*****FINAL*****

FY 02-03 Workplan
Surface Water Ambient Monitoring Program (SWAMP)
Lahontan Region

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EXECUTIVE SUMMARY

The Surface Water Ambient Monitoring Program (SWAMP) was first funded by the California Legislature in year 2000. The program relies primarily on contractors to collect information on the quality of the State's waters.

The Lahontan RWQCB is expected to receive approximately 1 staff position (PY) and $316,526 in contract funds for the SWAMP program in FY 02-03. This is $20,000 less than the contract allocation for FY 01-02, and $35,000 less than the contract allocation for FY 00-01. Given the limited funding, staff of the Lahontan RWQCB plans to continue (at reduced levels) the Region's existing water column sampling and bioassessment programs. The following table depicts the breakdown of planned contract expenditures:

Contract Purpose	Contractor	Amount
Surface water sampling	U.S. Geological Survey	$150,526
Bioassessment	U.C. Santa Barbara (SNARL)	$129,000
Student Assistants	Community College Foundation	$30,000
Miscellaneous water analyses	To be determined	$7,000
	TOTAL	**$316,526**

U.S. Geological Survey, $150,526
The available funds are sufficient for quarterly sampling at approximately twenty-five sites. The suite of analytes tested at each site is based upon the applicable Basin Plan objectives for that site, so that the information gathered can be directly compared to the most relevant water quality standards.

U.C. Santa Barbara, Sierra Nevada Aquatic Research Lab (SNARL), $129,000
The Lahontan Region will continue an effort begun in 1999 to establish "reference conditions" for streams in the eastern Sierra Nevada, and to develop indices of biological integrity based on benthic macroinvertebrate and algae assemblages.

Community College Foundation, $30,000
Student Assistants will be hired to aid with sample collection & processing, data entry, and data base management.

RWQCB Contract Lab, to be determined, $7,000
RWQCB staff & Student Assistants will collect synoptic water samples (for nutrients, hardness, sulfate, silica, etc.) at sites where bioassessment sampling is conducted by UC-SNARL, and transport those samples to a contract laboratory for analyses.

Introduction

History and Background

The Porter-Cologne Water Quality Control Act and the federal Clean Water Act direct that water quality protection programs be implemented to protect and restore the chemical, physical, and biological integrity of the state's waters. California Assembly Bill 982 (Water Code Section 13192; Statutes of 1999) requires the State Water Resources Control Board (SWRCB) to assess and report on the State's water quality monitoring programs.

AB 982 envisions that ambient monitoring be independent of other water quality regulatory programs, and serve as a measure of: (1) the overall quality of the State's water resources, and (2) the overall effectiveness of the prevention, regulatory, and remedial actions taken by the SWRCB and the nine Regional Water Quality Control Boards (RWQCBs). To implement this directive, limited funding for ambient water quality monitoring was allocated to the SWRCB and RWQCBs beginning in State Fiscal Year 2000-2001.

AB 982 also required the SWRCB to prepare a proposal for a comprehensive surface water quality monitoring program. That proposal, entitled *Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program*, was transmitted to the State Legislature on November 30, 2000. At this writing, funding has not been appropriated to fully implement that plan.

Using the available funding, the SWRCB has created the Surface Water Ambient Monitoring Program (SWAMP). The SWAMP is a new program that is intended (to the extent that funding is available) to provide measures of the State's ambient water quality and the effectiveness of the State's water quality protection programs.

The SWAMP program relies primarily on contractors to collect information on the quality of the State's waters. Limited RWQCB staff time is spent largely on programmatic (i.e., planning, contracting) issues; little staff time is available for sample collection or data analyses.

Goals and objectives of the year's monitoring

The goals and objectives of this year's SWAMP monitoring by the Lahontan Region are twofold. The first objective is to determine—using a region-wide network of sampling stations—whether ambient water quality achieves the chemical and physical water quality objectives contained in the *Water Quality Control Plan for the Lahontan Region* ("Basin Plan") for the monitored sites. The second objective is to continue an effort begun in 1999 to establish indices of biological integrity for streams in the eastern Sierra Nevada based on instream benthic macroinvertebrate and algae assemblages.

What this data will be used for

The data will be available and utilized for the entire suite of the RWQCB's regulatory and restoration efforts. For example, the data will be used to assess water bodies for compliance with relevant standards; to evaluate the effectiveness of permit conditions, watershed management programs, and nonpoint source programs; and to assist in developing remedial strategies when necessary.

Water bodies to be monitored and type of habitat they represent

Monitoring of chemical and physical parameters will occur at stations located throughout the Region. These stations represent the entire suite of diverse habitats found throughout the Lahontan Region, including alpine, subalpine, montane, mixed conifer forest, high desert, and low-elevation desert. Bioassessment monitoring will focus on the eastern Sierra Nevada, from the Truckee River watershed in the north, to the Owens River watershed in the south, including primarily montane and mixed conifer forested habitat types. A preliminary list of water bodies to be sampled during FY 02-03 is found in Attachment #1 ("Beneficial Uses and Monitoring Objectives"). Further information regarding the specific analytes and parameters to be sampled/measured is included in Attachment #2 ("USGS Surface Water Monitoring").

Description of watersheds & water bodies

Background

The Lahontan Region is the second largest region in California. (Only the Central Valley Region is larger.) The Lahontan Region spans eastern California from the Oregon border in the north to the Mojave Desert in the south. The Region is nearly 600 miles long and has a total area of more than 33,000 square miles. It includes the highest point (Mount Whitney, +14,494 ft.) and lowest point (Badwater, Death Valley, –282 ft.) in the contiguous United States, more than 3,000 miles of streams, and more than 700 lakes.

The economy of the Region is based largely on recreation and tourism; other major economic sectors include agriculture (i.e., livestock grazing, silviculture), resource extraction (i.e., mining, energy production), and defense-related activities.

Due to the size of the Region, its north-to-south extent of nearly 600 miles, and the variety of elevations, the Lahontan Region contains diverse habitats, ranging from alpine mountain environments that receive heavy snowpack each year, to low-elevation, dry deserts. There is also a great range of habitats, precipitation regimes, and ecosystem types in between these two extremes.

Because of its size and diversity, the limited funding under SWAMP, and because the Lahontan RWQCB has adopted discrete numeric water quality objectives that apply to specific locations throughout the Region (as identified in the Basin Plan), the Lahontan Region has elected not to employ the probabilistic or "rotating basin" approaches being utilized by some other (smaller) RWQCBs. The Lahontan Region has instead implemented a monitoring strategy similar to the other large regions in California (e.g., the Central Valley and North Coast regions) by using its limited SWAMP funding to establish a core network of long-term water monitoring stations throughout the entire Region. The Lahontan Region's water monitoring stations have been established primarily at locations where discrete numeric water quality objectives have been adopted, and where little or no monitoring has occurred in recent decades. This approach will allow the Lahontan Region to make more rapid and definitive assessments of the extent to which the sampled waters are meeting standards, because sampling results can be directly compared to relevant standards. Staff at the Lahontan Region recognize that a probabilistic and/or rotating basin sampling approach could provide a more robust estimate of the percentage of water bodies that meet (vs. violate) standards, but such approaches would require substantially more funding and staff resources.

