0.015J	1.1J
10/24/04	41	SFAR ds of Camino Powerhouse	6.2	0.022J	0.32	0.051	<2.0	0.027J	1.3
10/25/04	42	Slab Creek Inflow to Slab Creek Reservoir	10	<0.050	0.28	0.056	0.19J	0.020J	1.3J
10/25/04	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	6.2	<0.050	0.35	0.082	0.14J	0.029J	1.0J
10/27/04	46	South Fork American River below Rock Creek	13	<0.050	0.60	0.084	0.32J	0.017J	1.1J
10/27/04	47	South Fork American River downstream of White Rock Powerhouse	7.3	0.66	1.4	0.23	0.34J	0.014J	3.1J
10/25/04	48	SFAR below Chili Bar Dam	7.4	0.11	2.2	0.21	0.25J	0.017J	13
10/25/04	51	South Fork American River at Coloma Gage Stn.	12	0.011J	0.59	0.17	0.25J	0.048	1.3J
10/25/04	54	South Fork American River @ Salmon Falls	12	0.032J	0.91J	0.35J	0.33J	0.069	2.8

Appendix A-48. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Various Metals (Total Recoverable), and Total Hardness									
Date	**Site #**	**Site Name**	**Total Hardness**	**Cadmium**	**Copper**	**Lead**	**Nickel**	**Silver**	**Zinc**
			mg/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/L**
Reservoir Sites									
11/2/04	R-2	Rockbound Reservoir	2.5	0.011J	0.34	43	0.18J	0.025J	0.74J
11/2/04	R-3a	Buck Island Reservoir	2.2	0.012J	0.21	0.37	0.16J	0.035J	0.72J
11/10/04	R-4a	Loon Lake near Dam	<1.0	<0.050	0.15	41	0.083J	<0.040	0.46J
11/10/04	R-4b	Loon Lake West End	<1.0	0.015J	0.21	0.65	0.13J	<0.040	0.75J
11/10/04	R-4c	Loon Lake NE Waterbody	<1.0	0.15	1.5	1.9	0.22J	<0.040	3.7J
11/10/04	R-5	Gerle Ck. Reservoir	<1.0	0.27	0.26	3.3	0.13J	<0.040	0.93J
11/8/04	R-6a	Union Valley	3.1	0.014J	0.43	150	0.15J	<0.040	1.3J
11/8/04	R-6b	Union Valley - Mid	3.1	0.034J	0.38	2.3	0.10J	<0.040	1.3J
11/8/04	R-6c	Union Valley - Robbs TR	3.0	0.021J	0.41	9.4	0.15J	<0.040	1.2J
11/8/04	R-6d	Union Valley Res - Jones Fork Arm	3.0	0.014J	0.42	1.1	0.12J	<0.040	1.6J
11/1/04	R-7a	Ice House Res. Nr. Dam	2.2	<0.050	0.17	0.53	0.14J	0.041	0.82J
11/1/04	R-7aH	Ice House Res. Nr. Dam	3.8	0.011J	0.43	0.60	0.077J	0.027J	1.0J
11/1/04	R-7b	Ice House Res. Mid	2.5	<0.050	0.15	0.23	0.030J	0.023J	0.74J
11/1/04	R-7bH	Ice House Res. Mid	4.8	<0.050	0.16	47	0.058J	0.021J	1.1J
11/1/04	R-7c	Ice House Res - Upper Lake	2.5	0.058	0.23	1.2	0.059J	0.020J	0.96J
11/8/04	R-8a	Junction Reservoir	3.5	0.026J	0.25	3.8	0.14J	0.014J	1.1J
10/24/04	R-9a	Camino Reservoir	3.5	<0.050	0.28	0.035	<2.0	0.019J	0.96J
11/1/04	R-10a	Brush Ck. Reservoir	7.0	<0.050	0.19	53	0.14J	0.013J	1.3J
10/25/04	R-11a	Slab Creek Middle Site	5.9	<0.050	0.28	0.69	0.14J	0.025J	0.92J
10/25/04	R-11b	Slab Creek UpperSite	6.2	<0.050	0.44	0.61	0.16J	0.019J	1.3J
10/25/04	R-12a	Chili Bar-near Dam	7.2	0.014J	0.51	4.3	0.20J	0.016J	1.5J
10/25/04	R-12b	Chili Bar - Middle Reservoir	7.2	<0.050	0.40	12	0.46J	0.016J	1.4J

Appendix A-49. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Various Metals (Dissolved)															
Date	Site #	Site Name	Aluminum	Arsenic	Barium	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
			ug/l	ug/l	ug/l	ug/l	ug/l	mg/L	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Riverine Sites															
11/2/04	1	Rubicon River Inflow to Rubicon Reservoir	56	0.11J	2.6J	0.011J	0.29	0.012J	0.026	3.0J	0.0040	0.13J	<2.0	<0.040	0.80J
11/2/04	2	Rubicon R. outflow from Rubicon Res	60	0.17J	3.3J	0.090	0.75	0.026	0.075	6.2J	0.0038	0.21J	<2.0	<0.040	2.8J
11/2/04	3a	Fox Lake reach flow from Rubicon Reservoir	58	0.19	3.2	0.060	0.52	0.026	0.057	5.8J	0.0038	0.21J	0.077J	<0.040	2.4J
11/2/04	4	Highland inflow to Rockbound Res.	87	0.087J	2.5J	0.020J	0.30	0.0053J	0.045J	2.5J	0.0036	0.11J	0.19J	<0.040	1.8J
11/2/04	5	Rubicon Outflow from Rockbound Lake	25J	0.25J	2.5J	0.026J	0.24	0.015J	0.020J	4.9J	0.0012	0.11J	0.17J	<0.040	0.96J
11/2/04	6	Little Rubicon outflow from Buck Island Lake	21J	0.24J	3.0J	0.039J	0.29	0.030	0.050	5.8J	0.0030	0.14J	0.20J	<0.040	2.6J
11/10/04	7	Gerle Creek outflow from Loon Lake	4.2J	<1.0	2.3J	0.043J	0.32	<0.025	0.019J	1.6J	0.0052	0.67J	<2.0	<0.040	4.7J
11/10/04	14	Gerle Creek inflow to Gerle Creek Reservoir	23J	<1.0	6.0J	0.040J	0.33	0.035	0.070	2.6J	0.0055	0.41J	<2.0	<0.040	2.3J
10/31/04	15	Gerle Creek outflow from Gerle Creek Reservoir	11J	0.13J	5.0J	0.013J	0.61	0.030J	0.030J	4.2J	0.0057	0.33J	0.14J	<0.040	2.4J
10/31/04	16	Gerle Creek Canal inflow to Robb's Forebay	9.8J	0.15J	4.0J	0.019J	0.35	0.027	0.025J	4.3J	0.0055	0.20J	0.12J	0.012J	3.6J
10/31/04	17	South Fork Rubicon R. inflow to Robb's Forebay	21J	0.039J	4.4J	<0.05	0.36	0.012J	0.068	0.98J	0.0066	0.090J	0.075J	<0.040	2.1J
11/1/04	20	South Fork Rubicon upstream of Rubicon River.	9.4J	0.10J	6.1J	0.018J	0.26	0.017J	0.11	9.6J	0.0042	0.11J	0.10J	<0.040	1.3J
11/1/04	21	Tells Ck. Upstream of UV Res	23J	0.050J	8.6J	<0.05	0.20	0.024J	0.33	4.1J	0.0040	0.093J	<2.0	<0.040	0.70J
11/1/04	22	Big Silver Ck upstream of UV Res	37J	0.11J	5.6J	<0.05	0.20	0.012J	0.046J	0.50J	0.0055	<2.0	0.16J	<0.040	0.64J
11/1/04	23	Jones Fork Silver Ck inflow to UV Res.	36J	0.071J	7.5J	0.015J	0.30	0.039	0.034J	2.3	0.0056	0.032J	<2.0	<0.040	0.97
11/1/04	24	SF Silver Ck upstream of Ice House Res.	27J	0.076J	4.7J	<0.05	0.20	0.016J	0.15	0.76	0.0043	<2.0	<2.0	0.017J	1.4J
12/1/04	24	SF Silver Ck upstream of Ice House Res.	24J	0.12J	4.3J	<0.050	0.17	<0.025	0.024J	0.31J	0.0036J	<2.0	0.30J	<0.040	0.24J
10/27/04	25	SF Silver Ck outflow from Ice Hosue	18J	0.055J	8.7J	<0.05	0.20	0.240	0.038J	270J	0.0038J	0.074J	<2.0	<0.040	2.2J
12/1/04	25	SF Silver Ck outflow from Ice House	1.5J	0.042J	4.9J	<0.050	0.16	0.028	0.012J	16J	0.0028J	<2.0	<2.0	<0.040	0.16J
10/27/04	27	SF Silver Ck us of Junction Res.	13J	0.060J	8.6J	<0.05	0.27	0.160	0.044J	4.3J	0.0043J	0.11J	<2.0	<0.040	0.74J
11/8/04	28	Little Silver Creek inflow to Junction Res.	13J	<1.0	18J	<0.05	0.18	<0.025	0.022J	0.81J	0.0041J	0.41J	<2.0	<0.040	1.7J
11/8/04	29	SF Silver Creek outflow of Junction Dam	4.2J	<1.0	6.1J	0.023J	0.21	0.047	0.024J	9.9J	0.005	1.3J	<2.0	0.014J	0.30J
10/24/04	32	Silver Creek upstream of Jaybird Ck (upstream of Camino)	14J	0.081J	11J	<0.05	0.28	0.031	0.022J	0.75J	0.0075	<2.0	0.092J	<0.040	0.057J
10/24/04	33	Jaybird Canyon Creek inflow to Camino Reservoir	18J	0.15J	22	<0.05	0.68	0.0071J	0.029J	0.18J	0.0073	<2.0	0.16J	<0.040	0.67J
10/24/04	34	Silver Creek outflow from Camino Dam	5.6J	0.11J	7.7J	0.042J	0.54	0.090	0.022J	40J	0.0076	<2.0	0.13J	<0.040	1.5J
11/2/04	36	Silver Ck. Upstream of SFAR	1.7J	0.067	7.0	0.047J	0.36	0.014J	0.024J	0.62J	0.0026	0.56J	ND	0.018J	2.1J
10/24/04	38	SFAR above Camino Powerhouse	11J	0.26J	15J	<0.05	0.25	0.028	0.029J	1.3J	0.0061	<2.0	0.13J	<0.040	0.83J
11/1/04	39	Brush Ck Inflow	7.7J	0.028J	14J	<0.05	0.12	0.014J	0.012J	0.39J	0.0035	0.13J	<2.0	<0.040	0.47J
11/1/04	40	Brush Ck. Outflow from Brush Creek Res.	3.9J	0.095J	12J	<0.05	0.21	0.0063J	0.014J	11J	0.0030	0.55J	0.097J	<0.040	0.40J
10/24/04	41	SFAR ds of Camino Powerhouse	6.9J	0.11J	8.9J	0.022J	0.27	0.064	0.019J	42J	0.0049J	<2.0	<2.0	<0.040	1.2J
10/25/04	42	Slab Creek Inflow to Slab Creek Reservoir	28J	0.15J	14J	<0.05	0.36	0.044	0.056	0.88J	0.0054	0.16J	<2.0	<0.040	0.57J
10/25/04	43	SFAR outflow from Slab Ck Res.-upstream of Iowa-Brushy Cnyn Ck confl.	10J	0.15J	8.3J	<0.05	0.33	0.045	0.047J	3.8J	0.0050	0.17J	<2.0	<0.040	0.63J
10/27/04	46	South Fork American River below Rock Creek	18J	0.17J	12J	<0.05	0.49	0.091	0.044J	1.7J	0.0044J	0.24J	<2.0	<0.04	0.63J
10/27/04	47	South Fork American River downstream of White Rock Powerhouse	10J	0.12J	9.1J	0.072	0.46	0.050	0.038J	12J	0.0042J	0.22J	<2.0	<0.04	0.99J
10/25/04	48	SFAR below Chili Bar Dam	9.9J	0.14J	9.8J	0.072	0.62	0.033	0.089	6.9J	0.0037J	0.21J	<2.0	<0.040	8.1
10/25/04	51	South Fork American River at Coloma Gage Stn.	10J	0.18J	8.9J	0.0095J	0.65	0.030	0.095	1.1J	0.0048J	0.27J	<2.0	<0.040	1.2J
10/25/04	54	South Fork American River @ Salmon Falls	8.7J	0.21J	10J	0.034J	1.0	0.029	0.068	1.3J	0.0059	0.51J	<2.0	0.010J	2.1J
12/1/04	SFAR-1	SFAR at Riverton/Hwy 50	5.9J	0.32J	12J	0.032J	0.32	<0.025	0.048J	1.9J	0.0033J	0.068J	<2.0	0.0094J	0.86
Reservoir Sites															
11/2/04	R-2	Rockbound Reservoir	26J	0.25J	2.6J	0.019J	0.24	0.025J	1.1	5.0J	0.0032	0.12J	0.20J	<0.040	0.79J
11/2/04	R-3a	Buck Island Reservoir	18J	0.26J	2.9J	0.023J	0.23	0.026	28	5.1J	0.0030	0.099J	0.13J	<0.040	1.3J
11/10/04	R-4a	Loon Lake near Dam	3.5J	0.16J	2.4J	0.015J	0.19	<0.025	85	1.4J	0.0048J	0.39J	<2.0	<0.040	0.56J
11/10/04	R-4b	Loon Lake West End	3.3J	0.24J	2.5J	0.019J	0.18	<0.025	200	1.4J	0.0051	0.45J	<2.0	<0.040	0.80J
11/10/04	R-4c	Loon Lake NE Waterbody	4.7J	0.17J	2.5J	0.063	0.31	0.0074J	98	2.0J	0.0050	0.12J	<2.0	<0.040	1.0J
11/10/04	R-5	Gerle Ck. Reservoir	5.5J	0.27J	3.7J	0.073	0.21	0.012J	200	2.6J	0.0048J	0.16J	<2.0	<0.040	1.3J
11/8/04	R-6a	Union Valley	3.6J	<1.0	5.3J	0.018J	0.19	<0.025	0.11	7.7J	0.0045J	0.11J	<2.0	<0.040	0.67J
11/8/04	R-6b	Union Valley - Mid	2.1J	0.078J	5.7J	<0.05	0.15	<0.025	27	10J	0.0060	0.081J	<2.0	<0.040	0.26J
11/8/04	R-6c	Union Valley - Robbs TR	2.0J	0.11J	5.5J	<0.05	0.17	<0.025	44	11J	0.0051	0.094J	<2.0	<0.040	0.26J
11/8/04	R-6d	Union Valley Res - Jones Fork Arm	2.7J	0.15J	5.6J	<0.05	56	<0.025	25	10J	0.0049J	0.15J	0.11J	<0.040	1.6J
11/1/04	R-7a	Ice House Res. Nr. Dam	3.3J	0.15J	5.2J	<0.05	0.14	0.0062J	52	23J	0.0033	<2.0	<2.0	<0.040	0.82J
11/1/04	R-7aH	Ice House Res. Nr. Dam	7.7J	0.094J	7.9J	<0.05	0.14	0.076	4	250J	0.0038	<2.0	0.12J	<0.040	0.51J
12/1/04	R-7a	Ice House Res. Nr. Dam	2.0J	0.063J	5.3J	0.056	0.26	0.028	0.27	17J	0.0029J	<2.0	<2.0	<0.040	2.8J