Although the water column monitoring stations are dispersed broadly throughout the Lahontan Region, the Region is focusing its bioassessment efforts on a more limited area. ("Bioassessment" is defined as an assessment of the biological integrity of water bodies based on direct sampling of the assemblages of instream flora and/or fauna.) The Region's bioassessment monitoring is currently focused within six major watershed basins in the center of the Region (e.g., Truckee River, Lake Tahoe, Carson River, Walker River, Mono Basin, Upper Owens River). This central portion of the Region contains special resources, such as two designated Outstanding National Resource Waters (i.e., Lake Tahoe, Mono Lake), and key habitat for threatened aquatic species (i.e., Lahontan cutthroat trout, Paiute cutthroat trout, Yosemite toad, mountain yellow-legged frog, and others). This area also has numerous (approximately 50) water bodies that are listed as having impaired water quality. The reason for focusing on this area is to develop biological "reference conditions" for streams in the eastern Sierra. Establishment of reference conditions is a necessary first step toward developing indices of biological integrity that can be used to assess the current degree of support for aquatic life uses, and as a regulatory mechanism (e.g., "biocriteria," permit conditions, numeric targets for TMDLs) to ensure healthy stream ecosystems.

Beneficial uses, monitoring objectives, and indicators

The SWRCB's November 30, 2000, *Report to the Legislature* contains a comprehensive suite of potential monitoring objectives for the SWAMP. The objectives and associated beneficial uses of water for each sample location within the Lahontan Region are found in Attachment #1 ("Beneficial Uses and Monitoring Objectives").

A variety of water quality indicators will be used, as listed in Attachment #1. A tentative list of specific chemical analytes and physical parameters to be measured at each surface water sampling station are listed in Attachment #2 ("USGS Surface Water Monitoring"). Additional water quality indictors will be used for bioassessment studies. The bioassessment indicators being explored for use by the Lahontan Region are benthic macroinvertebrates, periphyton, and chlorophyll-a.

Overview of available information

The SWRCB's suggested workplan guidance requests that each RWQCB compile and present an overview of all available information for the water bodies and watersheds where SWAMP-funded sampling will occur. This would be a massive undertaking for the Lahontan Region, because the region-wide sampling approach taken by the Region would necessitate a summary of available information for every hydrologic unit throughout the Region. The RWQCB does not have sufficient staff resources to perform such a comprehensive task at this time. The Lahontan RWQCB maintains a library at its South Lake Tahoe office. There is much information contained in its library and other files, and available from other sources. The Lahontan RWQCB will conduct a review of available information as time and staff resources allow. Some general watershed information is presented below.

General watershed information

For purposes of watershed management, the Lahontan Region is divided into six geographic areas or Watershed Management Areas (WMAs). These WMAs are:

- **Northern WMA** (includes the following HUs: Cowhead Lake, Surprise Valley, Bare Creek, Cedarville, Fort Bidwell, Duck Flat, Smoke Creek, Madeline Plains, Susanville, Little Truckee River, Truckee River)
- **Lake Tahoe Basin WMA** (includes Lake Tahoe HU)
- **Carson/Walker WMA** (includes the following HUs: West Fork Carson River, East Fork Carson River, West Walker River, East Walker River)
- **Mono/Owens WMA** (includes the following HUs: Mono, Adobe, Owens, Fish Lake, Deep Springs, Eureka, Saline, Race Track, Amargosa, Pahrump)
- **Mojave WMA** (includes the following HUs: Mojave, Broadwell)
- **Antelope Valley/Other Southern Watersheds** (includes the following HUs: Mesquite, Ivanpah, Owlshead, Leach, Granite, Bicycle, Goldstone, Coyote, Superior, Ballarat, Trona, Coso, Upper Cactus, Indian Wells, Fremont, Antelope, Cuddeback)

Northern Watersheds Management Area. In the Surprise Valley (Modoc County) and Susan River (Lassen County) watersheds, there are likely some impacts from limited agriculture (alfalfa, some row crops). In the Susanville area of Lassen County, additional nonpoint source impacts are from urban runoff, construction-related impacts from land development, roads, timber harvest, use of herbicides for silviculture and weed control, and septic systems. Impacts to wetlands and riparian areas from fill or channelization is also a concern.

In the Truckee River watershed (Nevada County), nonpoint source impacts are from timber harvests, grazing, ski areas and other recreation, transportation corridors (railways and roads), urban runoff and construction-related impacts from land development. Sediment resulting from hydromodification activities such as reservoir management, is also a concern, as are impacts to wetlands and riparian areas from fill or channelization.

Lake Tahoe Watershed Management Area. In the Lake Tahoe basin (El Dorado and Placer counties), nonpoint source impacts are from ski areas and other recreation, timber harvests, grazing, roads, urban runoff and construction-related impacts from land development. Sediment from shoreline erosion from operation of Lake Tahoe as a reservoir, is also a concern. Also of concern are impacts to wetlands and riparian areas from fill or channelization.

Carson-Walker Watersheds Management Area. In the Carson River watershed (Alpine County), nonpoint source impacts are from recreation, timber harvests, grazing, roads, use of herbicides for weed control, and numerous abandoned mines. Also of concern are impacts to wetlands and riparian areas from fill or channelization.

In the Walker River watershed (Mono County), nonpoint source impacts are from recreation, timber harvests, grazing, roads, use of herbicides for weed control, septic systems, and abandoned mines. Also of concern are impacts to wetlands and riparian areas from fill or channelization, as well as impacts from operation of the Bridgeport Reservoir.

Mono-Owens Watersheds Management Area. In the Mono basin (Mono County), nonpoint source impacts are mainly from grazing, roads, and hydromodification due to water exports. There are some concerns from operation of Grant Lake as a reservoir, impacts from small hydroelectric plants, recreation including the ski area at June Mountain, and urban runoff. Also of concern are impacts to wetlands and riparian areas from fill or channelization.

In the upper Owens River watershed (Mono County), nonpoint source impacts are from recreation, grazing, roads, and hydromodification due to water exports and reservoir management. Also of concern are impacts to wetlands and riparian areas from fill or channelization. In the Town of Mammoth Lakes, additional concerns are from urban runoff and construction-related impacts from land development.