Appendix A-49. UARP & Chili Bar 2004 First Major Rain/Fall Turnover Sampling Results: Various Metals (Dissolved)														
Date	**Site #**	**Site Name**	**Aluminum**	**Arsenic**	**Barium**	**Cadmium**	**Copper**	**Iron**	**Lead**	**Manganese**	**Mercury**	**Nickel**	**Selenium**	**Silver**	**Zinc**
			ug/l	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**mg/L**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**	**ug/l**
11/1/04	R-7b	Ice House Res. Mid	3.3J	0.12J	5.3J	<0.05	0.13	0.012J	11	22J	0.0034	0.097J	0.14J	<0.040	0.33J
11/1/04	R-7bH	Ice House Res. Mid	9.7J	0.080J	10J	<0.05	0.16	0.077	2.2	610	0.0033	0.047J	0.086J	<0.040	1.4J
12/1/04	R-7b	Ice House Res. Mid	1.8J	0.18J	5.1J	<0.050	0.22	0.026	9.5	18J	0.0028J	0.60J	0.36J	<0.040	0.39J
11/1/04	R-7c	Ice House Res - Upper Lake	4.9J	0.12J	5.3J	<0.05	0.17	0.0092J	28	19J	0.0036	<2.0	<2.0	<0.040	0.60J
12/1/04	R-7c	Ice House Res - Upper Lake	2.5J	0.11J	5.2J	<0.050	0.21	0.026	8.5	23J	0.0028J	0.024J	0.077J	<0.040	0.97J
11/8/04	R-8a	Junction Reservoir	4.2J	0.099J	6.9J	<0.05	0.22	0.029	64	26J	0.0044J	0.13J	<2.0	<0.040	0.59J
10/24/04	R-9a	Camino Reservoir	5.8J	0.098J	7.0J	<0.05	0.22	0.074	0.012J	72J	0.0041J	<2.0	0.098J	<0.040	1.3J
11/1/04	R-10a	Brush Ck. Reservoir	3.7J	0.077	12J	<0.05	0.17	<0.025	0.090	0.056J	0.0031	0.36J	<2.0	<0.040	0.38J
10/25/04	R-11a	Slab Creek Middle Site	10J	0.18J	8.4J	<0.05	0.34	0.026	15	7.7J	0.0048J	0.14J	<2.0	<0.040	0.71J
10/25/04	R-11b	Slab Creek UpperSite	8.8J	0.19J	9.3J	0.025J	0.38	0.056	9.1	35J	0.0041J	0.20J	<2.0	<0.040	1.6J
10/25/04	R-12a	Chili Bar-near Dam	10J	0.18J	10J	0.021J	0.53	0.037	6.6	10J	0.013	0.22J	<2.0	<0.040	8.5
10/25/04	R-12b	Chili Bar - Middle Reservoir	9.5J	0.12J	9.7J	<0.05	0.36	0.036	0.18	5.0J	0.0035J	0.18J	<2.0	<0.040	1.7J

Appendix A-50a. UARP & Chili Bar 2004 Dissolved Metals Samples Exceeding CCC and CMC Criteria for Cadmium, Copper and Lead.

Site Number	Site Name	Date	Hardness (mg/L)	Cadmium (ug/L)			Copper (ug/L)			Lead[1] (ug/L)		
				Lab	CCC	CMC	Lab	CCC	CMC	Lab	CCC	CMC
UARP Riverine Sites												
2	Rubicon R. outflow from Rubicon Res	9/21/04	3.80							0.31	0.04	1.01
2	Rubicon R. outflow from Rubicon Res	11/2/04	2.20				0.75	0.34	0.37			
2	Rubicon R. outflow from Rubicon Res	11/2/04	2.20							0.08	0.02	0.50
3a	Fox Lake reach flow from Rubicon Reservoir	11/2/04	2.20				0.52	0.34	0.37			
3a	Fox Lake reach flow from Rubicon Reservoir	11/2/04	2.20							0.06	0.02	0.50
5	Rubicon Outflow from Rockbound Lake	9/21/04	1.60							0.035J	0.01	0.33
5	Rubicon Outflow from Rockbound Lake	11/2/04	2.00							0.020J	0.02	0.44
6	Little Rubicon Outflow from Buck Island	5/12/04	2.15							0.028J	0.02	0.49
6	Little Rubicon outflow from Buck Island Lake	9/21/04	1.90							0.025J	0.02	0.42
6	Little Rubicon outflow from Buck Island Lake	11/2/04	3.00							0.05	0.03	0.74
7	Gerle Creek outflow from Loon Lake	9/22/04	1.00	0.14	0.06	0.02						
7	Gerle Creek outflow from Loon Lake	9/22/04	1.00				0.42	0.18	0.18			
7	Gerle Creek outflow from Loon Lake	9/22/04	1.00							0.016J	0.01	0.18
7	Gerle Creek outflow from Loon Lake	11/10/04	ND	0.043J	0.06	0.02						
7	Gerle Creek outflow from Loon Lake	11/10/04	ND				0.32	0.18	0.18			
7	Gerle Creek outflow from Loon Lake	11/10/04	ND							0.019J	0.01	0.18
14	Gerle Creek inflow to Gerle Creek Reservoir	11/10/04	ND	0.040J	0.06	0.02						
14	Gerle Creek inflow to Gerle Creek Reservoir	11/10/04	ND				0.33	0.18	0.18			
14	Gerle Creek inflow to Gerle Creek Reservoir	11/10/04	ND							0.07	0.01	0.18
15	Gerle Creek outflow from Gerle Creek Reservoir	9/19/04	3.00							0.030J	0.03	0.74
15	Gerle Creek outflow from Gerle Creek Reservoir	10/31/04	3.00				0.61	0.45	0.49			
15	Gerle Creek outflow from Gerle Creek Reservoir	10/31/04	3.00							0.030J	0.03	0.74
16	Gerle Creek Canal inflow to Robb's Forebay	9/22/04	1.40				0.26	0.23	0.24			
20	South Fork Rubicon upstream of Rubicon River.	9/20/04	3.80				0.85	0.55	0.62			