In the lower Owens River watershed (Inyo County), nonpoint source impacts are from recreation, grazing, roads, septic systems, and hydromodification due to water exports and reservoir management. Also of concern are impacts to wetlands and riparian areas from fill or channelization. In the City of Bishop, additional concerns are from urban runoff and construction-related impacts from land development.

Mojave Watershed Management Area. In the Mojave River watershed (San Bernardino County), nonpoint source issues relating to overdraft of the ground water are of concern, including impacts to wetlands and springs. Confined animal facility impacts (as from dairies and chicken farms) are of concern, as are impacts from other agricultural activities. The area is generally in transition from predominately agricultural to urban. Thus, the nonpoint source concerns are shifting towards urban runoff and construction-related impacts from land development. Other concerns include efforts to eradicate invasion of exotic plants and animals, as well as flood control projects.

Antelope Valley/Other Southern Watersheds Management Area. In these watersheds, land development issues (urban runoff, septic systems) contribute to nonpoint source pollution. One confined animal facility is of concern. Historic agricultural use was mainly alfalfa; more common current crops are row crops such as carrots. Pesticide management and irrigation return water management are nonpoint source concerns. Ground water percolation and ground water overdraft are also issues. Some timber harvest occurs. Two small ski areas are proposed for expansion; snowmaking could become an issue. Habitat loss from deforestation following wildfires is also of concern.

General study design

Overview of general approach

Water sampling. The Lahontan Region is using an approach of investigator pre-selected sites. This approach is termed “directed” sampling. Sample locations for both water sampling and bioassessment are selected based on accessibility (i.e., public access must be available). While a probability-based (i.e., random) site-selection approach would provide a more robust estimate of the extent to which water bodies in the region attain (or violate) water quality standards, such probabilistic sampling would be far more expensive, and is not feasible within current budget constraints. Probabilistic sampling is more expensive for two key reasons: First, randomly selected sites would occur across the landscape, including on private lands. Considerable staff time would be needed to locate access and to obtain permission to sample on private lands, while most sites sampled under the "directed" approach will have easy (i.e., public) access. Second, a probabilistic approach would require substantial staff time for data analysis, which is not currently available.

Water sampling stations have been established throughout the Lahontan Region, including at least one station within most major hydrologic units. At each water sampling station, data on chemical and physical water quality is collected. Sampling will be conducted quarterly at most stations, except for lakes and desert springs, where samples will generally be collected twice per year. (Lakes are most appropriately sampled during "turnover," when the water column is mixed, which generally occurs during the spring and fall seasons. And the chemistry of most desert springs changes little over the course of a year, so it is more cost-effective to sample less often for a larger suite of analytes than to sample more often for fewer analytes.)

The analytes/parameters measured at each water sampling station generally include those chemical and physical analytes/parameters for which region-wide or site-specific standards have been adopted to protect beneficial uses of water, as found in the Basin Plan. Because the modest funding available under SWAMP is not sufficient to conduct exhaustive sampling or data analysis, the list of analytes is tailored to each site in order to streamline the analysis process. That is, an unique list of analytes has been selected for each site so that the data can be directly compared to the applicable water quality objectives adopted for that site.

Bioassessment. The current focus of the Region's bioassessment sampling is to establish "reference conditions" for streams in the eastern Sierra Nevada. Sampling is conducted at investigator-selected sites that are believed to be minimally-impaired. Selected sites are sampled synoptically for benthic macroinvertebrates, periphyton (i.e., attached algae & diatoms), and selected water chemistry parameters.

How data will be analyzed

The chemical and physical data gathered at water sampling stations will be directly compared to the objectives contained in the Basin Plan to assess compliance with water quality standards. Bioassessment data will be analyzed to yield conclusions on taxonomic composition (e.g., density, diversity, biotic index, presence or absence of indicator taxa, dominance of functional groups), in order to facilitate the eventual development of "reference conditions" and indices of biological integrity for eastern Sierra streams.

Specific study design & activities planned

Number of stations

During FY 02-03, the USGS will conduct water and sediment sampling at approximately twenty-five (25) stations located throughout the Lahontan Region, as detailed in Attachment #2 ("USGS Surface Water Sampling"), and UC-SNARL will conduct bioassessment sampling at approximately twenty (20) stations located throughout the eastern Sierra. (The locations for bioassessment sampling are yet to be determined.)

Types and numbers of samples

Surface water sampling by U.S. Geological Survey (USGS). The Lahontan Region will contract with the USGS to conduct surface water sampling at selected sites. The sites include streams, lakes, and desert springs. Sampling will generally be conducted four (4) times per year at each site, following standard USGS protocols for sample collection, handling, processing, preservation, and analysis. A tentative list of sites and analytes is included in Attachment #2 ("USGS Surface Water Monitoring"). That attachment includes sites to be sampled between summer 2002 and spring 2003, using FY 01-02 SWAMP funds. Sampling using FY 02-03 funds will begin during the summer of 2003, when the FY 01-02 funds have been exhausted. Sample locations and analytes for the FY 02-03 funds will be similar to those in Attachment #2, but have not been finalized.

Bioassessment. Using FY 02-03 funds, the Lahontan RWQCB will execute a contract with the University of California, Sierra Nevada Aquatic Research Lab (UC-SNARL) primarily to compile and analyze existing bioassessment data sets, although several new stations may be added/sampled. Any bioassessment sampling conducted at new sites will also include detailed physical habitat measurements.

Bioassessment sampling to be conducted during FY 02-03 will include sixteen (16) sites using FY 00-01 SWAMP funds (contract #00-091-160-0) and additional sites, as time allows, using FY 01-02 SWAMP funds (contract #01-119-160-0). Any sampling to be conducted using FY 02-03 funds would begin during the summer of 2003. (This "staggered" approach is necessary because the index period for bioassessment sampling in the Lahontan Region is mid-June through mid-September, and it is not possible to execute contracts in time for sampling to occur using the current FY's funds.) The number and location of sites to be sampled using FY 02-03 funds, and the specific method(s) have not been determined.

The Lahontan Region has executed a contract with UC-SNARL (#9-191-160-0), using funding sources other than SWAMP, to evaluate three common methods for collecting bioassessment information. The results of that study will be used to inform the decision regarding the methods by which bioassessment samples will be collected in the future. Pending the results of that "methods comparison" study, bioassessment (and physical habitat) data collection will follow the protocols specified in the above-referenced contracts, and detailed at: http://www.swrcb.ca.gov/rwqcb6/files/QAPP/QAPP.htm.

Bioassessment data will be analyzed to yield conclusions on taxonomic composition (e.g., density, diversity, biotic index, presence or absence of indicator taxa, dominance of functional groups), in order to facilitate the development of "reference conditions" and indices of biological integrity for eastern Sierra streams.