Appendix A-50a. (continued)												
				Lab	CCC	CMC	Lab	CCC	CMC	Lab	CCC	CMC
UARP Riverine Sites												
20	South Fork Rubicon upstream of Rubicon River.	9/20/04	3.80							0.07	0.04	1.01
20	South Fork Rubicon upstream of Rubicon River.	11/1/04	4.20							0.11	0.04	1.14
25	SF Silver Outflow from Ice House Res.	5/12/04	2.71							0.05	0.03	0.65
25	SF Silver Ck outflow from Ice House	9/15/04	2.50							0.032J	0.02	0.59
27	SF Silver Creek inflow to Junction Res.	5/12/04	5.12							0.35	0.06	1.47
29	SF Silver Creek outflow of Junction Dam	9/14/04	4.00							0.10	0.04	1.07
34	Silver Creek outflow from Camino Dam	9/12/04	ND				0.26	0.18	0.18			
36	Silver Ck. Upstream of SFAR	9/21/04	4.10							0.09	0.04	1.11
41	SFAR ds of Camino Powerhouse	9/12/04	ND				0.41	0.18	0.18			
41	SFAR ds of Camino Powerhouse	9/12/04	ND							0.012J	0.01	0.18
43	SFAR outflow from Slab Ck Res.- upstream of Iowa-Brushy Cnyn Ck confl.	9/13/04	ND				0.52	0.18	0.18			
43	SFAR outflow from Slab Ck Res.- upstream of Iowa-Brushy Cnyn Ck confl.	9/13/04	ND							0.037J	0.01	0.18
Non-Project Riverine Sites												
1	Rubicon River Inflow to Rubicon Reservoir	5/12/04	3.73							0.13	0.04	0.98
1	Rubicon River Inflow to Rubicon Reservoir	9/21/04	6.20							0.08	0.07	1.87
1	Rubicon River Inflow to Rubicon Reservoir	11/2/04	2.00							0.03	0.02	0.44
4	Highland inflow to Rockbound Res.	5/12/04	ND							0.025J	0.01	0.18
4	Highland inflow to Rockbound Res.	11/2/04	ND				0.30	0.18	0.18			
4	Highland inflow to Rockbound Res.	11/2/04	ND							0.045J	0.01	0.18
21	Tells Ck. Upstream of UV Res	11/1/04	8.00							0.33	0.10	2.59
22	Big Silver Ck upstream of UV Res	11/1/04	2.80							0.046J	0.03	0.68
24	SF Silver Upstrm of Ice House Res.	5/11/04	1.99							0.039J	0.02	0.44
24	SF Silver Ck upstream of Ice House Res.	9/15/04	5.80							0.07	0.07	1.72
24	SF Silver Ck upstream of Ice House Res.	11/1/04	2.80							0.15	0.03	0.68

Appendix A-50a. (continued)												
Site Number	Site Name	Date	Hardness (mg/L)	Cadmium (ug/L)			Copper (ug/L)			Lead (ug/L)		
				Lab	CCC	CMC	Lab	CCC	CMC	Lab	CCC	CMC
Reach Downstream of Chili Bar Sites												
48	SFAR below Chili Bar Dam	9/13/04	ND				0.28	0.18	0.18			
51	South Fork American River downstream of Greenwood Creek	9/13/04	ND				0.44	0.18	0.18			
51	South Fork American River downstream of Greenwood Creek	9/13/04	ND							0.06	0.01	0.18
54	South Fork American River @ Salmon Falls	9/13/04	8.00				1.40	1.03	1.24			
Reservoir Sites												
R-2	Rockbound Reservoir	5/12/04	1.99				0.50	0.32	0.34			
R-3a	Buck Island	5/12/04	1.89				0.62	0.30	0.32			
R-4a	Loon Lake near Dam	9/22/04	1.00				0.30J	0.18	0.18			
R-4a	Loon Lake near Dam	11/10/04	ND				0.19	0.18	0.18			
R-4b	Loon Lake West End	9/22/04	ND				0.52	0.18	0.18			
R-4b	Loon Lake West End	11/10/04	ND				0.18	0.18	0.18			
R-4c	Loon Lake NE Waterbody	9/22/04	1.50				0.29	0.25	0.26			
R-4c	Loon Lake NE Waterbody	11/10/04	ND	0.06	0.06	0.02						
R-4c	Loon Lake NE Waterbody	11/10/04	ND				0.31	0.18	0.18			
R-5	Gerle Ck. Reservoir	11/10/04	ND	0.07	0.06	0.02						
R-5	Gerle Ck. Reservoir	11/10/04	ND				0.21	0.18	0.18			
R-6d	Union Valley Res - Jones Fork Arm	11/8/04	3.00				56.00	0.45	0.49			
R-7a	Ice House Reservoir	5/11/04	2.65				0.49	0.40	0.44			
R-9a	Camino Reservoir	9/12/04	ND				0.22	0.18	0.18			
R-11a	Slab Creek Middle Site	9/13/04	ND				0.28	0.18	0.18			
R-11aH	Slab Creek Middle Site	9/13/04	ND				0.36	0.18	0.18			
R-11b	Slab Creek UpperSite	9/13/04	ND				0.39	0.18	0.18			
Chili Bar Reservoir												
R-12a	Chili Bar-near Dam	9/13/04	ND	0.08	0.06	0.02						
R-12a	Chili Bar-near Dam	9/13/04	ND				0.92	0.18	0.18			
R-12aH	Chili Bar-near Dam	9/13/04	ND				0.35	0.18	0.18			
R-12b	Chili Bar - Middle Reservoir	9/13/04	ND				0.36	0.18	0.18			
R-12bH	Chili Bar - Middle Reservoir	9/13/04	ND				0.29	0.18	0.18			
Snow Sample[2]												
	Snow Sample-1	5/12/04	ND	0.19	0.06	0.02	1.90	0.18	0.18	0.13	0.01	0.18

1 Reservoir lead samples were contanimated with lead from the sampler and thus reservoir results showing exceeded values are not valid and not reported in this table.

2 Zinc was not analyzed for the snow sample.

Appendix A-50b. UARP & Chili Bar 2004 Dissolved Metals Samples Exceeding the CCC and CMC criteria for Nickel, Silver and Zinc.

Site Number	Site Name	Date	Hardness (mg/L)	Nickel (ug/L)			Silver (ug/L)			Zinc (ug/L)		
				Lab	CCC	CMC	Lab	CCC	CMC	Lab	CCC	CMC
UARP Riverine Sites												
7	Gerle Creek outflow from Loon Lake	11/10/04	ND							4.7J	2.39	2.37
14	Gerle Creek inflow to Gerle Creek Reservoir	9/19/04	3.50				0.0090J	NA	0.008			
16	Gerle Creek Canal inflow to Robb's Forebay	9/22/04	1.40							7.40	7.40	7.34
20	South Fork Rubicon upstream of Rubicon River.	9/20/04	3.80							3.4J	2.39	2.37
Non-Project Riverine												
23	Jones Fork Silver Ck inflow to UV Res.	11/1/04	4.80				0.017J	NA	0.007			
28	Little Silver Creek inflow to Junction Res.	11/8/04	3.10				0.014J	NA	0.010			
UARP Reservoir Sites												
R-2H	Rockbound Reservoir	9/21/04	1.50				0.012J	NA	0.004			
R-7aH	Ice House Res. Nr. Dam	9/20/04	2.80				0.016J	NA	0.004			
Chili Bar Reservoir												
R-12a	Chili Bar-near Dam	9/13/04	ND							3.4J	2.39	2.37

Appendix A-51a. UARP & Chili Bar 2002-2003 Total Recoverabel Metals Samples Exceeding CCC and CMC Criteria.															
Site Number	**Site Name**	**Date**	**Hardness (mg/L)**	**Cadmium (ug/L)**			**Copper (ug/L)**			**Lead (ug/L)**			**Silver (ug/L)**		
				Lab	**CCC**	**CMC**	**Lab**	**CCC**	**CMC**	**Lab**	**CCC**	**CMC**	**Lab**	**CCC**	**CMC**
UARP Riverine Sites															
2	Rubicon R. outflow from Rubicon Res	10/7/02	11.00				2.30	1.36	1.68						
2	Rubicon R. outflow from Rubicon Res	10/7/02	11.00							0.20	0.15	3.89			
3a	Fox Lake reach flow from Rubicon Reservoir	6/11/03	6.50							0.15	0.08	1.99			
5	Rubicon Outflow from Rockbound Lake	10/7/02	3.90	0.12	0.18	0.11									
5	Rubicon Outflow from Rockbound Lake	10/7/02	3.90							0.09	0.04	1.04			
5	Rubicon Outflow from Rockbound Lake	6/11/03	4.50							0.06	0.05	1.25			
5	Rubicon Outflow from Rockbound Lake	9/17/03	2.22							0.032 J	0.02	0.51			
7	Gerle Creek outflow from Loon Lake	5/12/03	3.57	0.12	0.16	0.10									
7	Gerle Creek outflow from Loon Lake	5/12/03	3.57				1.20	0.52	0.58						
14	Gerle Creek Inflow to Gerle Creek Reservoir	11/11/02	4.80							0.06	0.05	1.35			
14	Gerle Creek Inflow to Gerle Creek Reservoir	9/17/03	3.33				0.60	0.49	0.54						
14	Gerle Creek Inflow to Gerle Creek Reservoir	9/17/03	3.33							0.05	0.03	0.85			
15	Gerle Creek Outflow from from Gerle Creek Reservoir	11/11/02	8.60							0.16	0.11	2.84			
15	Gerle Creek Outflow from from Gerle Creek Reservoir	11/11/02	8.60										0.09	NA	0.05
15	Gerle Creek Outflow from from Gerle Creek Reservoir	5/12/03	3.06							0.06	0.03	0.76			
15	Gerle Creek Outflow from Gerle Creek Reservoir	9/17/03	2.78							0.03 J	0.03	0.68			
16	Gerle Creek Canal inflow to Robb's Forebay	11/11/02	11.00							0.16	0.15	3.89			
16	Gerle Creek Canal inflow to Robb's Forebay	5/12/03	2.55				0.55	0.39	0.42						
16	Gerle Creek Canal inflow to Robb's Forebay	5/12/03	2.55							0.08	0.02	0.60			
16	Gerle Creek Canal inflow to Robb's Forebay	9/17/03	2.22							0.03 J	0.02	0.51			
20	S.F. Rubicon upstream of Rubicon River	9/17/03	2.78							0.037 J	0.03	0.68			
25	SF Silver Outflow from Ice House Res.	9/18/03	5.28										0.036 J	NA	0.02
27	SF Silver Creek inflow to Junction Res.	5/11/03	5.10							0.06	0.06	1.46			
27	SF Silver Creek inflow to Junction Res.	9/16/03	5.00							0.06	0.06	1.43			
29	SF Silver Creek ds of Junction Dam	11/14/02	5.30							0.06	0.06	1.54			
29	SF Silver Creek ds of Junction Dam	5/8/03	3.61							0.10	0.04	0.94			
32	Jay Bird Creek inflow to Camino Reservoir	11/13/02	8.10							0.32	0.10	2.63			
34	Silver Creek outflow from Camino Reservoir	11/13/02	5.30							0.07	0.06	1.54			
40	Brush Creek Outflow from Brush Ck. Reservoir	11/13/02	8.10				1.30	1.05	1.26						
40	Brush Creek Outflow from Brush Ck. Reservoir	11/13/02	8.10							0.11	0.10	2.63			
40	Brush Creek Outflow from Brush Ck. Reservoir	11/13/02	8.10										0.10	NA	0.05
41	SFAR downstream of Camino Powerhouse	11/13/02	9.80				1.50	1.23	1.51						

Appendix A-51a. (continued)

Site Number	Site Name	Date	Hardness (mg/L)	Cadmium (ug/L)			Copper (ug/L)			Lead (ug/L)					
				Lab	CCC	CMC	Lab	CCC	CMC	Lab	CCC	CMC			
Non-Project Riverine Sites															
1	Rubicon River Inflow to Rubicon Reservoir	9/17/03	3.89	0.12 J	0.17	0.11									
22	Big Silver Creek upstream of Union Valley Reservoir	5/8/03	3.09							0.07	0.03	0.77			
22	Big Silver Ck.	9/17/03	8.33							0.16	0.11	2.73			
23	Jones Fork Silver Ck. Inflow to Union Valley Reservoir	5/8/03	3.09							0.05	0.03	0.77			
24	SF Silver Creek Upstream of Ice House Reservoir	5/11/03	4.08							0.05	0.04	1.10			
24	SF Silver Upstrm of Ice House Res.	9/18/03	7.22				1.10	0.95	1.13						
28	Little Silver Creek inflow to Junction Res.	5/13/03	3.06				1.20	0.46	0.50						
33	Jaybird Canyon Creek inflow to Camino Reservoir	5/6/03	5.67							0.07	0.07	1.67			
42	Slab Creek Inflow to Slab Creek Reservoir	5/5/03	6.70							0.10	0.08	2.07			
Reach Downstream of Chili Bar															
48	SFAR outflow from Chili Bar Res.	11/12/02	8.6							0.24	0.11	2.84			
51	SFAR downstream of Lotus/Uniontown C	11/12/02	11							0.18	0.15	3.89	0.12	NA	0.08
51	SFAR downstream of Lotus/Uniontown C	9/15/03	11.7				1.5	1.43	1.78						
51	SFAR downstream of Lotus/Uniontown C	11/12/02	11										0.12	NA	0.08
54	South Fork American River downstream of Hiway 49 Bridge	10/10/02	12				3.4	1.46	1.82						
54	SFAR downstream of Hiway 49 Bridge / downstream of salmon falls	9/15/03	6.67							1.4	0.08	2.06			
Reservoir Sites															
R-2	Rockbound Reservoir	6/11/03	5.00							0.08	0.06	1.43			
R-2	Rockbound Reservoir	6/11/03	5.00										0.15	NA	0.02
R-3a	Buck Island	6/11/03	5.50				0.94	0.75	0.87						
R-3a	Buck Island	6/11/03	5.50							0.08	0.06	1.61			
R-3a	Buck Island	6/11/03	5.50										0.05	NA	0.02
R-4a	Loon Lake Reservoir near Dam	11/11/02	3.80							0.22	0.04	1.01			
R-4a	Loon Lake Reservoir near Dam	11/11/02	3.80										0.05	NA	0.01
R-4a	Loon Lake Reservoir near Dam	5/14/03	3.06										0.13	NA	0.01
R-4b	Loon Lake West End	11/11/02	6.70							0.22	0.08	2.07			
R-4b	Loon Lake West End	9/16/03	2.78				0.65	0.42	0.46						
R-4b	Loon Lake West End	9/16/03	2.78							0.1 J	0.03	0.68			
R-4b	Loon Lake West End	9/16/03	2.78										0.026 J	NA	0.01
R-4c	Loon Lake NE Waterbody	11/11/02	4.80							0.31	0.05	1.35			
R-4c	Loon Lake NE Waterbody	5/14/03	2.55							0.06	0.02	0.60			
R-4cH	Loon Lake NE Waterbody	9/16/03	2.22							0.028 J	0.02	0.51			

Appendix A-51a. (continued)																
Site Number	**Site Name**	**Date**	**Hardness (mg/L)**	**Cadmium (ug/L)**			**Copper (ug/L)**			**Lead (ug/L)**						
				Lab	**CCC**	**CMC**	**Lab**	**CCC**	**CMC**	**Lab**	**CCC**	**CMC**				
Reservoir Sites																
R-5	Gerle Creek Reservoir	11/11/02	1.90							0.57	0.02	0.42				
R-5	Gerle Creek Reservoir	5/14/03	3.06							0.06	0.03	0.76				
R-5	Gerle Ck. Reservoir	9/19/03	1.67							0.022 J	0.01	0.35				
R-6a	Union Valley Dam	11/14/02	15.00							0.26	0.22	5.77				
R-6a	Union Valley Dam	11/14/02	15.00										0.86	NA	0.13	
R-6b	Union Valley Res - Mid	11/14/02	12.00										0.52	NA	0.09	
R-6b	Union Valley Res - Mid	5/7/03	4.64										0.23	NA	0.02	
R-6c	Union Valley Robbs Tailrace	9/18/03	6.11				6.80	0.82	0.97							
R-6c	Union Valley Robbs Tailrace	9/18/03	6.11							3.00	0.07	1.84				
R-6d	Union Valley Res - Jones Fork Arm	11/14/02	10.00							0.20	0.13	3.44				
R-6d	Union Valley Res - Jones Fork Arm	11/14/02	10.00										0.15	NA	0.07	
R-6d	Union Valley Res - Jones Fork Arm	5/7/03	2.58				0.40	0.39	0.43							
R-6d	Union Valley Res - Jones Fork Arm	5/7/03	2.58							0.10	0.02	0.61				
R-6d	Union Valley Res - Jones Fork Arm	5/7/03	2.58										0.52	NA	0.01	
R7a	Ice House Reservoir	11/26/02	13.00							0.22	0.19	4.81				
R-7a	Ice House Reservoir	11/14/02	4.80							0.07	0.05	1.35				
R-7a	Ice House Reservoir	11/14/02	6.70							0.13	0.08	2.07				
R-7a	Ice House Reservoir	9/18/03	1.11							0.032 J	0.01	0.21				
R-7aH	Ice House Reservoir	9/18/03	2.22				2.20	0.35	0.37							
R-7aH	Ice House Reservoir	9/18/03	2.22							0.13	0.02	0.51				
R-7b	Ice House Reservoir- Mid	5/13/03	2.55										0.04	NA	0.01	
R-7c	Ice House Reservoir - Upper Lake	11/14/02	4.80							0.13	0.05	1.35				
R-7c	Ice House Reservoir - Upper Lake	5/13/03	2.55										0.07	NA	0.01	
R-8	Junction Reservoir	11/14/02	5.70				1.90	0.77	0.90							
R-8	Junction Reservoir	11/14/02	5.70							1.20	0.07	1.68				
R-8	Junction Reservoir	11/14/02	5.70										0.10	NA	0.02	
R-8a	Junction Reservoir	5/13/03	4.08										0.06	NA	0.01	
R-9	Camino Reservoir - mid reservoir	11/13/02	6.70							0.19	0.08	2.07				
R-9a	Camino Reservoir - mid reservoir	5/6/03	7.73							0.27	0.10	2.48				
R-10	Brush Creek Reservoir	11/13/02	8.10				1.60	1.05	1.26							
R-10	Brush Creek Reservoir	11/13/02	8.10							0.46	0.10	2.63				
R-10	Brush Creek Reservoir	11/13/02	8.10										0.15	NA	0.05	
R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	11/12/02	8.60							0.17	0.11	2.84				
R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	11/12/02	8.60										0.16	NA	0.05	
R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	9/15/03	6.11				50.00	0.82	0.97							

Appendix A-51a. (continued)

Site Number	Site Name	Date	Hardness (mg/L)	Cadmium (ug/L)			Copper (ug/L)			Lead (ug/L)					
				Lab	CCC	CMC	Lab	CCC	CMC	Lab	CCC	CMC			
Reservoir Sites															
R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	9/15/03	6.11							3.00	0.07	1.84			
R-11b	Slab Creek Reservoir-Uppersite	10/9/02	7.90										0.05	NA	0.04
R-11b	Slab Creek Reservoir - Upper Site	11/12/02	13.00							0.90	0.19	4.81			
R-11b: Mean	Slab Creek Reservoir - Upper Site	5/5/03	7.99							0.14	0.10	2.59			
R-11b: Mean	Slab Creek Reservoir - Upper Site	5/5/03	7.99										0.14	NA	0.04
Chili Bar Reservoir															
R-12a	Chili Bar near Dam	11/13/02	6.7							1.1	0.08	2.07	0.042	NA	0.03
R-12a-Mean	Chili Bar near Dam	5/5/03	10.31										0.077	NA	0.07
R-12b	Chil Bar, mid-reservoir site	11/13/02	11							0.54	0.15	3.89			
R-12b	Chil Bar, mid-reservoir site	5/5/03	10.82										0.096	NA	0.08