Surface water sampling by RWQCB staff. Staff of the Lahontan Region will strive to collect synoptic surface water samples at each of the sites where bioassessment samples are collected by UC-SNARL. Samples will be collected for nutrients, dissolved calcium, dissolved magnesium, dissolved silica, and sulfate. Standard operating procedures (SOPs) for surface water sampling by RWQCB staff have been developed and will be followed. A copy of the SOPs is attached to this workplan (Attachment #3). A contract will be executed with a private laboratory (to be determined) to conduct analyses of the samples collected by RWQCB staff.

Notes: A preliminary list of water bodies to be sampled during FY 02-03 is found in Attachment #1 ("Beneficial Uses and Monitoring Objectives"). Further information regarding specific analytes to be sampled and measured is included in Attachment #2 ("USGS Surface Water Monitoring"). All of the USGS and bioassessment sampling to occur during FY 02-03 is being funded using SWAMP funds from FYs 00-01 and 01-02. This is due to the time lag in executing contracts, as discussed above. Bioassessment sampling and analyses (by UC-SNARL) and water sampling (by USGS) utilizing FY 02-03 funds will begin during spring or summer of 2003. Therefore, the water bodies to be sampled by USGS and UC-SNARL using FY 02-03 funds have not been determined.

How stations will be designated

All sample locations will be designated by recording digital coordinates with a hand-held global positioning system (GPS) device. The latitude/longitude or Universal Transverse Mercator (UTM) coordinates will be recorded at each sampling location.

Quality assurance procedures

Quality assurance and quality control (QA/QC) procedures will be specified in a Quality Assurance Project Plan (QAPP) that is currently being developed for the state-wide SWAMP program by contractors working for the SWRCB. Once that state-wide QAPP is completed, all procedures in the QAPP will be followed by the Lahontan Region. In the interim (i.e., until the SWAMP QAPP is completed and approved by SWRCB staff), quality assurance procedures developed by each contractor (e.g., USGS, UC-SNARL) will be followed.

The U.S. Geological Survey (USGS) will follow all quality assurance procedures as documented in its "National Field Manual for the Collection of Water Quality Data" (USGS, TWRI Book 9).

Bioassessment and physical habitat data collection by UC-SNARL will follow the protocols and quality assurance procedures detailed in a QAPP prepared specifically for bioassessment, located at: http://www.swrcb.ca.gov/rwqcb6/files/QAPP/QAPP.htm.

Standard operating procedures (SOPs) for surface water sampling by RWQCB staff have been developed and will be followed. A copy of the SOPs is attached to this workplan (Attachment #3).

Description of deliverable products

The USGS and UC-SNARL will be required to provide the following deliverables to the Lahontan RWQCB: (1) quarterly progress reports; and (2) final reports that include the data collected under the contracts described above. The other contract analytical lab(s) will be required to provide the following: (1) analytical data for water samples, and (2) QA/QC data and results. Copies of the final USGS and UC-SNARL reports will also be provided to the State Water Resources Control Board by the Lahontan RWQCB.

Anticipated Milestones

Due to the lag time in executing contracts to encumber funds that became available during the first year of SWAMP (i.e., FY 00-01), actual sampling under the SWAMP program did not begin until Summer 2001. Therefore, the first two years of data will not be available for analysis until after Summer 2003. It is anticipated that two years of data will be available (i.e., returned from the contractors and analytical labs after completion of QA/QC) for analysis by RWQCB staff sometime during the fall or winter of 2003. An interpretive report summarizing the findings of the first two years of SWAMP data is anticipated by June 30, 2004. A relative schedule of sampling and reporting is as follows:

FY 02-03:
Water sampling by USGS using FY 01-02 funds
Bioassessment sampling by UC-SNARL using FY 00-01 and FY 01-02 funds
Synoptic water sampling by RWQCB staff using FY 02-03 funds

FY 03-04:
Water sampling by USGS using FY 02-03 funds
Bioassessment sampling by UC-SNARL using FY 01-02 and FY 02-03 funds
Synoptic water sampling by RWQCB staff using FY 03-04 funds
Receive all data from contractors for FYs 00-01 and 01-02 (by 12/31/03)
Produce interpretive report on first two years of SWAMP data (by 06/30/04)*
(Note: * = subject to adequate funding for analysis of data, not currently available)

Budget

The total amount available to the Lahontan Region for SWAMP contracts during FY 02-03 is $316,526. That amount will be distributed among four (4) contracts as depicted in the following table:

Contract Purpose	**Contractor**	**Amount**
Surface water sampling	U.S. Geological Survey	$150,526
Bioassessment	U.C. Santa Barbara (SNARL)	$129,000
Student Assistants	Community College Foundation	$30,000
Miscellaneous water analyses	To be determined	$7,000
	TOTAL	**$316,526**

As discussed in the Specific Study Design (above), a variety of bioassessment methods may be used, depending on the outcome of the "methods comparison study" that is currently underway. The level of effort and cost per sample for bioassessment will vary depending on travel time, collection/analysis method used, number of organisms in the sample, and whether (and what type of) associated physical habitat data is collected.

At this time, the Lahontan RWQCB does not expect to receive significant budget allocation(s) for FY 02-03 under other monitoring programs (e.g., Toxic Substances Monitoring Program, Mussel Watch).

Working Relationships

The following decision matrix illustrates the general relationships for implementing SWAMP.

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
Develop contract(s) for monitoring services.	●	●	●
Identify water bodies or sites of concern and clean sites to be monitored.		●	
Identify site-specific locations with potential beneficial use impacts or unimpacted conditions that will be monitored.		●	
Decide if concern is related to objectives focused on location or trends of impacts.		●	
Select monitoring objective(s) based on potential beneficial use impact(s) or need to identify baseline conditions.		●	
Identify already-completed monitoring and research efforts focused on potential problem, monitoring objective, or clean conditions.		●	●
Make decision on adequacy of available information.		●	●
Prepare site-specific study design	● (Work Plan Review	●	●

Task	Responsible Organization		
	SWRCB	RWQCBs	Contractors
based on monitoring objectives, & assessment of available info, sampling design, and indicators.	Role)		
Implement study design. (Collect and analyze samples.)		●	●
Track study progress. Review quality assurance information and make assessments on data quality. Adapt study as needed.	● (Review Role)	●	●
Report data through SWRCB web site.	●	● (Coordination Role)	●
Prepare written report of data.	●		●

Attachment #1, Lahontan Region SWAMP Workplan (FY 02-03)

Beneficial Uses & Monitoring Objectives (p. 1 of 3)					
Station Name Hydro Unit #	**Beneficial Use(s)**	**Monitoring Objective(s)** (1)	**Frequency**	**Category**	**Indicator(s)** (2)
Mill Creek at Upper Lake (near Lake City) 641.30	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Bidwell Creek 641.30	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Cedar Creek (near Cedarville) 641.20	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Susan River above confluence w/ Willard Cr 637.20	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Susan River near Litchfield 637.20	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
West Fork Carson River at Hope Valley 633.00	MUN, AGR, REC-2, COLD, WILD, RARE	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
East Carson River below Markleeville 632.10	MUN, AGR, REC-2, COLD, WILD, RARE	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
West Walker River at Coleville 631.10	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Robinson Cr below Barney Lake 630.40	MUN, REC-2, COLD, WILD	2, 20	Twice/year	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Buckeye Cr above Eagle Cr 630.40	MUN, REC-2, COLD, WILD	2, 20	Twice/year	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment

Notes: 1. Monitoring Objectives: From 11/30/00 Report to the Legislature, Section VI (attached)
2. Indicator: From 11/30/00 Report to the Legislature, Section VII, Table 3, Pages 33-35

Beneficial Uses & Monitoring Objectives (p. 2 of 3)					
Station Name Hydro Unit #	**Beneficial Use(s)**	**Monitoring Objective(s)** (1)	**Frequency**	**Category**	**Indicator(s)** (2)
Virginia Cr at Conway Summit 630.40	MUN, REC-2, COLD, WILD	2, 20	Twice/year	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Green Cr above Campground 630.40	MUN, REC-2, COLD, WILD	2, 20	Twice/year	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
East Walker River at CA/NV state line 630.10	MUN, AGR, REC-2, COLD, WILD, RARE	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Mammoth Creek at Twin Lakes 603.10	MUN, AGR, REC-2, COLD, WILD, RARE	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Mammoth Creek at Old Mammoth Road 603.10	MUN, AGR, REC-2, COLD, WILD, RARE	2,9,16,20	One time only	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Mammoth Creek at Hwy 395 603.10	MUN, AGR, REC-2, COLD, WILD, RARE	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Hilton Creek at Hwy 395 603.10	MUN, AGR, REC-2, COLD, WILD,	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Rock Creek above diversion 603.20	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients, Sediment
Haiwee Reservoir 603.30	MUN, COLD, WILD, RARE	2, 9	Twice	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry
Mesquite Spring (near Scotty's Castle) 609.11	MUN, REC-1, REC-2	2, 9, 20	Twice/year	Contaminant Exposure, Pollutant Exposure	Fecal coliform bacteria, Inorganic Water Chemistry, Nutrients

Notes: 1. Monitoring Objectives: From 11/30/00 Report to the Legislature, Section VI (attached)
2. Indicator: From 11/30/00 Report to the Legislature, Section VII, Table 3, Pages 33-35

Beneficial Uses & Monitoring Objectives (p. 3 of 3)					
Station Name Hydro Unit #	**Beneficial Use(s)**	**Monitoring Objective(s)** [1]	**Frequency**	**Category**	**Indicator(s)** [2]
Little Rock Reservoir 626.80	MUN, AGR, REC-1, REC-2, WARM, WILD	1,2,9,16,20	Twice/year	Contaminant Exposure, Pollutant Exposure,	Fecal coliform bacteria, Inorganic Water Chemistry, Nutrients
Mojave River at Upper Narrows 628.20	MUN, AGR, REC-2, WARM, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Organic Water Chemistry, Nutrients
Mojave River at Forks Dam 628.20	MUN, AGR, REC-2, WARM, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Organic Water Chemistry, Nutrients
Deep Creek above Deep Creek Lake 628.20	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients
Holcomb Creek at Crabflats Road 628.20	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients
Crab Creek at Crab Creek Road 628.20	MUN, AGR, REC-2, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients
Sheep Creek below Lake Arrowhead Scout Camp 628.20	MUN, AGR, REC-2, WARM, COLD, WILD	2,9,16,20	Quarterly	Contaminant Exposure, Pollutant Exposure	Inorganic Water Chemistry, Nutrients
approx 20 sites (to be determined) for bioassessment sampling	COLD, WILD, RARE	9	Once	Biological Response	Macroinvertebrate assemblage, Periphyton, assemblage, Chlorophyll-a

Notes: 1. Monitoring Objectives: From 11/30/00 Report to the Legislature, Section VI (attached)
2. Indicator: From 11/30/00 Report to the Legislature, Section VII, Table 3, Pages 33-35

Excerpts from 11/30/00 Report to Legislature:

SECTION VI. SITE-SPECIFIC MONITORING

The overall goal of this activity of SWAMP is to develop site-specific information on sites that are (1) known or suspected to have water quality problems and (2) known or suspected to be clean. It is intended that this portion of SWAMP will be targeted at specific locations in each region. This portion of SWAMP is focused on collecting information from sites in water bodies of the State that could be potentially listed or delisted under CWA Section 303(d). The RWQCBs are given significant flexibility to select the specific locations to be monitored. The RWQCBs at their discretion may perform monitoring at clean sites to determine baseline conditions (for assessments related to antidegradation requirements) or if this information is needed to place problem sites into perspective with cleaner sites in the Region.

Monitoring Objectives

In developing the SWAMP monitoring objectives, the SWRCB used a modified version of the model for developing clear monitoring objectives proposed by Bernstein et al. (1993). The model makes explicit the assumptions and/or expectations that are often embedded in less detailed statements of objectives (as presented in SWRCB, 2000). This section is organized by each major question posed in the SWRCB report to the Legislature on comprehensive monitoring (SWRCB, 2000).

Is it safe to swim?

Beneficial Use: Water Contact Recreation

1. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pathogenic contaminants, estimate the concentration of bacteria or pathogens above screening values, health standards, or adopted water quality objectives.

Is it safe to drink the water?

Beneficial Use: Municipal and Domestic Water Supply

2. At specific locations in lakes, rivers and streams that are sources of drinking water and suspected to be contaminated, estimate the concentration of microbial and chemical contaminants above screening values, drinking water standards, or adopted water quality objectives used to protect drinking water quality.

3. At specific locations in lakes, rivers and streams that are sources of drinking water and suspected to be contaminated, verify previous estimates of the concentration of microbial and chemical contaminants above screening values, drinking water standards, or adopted water quality objectives used to protect drinking water quality.

Is it safe to eat fish and other aquatic resources?

Beneficial Uses: Commercial and Sport Fishing, Shellfish Harvesting

4. At specific sites influenced by sources of bacterial contaminants, estimate the concentration of bacterial contaminants above health standards or adopted water quality objectives to protect shellfish harvesting areas.

5. At specific sites influenced by sources of chemical contaminants, estimate the concentration of chemical contaminants in edible aquatic life tissues above advisory levels and critical thresholds of potential human health risk.