Appendix A-51b. UARP & Chili Bar 2002-2003 Total Recoverable Metals Samples Exceeding CCC and CMC Criteria.												
Site Number	**Site Name**	**Date**	**Hardness (mg/L)**	**Nickel (ug/L)**			**Silver (ug/L)**			**Zinc (ug/L)**		
				Lab	**CCC**	**CMC**	**Lab**	**CCC**	**CMC**	**Lab**	**CCC**	**CMC**
UARP Riverine Sites												
15	Gerle Creek Outflow from from Gerle Creek Reservoir	11/11/02	8.60				0.09	NA	0.05			
25	SF Silver Outflow from Ice House Res.	9/18/03	5.28				0.036 J	NA	0.02			
40	Brush Creek Outflow from Brush Ck. Reservoir	11/13/02	8.10				0.10	NA	0.05			
Reach Downstream of Chili Bar												
51	SFAR downstream of Lotus/Uniontown C	11/12/02	11				0.12	NA	0.08			
51	SFAR downstream of Lotus/Uniontown C	11/12/02	11				0.12	NA	0.08			
Reservoir Sites												
R-2	Rockbound Reservoir	6/11/03	5.00				0.15	NA	0.02			
R-3a	Buck Island	6/11/03	5.50				0.05	NA	0.02			
R-4a	Loon Lake Reservoir near Dam	11/11/02	3.80				0.05	NA	0.01			
R-4a	Loon Lake Reservoir near Dam	5/14/03	3.06				0.13	NA	0.01			
R-4b	Loon Lake West End	9/16/03	2.78				0.026 J	NA	0.01			
R-6a	Union Valley Dam	11/14/02	15.00				0.86	NA	0.13			
R-6b	Union Valley Res - Mid	11/14/02	12.00				0.52	NA	0.09			
R-6b	Union Valley Res - Mid	5/7/03	4.64				0.23	NA	0.02			
R-6d	Union Valley Res - Jones Fork Arm	11/14/02	10.00				0.15	NA	0.07			
R-6d	Union Valley Res - Jones Fork Arm	5/7/03	2.58				0.52	NA	0.01			
R-7b	Ice House Reservoir- Mid	5/13/03	2.55				0.04	NA	0.01			
R-7c	Ice House Reservoir - Upper Lake	5/13/03	2.55				0.07	NA	0.01			
R-8	Junction Reservoir	11/14/02	5.70				0.10	NA	0.02			
R-8a	Junction Reservoir	5/13/03	4.08				0.06	NA	0.01			
R-10	Brush Creek Reservoir	11/13/02	8.10				0.15	NA	0.05			
R-11a	Slab Creek Reservoir - Middle (nr. Boat Launch)	11/12/02	8.60				0.16	NA	0.05			
R-11b	Slab Creek Reservoir-Uppersite	10/9/02	7.90				0.05	NA	0.04			
R-11b: Mean	Slab Creek Reservoir - Upper Site	5/5/03	7.99				0.14	NA	0.04			
Chili Bar Reservoir												
R-12a	Chili Bar near Dam	11/13/02	6.7				0.042	NA	0.03			
R-12a-Mean	Chili Bar near Dam	5/5/03	10.31				0.077	NA	0.07			
R-12b	Chil Bar, mid-reservoir site	5/5/03	10.82				0.096	NA	0.08			

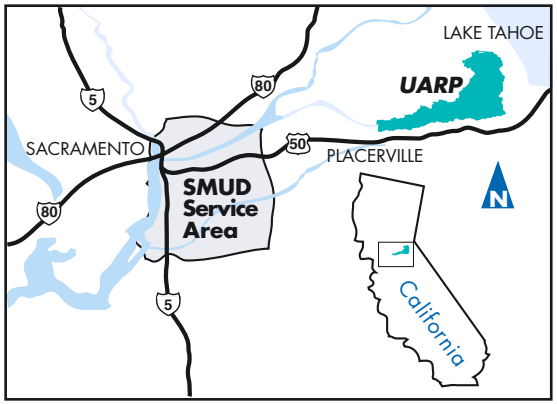
APPENDIX B1

UARP AND CHILI BAR PROJECT AREA MAPS

- Map (NE) of the SMUD Upper American River Project
- Map (SE) of the SMUD Upper American River Project
- Map (West) of the SMUD Upper American River Project
- Map (SW) of the SMUD Upper American River Project

APPENDIX B2

Water Quality Monitoring Sites
2002-2004



SACRAMENTO MUNICIPAL UTILITY DISTRICT

Upper American River Project

Federal Energy Regulatory Commission Project No. 2101

● *Water Quality Monitoring Sites 2002-2003*

OTHER WATER QUALITY MONITORING SITES

- R-12a Chili Bar near dam
- R-12b Chili Bar mid-reservoir
- 48 SFAR out flow from Chili Bar reservoir
- 49 SFAR upstream of Dutch Creek
- 50 SFAR at Coloma Gage Station
- 51 SFAR downstream of Greenwood Creek
- 52 SFAR upstream of Weber Creek
- 53 Weber Creek upstream of SFAR
- 54 SFAR below Weber Creek

UARP Plan

0 1 2 3 4 5

Scale in Miles

Each powerhouse serves as a step on the UARP power stairway as the water drops one mile in elevation over a 53-mile course, beginning at Rubicon Reservoir (6,545 feet elevation) and ending at White Rock Powerhouse (993 feet elevation).

SMUD

SACRAMENTO MUNICIPAL UTILITY DISTRICT

The Power To Do More.®

GAF1543-03 rev: 01.02.04

APPENDIX C

HISTORICAL *E. coli* DATA FROM EL DORADO COUNTY (1997-2002)

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
9/29/2002	Nugget composite	9:50	200		3
	Nugget shore				2
	State Park shore	11:30	200		3
	State Park composite	11:30			6
	County Park shore	12:00	200		5
	County Park composite				5
	Turtle Pond shore	11:15	200		15
	Turtle Pond composite	11:15	200		11
	Salmon Falls shore	10:45	200		4
9/12/2002	Nugget composite	12:45	1900		12
	Nugget shore				7
	State Park shore	11:30	1900		3
	State Park composite				3
	County Park shore	11:50	1900		9
	County Park composite				12
	Turtle Pond shore				13
	Turtle Pond composite	10:55	1900		13
	Salmon Falls shore	10:30	fish		11
8/29/2002	Nugget composite	9:00	1200		17
	Nugget shore				33
	State Park shore	12:30	1200		79
	State Park composite				6
	County Park shore	11:30	1200		37
	County Park composite				51
	Turtle Pond shore	10:40	1200		25
	Turtle Pond composite				23
	Salmon Falls	10:00		some current	31
8/15/2002	Nugget composite	9:00	1000		3.1
	Nugget shore				9.2
	State Park shore	11:10	800		14.6
	State Park composite				17.5
	County Park shore	12:30	800		28
	County Park composite				20
	Turtle Pond shore	10:35	800		28.5
	Turtle Pond composite				12
	Salmon Falls	10:00	900?	some current?	3.1

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
8/11/2002	Nugget composite				
	Nugget shore	12:10	1200	shore	6
Sunday	State Park shore	11:00			6
	State Park composite				10
	Beyond Limits	10:30			23
	County Park shore	11:45			228
	County Park composite				210
	Turtle Pond shore	10:15			12
	Turtle Pond composite	10:15			9
	Salmon Falls	9:30			6
8/1/2002	Nugget composite				7
	Nugget shore	14:15	1200		12
	State Park shore	12:45	1200		236
	State Park composite				5
	County Park shore	13:00	1200		16
	County Park composite				6
	Turtle Pond shore	12:05	1200		9
	Turtle Pond composite				18
	Salmon Falls	11:30	lake		1
7/21/2002	Nugget composite	8:20	1200		13
	Nugget shore				16
	State Park shore	9:00	800	front end of release	10
	State Park composite				17
	Beyond Limits	11:30	1200	shore	20
	County Park shore	9:30		ramping up	43
	County Park composite				48
	Turtle Pond shore	10:30	1200		37
	Turtle Pond composite				37
	Salmon Falls		lake		1
7/13/2002	Nugget composite	10:00	1200		6
	Nugget shore				4
	State Park shore	10:45	1200		63
	State Park composite				51
	County Park shore	13:00	1200		30
	County Park composite				28
	Turtle Pond shore	12:15	1200		27

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	Turtle Pond composite	12:15	1200		17
	Salmon Falls	11:40	lake		0
6/20/2002	Nugget composite				3
	Nugget shore				3
	State Park shore				11
	State Park composite				17
	Beyond Limits				40
	County Park shore				27
	County Park composite				31
	Turtle Pond shore				18
	Turtle Pond composite				21
	Skunk Hollow				0
6/6/2002	Nugget composite	9:15	2500		3.1
	Nugget shore				4.1
	State Park shore	10:00	2500		10.6
	State Park composite				4.1
	County Park shore	12:45	2500		12.1
	County Park composite				7.4
	Turtle Pond shore	12:00	2500		5.2
	Turtle Pond composite				7.4
	Skunk Hollow		lake		0
5/30/2002	Skunk Hollow		lake	right shore	5.2
resample				middle	60.9
				left shore	1
5/23/2002	Chili Bar shore	14:45	3000		63
	Chili Bar composite				2
	State Park shore	11:30	3000		6.3
	County Park shore	12:30	3000		56
	County Park composite				4
	Turtle Pond shore			campsite	3.1
	Turtle Pond shore	10:30	2000	shore	9.5
	Skunk Hollow shore	9:45	lake	sample from shore	649
5/2/2002	Nugget USGS		1300		1
	State Park shore		1300		2
	State Park composite				3
	County Park shore		1300		1
	Turtle Pond shore		1300		1