6. At frequently fished sites, estimate the concentration of chemical contaminants in commonly consumed fish and shellfish target species above advisory levels and critical thresholds of potential human health risk (Adapted from USEPA, 1995).

7. At frequently fished sites, verify previous estimates of the concentration of chemical contaminants in commonly consumed fish and shellfish target species above advisory levels and critical thresholds of potential human health risk (Adapted from USEPA, 1995).

8. Throughout water bodies (streams, rivers, lakes, nearshore waters, enclosed bays and estuaries), estimate the concentration of chemical contaminants in fish and aquatic resources from year to year using several critical threshold values of potential human impact (advisory or action levels).

Are aquatic populations, communities, and habitats protected?

Beneficial Uses: Cold Freshwater Habitat; Estuarine Habitat; Inland Saline Water Habitats; Marine Habitat; Preservation of Biological Habitats; Rare, Threatened or Endangered Species; Warm Freshwater Habitat; Wildlife Habitat

9. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded water or sediments in rivers, lakes, nearshore waters, enclosed bays, or estuaries using several critical threshold values of toxicity, water column or epibenthic community analysis, habitat condition, and chemical concentration.

10. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded sediment in rivers, lakes, nearshore waters, enclosed bays, or estuaries using several critical threshold values of toxicity, benthic community analysis, habitat condition, and chemical concentration.

11. Identify the areal extent of degraded sediment locations in rivers, lakes, nearshore waters, enclosed bays, and estuaries using several critical threshold values of toxicity, benthic community analysis, habitat condition, and chemical concentration.

Beneficial Use: Spawning, Reproduction and/or Early Development

12. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded water or sediment in rivers, lakes, nearshore waters, enclosed bays, and estuaries using several critical threshold values of early life-stage toxicity, chemical concentration, and physical characteristics.

13. At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, verify previous measurements identifying specific locations of degraded water or sediment in rivers, lakes, nearshore waters, enclosed bays, and estuaries using several critical threshold values of early life-stage toxicity, chemical concentration, and physical characteristics.

Is water flow sufficient to protect fisheries?

Beneficial Use: Migration of Aquatic Organisms; Rare, Threatened or Endangered Species; Wildlife Habitat

14. At specific sites influenced by pollution, estimate the presence of conditions necessary for the migration and survival of aquatic organisms, such as anadromous fish, using measures of habitat condition including water flow, watercourse geomorphology, sedimentation, temperature, and biological communities.

15. At specific sites influenced by pollution, verify previous estimates of the presence of conditions necessary for the migration and survival of aquatic organisms, such as anadromous fish, using measures of habitat condition including water flow, watercourse geomorphology, sedimentation, temperature, and biological communities.

Is water safe for agricultural use?

Beneficial Use: Agricultural supply

16. At specific locations in lakes, rivers and streams that are used for agricultural purposes, estimate the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect agricultural use.

17. At specific locations in lakes, rivers and streams that are used for agricultural purposes, verify previous estimates of the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect agricultural uses.

Is water safe for industrial use?

Beneficial Use: Industrial Source Supply; Industrial Process Supply

18. At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams that are used for industrial purposes, estimate the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect industrial use.

19. At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams that are used for industrial purposes, verify previous estimates of the concentration of chemical pollutants above screening values or adopted water quality objectives used to protect industrial uses.

Are aesthetic conditions of the water protected?

Beneficial Use: Non-Contact Water Recreation

20. At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams, estimate the aesthetic condition above screening values or adopted water quality objectives used to protect non-contact water recreation.

At specific locations in coastal waters, enclosed bays, estuaries, lakes, rivers and streams, verify previous estimates of the aesthetic condition above screening values or adopted water quality objectives used to protect non-contact water recreation.

Attachment #2, Lahontan Region SWAMP Workplan (FY 02-03)
USGS Surface Water Monitoring (Summer 2002 – Spring 2003)

LOCATION	FREQ	Lab Code	ANALYTES	BOTTLE SETS
Bidwell Creek	4 times	 27 2187 1571 1979 1986 2333	discharge suspended sediment TDS turbidity chloride nitrite + nitrate TKN total phosphorus	500TBY 250 FU 125 FCC 125WCA
Mill Creek at Upper Lake (near Lake City)	4 times	 27 2187 1571 1975 1986 2333	discharge suspended sediment TDS turbidity chloride nitrite + nitrate TKN total phosphorus	500TBY 250 FU 125 FCC 125WCA
Cedar Creek (near Cedarville)	4 times	 27 2187 1571 1975 1986 2333	discharge suspended sediment TDS turbidity chloride nitrite + nitrate TKN total phosphorus	500TBY 250 FU 125 FCC 125WCA
Susan River above confluence with Willard Creek	4 times	 27 2187 1571 1975 1986 2333	discharge suspended sediment TDS turbidity chloride nitrite + nitrate TKN total phosphorus	500TBY 250 FU 125 FCC 125WCA
Susan River near Litchfield	4 times	 27 2187 1571 1979 1986 2333	discharge suspended sediment TDS turbidity chloride nitrite + nitrate TKN total phosphorus	500TBY 250 FU 125 FCC 125WCA

West Fork Carson River at Hope Valley	4 times (see notes)	 27 2187 1571 1572 1973 1979 1986 2333 2110	discharge suspended sediment TDS turbidity chloride sulfate nitrite nitrite + nitrate TKN total phosphorus boron, twice (high & low flow)	500TBY 250 FU 125 FCC 125WCA 250 FA
East Fork Carson River near Markleeville	4 times (see notes)	 27 2187 1571 1572 1979 1986 2333 2110	discharge suspended sediment TDS turbidity chloride sulfate nitrite + nitrate TKN total phosphorus boron, twice (high & low flow)	500TBY 250 FU 125 FCC 125WCA 250 FA
West Walker River at Coleville	4 times (see notes)	 27 2187 1571 1572 1979 1986 2333 2110	discharge suspended sediment TDS turbidity chloride sulfate nitrate + nitrite TKN total phosphorus boron, twice (high & low flow)	500TBY 250 FU 125 FCC 125WCA 250 FA
Robinson Cr below Barney Lake	twice (Nov, Feb)	 2187 1979 1980 1985 1986 1978 2333	discharge suspended sediment turbidity nitrite + nitrate nitrogen, ammonia DKN TKN dissolved ortho-phosphate total phosphorus	500TBY 125 FCC 125 WCA