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	Skunk Hollow shore		lake		8.6
4/11/2002	Nugget USGS	14:15	3500		2
	State Park shore	13:30	1500		12
	County Park shore	11:30	1300	ramping up	2
	Turtle Pond shore	13:20	1500		10
	Skunk Hollow shore	12:15		lake	72
1/30/2002	Nugget USGS	16:00	700		1
	State Park shore	15:30	700	tail end of release	1
	County Park shore	15:15	700	tail end of release	65
	Turtle Pond shore	15:00	1000+		5
	Greenwood Ck.	15:00	med	running clear	65
	Skunk Hollow shore	14:20	med	running clear	3
	Skunk Creek	14:20	1000+	running clear	19
	first releases occurred over Thanksgiving weekend on				
11/29/2001	Nugget USGS	14:45	300	25-Nov	14
	State Park shore	14:30	300		15
	county Park shore	14:15	300		34
	Turtle Pond	14:00	300		32
	Greenwood Ck.	14:00	low, clear		113
11/6/2001	Nugget USGS	12:15	150	resample	2
	State Park shore	13:20	"	do to high	16
	State Park composite			results on 10/31	16
	Mt. Murphy bridge	13:45	"		22
	County Park shore	13:00	"		12
	County Park composite	13:00	"	no releases	16
	Turtle Pond	14:15	"	in October	12
	Turtle Pond shore	14:15	"		15
	Greenwood Ck.	14:15	"		30
	Skunk Hollow shore		"		na
10/30/2001	Nugget USGS	13:00	150 cfs	first significant	4
	State Park shore	12:15	"	rain of season	34
	Mt. Murphy bridge	12:30	"	on 10/29	344
	County Park shore	12:00		side creeks have	168
	County Park composite	na		some flow	
	Turtle Pond	na			
	Turtle Pond shore	11:30			410
	Greenwood Ck.	11:30			980
	Skunk Hollow shore	10:45			121
9/20/2001	Nugget USGS	14:00	150 cfs	approx 2 days	6
	State Park shore	13:00	"	with releases	26

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	State Park composite		"	this month	45
	County Park shore	12:00	"	after 9-3	25
	County Park composite		"		26
	Turtle Pond		"		
	Turtle Pond shore	11:30	"		12
	Skunk Hollow shore	10:45	"		4
	Skunk Hollow composite		"		4
8/30/2001	Nugget USGS	9:30	100 cfs	no release	7
	State Park shore	11:30	100	since 8-26	9
	State Park composite				12
	County Park shore	11:15	100		22
	County Park composite				23
	Turtle Pond	10:20	100		10
	Turtle Pond shore				123
	Skunk Hollow shore	9:30	100		9
	Skunk Hollow composite				5
8/18/2001	Nugget USGS		1000	Saturday	15
	State Park shore			sample	16
	State Park composite			while boat	12
	County Park shore			see records	361
	County Park composite			for addit. sample points	m
	Turtle Pond	11:00	200		49
	Turtle Pond shore				
	Skunk Hollow shore				m
	Skunk Hollow composite				
8/2/2001	Nugget USGS	12:45	200 cfs		4
	State Park shore	12:00	200		31
	State Park composite				19
	County Park shore	12:30	200		6
	County Park composite				7
	Turtle Pond	11:30	200		5
	Turtle Pond shore				7
	Skunk Hollow shore	10:30	200 cfs		2
	Skunk Hollow composite				2
7/14/2001	Nugget USGS	11:00	1100	no flow previous	8
	State Park shore	12:00	1100	5 days above	218
	State Park composite			200cfs	222
	Beyond Limits	14:00			120
	County Park shore	12:30	1100		548

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	County Park composite		1100		461
	Turtle Pond	13:00	1100		101
	Turtle Pond shore				23
	Skunk Hollow shore	13:40	lake		3
	Skunk Hollow composite				3
6/21/2001	Nugget USGS	13:20	1100		9
	State Park shore	13:00	1100		36
	State Park composite				79
	County Park shore	12:30	800	ramping up	17
	County Park composite				26
	Turtle Pond	11:15	200	b4 flow arrives	13
	Turtle Pond shore				12
	Skunk Hollow ck				
	Skunk Hollow shore	10:30	lake		5
	Skunk Hollow composite				7
6/7/2001	Nugget USGS	10:00	800		28
	State Park shore	13:30	500		325
	State Park composite	13;30	500		46
	County Park shore	10:30	500	ramping up	52
	County Park composite				86
	Turtle Pond	11:00	500		157
	Turtle Pond shore	11:00	500	ramping up	66
	Skunk Hollow ck				2
	Skunk Hollow shore				1
	Skunk Hollow composite	**11:45**	**lake**		**378**
5/31/2001	Skunk Hollow composite		**lake**		**65**
	Skunk Hollow shore				**145**
	Skunk Ck.				**166**
5/24/2001	Nugget USGS	13:00	1000		1
	State Park shore	11:30	800	rising	20
	State Park composite				16
	County Park shore	11:45	800		28
	County Park composite				30
	Turtle Pond	11:10	500	rising	24
	Turtle Pond shore				28
	Skunk Hollow	10:30	lake		**1553**
	Skunk Ck.				

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
5/10/2001	Nugget USGS		1000		5
	State Park shore		1000		4
	County Park shore		1000		42
	Turtle Pond		1000		13
	Skunk Hollow				M
3/7/2001	Weber Ck.		med	clear	15
	Skunk Hollow		200	"	10
	Skunk Ck. 1		med	"	12
	Skunk Ck. 2		"	"	16
3/5/2001	Nugget USGS	15:30	200	clear	1
	State Park shore	12:00	2000		17
	County Park shore	10:00	200	clear	23
	Turtle Pond	11:00			88
	Greenwood Ck.	"	700	ramping up	90
	Skunk Hollow	10:30	200	silty-turbid	435
	Skunk Ck.	"	medium		270
1/31/2001	Nugget USGS	10:00	1800		0
	State Park shore	14:00	700	flow dropping	2
	Beyond Limits	12:30	700	"	3
	County park shor	13:30	700	"	4
	Turtle Pond	11:00	200	fish flow	1
	Skunk Ck.	12:00		clear	3
	Salmon Falls	"	200	fish flow	6
12/19/2000	Nugget USGS	15:30	3000	clear	3
	Coloma bridge		3500	dam release	17
	State Park shore	14:00	3500		5
	Beyond Limits		3500		11
	County park shor	13:30	3500		9
	Turtle Pond		3500		39
	Greenwood Ck.	12:00	3500		12
	Salmon Falls	11:30	lake	low cfs	0
9/28/2000	Nugget USGS				3
	St park composite				28
	State Park shore		300		26
	Beyond Limits				21
	County composite				31
	County park shor				18

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	Turtle Pond				14
	Salmon Falls		lake		1
9/7/2000	Nugget USGS	13:00	2000		10
	St park composite				20
	State Park shore	15:40	2000		40
	Beyond Limits	14:30	2000		15
	County composite	15:00	2000		9
	County park shor				11
	Turtle Pond	14:15	2000		17
	Salmon Falls	13:30	lake		6
8/27/2000	Nugget USGS	10:00	1100	fish flow	2
	Miner's ck.	11:45	1200	samples	1
	T. maker shore	12:53	1200	also taken	2
	St park composite	13:20	1200	see data	9
	State Park shore			sheets	7
	County composite	14:00	1200		13
	County park shor				21
	Camp Lotus	11:00	300		6
	Turtle Pond		300		4
	Skunk H. sh				m
8/24/2000	Nugget USGS	14:00			4
	St park composite	12:40	1200		5
	State Park shore				1
	County composite	13:00	1200		9
	County park shor				3
	Beyond Limits	12:30	1200		4
	Turtle Pond	12:15	1200		5
	Skunk H. sh	11:35	lake		2
8/20/2000	Nugget USGS	19:00	1100		2
	St park composite	16:15	1100		5
	State Park shore				1
	County composite	16:00	1100		4
	County park shor				2
	Camp Lotus composite	16:45	1100		3
	Camp Lotus shor				2
	Turtle Pond	17:00	1100		1

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	Skunk H. composite				4
	Skunk Hollow sh				6
8/13/2000	Nugget USGS	8:00	500	rising	5
p.m.sample	Chili Bar	8:00	500	"	7
second #	St park composite	10:15	500	"	10 -- 1
	State Park shore	10:15	500	"	14 -- 1
	Beyond Limits	10:30	500	"	4
	County composite	10:40	500		6 -- 2
	County park shor	10:40	500	"	17 -- 4
	Turtle Pond	11:15	500		7 -- 3
	Skunk Hollow		lake	turb-beach activ	1
7/27/2000	Nugget USGS		fish flow		46
	St park composite		5 am to		39
	State Park shore		1100 at 8am		3
	County composite				36
	County park shor				10
	Turtle Pond				12
	Skunk Hollow				0
7/13/2000	Nuggett		fish flow @		3
	St park composite		5:00 AM		4
	State Park shore		ramp to 1800		8
	Beyond Limits		at 9am		13
	County composite				6
	County park shor				12
	Turtle Pond				31
	Skunk Hollow		lake		4
6/29/2000	Nugget USGS		1100-1400		2
	St park composite		8am-1pm		5
	State Park shore				13
	County composite				9
	County park shor				128
	Turtle Pond				11
	Skunk Hollow		lake		3
6/15/2000	Nugget USGS		steady		4
	St park composite		2000 cfs		13
	State Park shore		overnight		11
	County composite		and today		23

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	County park shor				14
	Turtle Pond				10
	Skunk Hollow				na
	Skunk Hollow				
5/25/2000	Nugget USGS	14:30		chili bar?	5
	St park composite				12
	State Park shore	11:30			9
	County composite				34
	County park shor	10:30			8
	Turtle Pond	13:20			63
	Skunk Hollow			composite	5
	Skunk Hollow			shore samples	23
5/10/2000	Nugget USGS	12:00	3,000	rain 5/6-7	6
	Mt. Murphy Br.	15:30		4,000 cfs on	11
	State Park shore	15:15		5/8/2009	14
	County composite	13:00		slightly turbid	12
	County park shor	13:00			16
	Turtle Pond	14:30			7
	Skunk Hollow	14:00		lake - center	31
3/31/2000	Nugget USGS	11:40	1900 cfs	clear flow	1
	State Park composite	13:30			0
	State Park shore				0
	County composite	13:00			1
	County park shor				1
	Turtle Pond	14:00			2
	Greenwood Ck		med flow		49
	Skunk Hollow	15:00	lake		2
	Skunk Hollow Ck		med flow		4
2/2/2000	Nugget USGS	11:20	1000 cfs	flow dropping	4
	State Park composite	12:45	1200	from 1450;	3
	State Park shore			river clear	5
	County composite	12:30	1200	since 1/29	5
	County park shor			dam control	4
	Turtle Pond	13:30	1400	since 1/28	3
	Skunk Hollow	14:00	500	no current	7
	Skunk Hollow Ck			good flow	23
1/25/2000	Nugget USGS	early pm	4700	2nd day of high	133