Buckeye Cr above Eagle Cr.	twice (Nov, Feb)	 2187 1979 1980 1985 1986 1978 2333	discharge suspended sediment turbidity nitrite + nitrate nitrogen, ammonia DKN TKN dissolved ortho-phosphate total phosphorus	500TBY 125 FCC 125 WCA
Virginia Cr at Conway Summit	twice (Nov, Feb)	 2187 1979 1980 1985 1986 1978 2333	discharge suspended sediment turbidity nitrite + nitrate nitrogen, ammonia DKN TKN dissolved ortho-phosphate total phosphorus	500TBY 125 FCC 125 WCA
Green Cr above Campground	twice (Nov, Feb)	 2187 1979 1980 1985 1986 1978 2333	discharge suspended sediment turbidity nitrite + nitrate nitrogen, ammonia DKN TKN dissolved ortho-phosphate total phosphorus	500TBY 125 FCC 125 WCA
East Walker River at CA/NV state line	4 times (see notes)	 27 2187 1571 1975 1986 2333 2110	discharge suspended sediment TDS turbidity chloride nitrite + nitrate TKN total phosphorus boron, twice (high & low flow)	500TBY 250 FU 1125 FCC 125 WCA 250 FA

Mammoth Creek at Twin Lakes	4 times		discharge	500 TBY
			suspended sediment	250 FU
		27	TDS	125 FCC
		2187	turbidity	125 WCA
		1571	chloride	
		1977	nitrite	
		1979	nitrite + nitrate	
		1986	TKN	
		1978	dissolved ortho-phosphate	
		2333	total phosphorus	
Mammoth Creek at Old Mammoth Road	one time (during runoff)		discharge	500 TBY
			suspended sediment	250 FU
		27	TDS	125 FCC
		2187	turbidity	125 WCA
		1571	chloride	
		1977	nitrite	
		1979	nitrite + nitrate	
		1986	TKN	
		1978	dissolved ortho-phosphate	
		2333	total phosphorus	
Mammoth Creek at Highway 395	4 times		discharge	500 TBY
			suspended sediment	250 FU
		27	TDS	125 FCC
		2187	turbidity	125 WCA
		1571	chloride	
		1977	nitrite	
		1979	nitrite + nitrate	
		1986	TKN	
		1978	dissolved ortho-phosphate	
		2333	total phosphorus	
Rock Creek above Diversion	4 times		discharge	500 TBY
			suspended sediment	250 FU
		27	TDS	125 FCC
		2187	turbidity	125 WCA
		1571	chloride	
		1977	nitrite	
		1979	nitrite + nitrate	
		1986	TKN	
		1978	dissolved ortho-phosphate	
		2333	total phosphorus	

Hilton Creek at Highway 395	4 times	 27 2187 1571 1977 1979 1986 1978 2333	discharge suspended sediment TDS turbidity chloride nitrite nitrite + nitrate TKN dissolved ortho-phosphate total phosphorus	500 TBY 250 FU 250 FU 125 FCC 125 WCA
Mesquite Spring (near Scotty's Castle)	twice (Spring, Fall)	 27 sc117 sc1269 1977 1979 1986 1978 2333 1574 489 1043 2369 2606 2010	 TDS major ions trace metals nitrite nitrite + nitrate TKN dissolved ortho-phosphate total phosphorus fecal coliform bacteria deuterium oxygen 18 tritium strontium 87 total carbon carbon 14	2-250 FA 250 FU 250 RU 125 FCC 125 WCA
Little Rock Reservoir	twice (Spring, Fall)	 27 1977 1979 sc117	profiles for SC, T, pH, and DO TDS nitrite nitrite + nitrate major ions fecal coliform bacteria	250 FU 250 FU 250 RU 250 FA 125 FCC
Mojave River at Upper Narrows	4 times (see note)	 27 1571 1572 1977 1975 1986 1984 s1307 31 2110	discharge TDS chloride sulfate nitrite nitrate + nitrite TKN total phosphorus VOCs fluoride, twice (high/low flow) boron, twice (high/low flow)	250 FU 250 FA 125 FCC 125 WCA 3-40 ml GVC

Mojave River at Forks Dam	4 times	 27 1571 1572 1977 1979 1986 1984 s1307 31 2110	discharge TDS chloride sulfate nitrite nitrite + nitrate TKN total phosphorus VOCs fluoride boron	250 FU 250 FA 125 FCC 125 WCA 3-40 ml GVC
Deep Creek above Deep Creek Lake (at town of Arrowbear Lake)	4 times (see note)	 27 1986 1977 1979 1978 1984 1572 1571 31 2110	discharge TDS TKN nitrite nitrite + nitrate dissolved ortho-phosphate total phosphorus sulfate chloride fluoride, twice (high/low flow) boron, twice (high/low flow)	250 FU 250 FA 125 FCC 125 WCA
Holcomb Creek at Crabflats Road	4 times (see note)	 27 1986 1977 1979 1978 1984 1572 1571 31 2110	discharge TDS TKN nitrite nitrite + nitrate dissolved ortho-phosphate total phosphorus sulfate chloride fluoride, twice (high/low flow) boron, twice (high/low flow)	250 FU 250 FA 125 FCC 125 WCA
Crab Creek at Crab Creek Road	4 times (see note)	 27 1986 1977 1979 1978 1984 1572 1571 31 2110	discharge TDS TKN nitrite nitrite + nitrate dissolved ortho-phosphate total phosphorus sulfate chloride fluoride, twice (high/low flow) boron, twice (high/low flow)	250 FU 250 FA 125 FCC 125 WCA

Sheep Creek below Lake Arrowhead Scout Camp	4 times (see note)	 27 1986 1977 1979 1978 1984 1572 1571 31 2504	discharge TDS TKN nitrite nitrite + nitrate dissolved ortho-phosphate total phosphorus sulfate chloride fluoride, twice (high/low flow) boron, twice (high & low flow); this is low-level analysis for B.	250 FU 250 FA 125 FCC 125 WCA
Haiwee Reservoir	twice (mid-July, & mid-Sept)		At each of 20 locations (see map): profiles for: temp, DO, pH, conductivity samples for: copper, total copper, dissolved TSS hardness total organic carbon	

STANDARD OPERATING PROCEDURES (SOPs) FOR SURFACE WATER SAMPLE COLLECTION

SURFACE WATER AMBIENT MONITORING PROGRAM ("SWAMP")

LAHONTAN REGIONAL WATER QUALITY CONTROL BOARD

Approved by: Thomas Suk, Staff Environmental Scientist
Date: 6/11/02

California Regional Water Quality Control Board, Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, California 96150
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Table of Contents

A. Scope and Application

These SOPs apply to the collection of surface water samples from streams as part of the Surface Water Ambient Monitoring Program (SWAMP). It includes procedures for collecting, filtering, and preserving samples for delivery to a laboratory for analysis of nutrients (i.e., species of nitrogen and phosphorus), and ions/minerals (i.e., sulfate, calcium, magnesium, silica, etc.).

B. Objectives

The primary objectives for collecting this data are to assist the Lahontan Regional Water Quality Control Board in assessing the ambient quality of surface waters in the Lahontan Region.

C. Sampling Equipment

Checklist:

- Copy of SOP
- Backpack
- Disposable, powder-free gloves
- Safety glasses
- Chain-of-Custody (COC) forms in sealed plastic bag
- Field notebook
- Clip board
- Sample bottle labels
- Pencil
- Ball point pen
- Permanent marker
- Hand vacuum pump w/ ¼-inch (inside diameter) tubing
- Reusable plastic filter apparatus
- Nylon microbiological filters (47 mm dia., 0.45 µm, Fisher Scientific R04SG04700)
- New, pre-cleaned HDPE sample bottles (2 x 500 ml; 2 x 250 ml)
- Vials of acid preservative (1-ml or 2-ml conc nitric acid)
- 500 ml HDPE waste bottle
- Deionized (DI) water for field method blank (if applicable)
- Ice chest
- Blue ice
- Packing tape
- UPS shipping labels
- Field safety manual

D. Field Information Required At Each Site

The following information shall be recorded on each sample bottle at the time of sampling:

- Sample ID Number (for contract laboratories)
- Sampling Date and Time
- Creek/Site Name
- Sampler's Name
- Analysis Requested
- Whether Sample is Field-Filtered or Raw
- Preservative (if any)

The following information shall be recorded in the field notebook:

At the start of the day:
- Project Name
- Date
- Weather Conditions (precipitation, cloud-cover, approximate temperature, and wind)
- Names of people in sampling crew.

At each site:
- Time of sample collection
- Creek/Site Name
- Sample ID Number
- Information about QC samples collected, if any.
- Comments (any pertinent observations such as cattle in stream, high turbidity, etc.)

E. Sampling Procedures

Collection of water samples will be conducted prior to or upstream from any other sampling activities that could disturb stream sediments and impact water quality (i.e., the collection of flow, sediment, or aquatic invertebrate samples).

1. Select a sampling location in a riffle zone at the upper end of the stream reach to be sampled. Flow rate should be moderate, and creek depth sufficient to submerge the sample bottles at least 3 cm below the water surface.

2. Select a work area nearby that is as flat as possible and with minimal vegetation. Remove sampling equipment and supplies from the backpack, minimizing contact with soil, vegetation, etc.

3. Take field notes, label sample bottles, and fill out the chain-of-custody form(s) for the samples.

4. Put on disposable gloves and set up the filter apparatus.

5. Proceed to the sampling location with the 500ml sample bottle labeled for sulfate analysis. Rinse the surface of the gloves with stream water. Triple-rinse the sample bottle: fill bottle ½

to 1/3 full; shake and rinse all internal surfaces; pour water out without disturbing stream channel; and, shake water droplets out of the bottle. For rinsing and sampling, fill the bottle by submerging the top of the bottle with the cap on 3 to 6 cm below the water surface, unscrewing the cap with the bottle opening facing upstream and tilted slightly up, and screwing the cap back on while still underwater.

6. Triple-rinse the filter apparatus with 250 ml of sample water; fill receiving apparatus with about 80 ml of filtered water; rinse receiving vessel; pump additional sample through filter; rinse the receptacle bottle; discard; repeat twice more.

7. Filter remaining 250 ml of stream sample and triple-rinse the 500 ml sample bottle labeled for dissolved Ca, Mg, and silica.

8. Repeat 5, filter the sample, and pour into the 500 ml sample bottle labeled for dissolved Ca, Mg, and silica. Tighten cap and place sample in cooler on ice.

9. Repeat 5, filter the sample, and triple-rinse the bottle labeled for Nitrate + Nitrite and SRP with a total of 250 ml of filtered sample. Following triple-rinse, pour remaining filtered sample into the bottle, tighten cap, and place in cooler on ice.

10. Repeat 5, tighten cap, and place sample in cooler on ice.

11. Triple-rinse and fill 250 ml bottle labeled for TKN and TP using the same procedure as 5. Tighten bottle cap, and place sample in cooler on ice.

12. Put on safety glasses and add 2ml of nitric acid to the sample bottle labeled for dissolved Ca, Mg, and silica. Tighten cap, shake bottle lightly to mix, and place back in cooler on ice. Place waste vial and cap in the waste container. Triple-rinse the vials prior to disposing as a municipal waste.

13. Double-check the sample bottle cap seals and arrangement of samples and ice in the cooler.

14. Break down the filter apparatus, removing the filter just used. Rinse with DI water and store in clean plastic bag for next site.

F. Sample Hold Times and Required Reporting Limits

Table 1. Sample Holding Times for Each Analyte.

Analyte	Maximum Hold Time	Storage Conditions
Dissolved Ca, Mg, and Silica	28 Days	@ 4°C once filtered and acidified (pH<2)
Sulfate	28 Days	@ 4°C
Nitrate+Nitrite, SRP	48 hours to lab	@ 4°C once filtered
TKN and TP	48 hours to lab	@ 4°C

Table 2. Reporting Limits Required to Meet Sampling Objectives

Analyte	Reporting Limit Concentration	Notes/Comments/Source
Dissolved Calcium	0.5 mg/L	NEL Labs
Dissolved Magnesium	0.5 mg/L	NEL Labs
Dissolved Silica	0.25 mg/L	NEL Labs
Sulfate	0.2 mg/L	NEL Labs
Nitrate + Nitrite	1 ug/L	High Sierra Water Lab
SRP	1 ug/L	High Sierra Water Lab
TKN	1 ug/L	High Sierra Water Lab
TP	1 ug/L	High Sierra Water Lab

G. Personnel Qualifications

Sampling crew shall be supervised by at least one person with a B.S. degree (minimum) in biological/environmental sciences, or engineering. Field technicians should take an active part in at least two sampling events supervised by a qualified staff person before allowed to sample alone.

H. Quality Control

At least five (5) percent of all samples collected shall be quality control samples.

Duplicates: Duplicate samples shall be collected as determined by the Region's SWAMP project manager. Duplicate samples should be noted in the field notebook, and may be noted as a duplicate on the chain-of-custody.

Field Method Blanks: The procedure for collecting a field method blank (FMP) consists of transporting sufficient DI water into the field and collecting a sample using identical sampling, filtering, and preserving procedures (if applicable) as described under sampling procedures above. The FMB sample should be assigned a fictitious sample location (i.e., Snowpeak Creek) and a unique sample ID, if applicable, so that the laboratory personnel are unaware that they are analyzing a blank.

Travel Blanks: Travel blanks are only needed when sampling for VOCs.

Split samples and spiked samples are not currently part of the SOP.