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	County park shor			flows;	118
	Turtle Pond			brown water;	139
	Skunk Hollow			shore samples	201
11/22/1999	Nugget USGS	13:00	1800-2000	4.7 gage	10
	State Park composite	13:45		river clear	7
	State Park shore				9
	County composite	14:00			12
	County park shor				8
	Turtle Pond	15:00			18
	Greenwood Ck			clear flow	308
	Skunk Hollow	15:45		some current	22
10/13/1999	Chili Bar shore	12:30			1
	Chili Bar composite	12:30			2
	St. Park composite	11:45	fish		6
	St. Park shore				6
	Beaver Point	11:00	fish		12
	HLP composite	11:20	"		7
	HLP shore				18
	Turtle Pond	10:30	"		7
	S Falls shore	10:00	lake		9
9/30/1999	nugget shore			resample 9/16	2
	State Park shore			high count	5
	49 bridge shore			at MGSHP	4
	County park shor				8
9/23/1999	State park shore	14:15	1900	"" ""	3
	49 bridge	15:00			3
	County Park sh	14:00			7
9/20/1999	Nugget shore	10:00		resample 9/16	4.1
	Coloma bridge	10:40		high count	145
	State park sh	10:45		at MGSHP	14.8
	County Park sh	11:00			8.6

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
9/19/1999	Chili Bar shore	12:00		""	7.4
	Coloma bridge s	15:00			9.7
	County Park	16:00			2
9/16/1999	Chili Bar composite	9:30	1000		2
	St. Park composite	12:30	1000+	flow increasing	12.2
	St. Park shore				1553
	Beaver Point	12:15	1000+		7.4
	HLP composite	13:00	1400		4
	HLP shore				43.9
	Camp Lotus shore				
	Turtle Pond	11:45	500	early ramp water	7.3
	S Falls shore	11:00		lake	0
9/4/1999	Nugget USGS	10:40			2
	St. Park composite	10:00			6
	St. Park shore				15
	Beaver Point	9:30			24
	HLP composite	8:00	fishflow		15
	HLP shore				40
	Camp Lotus shore				m
	Turtle Pond	9:15			12
	S Falls shore	8:40	lake		4

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
8/27/1999	Nugget USGS		1400 cfs 9:0(	begin ramp	no sample
	St. Park composite			@ 6:00	8
	St. Park shore				7
	Beaver Point				17
	HLP composite				18
	HLP shore				15
	Camp Lotus shore				no sample
	Turtle Pond				24
	S Falls shore				0
8/5/1999	Nugget USGS	13:00	400-1800	ramping	3?
	St. Park composite	11:15		begin @ 6am	1
	St. Park shore			1800 by 8 am	3
	Beaver Point	10:45			7
	HLP composite	11:00			7
	HLP shore				7
	Camp Lotus shore				
	Turtle Pond	10:20			5
	S Falls shore	9:50			0
7/22/1999	Nugget	12:10	800 cfs 7:00		4
	St. Park composite	11:05	1900 cfs		11
	St. Park shore		by 9:00		1
	Beaver Point	10:30			3
	HLP composite	10:40			12
	HLP shore				6
	Camp Lotus shore				
	Turtle Pond	10:10			5
	S Falls shore	9:34			2
7/8/1999	Nugget USGS	700 cfsovernight low @ 7:00			3
	St. Park composite	ramping to1800 cfs by 10:00			6
	St. Park shore				9
	Beaver Point				31
	HLP composite				6
	HLP shore				6
	Camp Lotus shore				4
	Turtle Pond				10
	S Falls shore				4
6/24/1999	Nugget USGS		1500-1800		3
	St. Park composite		in a.m		5

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	St. Park shore		ramping		3
	Beaver Point		to 3400		6
	HLP composite		btwn 13:00 & 16:00		7
	HLP shore				10
	Turtle Pond				10
	S Falls shore				2
6/1/1999	Nuggett USGS	12:00	4000	steady	
	County Park shore				5
	Camp Lotus				5
	Camp Lotus				1
	Turtle Pond	15:00	4000		1
5/25/1999	Nugget USGS	13:15	4500 7.5	4000-4500	10
	Coloma Bridge			turbid	20
	St. Park composite			milky	5
	St. Park shore	14:15		for	14
	HLP composite			several	13
	HLP shore	14:45		days	15
	Camp Lotus				206
	Turtle Pond	15:15			36
	S Falls lake	none			no data
	S Falls shore	none			no data
5/14/1999	Nugget USGS		4000	steady	no data
	Coloma Bridge			thru	""
	St. Park composite			days	""
	St. Park shore				""
	HLP composite				""
	HLP shore				""
	Turtle Pond				""
	S Falls lake				""
	S Falls shore				""
4/20/1999	Nugget USGS	15:30	4200, 6.85		2
	Coloma Bridge	15:00		steady	2
	St. Park composite	12:30		clear	1
	St. Park shore				2
	HLP composite	12:00			4
	HLP shore				3
	Turtle Pond	14:30			0

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
4/20/1999	S Falls lake	13:30	lake	current	6
	S Falls shore				3
4/1/1999	Nugget USGS	15:00	4000	ramp up pm	7
	St. Park composite	12:00	1800		3
	St. Park shore			flows	0
	HLP composite	11:30	1800	range fr/	1
	HLP shore			1800- 4000	5
	Turtle Pond	13:00	1800	lately	3
	S Falls shore	13:30	lake	rain 3/30	3
	Skunk Hollow ck	13:30	running		47
2/24/1999	Nugget USGS	14:25	3300, 5.7	slowly	2
	St. Park composite	11:15		dropping	1
	St. Park shore			clear	3
	HLP composite	10:45		3rd day	1
	HLP shore			since rain	1
	Turtle Pond	13:30			34
	S Falls shore	12:00			3
	Skunk Hollow ck				72
1/19/1999	Nugget USGS	10:30	3000	steady	96
	Nugget	10:45	"	silty,	119
	Big Canyon	11:15	"	follows	196
	St. Park shore	12:30	"	dry period	127
	HLP shore	12:00	"	"	141
	Turtle Pond	13:30	"	"	276
	Greenwood Ck	13:30	"	"	441
	S Falls shore	14:00	"	"	548

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
12/16/1998	Nugget	14:30	1900	steady	0
	St. Park -composite	15:00	1900		6
	St. Park - shore			steady	m
	HLP - composite	15:45	1900		11
	HLP -shore			steady	15
	Turtle Pond	10:30	200	steady	2
	Salmon Falls	11:15	lake		5
10/28/1998	Nugget	11:00	2000	inc	12
	St. Park -composite	11:30	1600	inc	40
	St. Park - shore				29
	HLP - composite	12:00	1500	inc	32
	HLP -shore				29
	Turtle Pond	12:30	700	inc	11
	Salmon Falls	13:30	lake	steady	38
9/27/1998	Nugget	13:30	800	dec	2
	St. Park -composite	12:30	1100	steady	12
	St. Park - shore	12:30	1100		7
	HLP - composite	11:30	1100	steady	14
	HLP -shore	11:30	1100		9
	Turtle Pond	10:00	700	inc	29
	Salmon Falls	9:30	lake		1
9/10/1998	Nugget	13:30	1600	steady	20
	St. Park -composite	11:00	1000	inc	36
	St. Park - shore				23
	HLP - composite	10:00	800	inc	11
	HLP -shore				13
	Turtle Pond	9:30	400	dec	11
	Salmon Falls	9:00	lake		1
8/30/1998	Nugget	10:00	1900	0900-2300	7
	St. Park -composite	12:00		flow	7
	St. Park - shore			duration	6
	HLP - composite	13:00			20
	HLP -shore				34
	Turtle Pond	m			5
	Salmon Falls	m	lake		1
8/16/1998	Nugget	12:30	1300	0800-2300	5
	St. Park -composite	11:30		flow	2

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	St. Park - shore			duration	6
	HLP - composite	10:00			1
	HLP -shore				7
	Turtle Pond				3
	Salmon Falls		lake		4
8/2/1998	Nugget	13:00	1600	24 hr	2
	St. Park -composite	12:00			1
	St. Park - shore				5
	HLP - composite	11:30			3
	HLP -shore				4
	Turtle Pond	10:00			15
	S.Falls shore	9:00	lake		3
7/19/1998	Nugget	13:00	2000	24 hr	2
	St. Park -composite	11:30			16
	St. Park - shore				20
	HLP - composite	12:30			50
	HLP -shore				58
	Turtle Pond	11:00			13
	Salmon Falls		lake		27
7/8/1998	Nugget	13:00	3800	24 hr	2
	St. Park -composite	11:00			1
	St. Park - shore				1
	HLP - composite	12:00			6
	HLP -shore				6
	Turtle Pond	11:30			39
	S. Falls shore		lake		na

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
6/18/1998	Nugget	15:30	6600	24hr	3
	St. Park -composite	13:00			1
	St. Park - shore				6
	HLP - composite	11:00			6
	HLP -shore				10
	Turtle Pond	14:45			11
	Salmon Falls		lake		10
6/3/1998	Nugget	15:45	4100	24 hr	7
	St. Park -composite	14:45			5
	St. Park - shore				4
	HLP - composite	12:00			19
	HLP -shore				11
	Turtle Pond	13:40			19
	S Falls shore				260
	S Falls composite	12:45	lake		19
5/20/1998	Nugget	13:00	3600	24 hr	2
	St. Park -composite	12:30			2
	St. Park - shore				2
	HLP - composite	12:00			1
	HLP -shore				1
	Turtle Pond	11:15			28
	S. Falls shore	10:30	lake		6
	S. Falls composite				na
5/7/1998	Nugget	3:30	3500	24 hr	172
	St Park composite	14:30			6
	St. Park - shore				13
	HLP - composite	11:40			2
	HLP - shore				8
	Turtle Pond	14:25			79
	S. Falls shore	13:15	lake		1986
	S. Falls composite				
12/15/1997	Nugget				46
	St. Park -composite		2000		58
	St. Park - shore				62
	HLP - composite		1200		48
	HLP - shore				36
	Turtle Pond				39
	S. Falls shore				na

South Fork American River Water Quality Monitoring Data

Date	Location	Time	Flow	Comment	E.coli
	S. Falls composite				
11/19/1997	St. Park -composite		150		25
	St. Park - shore				5
	HLP - composite				4
	HLP - shore				4
	Turtle Pond				6
	S. Falls shore				4
	S. Falls composite				3
10/21/1997	Nugget				12
	St. Park -composite				17
	St. Park - shore				19
	HLP - composite				13
	HLP - shore				19
	Turtle Pond				25
	S. Falls shore		150		na
9/24/1997	Nugget				5
	St. Park -composite				7
	St. Park - shore				9
	HLP - composite				7
	HLP - shore				12
	Turtle Pond				6
	S. Falls shore				15
8/30/1997	Nugget 1		910	steady	4
	Nugget 2				3
	Chili Bar				2
	Coloma Bridge				12
	Beaver Pt.				152
	Camp Lotus				11
	Bacchi				9
	S Falls				na

APPENDIX D

LABORATORY REPORT ON RESULTS OF LEACHING TESTS CONDUCTED ON KEMMERER SAMPLER

ToxScan Inc.

42 Hangar Way • Watsonville, CA 95076-2404 • (831) 724-4522 • FAX (831) 724-3188

5 April 2005

Mr. Lonn Maier
MS A352
SMUD
P.O. Box 15830
Sacramento, CA 95852-1830

Subject: Report on results of SMUD sampling device leaching tests

Dear Mr. Maier,

To address the source of suspicious results for Lead in previous sampling events, ToxScan was contracted to conduct a series of leaching tests on the sampling device SMUD personnel have used to collect water samples. Sampling was conducted according to a prescribed protocol developed by SMUD. A description of the sampling methods used is shown below.

On 21 March 2005, a glass 2.5 gallon bottle was used as a reservoir for the water used to conduct the leaching tests. The water used was the standard MilliQ-treated water used at the laboratory for all blanking studies conducted for in-house QC testing. While the container was being filled, a 500 mL plastic bottle was also filled. This bottle was from the same lot of precleaned bottles that would be used for the samples of the leaching procedures to follow. This sample was labeled "bottle blank". After the reservoir was full, a sample of the water was taken in separate containers for lead and hardness testing. These samples were labeled "reservoir blank".

The sampler was sampled by firmly securing the bottom stopper, filling the sampler with about one liter of reservoir water, securing the top stopper and agitating the water within the sampler for 5 minutes. Agitation was accomplished by both shaking and inversion of the sampler to insure complete contact with all internal surfaces. The samples for lead and hardness were taken from the petcock in the bottom stopper of the sampler by screwing it into the sampler to release a flow of water. The first sample was labeled "sample 1" with the time and date of sampling. After collection of the samples, the excess water in the sampler was discarded, the stoppers reinserted and the sampler allowed to stand at ambient temperature on the lab bench. No additional rinsing was done.

The above sampling procedure was repeated three more times at one-hour intervals to generate samples 2, 3, and 4. Following that, the sampler was filled again and allowed to stand vertically for approximately 18 hours. Following agitation for 5 minutes, samples 5 were drawn from the sampler through the petcock.

To check to see if there could be an additional source of lead in the samples, the messenger and rope were also subjected to leaching procedures. The messenger was agitated by swirling and dipping in and out of one liter of the reservoir water for 5 minutes. This sample was labeled "messenger blank" and would be tested for total lead only. The rope was sampled by inserting about 22-23 feet of the rope immediately above the sampler into two liters of water and moving the rope around for 5 minutes with a cleaned glass stirring rod. This sample was labeled "rope blank" and would also only be tested for total lead.

All samples taken from the sampler as well as the reservoir blank were analyzed for both total and dissolved lead by two different techniques. Before and after filtration, samples were prepared by a full digestion/concentration technique as has been used routinely on previous sampling events. In addition, samples were run "straight", which means that they were acidified but not digested or concentrated. That meant that the 6 samples taken produced 24 different results. The bottle blank was analyzed for total lead, concentrated only, while the messenger and rope blanks were analyzed for total lead by both concentration and straight techniques. Samples for hardness were run as totals only.

The results for the analyses are shown in the attached table. It is clear from these results that the sampler is quite contaminated with lead. From the results of the messenger blank sample, it would appear that it is the source of the contamination. In looking at the data, several trends are apparent. First, the results of the unfiltered samples (total) are higher than the filtered samples (dissolved). That is somewhat strange since the water used had no particulates whatsoever. Secondly, the concentrated samples were generally lower than the corresponding straight samples. This is less apparent at lower concentrations. With the exception of the reservoir blank, most of the differences between the four different analyses for each sample are less than the 20% RPD "allowed" in the laboratory QC criteria for duplicates. As would be expected, the hardness values were all less than the reporting limit of 1 ppm.

In looking at the different data, it is apparent that the water used had a very low concentration of lead. Both the bottle blank and digestion blank had values less than 20 ppt. The filter blank was somewhat larger at 39 ppt, but still less than the reporting limit of 50. The reservoir blank, however, showed a considerably larger blank hit at about 130 ppt, presumably from the container used to hold the reservoir water. While the container was thoroughly cleaned and rinsed many times with reagent water, it was not soaked in acid. Even though the reservoir water did contain a small background level of lead, the contribution to the sample hits was negligible.

Thank you for the opportunity to conduct this special study for SMUD. It obviously was important and definitive. If you have any questions or comments, please do not hesitate to notify me.

Respectfully,

Philip D. Carpenter

Philip D. Carpenter, Ph.D.
President

Table 1. Results for SMUD sampling devise.

Sample	Dissolved / Concentrated	Total / Concentrated	Dissolved / Straight	Total / Straight	Hardness
Reservoir Blank	0.085	0.13	0.082	0.13	ND
Bottle Blank	na	0.013	na	na	ND
1st Sample	43.7	51.5	47.9	57.6	ND
2nd Sample	14.2	14.7	15.5	17.2	ND
3rd Sample	12.3	13.0	13.0	15.3	ND
4th Sample	11.3	12.2	12.4	13.7	ND
5th Sample	67.1	69.5	74.3	77.9	ND
Messenger Blank	na	246	na	276	na
Rope Blank	na	5.17	na	5.86	na
Filter Blank	0.039	na	0.003	na	na
Digestion Blank	na	0.017	na	na	na

Units are in ppb
na = Not Analyzed

Sacramento Municipal Utility District PO Box 15830, MS A352 Sacramento CA, 95852-1830	Project: UARP Project Number: SMUD Sampler Project Manager: Lonn Maier	T503027 Reported: 4/5/2005

Metals (Dissolved) by EPA 200.8 - Quality Control

ToxScan Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch TC53002 - EPA 200 Series											
Blank (TC53002-BLK1)					Prepared & Analyzed: 03/29/05						
Lead	0.0391	0.012	0.050	ug/l							J
Blank (TC53002-BLK2)					Prepared & Analyzed: 03/29/05						
Lead	ND	0.024	1.0	ug/l							
LCS (TC53002-BS1)					Prepared & Analyzed: 03/29/05						
Lead	24.6	0.024	0.050	ug/l	25.0		98.4	70-130			
LCS Dup (TC53002-BSD1)					Prepared & Analyzed: 03/29/05						
Lead	24.8	0.024	0.050	ug/l	25.0		99.2	70-130	0.810	20	
Duplicate (TC53002-DUP1)		Source: T503027-05			Prepared & Analyzed: 03/29/05						
Lead	12.3	0.012	0.050	ug/l		12			2.47	20	
Matrix Spike (TC53002-MS1)		Source: T503027-05			Prepared & Analyzed: 03/29/05						
Lead	24.4	0.012	0.050	ug/l	12.5	12	99.2	70-130			
Matrix Spike Dup (TC53002-MSD1)		Source: T503027-05			Prepared & Analyzed: 03/29/05						
Lead	24.3	0.012	0.050	ug/l	12.5	12	98.4	70-130	0.411	20	
Reference (TC53002-SRM1)					Prepared & Analyzed: 03/29/05						SW-03
Lead	90.0	0.60	5.0	ug/l	86.1		105	75-125			
Reference (TC53002-SRM2)					Prepared & Analyzed: 03/29/05						SW-03
Lead	87.8	0.12	1.0	ug/l	86.1		102	75-125			
Reference (TC53002-SRM3)					Prepared & Analyzed: 03/29/05						SW-03
Lead	87.3	0.60	5.0	ug/l	86.1		101	75-125			

Sacramento Municipal Utility District	Project: UARP	T503027
PO Box 15830, MS A352	Project Number: SMUD Sampler	**Reported:**
Sacramento CA, 95852-1830	Project Manager: Lonn Maier	4/5/2005

Metals (Dissolved) by EPA 200.8 - Quality Control

ToxScan Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch TC53002 - EPA 200 Series											
Reference (TC53002-SRM4)					Prepared & Analyzed: 03/29/05						SW-03
Lead	84.9	0.12	1.0	ug/l	86.1		98.6	75-125			

Sacramento Municipal Utility District PO Box 15830, MS A352 Sacramento CA, 95852-1830	Project: UARP Project Number: SMUD Sampler Project Manager: Lonn Maier	T503027 Reported: 4/5/2005

Metals (Total Recoverable) by EPA 200.8 - Quality Control

ToxScan Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch TC53001 - EPA 200 Series											
Blank (TC53001-BLK1)					Prepared & Analyzed: 03/29/05						
Lead	0.0166	0.012	0.050	ug/l							J
LCS (TC53001-BS1)					Prepared & Analyzed: 03/29/05						
Lead	23.2	0.024	0.050	ug/l	25.0		92.8	70-130			
LCS Dup (TC53001-BSD1)					Prepared & Analyzed: 03/29/05						
Lead	23.6	0.024	0.050	ug/l	25.0		94.4	70-130	1.71	20	
Duplicate (TC53001-DUP1)		Source: T503027-05			Prepared & Analyzed: 03/29/05						
Lead	13.1	0.012	0.050	ug/l		13			0.766	20	
Matrix Spike (TC53001-MS1)		Source: T503027-05			Prepared & Analyzed: 03/29/05						
Lead	26.9	0.012	0.050	ug/l	12.5	13	111	70-130			
Matrix Spike Dup (TC53001-MSD1)		Source: T503027-05			Prepared & Analyzed: 03/29/05						
Lead	27.1	0.012	0.050	ug/l	12.5	13	113	70-130	0.741	20	
Reference (TC53001-SRM1)					Prepared & Analyzed: 03/29/05						SW-03
Lead	87.3	0.60	5.0	ug/l	86.1		101	75-125			
Reference (TC53001-SRM2)					Prepared & Analyzed: 03/29/05						SW-03
Lead	84.9	0.12	1.0	ug/l	86.1		98.6	75-125			
Reference (TC53001-SRM3)					Prepared & Analyzed: 03/29/05						SW-03
Lead	84.2	0.60	5.0	ug/l	86.1		97.8	75-125			
Reference (TC53001-SRM4)					Prepared & Analyzed: 03/29/05						SW-03
Lead	81.7	0.12	1.0	ug/l	86.1		94.9	75-125			

Notes and Definitions

J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
SW-03	Environmental Resource Associates Lot # S058-697
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the MDL
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference