SOUTHERN SAN JOAQUIN VALLEY WATER QUALITY COALITION

QUALITY ASSURANCE PROJECT PLAN

DECEMBER 2011

Prepared under the guidelines of the Monitoring and Reporting Program for the Irrigated Lands Regulatory Program

R5-2008-0005

THIS VERSION CONTAINS PROPRIATARY INFORMATION
NOT FOR PUBLIC DISTRIBUTION

This document reflects the changes requested by the Central Valley Regional Water Quality Control Board and corrects a small number of errors and omissions present within the previous version. Because no substantial changes in methods have occurred, the version number remains unchanged.

QUALITY ASSURANCE PROJECT PLAN for the MONITORING and REPORTING PROGRAM, R5-2008-0005
Version 1.0

SOUTHERN SAN JOAQUIN VALLEY WATER QUALITY COALITION

David Orth
Coordinator, SSJVWQC
David Orth 11/2/11
Date

Rick Hoelzel
Coordinator, Kings River Sub-Watershed
11/2/11
Date

Eric Athorp
QA Manager, SSJWQC
Laboratory Coordinator
Kings River Sub-Watershed
Eric Athorp 11/2/11
Date

Dennis R. Keller, Consulting Engineer
Kaweah River Sub-Watershed
Dennis R. Keller 11/02/11
Date

Ed Glass
Laboratory Coordinator
Kaweah River Sub-Watershed
Ed Glass 11/2/11
Date

Richard L. Schafer, Consulting Engineer
Laboratory Coordinator
Tule River Sub-Watershed
11/02/11
Date

John Schaap, Consulting Engineer
Laboratory Coordinator
Kern River Sub-Watershed
John Schaap 11/2/11
Date

Table of Contents

Appendices

Tables

Distribution List

Staff Contact List

Primary Contacts:

David Orth, Coordinator
Southern San Joaquin Water Quality Coalition
General Manager
Kings River Conservation District
(559) 237-5567
(559) 237-5560 fax
dorth@krcd.org

William J. Thomas, Jr., Coalition Counsel
Best Best & Krieger LLP
400 Capitol Mall, Suite 1650
Sacramento, CA 95814
916-325-4000
William.Thomas@BBKLAW.com

Secondary Contacts (Sub-Watershed Level):

Kings River
Rick Hoelzel, Coordinator, Kings River Sub-Watershed
Kings River Conservation District
4886 E Jensen Ave
Fresno, CA 93725
(559) 237-5567 ext 126
(559) 237-5560 fax
rhoelzel@krcd.org

Eric Athorp, QA Manager, SSJWQC
Laboratory Coordinator, Kings River Sub-Watershed
Kings River Conservation District
4886 E Jensen Ave
Fresno, CA 93725
(559) 237-5567 ext 117
(559) 237-5560 fax
eathorp@krcd.org

Kaweah/St Johns
Dennis R. Keller, Consulting Engineer
Coordinator, Kaweah River Sub-Watershed
Keller Wegley Consulting Engineers
PO Box 911
Visalia, CA 93279
(559) 732-7938
(559) 732-7937 fax
kelweg1@aol.com

Ed Glass, Laboratory Coordinator
Kaweah River Sub-Watershed
Keller Wegley Consulting Engineers
PO Box 911
Visalia, CA 93279
(559) 732-7938
(559) 732-7937 fax
kelweg1@aol.com

Tule River
Richard L. Schafer, Consulting Engineer
Coordinator
Laboratory Coordinator, Tule River Sub-Watershed
R.L. Schafer and Associates
2904 W. Main Street
Visalia, CA 93291
(559) 734-1348
(559) 734-1413 fax
rschafer@rlsmap.com

Kern River
John Schaap, Consulting Engineer
Provost and Pritchard Consulting Group
Coordinator
Laboratory Coordinator, Kern River Sub-Watershed
130 N Garden St.
Visalia, CA 93291
(559) 636-1166
jschaap@ppeng.com

QAPP Recipients

Pamela Creedon
Executive Officer
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

Clay Rogers
Central Valley Regional Water Quality Control Board
Fresno Office
1685 E Street
Fresno, CA 93706

Brent Vanderburgh
Central Valley Regional Water Quality Control Board
Fresno Office
1685 E Street
Fresno, CA 93706

APPL, Inc.
Diane Anderson, President
908 North Temperance Ave
Clovis, CA 93611

SFL, Inc.
Sandy Nurse
255 Scottsville Blvd.
PO Box 1268
Jackson, CA 95642

Pacific EcoRisk
Stephen Clark
2250 Cordelia Road
Fairfield, CA 94534

FGL, Inc
853 Corporation Street
Santa Paula, CA 93060

Kings River Conservation District
4886 E Jensen Ave
Fresno, CA 93725

Kaweah Delta Water Conservation District
2975 N. Farmersville Blvd.
Farmersville, CA 93223

Tule River Water Association
2904 W Main Street
Visalia, CA 93291

Kern County Water Agency
3200 Rio Mirada Drive
Bakersfield, CA 93308

PROJECT ORGANIZATION

David Orth, Coordinator
Southern San Joaquin Water Quality Coalition
General Manager, Kings River Conservation District

Mr. Orth is the Chairman of the Steering Committee for the Southern San Joaquin Water Quality Coalition (SSJWQC, Coalition), as well as its fiscal agent. As Chairman, he is the lead contact between the Coalition (and its member sub-watersheds) and the Regional Water Quality Control Board (Regional Board) for all written correspondence. The Steering Committee is comprised of the Coordinators for the four sub-watersheds within the Coalition and functions as the primary policy setting body.

As fiscal agent, all invoices from legal counsel and the State Water Resources Control Board are processed through his office. As the General Manager at the Kings River Conservation District (KRCD), he is the direct supervisor to Rick Hoelzel, the Kings River Sub-Watershed Coordinator.

Rick Hoelzel, Coordinator
Kings River Sub-Watershed

Mr. Hoelzel coordinates the KRCD staff activities for the Kings River Sub-Watershed. He reviews the written reports, manages internal budgeting, and any tasks related to the Coalition that are delegated by Mr. Orth. He approves the sample site selections and monitoring strategies employed by the sub-watershed, as submitted by Mr. Athorp. He is the direct supervisor to Mr. Athorp at the Kings River Sub-Watershed through his role as Manager, Water Resources at the KRCD.

Eric Athorp, QA Manager, SSJWQC
Laboratory Coordinator
Kings River Sub-Watershed

Mr. Athorp is a Resource Analyst at the KRCD and has been designated as the Quality Assurance Manager for the SSJWQC. Mr. Athorp is the author of the QAPP for the SSJWQC, and is generally responsible for the oversight of the six labs used by the Kings Sub-Watershed. Supervision of FGL, Inc. (the laboratory used by the Kaweah, Tule, and Kern Sub Watersheds) and its sub contractors has been delegated to the individuals listed below. In his role as Quality Assurance Manager, Mr. Athorp will collect and review laboratory performance information (from all labs) to insure that the laboratories are performing adequately. Mr. Athorp reports directly to his immediate supervisor Rick Hoelzel on Kings Sub-Watershed related issues, and communicates general laboratory and reporting issues to the SSJWQC Steering Committee.

Mr. Athorp is responsible for the compilation, review, and distribution of the Quarterly data reports and the Annual Report on a Coalition level, and the selection of the monitoring sites, preparation of the field sheets and chains of custody, supervision of the sample collection process, and laboratory data review and oversight for the Kings Sub-Watershed. Mr. Athorp will also be responsible for the drafting of any Kings Sub-Watershed related Communication Reports/Management Plans required for any exceedances; said reports to be reviewed by Rick Hoelzel and signed by Dave Orth prior to submission.

Mr. Athorp maintains copies of all Semi- and Annual Reports, and electronic copies of the SWAMP data submitted quarterly.

Mr. Athorp also provides guidance to the other sub-watersheds regarding testing requirements and other laboratory issues as needed. He attends the monthly Coalition meetings, the Regional Board TIC meetings as they occur on behalf of the Coalition, and various workshops that deal directly or indirectly with the ILRP.

Dennis Keller, Consulting Engineer
Coordinator, Kaweah River Sub-Watershed

Mr. Keller, under the direction of the Kaweah Delta Water Conservation District Board, oversees the administration of the irrigated lands program within the Kaweah Sub-Watershed. Unlike the Kings Sub-Watershed, the Kaweah (as well as the Tule and Kern Sub-Watersheds) has contracted with a single laboratory for sampling and testing services. He prepares any correspondence for the Kaweah, including communication and exceedance reports, as well as the Kaweah portion of the semi-annual and annual reports. Communication reports are submitted to Dave Orth for submission to the Regional Board; laboratory data and Annual Reports are submitted to Eric Athorp via Ed Glass for compilation into a single submission.

Ed Glass, Laboratory Coordinator
Kaweah River Sub-Watershed

Mr. Glass coordinates the monitoring efforts with Fruit Growers Lab under the direction of Mr. Keller. Responsibilities include data review and compilation, report preparation, and correspondence required under the MRP. Completed reports are submitted to the Quality Assurance Manager for review and submission. Mr. Glass also handles the development of Management Plans within the Kaweah Sub-Watershed.

Richard Schafer, Consulting Engineer
Coordinator, Laboratory Coordinator
Tule River Sub-Watershed

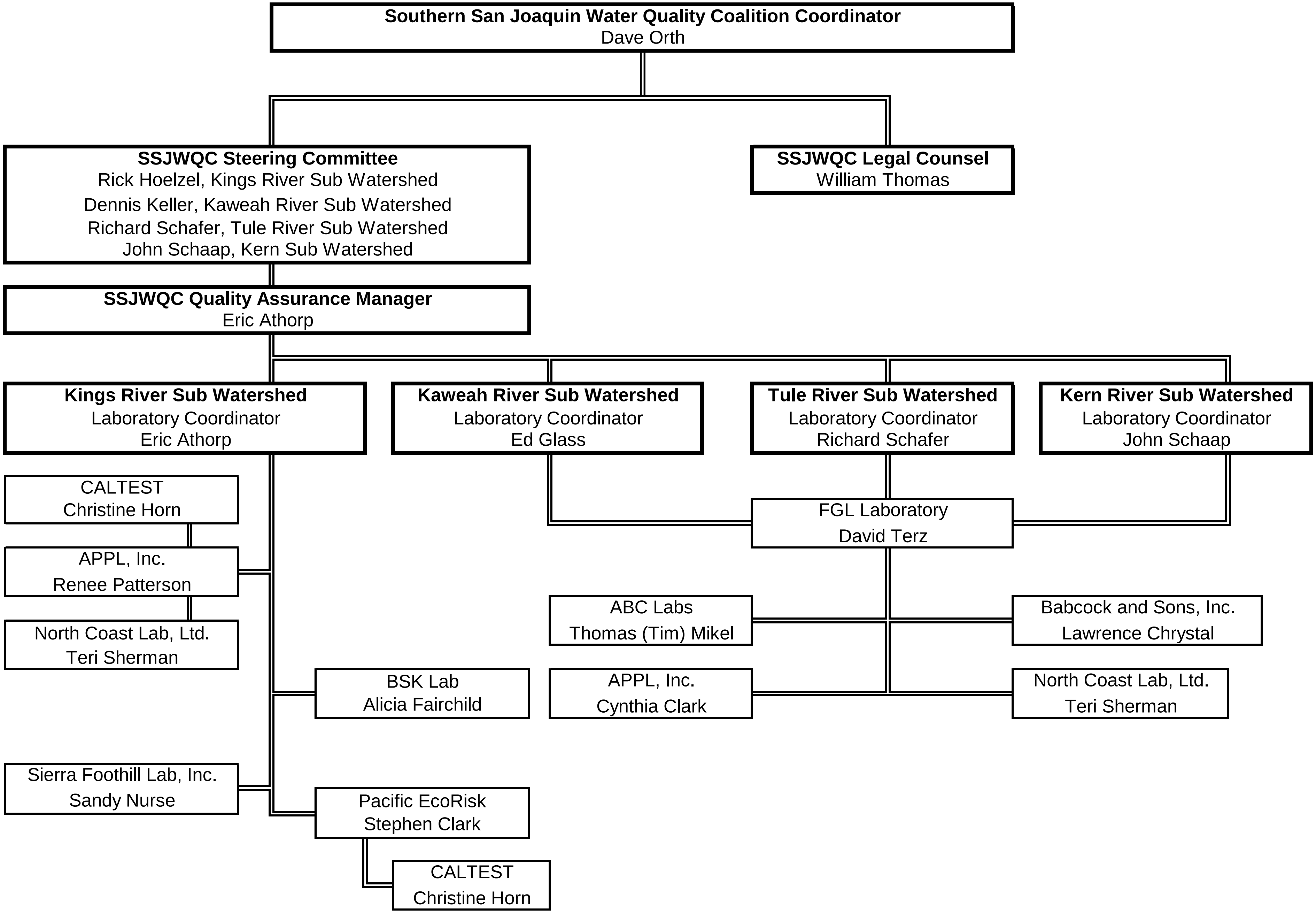
Mr. Schafer, in addition to managing the Tule River Sub-Watershed, is also the Watermaster of the Tule River and Secretary of the Tule River Association. Mr. Schafer prepares all the correspondence related to the Tule River Sub-Watershed, coordinates with the Regional Board on the Tulare Lake Basin Water Quality Control Plan updates, supervises the activities of Fruit Growers Lab, and prepares the Tule River portion of the Quarterly and Annual Reports. These are submitted to the Quality Assurance Manager for further review. He is also responsible for the development of the Management Plans for the Tule River Sub-Watershed as required by the Regional Board.

John Schaap, Consulting Engineer
Coordinator
Laboratory Coordinator, Kern River Sub-Watershed

Mr. Schaap is a consulting engineer with Provost and Pritchard with extensive experience regarding the Regional Board's Dairy Order. As the Kern County Water Agency has elected to no longer provide administrative services to the Kern River Sub-watershed interests, Mr. Schaap has been contracted to provide these services. Mr. Schaap will represent the Kern Sub-watershed at the monthly Coalition meetings, provide input on the Coalition related issues, and assume oversight responsibilities for the laboratory activities conducted within the Kern Sub-watershed.

A chart outlining the organizational structure of the Coalition is presented on the next page.

Southern San Joaquin Water Quality Coalition
Organization Chart



Contracted Laboratories

The Coalition has contracted with the following laboratories for chemical testing, toxicity testing, and sampling services. Sub contracting laboratories are mentioned under each primary laboratory.

Fruit Growers Laboratories, Inc.
853 Corporation St.
Santa Paula, CA 93060
(805) 392-2000
(805) 525-4172 fax
www.fglinc.com

This company performs sampling services and chemical/toxicity testing for the Kaweah, Tule, and Kern Sub-Watersheds. Some tests are sub-contracted to other labs (toxicity to Aquatic Bioassay & Consulting, limited chemical testing to APPL, Inc.). It is available as an alternate to Sierra Foothill Labs for the Kings Sub-Watershed.

APPL, Inc.
908 North Temperance Ave
Clovis, CA 93611
(559) 275-2175
(559) 275-4422 fax
www.applinc.com

This company performs the primary chemical analysis for the Kings Sub-Watershed. The paraquat and glyphosate tests are sub-contracted to North Coast Laboratories in Arcata, CA. Certain metals and nutrients are sub-contracted to CalTest Analytical Laboratory, Napa, CA.

Sierra Foothill Lab
255 Scottsville Blvd.
Jackson, CA 95642
(209) 223-2800
(209) 223-2747 fax
www.sierrafoothilllab.com

This is the primary lab which handles the water column toxicity samples collected from the Kings Sub-Watershed.

Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534
(707) 207-7760
(707) 207-7916
www.pacificecorisk.com

This lab conducts the sediment testing for the Kings Sub-Watershed.

BSK Analytical Laboratories
1414 Stanislaus St
Fresno, CA 93706
(559) 497-2888
(559) 485-6935 fax
www.bsklabs.com

BSK provides the testing services for bacterial samples within the Kings Sub-Watershed.

Laboratories used by the Coalition will be certified at a minimum under the California Environmental Laboratory Accreditation Program (ELAP). A number of the laboratories also carry NELAP accreditation. The laboratories listed in the QAPP will meet all Quality Assurance and Control requirements provided in this document. The selection of sub-contractors by a contracted lab must first be approved by the Coalition, and such sub-contractors must abide by the conditions set forth by the Regional Board and this QAPP document.

PROBLEM DEFINITION AND BACKGROUND

Introduction

It is known that some waters of the State are negatively impacted by discharges from agricultural lands. Said discharges are likely to contain applied pesticides or chemical fertilizers that negatively impact the water quality and ecosystems present within the receiving waters.

The Coalition has conducted chemical and physical parameter testing on representative waterways within the Coalition boundaries since the inception of the Agricultural Waiver program in 2003. To date, only isolated issues have been found within the Coalition.

The hydrology of the Coalition is one where surface water supplies are frequently limited, and when available, are only released during the peak period of water demand. Groundwater is used where surface delivery infrastructure does not exist or when the irrigation district is unable to deliver water on the farmer's irrigation schedule.

Stormwater is a potential source of agricultural discharge, but discharges are only likely during a short, intense storm or after a prolonged period of precipitation. The first storms of the season are quickly absorbed into the soil (unless unusually intense), taking with it any "washed off" agricultural chemicals. These chemicals are typically fixed into the upper layers of the soil profile, and become subject to microbial degradation.

The topography of the developed agricultural land is generally flat (either naturally or artificially) with limited areas on the east side having moderate slopes. Soil types vary across the Coalition, ranging from highly porous soils in the alluvial fans of the four rivers that feed into the Coalition, to the clays present in the eastern foothills and the Tulare Lake bottom.

Many of the irrigation canals are constructed above grade, so as to provide sufficient head pressure to service the grower's irrigation systems via gravity. Thus, they are not generally susceptible to return flows from the fields they service.

Irrigation practices in use are the most efficient/cost effective available for the cropping pattern present. Where furrow irrigation is not possible within field crops, sprinklers are used. Microirrigation (drip or microsprayer) is used in many of the orchards/vineyards where surface water supplies or soil conditions do not permit surface irrigation or improved irrigation management is desired. Sub-surface irrigation is gaining ground where furrow irrigation once dominated. Many areas of field crops continue to be surface irrigated, because it is the most practical/economical method available.

Increased usage of irrigation scheduling based on current crop usage and future needs is also taking place, thus maximizing the efficient usage of available water, and reducing the risk of runoff. Irrigation management has also been employed to influence crop development and maturity.

Even with all of these factors, there remains the risk that the limited return flows within the Coalition may contain chemistries that potentially degrade the waters of the State. This program is designed to monitor such occurrences, trace the source, and under the Monitoring and Reporting Program, alter the Management Practices used to reduce/eliminate the problem.

Project Objectives

In accordance with the requirements of the California Water Code and the Irrigated Lands Regulatory Program's Monitoring and Reporting Program Plan (MRP), the objectives of this project are to (1) categorize the current conditions of the waters of the state within the jurisdictional boundaries of the Coalition, and (2) prevent further degradation (if any) of the waters of the State as may be caused by irrigated agriculture through the by implementation, where feasible, of management plans that prevent future negative impacts and eventual recovery of the waters to acceptable conditions that are protective of the identified beneficial uses.

The Plan is based on the knowledge gained under the previous MRP as adopted by the Coalition. Extensive testing within the Coalition has been in place since June 2006, with limited testing being done since July 2003.

The MRP Plan written by the Coalition is designed to address the five Program questions posed by the Regional Board regarding water quality:

1. Are conditions in waters of the State that receive discharges of wastes from irrigation lands within the Coalition boundaries, as a result of activities within those boundaries, protective of beneficial uses?
2. What is the magnitude and extent of water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within Coalition boundaries, as determined using monitoring information?
3. What are the contributing source(s) from irrigated agriculture to the water quality problems in waters of the State that receive agricultural drainage or are affected by other irrigated agriculture activities within Coalition boundaries?
4. What are the management practices that are being implemented to reduce the impacts of irrigated agriculture on waters of the State within Coalition boundaries and where are they being applied?
5. Are water quality conditions in waters of the State within Coalition boundaries getting better or worse through implementation of management practices?

Approaches Used

To achieve these objectives, the SSJWQC has implemented a Monitoring and Reporting Program Plan that selects representative monitoring sites within the individual waterways of the four sub-watersheds that comprise the SSJWQC. Testing is done for physical and chemical constituents related to agricultural practices common to the region surrounding the monitoring site. The monitoring consists of monthly collection of water samples by qualified personnel, at sites that represent best the local cropping patterns and general conditions. When water is not present, monthly photo documentation of the monitoring site will be conducted.

Since the Monitoring and Reporting Program Plan's implementation, the detection of agriculturally related materials has been limited within the Coalition's waterways. Where multiple detections of significance have been found, Management Plans have been or are being drafted to address the issue.

Regulatory Information

The SSJWQC covers essentially all of the Tulare Lake Basin. The State has recognized that the conditions present within this Basin are distinctly different from the conditions found in the San Joaquin or Sacramento River Basins, and that the Tulare Lake Basin is closed and isolated from the San Joaquin-Sacramento River delta under normal hydrologic circumstances. As such, a separate basin plan was developed to address the Tulare Lake Basin.

Table 1 provides the Basin Plan Objectives for the Tulare Lake Basin, as well as the spectrum of chemistries tested under the current MRP. Many of the constituents listed do not have official numerical limits in place, although the interpretation of the narrative would lead to a zero tolerance for many. The Regional Board provided *interim numeric standards* for the narrative requirements in March 2011.

Decisions to be Made with Information Obtained

The purpose of any testing program is to detect a problem as the first step. The second step is to evaluate the seriousness of the detection. Once detection has been made, the approach of the Coalition is to trace the material to its potential source. This includes a physical survey of the river system for points of return for applied irrigation waters (pipes, culverts, canal gates), evaluation and documentation of cropping patterns, and the eventual tracking of the application with the local agricultural commissioner. Once the likely source has been identified, contact with the suspected grower(s) would begin so as to prevent future occurrences. A wide range of options are available, including improved irrigation management, changes in chemistry applied, changes in application methods, or any other method that would prevent the offsite movement of the detected material.

The proposed MRP covers the specifics for each sub-watershed on pages 30-89.

Project Background

The requirement for a comprehensive testing program as part of the Agricultural Discharge Waiver (now Irrigated Lands Regulatory Program) was put into place in July 2003 with the installation of a new discharge waiver. The program was revised in January 2008 to incorporate additional requirements for the selection of sample sites and the development of management plans, if triggered.

Table 1: MRP Chemistries Tested for and Basin Plan Objectives for Tulare Lake Basin

CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS	CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS
Flow		cfs	EC	300 - 600*	umhos/cm
pH	**6.5 – 8.3**	pH units	Temperature	Variable	ºC
Dissolved Oxygen	**5-7** (WARM/COLD)	mg/L	TDS	450	mg/L
Turbidity	Variable	NTU	Nitrate-N	10	mg/L
Nitrite-N	1	mg/L	Orthophosphate-P	NA	mg/L
Ammonia-N	**25**	ug/L	TKN	NA	mg/L
Color	NA	APHA	Phosphorus	NA	ug/L
Arsenic	**10**	ug/L	Boron	700	ug/L
Cadmium	**5**	ug/L	Copper	Variable	ug/L
Lead	**15**	ug/L	Nickel	**100**	ug/L
Selenium	5	ug/L	Zinc	Variable	ug/L
Hardness	NA	mg/L	Atrazine	**1**	ug/L
Cyanazine	1	ug/L	Simazine	**4**	ug/L
Methamidophos	0.35	ug/L	DDE	0.001	ug/L
DDT	0.001	ug/L	DDD	0.001	ug/L
Dicofol	NA	ug/L	Dieldrin	0.056	ug/L
Endrin	**2**	ug/L	Methoxychlor	**30**	ug/L
Bifentrhin		ug/L	Cyfluthrin		ug/L
Cypermethrin		ug/L	Esfenvalerate		ug/L
Lambda cyhalothrin		ug/L	Permethrin		ug/L
Aldicarb	3	ug/L	Carbaryl	2.53	ug/L
Carbofuran	**18**	ug/L	Diruon	2	ug/L
Linuron	1.4	ug/L	Methiocarb	5	ug/L
Methomyl	0.52	ug/L	Oxamyl	**50**	ug/L
Azinphosmethyl	0.01	ug/L	Chlorpyrifos	0.015	ug/L
Diazinon	0.1	ug/L	Dimethoate	1	ug/L
Disulfoton	0.05	ug/L	Malathion	0.1	ug/L
Methidathion	0.7	ug/L	Molinate	**20**	ug/L
Methyl Parathion	0.08	ug/L	Phorate	0.7	ug/L
Thiobencarb	**70**	ug/L	Glyphosate	**700**	ug/L
Paraquat	3.2	ug/L	TOC	NA	ug/L
Trifluralin	5	ug/L	Dichlorvos	0.085	ug/L
Dimeton-s	NA	ug/L	Phosmet	140	ug/L
Molybdenum	10	ug/L	Fenpropathrin		ug/L

*EC objective is allowed to fluctuate between irrigation delivery and non-delivery. Basin Plan Objectives are **bold black**, *Interim Objectives* are in blue. *Interim Objectives* provided March 19, 2011. These are not the mandated reporting limits for the constituent in question.

Limited laboratory testing (water column toxicity) along with physical parameter (dissolved oxygen (DO), electrical conductivity (EC), pH, and temperature) measurements were started on a systematic schedule in 2003. The water column toxicity tests included an evaluation of algae growth (*Selenastrum capricornutum*), fathead minnow (*Pimephales promelas*), and water flea (*Ceriodaphnia dubia*) survival. Each represents an important step in the aquatic food chain, and was felt that a problem with one or more, when combined with the physical parameters, would be indicative of some form of water contamination. Measurements collected were transmitted to the Regional Board as a base indicator of whether a problem existed within the Coalition.

Starting in June 2006, the testing was expanded to include general chemistry (dissolved metals), nutrients, and pesticides that the Regional Board also felt was important, and was inline with other testing done under the Surface Water Ambient Monitoring Program (SWAMP).

The program was revised in 2008 to give the Coalitions greater flexibility in selecting the sampling sites, frequency of sampling, and constituents tested for as long as each change from the previous program could be adequately justified. Sampling was increased to once per month for all submitted sites. Reporting requirements under the program were also adjusted to quarterly reports of accumulated data (in a SWAMP comparable format) and one annual report of the data collected instead of two reports per year. The increased frequency of data reporting was to help the Regional Board see trends sooner, and the single report by the Coalitions was to help reduce costs.

The sites to be tested were to be categorized as either Assessment or Core, with differing requirements for each. Assessment sites are those sites that are new to the program and thus have no historical data associated with them.

Core sites are those with historical data, and are used for the monitoring of trends within a watershed. Both types of sites would be monitored intensely for a one-year period, then only lightly sampled (lower chemistry test requirements) for the next two years, unless problems are detected during the first year. Site selection for either type is to also include any known impaired waterways within the Coalition boundaries.

A third type of site to be tested is the Special Study site, where research into a specific question is undertaken. Once sufficient data has been collected at such a site, it can be discontinued if no issues have been identified.

Overall, the water conditions present within the SSJWQC are very good. Some issues exist, but they are few and isolated.

PROJECT DESCRIPTION

Summary of Work to be Performed

The following is a description of the sampling techniques to be used under this QAPP. The basic processes used to collect samples will remain unchanged from the previous MRP/QAPP. Sampling or site photographs visits will occur on a monthly basis for each monitoring site once the MRP is adopted.

Sampling Procedures

Prior to the sampling event, physical parameter equipment will be recalibrated using known laboratory standards and according to the manufacturer's instructions. This equipment includes pH meters, EC meters, and DO meters. Known standards are brought to the field to recheck the calibration (pH, EC) at each site prior to sample collection.

Field samples of the water are collected in bottles provided by the laboratory (chemistry) or in one-gallon amber jugs specially purchased for the sampling event (water column toxicity). The containers are marked with site id, time of collection, and tests to be performed, along with any preservative added by the lab on waterproof labels. Photo documentation is performed at each site during each visit.

Glass bottles are wrapped in bubble wrap to prevent breakage during transport to the collection sites, and after collection, "blue ice" packs are placed with the samples to maintain the sample temperature as low as possible until they are packed with wet ice for shipment to the destination laboratory. Ice packing takes place the same day as the original sample with the goal of getting the sample to 4ºC or below.

Chains of custody are filled out with matching information (sample id, sample time, site, and tests required) and are given to either the courier or the lab representative when the samples change hands.

The hold time for the water column toxicity samples is 36 hours, and the samples are shipped the morning after collection by courier. Ice levels are rechecked prior to shipment. The chemistry samples are delivered to the lab the same day. The labs reship the samples to the sub-contracting labs to insure delivery within the specified hold times.

Sample Site Descriptions

Maps and coordinates for the sample site locations are included in the MRP document (maps 11-14, and pages 34-37).

Kings River Sub-Watershed

The Kings River Sub-Watershed has eight sampling sites proposed for the new MRP. Working upstream to downstream, they are Tivy Valley Creek, Gould Canal, Manning Ave, Lemoore Weir, Crescent Weir, Stinson Weir, Jackson Ave Bridge, and Empire Weir #2. Each of these sites was selected based on their ability to accurately represent specific sections of the Kings and the surrounding irrigated lands.

Tivy Valley Creek is a small watershed on the left bank (east side) of the Kings that drains an area within the foothills that has been developed to support citrus cultivation. The crop is irrigated with microirrigation systems and does not use surface water for frost protection, due to the elevation of the lands and the slopes involved. Because of the local topography and the soil types involved, substantial risk exists for sediment movement from the developed lands. Efforts are currently underway to study the potential to intercept storm runoff water and prevent the entry of sediments or other potentially detrimental materials into the Kings. The primary grower in the region is highly proactive in reducing runoff from the developed orchards.

Gould Canal is an irrigation water delivery canal constructed by the Fresno Irrigation District (FID) to convey waters obtained from the Kings River to the lands that lie between the San Joaquin River and the Kings River. It is the highest point of diversion for FID, located upstream of the diversion point for its main canal, which is located at the intersection of the Friant-Kern canal and the Kings River. A portion of this canal passes through lands developed to support citrus production, but the flatter topography and lower elevation may require that frost protection waters be applied. Consequently, numerous drain pipes have been placed into the canal to convey the excess frost protection/storm waters away from the irrigated lands and to protect the banks of the canal from erosion. In addition to this point, waters conveyed within this canal are eventually delivered to a surface water treatment facility to augment the drinking water supplies of the city of Clovis, CA (via the Enterprise Canal). The Gould Canal site represents the area that three FID irrigation canals (Enterprise, FID Main, and Gould) pass through as the waters flow westward. Water is present at least 9 months per year. The nature of the canal construction precludes the collection of sediment, as the narrow and rocky bottom and high water velocities do not allow for sediment accumulation in sufficient quantities for sampling.

The Manning Ave site is located behind Reedley City College, just below the confluence with Wahtoke Creek. It is a site that has proven to be very useful since the beginning of the sampling program, as it represents much of the “tree fruit belt” that exists within the eastern Kings River service area. Waters released to maintain the fisheries below Pine Flat Dam pass by the site during the winter months, along with any uncontrolled waters from the five minor watersheds upstream (Mill Creek, Fish Creek, Holland Creek, Tivy Valley Creek, and Wahtoke Creek). Ample sediment exists for sampling for *Hyalella azteca* toxicity.

Lemoore Weir is a major diversion point on the lower Kings River, and typically receives irrigation deliveries in the late winter or early spring. The channel normally dries shortly after deliveries are shut off. Diversions into Lemoore Canal have the potential of returning to the river (the South Fork) near Empire Weir #1, which impounds the water at Jackson Ave Bridge (discussed below).

During the irrigation season, water samples are collected downstream of the weir near a structure constructed to support the river gauging station. Sediment samples are collected between the weir and this structure. During the winter/early spring, water is collected upstream of the weir before the water passes the Lemoore Canal head gates. The distance between the two points is perhaps 300 yards.

Crescent Weir is the next major structure on the North Fork of the Kings. In normal to above normal rainfall years, water deliveries can be made to this point or perhaps beyond (to Stinson Weir, discussed below). This site captures any discharges that may occur as the water moves west-northwest towards the irrigation districts that depend more on pumped groundwater than surface deliveries. Ample sediment is present for sampling purposes.

Stinson Weir is the last *practical* delivery point on the Kings River for any flows short of Army Corps of Engineers ordered flood releases. Surface water rights exist here, but the high rate of channel losses make deliveries difficult at best. Ample sediment also exists here for sampling, should water deliveries occur.

The channel from Crescent Weir to Stinson Weir has a network of sub-surface drains installed by the Kings River Conservation District that are designed to return seepage from the river channel back to the river during flood flows. Native groundwater is sometimes returned on occasion.

The last sampling point in the program is the pool behind Empire Weir #2, located southwest of Stratford, CA. This is the last diversion point on the Kings, and the remaining flow is split between three canals that feed into the Tulare Lake bottom. The river at this point has passed though the region of shallow groundwater (and salt laden soils) and should reflect the cumulative effect of the passage of the Kings through the irrigated lands it serves. Water is generally present year-round, and given the depth of the pool, sediment samples are not going to be collected.

Several special study sites have been included in the MRP. Working from upstream to downstream, they are: Avocado Lake, Jackson Ave Bridge, and the study of the upper San Joaquin River between Friant Dam and Skaggs Bridge.

Avocado Lake was created when gravel mining for the construction of Pine Flat Dam was underway. The remaining pit, while isolated from the river (no direct inflow or outflow), is filled with seepage from the river channel. The lake is a popular recreational site during the warm summer months, and as such, is suspected of being a site of bacterial contamination. A Special Study will involve the collection of water above and below the Lake to verify any impact on the river system. Physical parameters and *E. coli*-Fecal Coliform samples will be collected only.

Going south from Lemoore Weir, the next sampling point is Jackson Ave Bridge. This site is a 303(d) impacted site for toxaphene, molybdenum, and EC. The site is located on the storage pool behind Empire Weir #1. Local groundwater conditions contribute to the higher than normal EC levels within the river at this point, and the observed molybdenum levels may also be the result of this shallow groundwater.

Samples collected here include physical characteristics (pH, DO, EC) and water samples for toxaphene and molybdenum. To date, no toxaphene has been detected and molybdenum levels vary between 1 and 25 ppb, depending upon flow through the pool. No sediment samples are collected here.

Another Special Study area is the interface between the northern Coalition boundary and the San Joaquin River. Several known points of discharge exist for operational spills from Fresno Irrigation District canals (including one covered by an NPDES permit for the Fresno Metropolitan Flood Control District), and additional time is required to assess and develop a sampling program for these sites.

Time is a crucial factor given the wide dispersal of the sampling sites. Typical on site time is 30 minutes, and the typical driving time between the major sites (those close to roads) can be as long as 60 minutes. Crescent Weir and Stinson Weir are more remote than the other sites, and require a significant amount of travel time on dirt roads to reach. While hold times are not critical for the chemistry and water column toxicity samples, bacteriological samples only have a hold time of four hours. This means that multiple teams will be collecting samples; most likely a couple of days after the chemistry and water column toxicity samples are collected.

Kaweah River Sub-Watershed

The Kaweah River Sub-watershed lies on the valley floor and contains numerous seasonal waterways and distributaries. In general, these waterways originate downstream of Terminus Dam (Lake Kaweah) and fan out across the Sub-watershed. The waterways ultimately drain to the Tulare Lakebed. The Sub-watershed is characterized by the lack of year-round surface water flows. Water flows are seasonal and consist of irrigation deliveries, flood waters, storm water flows and agricultural discharges/return flows.

The Kaweah River Sub-watershed has identified three geographic areas that will delineate the monitoring areas: Cross Creek, Kaweah River and Elk Bayou. Cross Creek flows through the northern portion of the Sub-watershed and includes some of the Sub-watershed's most agriculturally intensive areas. The Kaweah River and its distributaries flow throughout the central portion. Many of the downstream reaches of the Kaweah River and its distributaries flow through urban areas, thereby limiting monitoring opportunities. Elk Bayou flows through the southern portion of the Sub-watershed and includes a diverse range of agricultural land uses.

SP-1 is located immediately upstream of Oakes Basin at the end of the Kaweah River. The sampling point is just upstream of the bifurcation of the Kaweah River into Mill Creek and Packwood Creek. The site is accessed from Road 158 and is located approximately one mile north of Highway 198.

SP-1 was chosen based on its potential to demonstrate if any adverse impacts to water quality have occurred as waters are conveyed in the lower Kaweah River at a site upstream of the urban discharges. The sample location provides a twofold opportunity. First, the location is sited downstream of primarily pasture field crops and deciduous fruit and nut trees. There are, however, currently no identified agricultural discharges into this stretch of water and, thus, the potential to monitor a known impaired source to determine its downstream impact does not exist. The sampling point allows for a determination of the existence of any contaminant and, if contamination was found, progressive samples can occur in an upstream fashion to McKay Point and then to Terminus Dam to allow for a determination of the source of contamination. Second, the sample location also establishes baseline water quality for downstream locations.

SP-2 is located north of the City of Visalia at the crossing of Ben Maddox Way and the St. Johns River. The sampling site is downstream of the bridge crossing, but prior to the diversion dam serving the Modoc Ditch Company head gate. Agricultural uses upstream of this location consist of fruit and nut trees, field crops and commercial landscape nurseries.

SP-2 has been chosen to allow for sampling of the only identified agricultural discharge to the St. Johns River. The sampling site is below the point where the Wutchumna Water Company has operational spill capability into the St. Johns River. Thus a sample taken at this location, if taken during an operational spill period, would have the capability to demonstrate any adverse affects of that discharge on this portion of the Kaweah River. Should it be determined that identified contamination is not from this source, then sampling could continue upstream on the St. Johns River to McKay Point to determine the specific source of the contamination. If contamination were introduced between McKay Point and Terminus Reservoir, the results of such contamination should be evident at both SP-1 and SP-2.

SP-3 is a sampling point designed specifically to test the water quality of the discharge from the Stone Corral Irrigation District's Storm Water Control Project. The sampling point is located along the east right-of-way line of Road 156 just north of the Cottonwood Creek bridge crossing.

SP-3 has been located specifically to test the storm water control project impacts of the discharges from lands within the Stone Corral Irrigation District on the waters of Cottonwood Creek. The agriculture uses within the Stone Corral Irrigation District consists of primarily citrus crops. If flows in Cottonwood Creek were sufficient, the potential impact on Cross Creek could also be determined. Sampling at this location would obviously be conducted only when subterranean discharges and/or subterranean combined with surface water discharges were being produced by lands within the Stone Corral Irrigation District.

SP-4 is designed to sample the waters being conveyed in Cross Creek. The sampling location is located 500 feet upstream of the railroad tracks on the east side of Highway 99.

SP-4 was chosen to test waters in Cross Creek downstream of the introduction of influence from discharges from Kennedy Wasteway, Sand Creek and Cottonwood Creek. These areas are primarily dominated by field, grain and hay crops. If contamination was detected at that location, sampling could continue upstream to determine if the source was from the St. Johns River or from one of the contributing watersheds to the north. If the contamination was discovered to be from a source contributory to the St. Johns River, and said contaminant was absent at SP-2, then the source of contamination would likely be located on the River between the two sampling points. Sources of contamination determined to be from one of the northerly tributaries would have to be identified by upstream sampling at discreet locations dividing one stream group from another.

Rationale for a sampling location upstream of SP-4 exists as said site is often devoid of water, even during a water run. When insufficient entitlement exists for the lower river units to run, the St. Johns River is dry below Road 80 and, at times, is dry below Road 108. At these times, SP-2 is adequate to demonstrate if impacts exist.

The Regional Board previously requested that a site be added at a point on Elk Bayou. Sampling Point SP-5 was chosen at a site easterly of Highway 99. The location was chosen to reflect the agricultural activities which could contribute return flows to Bates Slough, Outside Creek and Lewis Creek, all of which combine to form Elk Bayou Slough. These waterways flow principally through pasture and field crops. The sampling point was located easterly of Highway 99 to avoid potential adverse influences from a number of sources which are not agricultural in nature. These include the Tulare Municipal Golf Course, the airport operations associated with Mefford Field and air pollution and weed control measures associated with Highway 99.

An additional location was also requested by the Regional Board which would reflect the impacts of agricultural return flows on diversions for agricultural purposes on users in the lower end of an agricultural water supply system. Sampling and testing of Goshen Ditch at SP-6 was selected to accomplish this objective. The last diversion for reasonable beneficial use for agricultural purposes from Goshen Ditch is at SP-6. As the last point of diversion, this location will allow for the impacts of agricultural return flows on downstream water users within the Goshen Ditch Company service area, if any, to be determined. Thus, the objectives sought by the Regional Board could be accomplished with the selection of this site. The Goshen Ditch Company service area consists of pastures and field crops.

Tule River Sub-Watershed

The average long term (1903-2007) water year runoff of the Tule River at Success Reservoir has been 141,530 acre-feet, of which the average April-July runoff is 64,140 acre-feet. The daily inflow is stored in Success Reservoir, dependant upon the storage restriction for maintenance of flood control storage space, for later release in conformance with irrigation demands.

Flood controlled releases during the winter and spring months, November through April, result in flows in the Tule River distributary channels during those months, dependant upon the hydrologic conditions of the water year. The flows in the Tule River during the months of May through October are in conformance with the irrigation demands of the water rights holders below Success Reservoir.

The Porterville Irrigation District (PID) and the Lower Tule River Irrigation District (LTRID) have water service contracts with the U. S. Bureau of Reclamation for the delivery of Central Valley Project (CVP) water into the Tule River Basin from the Friant-Kern Canal. The CVP water may be delivered directly from the Friant-Kern Canal into the Tule River or through distribution canals to the Tule River for irrigation of crops within the District.

Neither the flows in the Tule River below Success Reservoir or the discharges of CVP water from the Friant-Kern Canal occur on a continuous schedule, resulting in dry channels of the Tule River and its distributaries for may days and months of the water year.

Deer Creek is an uncontrolled stream that has been gauged by the U. S. Geological survey (USGS) and the Terra Bella Irrigation District at alternative locations since 1920. The USGS site No. 11200800, Deer Creek near Fountain Springs, elevation 980 feet, indicates an average annual runoff of 22,708 acre-feet. Only during above normal hydrologic conditions in the Deer Creek Watershed does the flow of Deer Creek reach the Friant-Kern Canal.

The Pixley Irrigation District, a Central Valley Project, Cross Valley Canal, contractor uses Deer Creek as a conveyance channel for the delivery of CVP water from the Friant-Kern Canal to the distribution facilities of the District.

Porter Slough is a high flow right distributary of the Tule River below Success Reservoir. Assessment monitoring will be used to characterize the quality of the Tule River water as it flows in Porter Slough after passing through the City of Porterville and downstream agricultural lands prior to discharge into the Lower Tule River Irrigation District's (LTRID) distributary canal that may contain federal Central Valley Project water. The monitoring site for Porter Slough will be near the gauging station discharge at the No. 4 canal of the LTRID. The site also is known as "Porter Slough at Road 192."

Elk Bayou is a distributary from the Lower Kaweah River system that discharges into the Tule River below Road 96. Assessment Monitoring will be used to characterize the water quality of the of the Elk Bayou flows of the Lower Kaweah River after passing through a portion of the City of Tulare Industrial Complex and downstream of the State Route 99 Highway before commingling with waters of the Tule River. The monitoring site is situated at the historic gauging station at Road 96.

The assessment monitoring site for Deer Creek will be sited above the federal Friant-Kern Canal and several miles downstream of the commencement of irrigated agriculture. Assessment Monitoring will be used to characterize the water quality of Deer Creek flows prior to commingling with Central Valley Project water from the Friant-Kern Canal. There are no tributaries or distributaries of further consideration of Deer Creek below the commencement of irrigated agriculture.

The core monitoring site of Tule River, North Fork Road 144 was selected because of the extended history of stream flow and the long-term water quality data that has been collected at the site. The Tule River, North Fork Road 144 core monitoring site is located downstream of irrigated agriculture adjacent to the Tule River and at a historic gauging station.

The core monitoring site of Tule River, Road 92 was selected because of the extended history of stream flow and the long-term water quality data that has been collected at this site. The Tule River, Road 92 core monitoring site is located downstream of irrigated agriculture adjacent to the Tule River and at a historic gauging station.

The core monitoring site of Deer Creek at Road 176 was selected at this location because of the extended history of stream flow and the long-term water quality data that has been collected at the site. The Deer Creek at Road 176 core monitoring site is located downstream of irrigated agriculture adjacent to the Deer Creek and at a historic gauging station.

The core monitoring site of Deer Creek at Road 120 was selected by the Regional Board staff due to the location below State Route 99 and because of the water quality data that has been previously collected at the site. The Deer Creek at Road 120 core monitoring site is located downstream of irrigated agriculture adjacent to Deer Creek and near the terminus of distribution facilities of Pixley Irrigation District.

Kern River Sub-Watershed

The Kern River Sub-watershed has identified four geographic areas in which its monitoring program will be conducted: (1) the Main Canal in Buena Vista Water Storage District; (2) Poso Creek after it leaves the foothills on the east side of the valley; (3) Chanac Creek in the Tehachapi area; and (4) White River within Delano-Earlimart Irrigation District.

The Main Canal/Goose Lake Canal system serves a dual benefit to agricultural and wildlife users. It is used to collect and convey tail water from the Buttonwillow Service Area of the Buena Vista Water Storage District (BVWSD) to downstream agricultural users and to convey, under long-term contract, federal and other water from the California Aqueduct to the Kern National Wildlife Refuge (KNWR) and other privately owned duck clubs. Typically, tail water flows occur in February, June, July and August, while federal deliveries to the Kern National Wildlife Refuge (KNWR) occur in September through January. The soil texture of the surrounding lands is clay and clay loams, thus resulting in murky brown water most of the time.

BVWSD and KNWR have collected water quality data on the Main Canal/Goose Lake Canal system for more than a decade. The historical records show that the system is adequately suited for agricultural and wildlife benefits for all constituents measured. These constituents include physical properties, general minerals, inorganic compounds, volatile and synthetic organic compounds (including pesticides and herbicides). For pesticides and herbicides, the values have been at a non-detectable level. TDS typically ranges from 300-1300 mg/l depending on current local irrigation supply type and hydrology.

The town of Buttonwillow discharges storm water runoff into the Main Canal, which may impact the quality of the water as it is conveyed northward. Because Kern County’s annual rainfall averages about 6.5 inches, storm water discharges from Buttonwillow do not typically create serious water quality problems.

Flows in the Main Canal at Highway 46 are seasonal. Because the majority of the crops grown in BVWSD are field crops, the Main Canal system is shut down during the non irrigation season. When the system is shut down, some shallow groundwater from adjacent lands, particularly in the vicinity of the Kern River Outlet Channel to the west, may migrate into the Main Canal.

Buttonwillow Drive is the point at which the storm water discharge into the Main Canal occurs. The site was chosen due to its potential for discharges into the Main Canal during storm events and the associated need to separate influences of urban storm runoff from irrigation runoff, and also to determine if irrigation runoff in the southern end of BVWSD (dominated by field crops) is different from irrigation runoff in the northern end of BVWSD (dominated by wildlife areas).

Main Canal and Highway 46 is an existing water quality monitoring site. This site was chosen due to the fact that a portion of the water passing this point changes beneficial use from AGR to WILD, especially if the water reaches the KNWR. Also, some agricultural lands in the northern part of BVWSD have been converted to seasonal wildlife habitat.

Flows in the Main Canal at Highway 46 are seasonal. Because the majority of the crops grown in BVWSD are field crops, the Main Canal system is shut down during the non irrigation season. When the system is shut down, some shallow groundwater from adjacent lands, particularly in the vicinity of the Kern River Outlet Channel to the west, may migrate into the Main Canal.

Poso Creek is the largest of Kern's minor streams and flows from the mountains northeast of Bakersfield to the valley floor (just east of Highway 46 and Highway 99). Poso Creek is an ephemeral stream that almost never flows the entire year. Flows on Poso Creek average 20,000–25,000 acre-feet annually, as measured at a stream gage located at Coffee Canyon. The stream gage is operated by Kern County Water Agency (Agency). The creek flows through Cawelo WD, North Kern WSD and Semitropic WSD, terminating at the Kern National Wildlife Refuge. The Poso Creek does not divert into a surface stream or waterway. In very large flood years it historically has broken out of its channel and flooded lands in the vicinity. Cawelo and North Kern often use the dry creek bed for intentional groundwater recharge. Occasionally, Semitropic WSD diverts Friant-Kern water it obtains into Poso Creek for recharge and uses the creek to distribute surface water. During flood flow events, Kern River water may be diverted into Poso Creek for recharge.

Poso Creek is the largest of the minor streams in Kern County. It infrequently flows into the valley floor. When it does, it passes through mostly permanent crops as it travels westward to the KNWR. At this point, the beneficial use changes from mainly AGR to various habitat designations.

Chanac Creek is located in the Cummings Valley in the Tehachapi area. It is an ephemeral stream which flows naturally only during storm events. The Chanac Creek watershed drains about 1,225 acres. In the Cummings Valley, agricultural plantings have obliterated the original creek bed. The creek bed reappears just downstream of the agricultural activities and runs through non irrigated pasture lands and natural landscape until it enters Tejon Creek. Sod farming previously resulted in storm runoff into Chanac Creek and resulted in a complaint to the Regional Board, who verified that storm runoff from the sod farms was occurring. Most of the sod farms have recently been replaced with small vegetables with tail water sumps to capture field runoff.

When Chanac Creek crosses Banducci Rd, it enters the Stallion Springs urban area. Stallion Springs has developed a park setting on the banks of Chanac Creek for recreation. At this point the beneficial use changes to include REC-1 and REC-2.

The Tulare Lake Basin Plan does not specify beneficial uses for Chanac Creek, except for “Other eastside streams beneficial uses.” Because it only flows during storm events, WARM and COLD beneficial uses are not applicable. Based on historical and present land uses, the main uses of Chanac Creek are AGR, REC-1, REC-2, WILD and GWR.

The White River has its headwaters on the west side of Bull Run Creek, with a drainage area of 90.6 square miles. The watershed drains a portion of the western slope of the Greenhorn Mountains. White River runs through Kern-Tulare Water District, Rag Gulch Water District and Delano-Earlimart Irrigation District, which are partially in Kern County and partially in Tulare County. It continues on through the communities of Ducor, Earlimart, Allensworth and Alpaugh en route to the Tulare Lake Basin. Similar to Poso Creek, White River is an ephemeral stream that seldom flows yearlong. Only during periods of extreme runoff (flood conditions) do flows reach Tulare Lake Basin. Flows that reach Tulare Lake Basin are diverted to holding cells and beneficially used for irrigation or evaporate. The Tulare Lake Basin is a closed basin without an outflow.

White River is an ephemeral creek in Tulare County. It infrequently flows into the valley floor. When it does, it passes through mostly permanent crops as it travels westward. While not specifically mentioned in the Basin Plan, beneficial uses of White River are assumed to be similar to Poso Creek, with AGR and GWR the most prevalent uses.

QUALITY OBJECTIVES

Quantitation Limits

The primary goals of any sampling program are to (1) collect representative samples and (2) insure that the samples are analyzed properly. In order to obtain quality data from the contracted lab, the samples must be collected and transported correctly. Once at the lab, the methods used must be followed as written, unless pre-approved modifications have occurred. The methods used, reporting and detection limits, Basin Plan Objectives (where specified), and related SOPs are shown in Table Two.

The majority of the chemical testing is done to the parts-per-billion level. Values between the PQL and MDL are reported as J-flagged (a number is given, but listed as an estimate), and values below the MDL are listed as non-detect. The flags ‘trace” or “<PQL” are not acceptable entries. Values between the MDL and the PQL are not considered “hits” under this program by the SSJWQC and will not trigger further testing.

Water toxicity tests will be considered significant at the 95% level of significance, and TIEs will not be initiated until 50% survival or below is reported. Phase I TIE testing, along with a retest of the failed test, will begin as quickly as practical for the laboratory.

MDL studies are to be performed as needed to maintain data quality. A new or current MDL study will be requested upon the adoption of this QAPP.

As part of the written report for each sampling event, the contracted chemistry lab will provide copies of the “bench sheets” for each test, as well as the calibration data for the instrument used. The laboratory reports will also contain the full report from the instrument for each sample, but the results published only reflect the requested analytes.

Quality Control Measurements

Every effort to provide quality data at both the SSJWQC and the contracted labs will be made. Field/laboratory personnel will/have received training on proper sampling/analysis techniques appropriate to the tasks performed. Verification will be the responsibility of the Laboratory Coordinator.

1. Representativeness. The sample sites selected by the SSJWQC accurately represent the regions they are located within. Samples are to be collected on a regular schedule, providing a steady workflow to the contracted labs. Samples are to be released to the laboratory in a timely manner to insure that hold times are met.
2. Comparability. All samples are to be collected in the same manner, from approximately the same location at each site, allowing for variances due to water levels, flow rates, and safety concerns. Tests used by the contracted lab

Table Two: Limits, Methods, and SOPs Used

Constituent	Matrix	Field/Lab	BPO	PQL	MDL	units	Method	Sub Watershed	SOP
Physical Parameters									
Flow	Fresh Water	Field		1		cfs		all	Appendix A, B.8
pH	Fresh Water	Field	6.5 - 8.3	1		units		all	Appendix A, B.8
EC	Fresh Water	Field	300 - 600*	0.5		umhos/cm		all	Appendix A, B.8
DO	Fresh Water	Field	7 - 5**	0		mg/l		all	Appendix A, B.8
Temp	Fresh Water	Field	variable	0		ºC		all	Appendix A, B.8
Turbidity	Fresh Water	APPL	variable	0.1	0.035	NTU	180.1	Kings	Appendix B.2
		FGL		0.2		NTU	SM 2130 B	Kaweah, Tule, Kern	Appendix B.9
TDS	Fresh Water	APPL	450***	10	4.4	mg/l	160.1	Kings	Appendix B.2
		FGL		10		mg/l	SM 2540 C	Kaweah, Tule, Kern	Appendix B.9
TSS	Fresh Water	APPL	na	10	na	mg/l	160.2	Kings	Appendix B.2
		FGL		2		mg/l	SM 2540 D	Kaweah, Tule, Kern	Appendix B.9
Hardness	Fresh Water	APPL	na	1	1	mg/l	SM 2340	Kings	Appendix B.3
		FGL		2.5		mg/l	200.7	Kaweah, Tule, Kern	Appendix B.9
Color	Fresh Water	APPL	na	5			SM 2120	all	Appendix B.2
TOC	Fresh Water	APPL	na	0.5	0.13	mg/l	415.1	all	Appendix B.4
		Babcock		0.3	0.23		SM 5310B	Kaweah, Tule, Kern	Appendix B.11
Pathogens									
E. coli	Fresh Water	BSK	235***	1.1		MPN	SM 9221	Kings	Appendix B.6
		FGL		1		MPN	SM 9221	Kaweah, Tule, Kern	Appendix B.6
Fecal coliform	Fresh Water	BSK	200/400	1.1		MPN	SM 9221	Kings	Appendix B.6
		FGL		1		MPN	SM 9221	Kaweah, Tule, Kern	Appendix B.6
Water Column Toxicity									
algae	Fresh Water	SFL				96h % survival	821-R02-013	Kings	Appendix B.5
water flea	Fresh Water	SFL				48h % survival	821-R02-012	Kings	Appendix B.5
fathead minnow	Fresh Water	SFL				48h % survival	821-R02-012	Kings	Appendix B.5
algae	Fresh Water	ABC				96h % survival	821-R02-013	Kaweah, Tule, Kern	Appendix B.12
water flea	Fresh Water	ABC				48h % survival	821-R02-012	Kaweah, Tule, Kern	Appendix B.12
fathead minnow	Fresh Water	ABC				48h % survival	821-R02-012	Kaweah, Tule, Kern	Appendix B.12
Sediment									
Hyalella	Sediment	PER				10d % survival	600-R-99-064	Kings	Appendix B.7
Hyalella	Sediment	ABC				10d % survival	600-R-99-064	Kaweah, Tule, Kern	Appendix B.12
Carbamates									
Aldicarb	Fresh Water	APPL	3	0.4	0.2	ug/l	8321A	all	Appendix B.4
Carbaryl	Fresh Water	APPL	2.53***	0.07	0.05	ug/l	8321A	all	Appendix B.4
Carbofuran	Fresh Water	APPL	0.5***	0.07	0.05	ug/l	8321A	all	Appendix B.4
Methiocarb	Fresh Water	APPL	5***	0.4	0.2	ug/l	8321A	all	Appendix B.4
Methomyl	Fresh Water	APPL	0.52***	0.07	0.05	ug/l	8321A	all	Appendix B.4
Thiobencarb	Fresh Water	APPL	3.1***	0.5	0.06	ug/l	8141A	all	Appendix B.4
Oxamyl	Fresh Water	APPL	50	0.4	0.2	ug/l	8321A	all	Appendix B.4

Table Two: Limits, Methods, and SOPs Used

Constituent	Matrix	Field/Lab	BPO	PQL	MDL	units	Method	Sub Watershed	SOP
Organochlorines									
DDD	Fresh Water	APPL	0.00083	0.01	0.003	ug/l	8081A	all	Appendix B.4
DDE	Fresh Water	APPL	0.00059	0.01	0.004	ug/l	8081A	all	Appendix B.4
DDT	Fresh Water	APPL	0.00059	0.01	0.007	ug/l	8081A	all	Appendix B.4
Dicofol	Fresh Water	APPL	na	0.1	0.01	ug/l	8081A	all	Appendix B.4
Dieldrin	Fresh Water	APPL	0.00014	0.01	0.005	ug/l	8081A	all	Appendix B.4
Endrin	Fresh Water	APPL	0.036	0.01	0.007	ug/l	8081A	all	Appendix B.4
Methoxychlor	Fresh Water	APPL	0.03***	0.01	0.008	ug/l	8081A	all	Appendix B.4
Toxaphene	Fresh Water	APPL	0.0002	0.5	0.38	ug/l	8081A	Kings	Appendix B.4
Organophosphates									
Azinphos-methyl	Fresh Water	APPL	0.01***	0.1	0.02	ug/l	8141A	all	Appendix B.4
Chlorpyrifos	Fresh Water	APPL	0.015	0.015	0.003	ug/l	8141A	all	Appendix B.4
Diazinon	Fresh Water	APPL	0.1	0.02	0.004	ug/l	8141A	all	Appendix B.4
Dichlorvos	Fresh Water	APPL	0.085***	0.1	0.02	ug/l	8141A	all	Appendix B.4
Dimethoate	Fresh Water	APPL	1***	0.1	0.08	ug/l	8141A	all	Appendix B.4
Demeton-S	Fresh Water	APPL	na	0.1	0.01	ug/l	8141A	all	Appendix B.4
Disulfoton	Fresh Water	APPL	0.05***	0.1	0.02	ug/l	8141A	all	Appendix B.4
Malathion	Fresh Water	APPL	0.1***	0.1	0.05	ug/l	8141A	all	Appendix B.4
Methamidophos	Fresh Water	APPL	0.35***	0.2	0.08	ug/l	8321A	all	Appendix B.4
Methidathion	Fresh Water	APPL	0.7***	0.1	0.04	ug/l	8141A	all	Appendix B.4
methyl Parathion	Fresh Water	APPL	0.08***	0.1	0.075	ug/l	8141A	all	Appendix B.4
Phorate	Fresh Water	APPL	0.7***	0.1	0.072	ug/l	8141A	all	Appendix B.4
Phosmet	Fresh Water	APPL	140***	0.2	0.06	ug/l	8141A	all	Appendix B.4
Herbicides									
Atrazine	Fresh Water	APPL	1	0.5	0.07	ug/l	619	Kings	Appendix B.4
		FGL		0.5		ug/l	507	Kaweah, Tule, Kern	Appendix B.9
Simazine	Fresh Water	APPL	4	0.5	0.08	ug/l	619	all	Appendix B.4
Cyanazine	Fresh Water	APPL	1***	0.5	0.09	ug/l	619	all	Appendix B.4
Diuron	Fresh Water	APPL	2***	0.4	0.2	ug/l	8321A	all	Appendix B.4
Molinate	Fresh Water	APPL	13***	0.5	0.13	ug/l	8141A	all	Appendix B.4
Glyphosate	Fresh Water	North Coast / FGL	700	5	2.8	ug/l	547	all	Appendix B.4
Paraquat	Fresh Water	APPL / FGL	3.2***	0.4	0.21	ug/l	549.2	all	Appendix B.4
Linuron	Fresh Water	APPL	1.4***	0.4	0.2	ug/l	8321A	all	Appendix B.4
Trifluralin	Fresh Water	APPL	5***	0.05	0.036	ug/l	8141A	all	Appendix B.4

Table Two: Limits, Methods, and SOPs Used

Constituent	Matrix	Field/Lab	BPO	PQL	MDL	units	Method	Sub Watershed	SOP
Metals									
Arsenic	Fresh Water	APPL	10	0.2	0.09	ug/l	6020	Kings	Appendix B.3
		FGL		1		ug/l	200.8	Kaweah, Tule, Kern	Appendix B.9
Boron	Fresh Water	CalTest	700***	10	5	ug/l	200.8	Kings	Appendix B.3
		FGL		10	5	ug/l	6020	Kaweah, Tule, Kern	Appendix B.3
Cadmium	Fresh Water	CalTest	5	0.1	0.02	ug/l	200.8	Kings	Appendix B.3
		FGL		0.1	0.02	ug/l	6020	Kaweah, Tule, Kern	Appendix B.3
Copper	Fresh Water	APPL / FGL	variable	0.5	0.13	ug/l	6020	all	Appendix B.3
Lead	Fresh Water	APPL / FGL	15	0.2	0.11	ug/l	6020	all	Appendix B.3
Molybdenum	Fresh Water	APPL / FGL	10***	0.5	0.07	ug/l	6020	all	Appendix B.3
Nickel	Fresh Water	APPL / FGL	100	0.5	0.16	ug/l	6020	all	Appendix B.3
Selenium	Fresh Water	APPL / FGL	5	1	0.1	ug/l	6020	all	Appendix B.3
Zinc	Fresh Water	CalTest	variable	1		ug/l	200.8	Kings	Appendix B.3
		FGL		20	2.3	ug/l	6020	Kaweah, Tule, Kern	Appendix B.3
Nutrients									
TKN	Fresh Water	APPL / FGL	na	0.5	0.267	mg/l	351.2	all	Appendix B.2
Nitrate-N	Fresh Water	CalTest / FGL	10000	0.05	0.01	ug/l	SM 4500 NO3-F	all	Appendix B.2
Nitrite-N	Fresh Water	CalTest / FGL	1000	0.05	0.01	ug/l	SM 4500 NO3-F	all	Appendix B.2
Ammonia	Fresh Water	CalTest	25	0.1		mg/l	SM 4500 NH3	Kings	Appendix B.2
		FGL		0.1		mg/l	SM 4500 NH3	Kaweah, Tule, Kern	Appendix B.9
Orthophosphate	Fresh Water	CalTest	na	0.01	0.21	mg/l	SM 4500 PE	Kings	Appendix B.2
		FGL		0.01		mg/l	SM 4500 PE	Kaweah, Tule, Kern	Appendix B.9
Phosphorus	Fresh Water	CalTest	na	0.01	8.1	ug/l	SM 4500 PE	Kings	Appendix B.3
		FGL		0.1		mg/l	SM 4500 PE	Kaweah, Tule, Kern	Appendix B.9
Pyrethroids									
Bifentrhin	Fresh Water	APPL		0.02	0.006	ug/l	8081A	all	Appendix B.4
Cyfluthrin	Fresh Water	APPL		0.03	0.003	ug/l	8081A	all	Appendix B.4
Cypermethrin	Fresh Water	APPL		0.05	0.004	ug/l	8081A	all	Appendix B.4
Esfenvalerate	Fresh Water	APPL		0.02	0.002	ug/l	8081A	all	Appendix B.4
Fenpropathrin	Fresh Water	APPL		0.01	0.005	ug/l	8081A	all	Appendix B.4
Permethrin	Fresh Water	APPL		0.02	0.009	ug/l	8081A	all	Appendix B.4
Lamda Cyhalothrin	Fresh Water	APPL		0.02	0.001	ug/l	8081A	all	Appendix B.4

*subject to flow conditions. High flow limit 300 umhos/cm, low flow limit 600 umhos/cm

**COLD limit 7 mg/l, WARM limit 5 mg/l

***Interim Value

APPL = Agricultural Priority Pollutants Laboratory, Inc., Clovis, CA
North Coast = North Coast Laboratory, Arcata, CA
BSK = BSK Laboratories, Fresno, CA
SFL = Sierra Foothill Labs, Inc., Jackson, CA
PER = Pacific EcoRisk, Inc., Fairfield, CA
ABC = Aquatic Bioassay & Consulting, Ventura, CA
Babcock = Edward S Babcock and Sons
CalTest = CalTest Analytical Laboratory, Napa, CA
FGL = Fruit Growers Laboratories, Inc., Santa Paula, CA

are to be in accordance with the ILRP program requirements. Results are to be formatted for easy importation into SWAMP.

3. Completeness. The measurement of the amount of valid data obtained per sampling event (by site) verses the amount planned. The target of the program is to achieve 90 percent completeness at each event. Efforts to prevent sample loss include careful packaging of the sample for transport, and collection of adequate volumes for analysis, laboratory losses (errors, QC failures, and equipment failure). The contracted laboratories have determined the volumes required for the tests requested, and it is assumed that this final volume contains sufficient surplus to account for laboratory issues. As such, they have specified or provided the necessary containers for the sampling collection process.
4. Recovery. Specific methods require the use of a surrogate chemical spike to test the instrument for proper function. The amount within the sample to be tested is known, the instrument in use must report a value within the acceptable range (as reported in the results section of the lab reports). Failure to report an acceptable value results in a stoppage of the procedure and determination of the cause.

Completeness will be calculated on two levels: Field and Transport, and Laboratory with levels reported within each annual report. As FGL, Inc. does the sampling for the Kaweah, Tule, and Kern Sub-Watersheds, the calculation of Completeness will be performed by them. The following describes the Completeness calculation with regards to the Kings River Sub-Watershed.

Field and Transport completeness will include: Completion of the site inspection report elements as specified on the Field Data Sheet (32 of the 42 elements listed), results of field instrument calibration checks (5 elements), actual test results for physical parameters (6 elements), completion of the Chain of Custody with the requested analyte list with no broken sample containers (2 elements). Seven items on the Field Data Sheet will not be recorded, including: Air Temp, TDS, Hydromodloc, Wet Channel width (listed twice), Mid-Channel depth, and stage. These data points are either not available (no instrument available), are measured by the contracted lab, not surveyed and highly variable, unsafe to obtain due to flow rates, or not published. Chain of Custody forms are provided by the lab, and constituent requests are photocopies of the list of analytes listed in the MRP. The samples are inspected prior to packing with ice for breakage. Bottle counts are done when the labels are affixed to the containers.

Field instrumentation calibration records (both field and office) will be submitted with the Annual Report, and count towards Field Completeness calculations.

For the Field and Transport section to be judged 90 percent complete, it must score 40 out of 44.

Laboratory Completeness is achieved via the signed Chain of Custody, the reporting of the conditions of the samples as they are unpacked by the lab and labels with internal tracking tags, and the preparation of an exception report. Laboratory failures (breakage of sample container, instrument failure, etc.) would be documented here.

Further evaluation of completeness will be an exhaustive examination of the results (proper constituents tested using the proper methods). For the laboratory section to have a 90 percent completeness rating, it must score 69 out of 77.

Failure analysis, consisting of a verbal discussion between the Coalition and the laboratory regarding the failure (broken bottles, inadequate samples, instrument failure) will be documented both in a communication report to the Regional Board and in the Annual Report. Quality objective categories are outlined in Tables Three and Four.

Table Three: Data Quality Objectives

Measurement or Analysis Type	Applicable Data Quality Objective
Field Measurements	
Physical Parameters (EC, pH, DO, temp)	Accuracy, Precision, Completeness
Toxicity	Precision, Completeness
Pathogens	Precision, Completeness, Contamination
Nutrients	Accuracy, Precision, Completeness, Recovery, Contamination
Metals	Accuracy, Precision, Completeness, Recovery, Contamination
Carbamates	Accuracy, Precision, Completeness, Recovery, Contamination
Organochlorines	Accuracy, Precision, Completeness, Recovery, Contamination
Organophosphates	Accuracy, Precision, Completeness, Recovery, Contamination
Pyrethroids	Accuracy, Precision, Completeness, Recovery, Contamination
Herbicides	Accuracy, Precision, Completeness, Recovery, Contamination

Table Four: QA/QC Requirements

Constituent	Matrix	Matrix Spike/Lab Control Spike Frequency	Accuracy/ Recovery	Lab Duplicate Frequency	Precision	Completeness
Physical Parameters						
Flow	Fresh Water	na	+/- 2%	na	+/- 2%	90%
pH	Fresh Water	na	+/- 0.5 units	na	+/- 0.5 units	90%
EC	Fresh Water	na	+/- 5%	na	+/- 5%	90%
DO	Fresh Water	na	+/- 0.5 mg/l	na	+/- 0.5 mg/l or +/- 10%	90%
Temp	Fresh Water	na	+/- 0.5 ºC	na	+/- 0.5 ºC or 10%	90%
Turbidity	Fresh Water	na	na	1 per batch	RPD ≤ 25%	90%
TDS	Fresh Water	na	na	1 per batch	RPD ≤ 25%	90%
TSS	Fresh Water	na	na	1 per batch	RPD ≤ 25%	90%
Hardness	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
TOC	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
Pathogens						
E. coli	Fresh Water	1 per batch	na	na	Rlog ≤ 3.27* mean Rlog	90%
Fecal coliform	Fresh Water	1 per batch	na	na	Rlog ≤ 3.27* mean Rlog	90%
Water Column Toxicity						
algae	Fresh Water	1 per batch	na	na	RPD ≤ 25%	90%
water flea	Fresh Water	1 per batch	na	na	RPD ≤ 25%	90%
fathead minnow	Fresh Water	1 per batch	na	na	RPD ≤ 25%	90%
Sediment						
Hyalella	Sediment	1 per batch	na	na	RPD ≤ 25%	90%
Carbamates						
Aldicarb	Fresh Water	1 per batch	31-133%	1 per batch	RPD ≤ 25%	90%
Carbaryl	Fresh Water	1 per batch	44-133%	1 per batch	RPD ≤ 25%	90%
Carbofuran	Fresh Water	1 per batch	36-165%	1 per batch	RPD ≤ 25%	90%
Methiocarb	Fresh Water	1 per batch	35-142%	1 per batch	RPD ≤ 25%	90%
Methomyl	Fresh Water	1 per batch	23-152%	1 per batch	RPD ≤ 25%	90%
Oxamyl	Fresh Water	1 per batch	10-117%	1 per batch	RPD ≤ 25%	90%
Organochlorines						
DDD	Fresh Water	1 per batch	38-135%	1 per batch	RPD ≤ 25%	90%
DDE	Fresh Water	1 per batch	21-134%	1 per batch	RPD ≤ 25%	90%
DDT	Fresh Water	1 per batch	18-145%	1 per batch	RPD ≤ 25%	90%
Dicofol	Fresh Water	1 per batch	40-135%	1 per batch	RPD ≤ 25%	90%
Dieldrin	Fresh Water	1 per batch	48-121%	1 per batch	RPD ≤ 25%	90%
Endrin	Fresh Water	1 per batch	24-143%	1 per batch	RPD ≤ 25%	90%
Methoxychlor	Fresh Water	1 per batch	30-163%	1 per batch	RPD ≤ 25%	90%
Toxaphene	Fresh Water	1 per batch	23-140%	1 per batch	RPD < 25%	90%
Organophosphates						
Azinphos-methyl	Fresh Water	1 per batch	36-189%	1 per batch	RPD ≤ 25%	90%
Chlorpyrifos	Fresh Water	1 per batch	61-125%	1 per batch	RPD ≤ 25%	90%
Diazinon	Fresh Water	1 per batch	57-130%	1 per batch	RPD ≤ 25%	90%
Dichlorvos	Fresh Water	1 per batch	10-175%	1 per batch	RPD ≤ 25%	90%
Dimethoate	Fresh Water	1 per batch	68-202%	1 per batch	RPD ≤ 25%	90%
Demeton-S	Fresh Water	1 per batch	40-125%	1 per batch	RPD ≤ 25%	90%
Disulfoton	Fresh Water	1 per batch	47-117%	1 per batch	RPD ≤ 25%	90%
Malathion	Fresh Water	1 per batch	47-125%	1 per batch	RPD ≤ 25%	90%
Methamidophos	Fresh Water	1 per batch	25-136%	1 per batch	RPD ≤ 25%	90%
Methidathion	Fresh Water	1 per batch	50-150%	1 per batch	RPD ≤ 25%	90%
methyl Parathion	Fresh Water	1 per batch	55-164%	1 per batch	RPD ≤ 25%	90%

Table Four: QA/QC Requirements

Constituent	Matrix	Matrix Spike/Lab Control Spike Frequency	Accuracy/ Recovery	Lab Duplicate Frequency	Precision	Completeness
Phorate	Fresh Water	1 per batch	44-117%	1 per batch	RPD ≤ 25%	90%
Phosmet	Fresh Water	1 per batch	50-150%	1 per batch	RPD ≤ 25%	90%
Herbicides						
Atrazine	Fresh Water	1 per batch	39-156%	1 per batch	RPD ≤ 25%	90%
Simazine	Fresh Water	1 per batch	21-179%	1 per batch	RPD ≤ 25%	90%
Cyanazine	Fresh Water	1 per batch	22-172%	1 per batch	RPD ≤ 25%	90%
Diuron	Fresh Water	1 per batch	52-136%	1 per batch	RPD ≤ 25%	90%
Glyphosate	Fresh Water	1 per batch	72-131%	1 per batch	RPD ≤ 25%	90%
Paraquat	Fresh Water	1 per batch	50-141%	1 per batch	RPD ≤ 25%	90%
Linuron	Fresh Water	1 per batch	49-144%	1 per batch	RPD ≤ 25%	90%
Trifluralin	Fresh Water	1 per batch	40-148%	1 per batch	RPD ≤ 25%	90%
Metals						
Arsenic	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Boron	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Cadmium	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Copper	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Lead	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Molybdenum	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Nickel	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Selenium	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Zinc	Fresh Water	1 per batch	75-125%	1 per batch	RPD ≤ 25%	90%
Nutrients						
TKN	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
Nitrate-N	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
Nitrite-N	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
Ammonia	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
Orthophosphate	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
Phosphate	Fresh Water	1 per batch	80-120%	1 per batch	RPD ≤ 25%	90%
Pyrethroids						
Bifentrhin	Fresh Water	1 per batch	15-146%	1 per batch	RPD ≤ 25%	90%
Cyfluthrin	Fresh Water	1 per batch	15-146%	1 per batch	RPD ≤ 25%	90%
Cypermethrin	Fresh Water	1 per batch	15-146%	1 per batch	RPD ≤ 25%	90%
Esfenvalerate	Fresh Water	1 per batch	15-146%	1 per batch	RPD ≤ 25%	90%
Fenpropathrin	Fresh Water	1 per batch	15-146%	1 per batch	RPD ≤ 25%	90%
Permethrin	Fresh Water	1 per batch	15-146%	1 per batch	RPD ≤ 25%	90%
Lamda Cyhalothrin	Fresh Water	1 per batch	15-146%	1 per batch	RPD ≤ 25%	90%

Table Five: Laboratory Objectives, Frequencies, and Corrective Actions

Conventional Constituents in Water

Sample Type	**Objective**	**Frequency of Analysis**	**Recommended Control Limits**	**Recommended Corrective Action**
External Calibration (3 to 5 standards tests with 1 near MDL)	Full Calibration	Manufacturers Recommendations and Method Requirements	Linear Regression, $R^2 > 0.995$	Determine cause and take corrective action; recalibrate
Calibration Verification using a mid range standard	Verify Calibration	After every 20 samples	% Recovery = 80 to 120 %	Determine cause and take corrective action, recalibrate or flag data
MDL Determination	Establish or Confirm MDL	7-replicate analysis prior to use of method, annual MDL after	Determined by program manager	Redetermine MDL
Accuracy and Precision Assessment using reference materials above and below anticipated levels	Assess Method performance for initial assessment and routine accuracy assessment	As required to verify accuracy of method; then 1 blind per 20 samples or batch	% Recovery value = 80 to 120 %	Determine cause and take corrective action, recalibrate or flag data
Matrix spikes using field water samples at 10x MDL	Assess matrix effects and accuracy (%R) routinely	1 per 20 samples or 1 per batch, whichever is more frequent	%Recovery = 80 to 120% or Control limits of 3x the St Dev	Determine cause and take corrective action, recalibrate or flag data. Zero percent recovery rejects all data.
Matrix Spike replicates	Assess method precision	1 per 20 samples or 1 per batch, whichever is more frequent	RPD <25% for duplicates	Determine cause and take corrective action, recalibrate or flag data
Laboratory Duplicate	Assess method precision	1 per 20 samples or 1 per batch, whichever is more frequent	RPD <25% for duplicates	Determine cause and take corrective action, recalibrate or flag data
Field Replicate	Assess method precision, assess total variability	5% annual rate or one per sample event	RPD <25% for duplicates	Determine cause and take corrective action, recalibrate or flag data
Contamination Assessment Laboratory Blank	Assess contamination from equipment	1 per 20 samples or 1 per batch, whichever is more frequent	Blank <MDL for target analyte	Determine cause (contaminated reagent, bottles, equip), remove source and reanalyze or flag
External QA Assessment	On-going demonstration of lab capability	One per year	Determined by study manager	Determine cause of problem, reanalyze sample. QA manager to review

Criteria for Synthetic Organic Compounds (non-volatiles)

Sample Type	Objective	Frequency of Analysis	Recommended Control Limits	Recommended Corrective Action
Internal/External Calibration (3-5 standards over expected range with 1 near MDL)	Full Calibration, establish instrument response to target conc.	Follow manufacturers recommendations and protocols, minimum 3 pt calibration	Linear regression, $R^2 > 0.995$ or %RSD <10 %	Determine cause and take appropriate corrective action. Recalibrate and reanalyze, or flag
Calibration Verification	Verify calibration	After initial calibration, every 10 samples	%R = 85 to 115 %	Determine cause and take appropriate corrective action. Recalibrate and reanalyze, or flag
MDL Determination	Establish or confirm MDL for analyte of interest	7 replicates before, 5 replicates at 3 concentrations with 1 near MDL; annually	Determined by program manager	Redetermine MDL
Accuracy and Precision Assessment	Assess method performance (initial and routine)	Method validation, as many as needed. 1 per 20 samples or batch	% Recovery = 50-150 %	Determine cause and take appropriate corrective action. Recalibrate and reanalyze, or flag
Matrix spikes with field water	Assess matrix effects and accuracy	1 per 20 samples or per batch, whichever is greater	% Recovery = 50 to 150 %, or Control limits based on 3x St Dev	See Reference materials protocols Zero percent recovery rejects all samples
Matrix spikes replicates	Assess method precision	1 duplicate per 20 samples or per batch	RPD <25 % for duplicates	See Reference materials protocols
Field Replicate	Assess method precision, assess total variability	5% annual rate or one sample per event	RPD <25% for duplicates	Determine cause and take appropriate corrective action. Recalibrate and reanalyze, or flag
Contamination Assessment Laboratory Blanks	Assess contamination from equipment, reagents, etc.	1 per 20 samples or per batch	Blank < MDL for target analyte	Determine cause of problem (reagents, equipment, instrument), remove source, reanalyze or flag
Routine Monitoring of Method Performance for Organic Analysis Surrogate spikes	Assess method performance and estimate recovery	In every calibration standard, sample, and blank	Determined by program manager	Determine cause of problem, take appropriate corrective action, reanalyze or flag data
External QA Assessment	Demonstration of lab capability	One per year	Determined by study manager	Determine cause and reanalyze

Criteria for Trace Metals in Water

Sample Type	**Objective**	**Frequency of Analysis**	**Recommended Control Limits**	**Recommended Corrective Action**
External Calibration (3-5 standards over expected range including 1 near MDL	Full Calibration	Follow manufacturers protocols, 3 pt calibration	Linear regression $R^2 = 0.995$	Determine cause, correct, and reanalyze sample or flag data
Calibration Verification (one independent mid-range standard)	Verify calibration	Every 10 samples	Mercury %R = 80-120 %, others %R = 90 – 110 %	Determine cause, correct, recalibrate and reanalyze or flag data
MDL Determination spiked matrix (analyte free) samples at 3-10x MDL	Establish or confirm MDL	7 replicates prior to use of method; Reevaluate annually	Determined by program manager	Redetermine MDL
Accuracy and Precision Assessment	Assess method performance, routine assessment	Method validation as required, 1 per 20 samples or per batch	Method validation % R = 75-125 %	Determine cause, correct, recalibrate and reanalyze or flag data
Matrix spikes with field water at 5-10 times MDL	Assess matrix effects and accuracy	1 per 20 samples or per batch	% R = 75-125 %	Determine cause, correct, recalibrate and reanalyze or flag data Zero percent recovery rejects all data
Matrix spikes replicates	Assess precision	1 per 20 samples or batch	RPD < 25 % for duplicates	Determine cause, correct, recalibrate and reanalyze or flag data
Laboratory duplicate	Assess method precision	1 per 20 samples or batch	RPD < 25 % for duplicates	Determine cause, correct, recalibrate and reanalyze or flag data
Field replicate	Assess method precision, total variability	5 % annual rate or 1 sample per event	RPD < 25 % for duplicates	Determine cause, correct, recalibrate and reanalyze or flag data
Contamination Assessment Laboratory blanks	Assess contamination of reagents, equipment	1 method blank per 20 samples or 1 per batch	Blanks < MDL for target analyte	Determine cause (reagent, equipment, instrument, remove source, reanalyze or flag data
External QA Assessment	Demonstration of lab capability	Once per year	Determined by study manager	Determine cause of problem and reanalyze sample

Photo documentation shall constitute 100 percent Completeness for those times when no sample water is available.

Transport represents the greatest risk to the sample once collected, and every effort is made to package the samples in protective materials. Glass containers are wrapped in “bubble-wrap” both before and after sample collection. Care is exercised in placing the “blue-ice” temperature control materials within the ice chests after the sample is collected, to prevent breakage. Travel speeds on unimproved roads are also limited.

An additional concern is the stress induced upon the 1-gallon bottles caused by water expansion. An air space is now left within the bottles to relieve the stress on the neck caused by this expansion. Several bottles have broken at the lab as the bottles are removed from the ice, sometimes with injuries.

An additional factor in the Completeness calculation is an evaluation of the *precision and accuracy* within the laboratory. This is addressed through the methods specified and the running of sample spikes for selected materials. The presence of a blank and spiked sample within the chemical constituent tests shall be construed a precision and accuracy test. Any variances for these tests are noted in the QC notes at the beginning of the report. A current MDL study shall also be kept on file.

Calculations of Relative Percent Difference (RPD) or Relative Standard Deviation (RSD) should be included within the data package submitted.

A summary of the Completeness calculation process is appended to the end of this document.

Special Training Needs/Certification

As of this time, there are no Coalition staff members with specialized training in chemistry or laboratory procedures, outside of the coursework taken as part of their general educational curriculum. All personnel involved in the project have been part of the sample collection team since the inception of the program, and are familiar with the maintenance and calibration of the equipment used. Technical questions are fielded by the contracted labs.

Because the sampling for the Kings Sub-Watershed is done “in-house,” the Laboratory Coordinator at the Kings Sub-Watershed is responsible for the proper documentation of equipment calibration, the safety of the sampling crew while in the field, and the review and analysis of the data collected. The Laboratory Coordinators at the other sub-watersheds are responsible for the oversight of the contracted sampling technician.

The majority of the samples are grab samples of flowing river water, so the only training is in the operation of the field instruments used and proper sampling techniques. Sample containers for chemistry are provided by the contracted laboratory, and extreme care is exercised when filling containers containing acid preservatives.

Sediment samples are allowed to be collected by an “in-house” representative of the Coalition. As this service is included with the FGL contract with Kaweah, Tule, and Kern, a staff person(s) will be trained at the Kings River Sub-Watershed for sample collection in accordance with State Board SWAMP guidelines.

Data generated by the laboratories must pass a QA/QC process and any exceptions to the methods used in the analysis are noted in the reports.

Documents and Records

Record keeping is a critical component to any research project. The data collected by the Coalition is maintained in multiple locations. Each lab is required to maintain a copy of the data for a specified period of time.

Copies of the data submitted by the labs to the Coalition are kept at the offices of the individual sub-watersheds that contracted the work. Additional copies of the data are submitted to the Regional Board with the Semi-Annual (now Annual) reports. Copies of this data are kept at the local Board office in Fresno, the Regional Board office in Rancho Cordova, and at the Coalition's legal counsel's office.

Data is submitted to the Coalition by the labs in pdf format, and stored electronically. This is more efficient than paper copies of the reports, given the voluminous amounts of data generated (sample data, calibration data, bench sheets, etc.). CD's of the data are routinely made and stored in a secure manner.

Data submission is to be in a SWAMP comparable excel spreadsheet prepared by the individual laboratories (in addition to the previous data formats submitted), which will be combined into a single spreadsheet for submission to the Regional Board. Data can also be directly input into the SWAMP database.

Data collected and held by the Coalition will be stored indefinitely at each of the Sub-Watershed's offices (each Sub-Watershed will hold the data they generate). How long the data submitted to the Regional Board is held is unknown.

Electronic data at the Kings Sub-Watershed is backed up each night, with a full network backup weekly on removable hard drives. All chemical data is received as CD's (or attachments to emails) and copied onto the computer network; no data is stored on individual desktop units. Some backup copies are kept at an offsite storage facility; others are kept within a fire-proof vault on site. Chemical data submitted to the Coalition on CD's are kept on site. Laboratories maintain test results as required.

Documents retained by the Coalition include: paper copies of the field data sheets, paper copies of the Chains of Custody, purchase orders for lab services, and printed copies of the Water Column Toxicity results. All of which are also backed up electronically.

Each data submission to the Regional Board will be a stand alone file stored electronically at the Coalition. Once submitted and accepted by the Regional Board, the data will be integrated into the SWAMP database as maintained by UC Davis.

The QAPP, once approved, will be submitted to the recipient list on CD. Two versions will be submitted, one containing proprietary information regarding chemical testing from sediment samples, the other for public viewing. They will be clearly labeled. A paper copy of each version will be provided to the Regional Board for review.

DATA GENERATION AND ACQUISITION

Sampling Process Design

The data points selected by the Coalition are based on known local conditions by those who know the conditions best, the representatives of the Sub-Watersheds. Each site is chosen based upon its suitability for sampling and its ability to represent the local conditions within which it is situated.

Sampling will be conducted according to the schedule mandated within the MRP, with visits to all sample sites on a monthly basis. The date for the sampling event was left open to the Coalitions, and a fixed schedule was selected as being most suitable. This allows the contracted labs to schedule their workloads accordingly, thus allowing for the timely processing of the samples submitted (this insures that hold times are met for all samples).

The sampling design is to test for the specified chemistries at each of the identified sampling points, thus creating defined areas that can be easily addressed should detection occur. Some points are aimed at storm water detections; others are focused on management practices that are unique to a specific area. The remaining points are general sites that serve to monitor the water quality present. Modifications to the list of tested chemistries are planned once cropping patterns and pesticide usages are analyzed.

The study design is a simple one because of the nature of the waterways involved. Many of the river systems within the Tulare Lake Basin have been optimized for irrigation deliveries. The larger streams are controlled (Army Corps of Engineers), while the other, smaller watersheds remain uncontrolled. The nature of the delivery channels is such that many are located above grade to the field they serve. The program is designed to detect any occurrence of chemical contamination of these waterways, and then to trace the source.

Monitoring is done at predetermined sites based on local conditions. Three of the four sub-watersheds plan to continue monitoring at the designated sites, while the fourth plans an aggressive program of identifying and removing points of discharge into the systems it monitors.

The sampling strategy employed by the SSJWQC is based on an analysis of the service area covered by the Coalition within the Tulare Lake Basin and the lands located to the east that would have a potential to impact basin. Local cropping patterns, local topography, reaction of the smaller watersheds to storm events, the potential of a cumulative effect on the river systems as they move towards the Tulare Lake Basin are addressed by the sample sites selected. Interior issues, such as the drainage of frost protection waters into constructed waterways are also addressed.

All monitoring sites listed within the MRP will be visited during each month. It is anticipated that many of the sample sites will only require photo documentation for the majority of the sample dates. This is due to the ephemeral nature of the river system when irrigation deliveries are discontinued. Remaining irrigation demand in these areas is supplied by groundwater. Several sites will have water present during all 12 sampling periods, even though water flows will have ceased. Water remains at the surface due to the changing nature of the subsoil, and the presence of elevated groundwater levels.

The occurrence of an exceedance at any of the sites will trigger a review of the possible sites where the detected chemical could have been used. Also, a physical survey may be undertaken to determine where the chemical could have entered into the river system. The problem involved with this approach is the time lag between the date of the sample and the date the results are returned from the laboratory. In many cases, another sampling event will have taken place before the offending sample has been analyzed. The exact course of action will depend upon the chemistry detected, and the conditions that were present when the sample was collected.

Some of the sample sites are certain to be wet during the full course of the year. At these sites, a full set of chemical tests (as specified by the MRP) will be run. Samples will be grab samples of ambient water. Another site that will remain wet for the full year is a 303(d) site that will be tested for toxaphene and molybdenum only, plus the usual tests for physical characteristics.

The remaining sites are expected to be dry the majority of the year.

A duplicate sample is randomly collected from those sites with water present. One duplicate will be collected within each sub-watershed for each event. It will consist of chemistry tests only and will not include the Jackson Ave., Kings River Sub-Watershed site due to its 303(d) listing status.

All data collected is critical for this project, as its collection is mandated within the MRP.

The only sources of natural variation within the testing program are the EC values. This is due to the ephemeral nature of the uncontrolled streams that are monitored, and their impacts on the major streams that feed into Tulare Lake. These sources of variation are natural, and as such, uncontrollable.

No known sources of bias exist within the testing program. Field instruments, which could be considered a source of bias, are constantly checked for calibration against known standards and rechecked at the field during the course of the day. The laboratories constantly recalibrate their instrumentation as per method, so that source is minimized as well.

Sample Collection Methods

A more detailed description of the Sample Collection Methods is listed in Appendix A.

For the water sample to be acceptable, the following criteria must be met:

1. Sample must come from flowing water or from a body of water where flow is taking place.
2. The sampler must remain downstream of the sample bottle while the sample is being collected.
3. A delay between samples must occur to allow any disturbed sediment to clear the area of sample collection.
4. The Water Column Toxicity sample bottles should be rinsed with sample water before the final sample is collected.
5. The samples must be kept chilled prior to packing with ice for transport.

Unacceptable water samples would include samples from stagnant water (no current flow or recent flow), and water that is too shallow to completely submerge the sample container without excessive disturbance of the sediment.

Sediment samples are considered acceptable if the depth of the sediment collected does not exceed 2.5 cm (per method). The sediment must be collected within a reasonable distance of the water collection site, and in sufficient volume to perform an adequate analysis.

Unacceptable sediment samples would be those collected from depths in excess of 2.5 cm, from too far away from the water sample site (thus potentially representing different conditions than those present when water samples are collected), and samples of insufficient volume. Failure to transport the sample at controlled temperatures would also constitute an unacceptable sample.

Volumes of collected sample are designated by the contracted laboratory to allow for sufficient volume to test, plus additional volume for retesting in the event of laboratory errors (spillage, instrument failure, operator error). Breakage, unfortunately, cannot be anticipated once the sample is delivered to the lab, so no contingency plan is available for such an occurrence. The only recourse is to fully duplicate <u>all</u> samples, which is impractical for all concerned.

The sequence of events for a sampling event is as follows:

1. Several days before the event, all bottles are collected and labeled for the event. They are then packed into labeled ice chests for transport.
2. The day before the event, the calibration of the field instruments is performed according to manufacturer specifications. Adequate supplies of standard solutions are placed within the field equipment box for instrumentation checks

while at the sample sites. Battery issues with field instruments are addressed at this time.

3. The day of the sample, chests are loaded into the vehicles along with a chest filled with “blue ice” sample temperature maintaining blocks.

Once at a site, the sequence is as follows:

1. One team member begins the filling out of the sample sheet for the site (field sheet and chain of custody), and takes a photo of the site. The site where the sample is collected does not change from event to event (except at Lemoore Weir in the spring, but not significantly), so the GPS coordinates remain the same from event to event. The names of the sampling crew are recorded on the sample sheet.
2. Ice chests to be used at the site are carried from the vehicle to the sample site.
3. Date, sampler, and time of sample are recorded on the bottles within the chests.
4. Field instruments are checked against the standard solutions (pH and EC), and the data recorded.
5. Field instruments are placed in the water for readings.
6. After recording the readings, the instruments are moved to a second position at the sample site for a duplicate reading. Instruments are rinsed with distilled water after use. This process is completed before the sample containers are released for collection.
7. Water samples are collected until all bottles are filled. Care is exercised to repack the bottles to prevent breakage.
8. “Blue ice” is placed in the chests once they are carried back to the vehicle.

After the samples are returned to the office, and offloaded from the vehicle, cubed ice is purchased and packed into the chests (blue ice is removed). Chemical test samples are then transported to the lab. Water Column Toxicity samples are stored within the office for transport the next morning.

Sample containers are provided by the contracted laboratory for the chemistry samples, and include the following for each site:

#	Volume	Color	Material	Preservative
6	Liter	Amber	Glass	None
1	Liter	Amber	Plastic	$Na_2S_2O_3$ (for paraquat)
1	500 ml	-------	Plastic	None
1	500 ml	-------	Plastic	HNO_3
1	500 ml	-------	Plastic	H_2SO_4
1	250 ml	Amber	Glass	H_2SO_4
1	40 ml	Amber	Glass Vial	None

This is the bottle order list for samples submitted to APPL, Inc. and is representative of the requirements for the specified chemistry tests.

Glass bottles are wrapped in bubble wrap to prevent breakage, and all are carried in a standard sized ice chest.

Water Column Toxicity samples are collected in 1-gallon amber glass jugs, with 6 gallons of sample per site. Each jug is rinsed using sample water prior to filling with the final sample. Each bottle is wrapped in bubble wrap to prevent breakage. Headspace is left at top of bottle to reduce risk of bottle breakage at lab.

As stated in the SOP section (Appendix A), the field instruments are rinsed in distilled water after the second (duplicate) reading, and stored within the instrument case. The pH meter is returned to a container containing pH 7 solution for transport.

Problems are always unforeseen. Barring a technical failure in the field instrumentation or an accident during or between the sampling events, most anticipated issues can be dealt with.

Technical failures will result in the loss of all data from the instrument from the point of failure on due to the need to return the instrument to the manufacturer for repairs. Battery issues are eliminated by inspecting the instrument during calibration.

Auto accidents or the dropping of a sample container are by nature unpredictable.

Access restrictions to the sample site are likely to be rare, and corrected (if practical) by hiking to the site.

Sufficient staff exists to cover a sampling event in the event of scheduling conflict or illness.

The only samples that require homogenization are the sediment samples, which are collected across the entire channel. The process is completed within the sample container using a clean instrument.

Sample Handling and Custody

The sample holding time for liquid samples are as follows (details of which are listed in Appendix C):

Water Column Toxicity: Testing to begin within 36 hours of collection. Delivery to the lab occurs between 24 and 36 hours after collection.

Chemistry samples are turned over to the lab the day they are collected. Holding time at the lab is specified by the analysis method used.

Pathogen samples are collected and returned to the contracted lab within 24 hours of collection.

All samples are collected in laboratory supplied containers (except toxicity samples). Storage once the samples are released to the lab is at the lab's discretion. Any exceptions to the holding times are noted in the laboratory report and are addressed on a case by case basis. Sample preservation is handled by the chemistry lab, and the bottles supplied are pre-treated with the proper preservation (if required).

Samples are transported within ice chests that contain "blue ice" blocks to maintain low temperatures until the samples can be packed with wet ice. Glass bottles are wrapped in bubble wrap to prevent breakage (it also insulates the samples before they are packed in ice). Toxicity samples are repacked in ice (or have the levels checked) the next morning prior to transport.

Chains of custody forms are provided by the contracted lab, and include all the required information for the proper handling of the samples collected. As the sample passes from the control of one entity to another, the form is signed off by the responsible parties. Copies of the completed custody forms are provided with the final lab reports.

The Quality Assurance Manager and Laboratory Coordinators are responsible for the review and filing of the chains of custody forms.

Once at the lab, the condition of the samples is logged, with copies of the log appended to the lab report. Bar codes are attached to the samples, and logged in a computerized tracking system.

Analytical Methods and Field Methods

The contracted laboratories will continue to utilize the current methods for sample analysis for the new MRP as they did for the previous MRP. The method numbers used will be as specified by the ILRP and are described in detail in Appendix B (Proprietary copy only). Instrument calibration is ongoing, as specified within the methods used.

Field methods will remain as currently practiced (defined above), with equipment calibration and operation as specified by the manufacturer. The field instruments currently in use by the Kings River Sub-Watershed are: YSI 30/10FT for EC, YSI 60/10FT for pH, and YSI 550A for DO. All are checked against known standards before a sampling event, and the calibration sheets are included in the Coalition report.

The following tables summarize the typical performance for each instrument.

Table Six: YSI Model 30 EC meter*

Measurement	Range	Resolution	Accuracy
Conductivity	0 – 499.9 uS/cm	0.1 uS/cm	+/- 0.5% FS
	0-4999 uS/cm	1.0 uS/cm	+/- 0.5% FS
Temperature	-5 to 95 °C	0.1 °C	+/- 0.1 °C (+/- 1 lsd)

Table Seven: YSI Model 60 pH meter*

Measurement	Range	Resolution	Accuracy
pH	0 to 14	0.01 unit	+/- 0.1 pH unit within 10 °C of calibration temp +/- 0.2 pH unit within 20 °C of calibration temp
Temperature	-5 to 75 °C	0.1 °C	+/- 0.1 °C +/- 1 LSD

Table Eight: YSI Model 550A DO meter*

Measurement	Range	Resolution	Accuracy
Dissolved Oxygen mg/L	0 to 20 mg/L	0.01 mg/L or 0.1 mg/L, user defined	Greater of +/- 0.3 mg/L or 2% of reading
Temperature	-5 to 45 °C	0.1 °C	+/- 0.3 °C

*these numbers are published within each respective instrument's instruction manual.

Field samples are disposed of by the laboratory at the lab's discretion, in accordance to established policies and the appropriate regulatory standards. Samples are stored for 30 days after the final report is issued, unless a request is made to hold the samples longer.

Each lab has provided a copy of its internal QAPP (QA Manual for FGL) which outlines technician performance standards, as well as procedures for failed tests, instrument maintenance, and calibrations and is included in Appendix B.

Field instrument failure is considered a rare occurrence, given the care taken to calibrate and maintain the equipment. Batteries are changed well before the expected 100 hour lifespan is exceeded; the instruments are field checked before samples are taken to insure proper operation. Should a failure occur, the instrument would be sent to the manufacturer for immediate repair.

Laboratory instrument failures are considered even more unlikely, due to the redundancy present within the lab itself. While a failure is not considered impossible, the probabilities are against it. Any equipment failures are documented in the laboratory's QA/QC report, which is submitted with the sample data package.

The field instruments have a visual readout, which is recorded on the field datasheets (printed on waterproof paper) at the time the reading is taken.

Laboratory instruments are connected to a computer network that records the data generated for input into a data management database.

The policy of the Regional Board with regards to instrument failures will be implemented within this QAPP.

> "*When an out of control situation occurs, analyses or work must be stopped until the problem has been identified and resolved. The analyst responsible must document the problem and its solution and all analyses since the last in control point must be repeated or discarded. The nature and disposition of the problem must be documented in the data report that is sent to the Central Valley Regional Water Board.*"

Calibration curves shall continue to be available for all tests done per method requirements. Linear regression is the required method for instrument calibration.

Pesticide analyses are to be performed on unfiltered (whole) fractions of the samples provided. Prior to the analysis, the laboratory must demonstrate that it can meet the PQL requirements of the ILRP program.

Algae toxicity testing shall not be preceded with treatment of the chelating agent EDTA. It is recognized that the addition of this agent may remove algae control materials from the field sample, thus improving the growth characteristics of the algae culture during the test.

The counterpoint to this requirement is that the nutrient solution added to the sample and the control solution may bring certain native materials into the toxic range for the testing.

Sediment testing is to occur twice per year, post irrigation season and post storm season. The post storm season sample is tricky, as some irrigation districts may begin irrigation deliveries before the rains have stopped because of a dry winter. At the very least, samples would nominally be collected in October and February. Flood operations will likely interfere with sample collection.

Quality Control

Quality control is essential to obtaining sample data that is representative of the conditions present. The control measures are more critical at the laboratory due to the extensive manipulation of the samples prior to analysis. Once released from the Coalition's control, complete trust is placed on the laboratory to handle the samples correctly, and to insure that the instruments used are properly maintained and calibrated for the tests involved. It is also important to know that contamination is not introduced at the laboratory through the use of method blanks.

For this program, the Coalition will submit for testing a complete sample set from each site plus a duplicate sample randomly collected from one of the sample sites.

The laboratory will complete a matrix spike, a control spike, and a blank plus all the required duplicates to insure that laboratory contamination is not an issue and instrument calibrations are correct. This also insures that the laboratory can produce results at the required PQL. A field duplicate is provided to the lab (at the most comprehensive level tested) with each sampling event.

The Water Column Toxicity tests will continue to be run as before, with sufficient sample sizes to allow for duplication of samples, negative controls, and reference toxicant tests.

All requirements of the methods used will be implemented.

Instrument/Equipment Testing, Inspection, and Maintenance

The ready availability of equipment shall be maintained by both the Coalition (field units) and the laboratories.

Field units are maintained constantly. Batteries are replaced on a regular schedule to insure against failure in the field. The instruments are continually checked for calibration against known standards. The instruments are also used for non ILRP activities, and any indication of failure can quickly be addressed.

Laboratories have sufficient redundancy in their instrumentation to recover from the failure of any particular instrument. Calibrations are ongoing, as are MDL studies. Compliance with method procedures is a must. Instrument failures or anomalous data are documented in the lab report.

Instrument/Equipment Calibration and Frequency

Field instruments are recalibrated prior to the beginning of the sampling event, and rechecked in the field using known standards. Instruments that require calibration checks include the EC, pH, and DO meters listed earlier in this document.

Calibration at the laboratory is conducted according to method requirements. Specific schedules are outlined in the Laboratory specific QAPPs provided in Appendix B (Proprietary copy only). Checks include blanks and spike recoveries done to the levels required by the MDL. All calibration runs are documented and reported by the laboratory in the sample data package.

Inspection/Acceptance of Supplies and Consumables

Field instruments are calibrated with commercially available standard solutions. The bottles are noted as to when first opened, and used before the expiration date. Fresh bottles are taken for field calibration checks; used solution is available to rinse the sensor after the testing.

Table Nine: Field and Laboratory Equipment Maintenance

Equipment/ Instrument	Maintenance, Testing, or Inspection Activity	Responsible Party	Frequency	SOP Reference
Field Equipment				
YSI Model 30 EC Meter	Battery, Probe Condition, Calibration	Ray Johnson, Kings Sub Watershed, SSJWQC	Monthly, Prior to each event	Appendix A
YSI Model 60 pH Meter	Battery, Probe Condition, Calibration	Ray Johnson, Kings Sub Watershed, SSJWQC	Monthly, Prior to each event	Appendix A
YSI Model 550A DO Meter	Battery, Probe Condition, Calibration	Ray Johnson, Kings Sub Watershed, SSJWQC	Per Manufacturer Guidelines	Appendix A
FGL Field SOP does not list Field Equipment employed	Assumed normal	Neil Jessup, Field Technician FGL	Per Manufacturer Guidelines	Appendix B.8
Laboratory Equipment				
Equipment used by APPL, Inc. is listed within their QAPP (pg 73-74)	Calibration Frequency and Acceptability is Described on pg 75-81 of APPL, Inc. QAPP	Leonard Fong, Ph.D, Laboratory Director	Per Manufacturer Guidelines, Method Requirements, and QAPP	Appendix B.1, B.2.x - B.4.x
Equipment used by FGL, Inc. is listed within their Quality Manual (pg 26-30)	Calibration Frequency and Acceptability is Described on pg 26 and in each SOP	David Terz, Quality Assurance Director	Per Manufacturer Guidelines, Method Requirements, SOP, and QAPP	Appendix B.8
Equipment used by SFL is covered by their Aquatic Toxicity SOP	No Equipment Listed in SOP	Dale Gimble, Technical Director, Client Services, Quality Assurance		Appendix B.5, B.5.1
Equipment used by ABC is covered by their Aquatic Toxicity SOP	No Equipment Listed in SOP	Thomas (Tim) Mikel, Laboratory Director		Appendix B.12
Equipment used by BSK are basic lab supplies	No Equipment Listed in SOP	Jeffrey Koelewyn, Laboratory Director		Appendix B.6, B.6.1
Equipment used by CalTest are basic lab supplies	No Equipment Listed in SOP	Todd Albertson, Vice President		Appendix B.2.1, B.3.2, B.3.4
Equipment used by Pacific EcoRisk are basic lab supplies	No Equipment Listed in SOP	Stephen Clark, Special Projects Director, QA Officer		Appendix B.7, B.7.1

Non-Direct Measurements

The only non direct measurement used in this program is the flow rates within the system. These values are obtained from the hydrologists or watermasters that supervise the delivery of irrigation water Accuracy is critical because of the water rights issues involved.

Data Management

Field generated data (from the EC, pH, and DO meters) is recorded on water-proof paper at the time the chemical and toxicity samples are collected. This data is later entered into an excel spreadsheet used to present the sample results in tabular form.

The laboratories generate the data and record the results into a laboratory information system. The reports are then printed in an easy to read format as a pdf file, and either emailed (toxicity) or burned onto a CD (chemistry). The files are then copied into a file that covers the specific sample period (6 month period for Semi-Annual reports) on a network server (backed up daily on removable hard drives). Results data is entered into the data tables for the report to the Regional Board, also stored on the network drives. The CD's remain at the Coalition office. Backup records of the tests are stored at the contracted laboratories.

Data generated by FGL, Inc. are available to the Laboratory Coordinators at the Kaweah, Tule, and Kern Sub-Watersheds through an online account. Electronic copies of the data are downloadable and emails are sent when data from a recent testing event is available.

It is the intent of the Coalition to have the data also reported to the Coalition in a SWAMP comparable format, preferably in an excel spreadsheet form. Data from the four sub-watersheds will be sent to a central location, merged into a single file, and sent to the Regional Board during the quarterly data dumps. The file created would be stored on the network of the central location.

Assessment and Oversight

The Quality Assurance Manager, in cooperation with the Laboratory Coordinators, will review both sampling procedures and laboratory performance annually. Changes in the SOPs used by any of the contracted labs will be communicated between the QA Manager and the Laboratory Coordinators as they occur.

The individual Laboratory Coordinators have the responsibility of managing the laboratories that they have contracted with. Any issues encountered during the analysis of the samples are to be resolved by the Laboratory Coordinator and then communicated to the QA Manager. Any reported issues at the laboratories will be communicated to the Regional Board as needed, and discussed in detail within the Annual Report.

The laboratory QAPPs contained within the attached appendices all address the issue of analyst training and performance, as well as procedures for failed tests. These procedures closely match Regional Board guidelines.

A copy of the most recent MDL study is to be obtained on a yearly basis. Said copy is to be stored in electronic format.

Reports to Management

Activities of the sampling staff are documented on the monthly status reports that are submitted to immediate supervisors.

Quarterly reports (SWAMP formatted data) are prepared by the individual Laboratory Coordinators and submitted to the QA Manager for final review. Once the review is completed, the Coalition Coordinator prepares a cover letter to accompany the data to the Regional Board.

Each sub-watershed has a person responsible for the drafting of the yearly report for submission to the Regional Board. Said reports are integrated into a single submission on behalf of the Coalition as a whole.

Reports submitted to the Regional Board will be sent to the liaison within the Fresno, CA office. Additional copies of the integrated report are kept at the Coalition office and at the office of its legal counsel.

Data Review, Verification, and Validation

Data submitted to the Coalition has been reviewed by the laboratory manager at the contracted labs. A statement that the data has been reviewed and is acceptable is provided with the lab report linked to each chain of custody. Data is further reviewed by the QA Officer for exceedances, and the appropriate communication reports are prepared, if necessary.

Verification and Validation Methods

The laboratory manager verifies that the data is correct, that no issues in the analysis occurred, and any corrective actions taken should an error occur. The lab reports contain an extensive checklist as to the condition of the samples as they are submitted, including copies of the bar codes that are attached to the sample bottles for tracking purposes.

Reconciliation with User Requirements

The purpose of the sampling program is to determine if any of the target chemical constituents are present within the water samples. If such detections are made, the Coalition will then open an inquiry as to the persistence of the detection (is it in more than one site, is it still present in the next sample period), review the conditions prior to the sampling event that produced the detection, and begin to research the potential sources of the detection.

The data, as reported by the lab, is considered valid if no problems are reported by the laboratory manager. Questions will always arise when a toxicity study shows an impact, but the chemistry data taken at the same time fails to show a toxic substance that might cause the problem.

Any concerns or unanswered questions that arise from the data will be addressed as comments or footnotes within the written reports submitted to the Regional Board.

APPENDIX A

SSJWQC MRP Standard Operating Procedures (SOPs)
Recommended Methods for Field Sample Collection

This protocol describes the techniques used to collect water samples in the field in a way that neither contaminates, loses, or changes the chemical form of the analytes of interest. The samples are collected in the field into previously cleaned and tested (if necessary) sample bottles of a material appropriate to the analysis to be conducted. Pre-cleaned sampling equipment is used for each site, whenever possible and/or when necessary. Appropriate sampling technique and measuring equipment may vary depending on the location, sample type, sampling objective, and weather. Trade names used in connection with equipment or supplies do not constitute an endorsement of the product.

Field Methods

Field instruments are to be calibrated/inspected prior to leaving the office according to manufacturers instructions. The instruments are to be checked against a known standard and their performance recorded. Batteries are replaced as needed.

Once at the field site, the time of arrival and current conditions are recorded on the SWAMP approved field sheets. A photo of the site is taken with the TIME/DATE stamp feature of the camera enabled.

Flow rates at the site are obtained from the controlling agency for the site; either the Water Association or Irrigation District. As it is their legal responsibility to manage surface water deliveries, these rates are considered to be accurate.

Field instruments are again checked against known standards (EC meter against distilled water (EC = 0) and 100 uS/cm standard, pH against ph 7 standard) and the values recorded. Two sets of observations for EC, pH, temperature, and DO are recorded at each site.

Once physical parameter readings have been recorded, appropriate water samples are collected and stored as per the methods outlined below.

Summary of Method

Appropriate sample containers and field measurement gear as well as sampling gear are transported to the site where samples are collected according to each sample's protocol. Water velocity, temperature, pH, conductivity, dissolved oxygen as well as other field data are measured and recorded using the appropriate equipment. Samples are put on ice and appropriately shipped to the processing laboratories. In the field, all samples will be packed in wet ice or frozen ice packs during shipment, so that they will be kept at approximately 4°C. Samples will be shipped in insulated containers. All caps and lids will be checked for tightness prior to shipping. All samples will be handled, prepared, transported and stored in a manner so as to minimize bulk loss, analyte loss, contamination or biological degradation. Sample containers will be clearly labeled with an indelible marker. Where appropriate, samples may be frozen to prevent biological degradation.

Water samples will be kept in Teflon™, glass, or polyethylene bottles and kept cool at a temperature of 4°C or lower until analyzed. Maximum holding times for specific analyses are specified in the method for each analyte. Ice chests are sealed with tape before shipping. Samples are placed in the ice chest with enough ice to completely fill the ice chest. RFA forms are placed in an envelope and taped to the top of the ice chest or they may be placed in a plastic bag and taped to the inside of the ice chest lid. It is assumed that samples in tape-sealed ice chests are secure whether being transported by staff vehicle, by common carrier, or by commercial package delivery. The receiving laboratory has a sample custodian who examines the samples for correct documentation, proper preservation and holding times.

Contract laboratories will follow sample custody procedures outlined in their QA plans. Contract laboratory QA plans are on file with the respective laboratory. All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of the personnel of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals. Chain-of-custody procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. A complete chain-of-custody form is to accompany the transfer of samples to the analyzing laboratory. Laboratories shall maintain custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times.

Water Sample Collection

Water chemistry, toxicity, and bacteriological samples, as requested, are collected at the same location. *Water samples are best collected before any other work is done at the site.* If other work (i.e., sediment sample collection, flow measurement or biological/habitat sample collection or assessment) is done prior to the collection of water samples, it might be difficult to collect representative samples for water chemistry and bacteriology from the disturbed stream. Care must be taken, though, to not disturb sediment collection sites when taking water samples.

The following general information applies to all types of water samples, unless noted otherwise:

Sample Collection Depth:	Samples are collected at 0.1m below the water surface. Containers should be opened and re-capped under water in most cases.
Surface Grab Sample:	Samples are collected at the surface when water depth is <0.1m.

Where to Collect Samples:	Water samples are collected from a location in the stream where the stream visually appears to be completely mixed. Ideally this would be at the centroid of the flow (Centroid is defined as the midpoint of that portion of the stream width, which contains 50% of the total flow), but depth and flow etc. do not always allow centroid collection. For stream samples, the sampling spot must be accessible for sampling physicochemical parameters, either by bridge, boat or wading. Sampling from the shoreline of any water body (meaning standing on shore and sampling from there) is the least acceptable method, but in some cases is necessary.
Sampling Order if Multiple Media are Requested:	The order of events at every site has to be carefully planned. For example, if sediment is to be taken, the substrate can not be disturbed by stepping over or on it; water samples can not be taken where disturbed sediment would lead to a higher content of suspended matter in the sample. *For the most part, water samples are best collected before any other work is done at the site.* This information pertains to walk-in sampling.
Sample Container Labels:	Label each container with the station ID, sample code, matrix type, analysis type, project ID, and date and time of collection (in most cases, containers will be pre-labeled). After sampling, secure the label by taping around the bottle with clear packaging tape (not required with lab supplied labels).
Procedural Notes:	For most water samples (not for organics, inorganics or bacteria), prior to collecting sample, rinse the container with ambient water, unless protocol for specific analytical procedure dictates otherwise.
Sample Short Term Storage and Preservation:	If applicable to the sample and analysis type, the sample container should be opened and re-capped under water. Properly store and preserve samples as soon as possible. Usually this is done immediately after returning from the collection by placing the containers on bagged, crushed or cube ice in an ice chest. Sufficient ice will be needed to lower the sample temperature to at least 4°□C within 45 minutes after time of collection. Sample temperature will be maintained at 4°□C until delivered to the laboratory. Care is taken at all times during sample collection, handling and transport to prevent exposure of the sample to direct

sunlight. Samples are preserved in the laboratory, if necessary, according to protocol for specific analysis (acidification in most cases).

Field Safety Issues: Proper gloves must be worn to prevent contamination of the sample and to protect the sampler from environmental hazards (disposable polyethylene, nitrile, or non-talc latex gloves are recommended, however, metals and mercury sample containers can only be sampled and handled using polyethylene gloves as the outer layer). Wear at least one layer of gloves, but two layers help protect against leaks. One layer of shoulder high gloves worn as first (inside) layer is recommended to have the best protection for the sampler. Safety precautions are needed when collecting samples, especially samples that are suspected to contain hazardous substances, bacteria, or viruses.

Sample Handling: Due to increased shipping restrictions, samples being sent via freight carriers require additional packing. Although care is taken in sealing the ice chest, leaks can and do occur. Samples and ice should be placed inside a large plastic bag inside the ice chest for shipping. The bag can be sealed by simply twisting the bag closed (while removing excess air) and taping the tail down. Prior to shipping the drain plug of the ice chests have to be taped shut. Leaking ice chests can cause samples to be returned or arrive at the lab beyond the holding time. Although glass containers are acceptable for sample collection, bubble wrap must be used when shipping glass.

Chain of Custody Forms: Every shipment must contain a complete Chain of Custody Form (see Appendix D) that lists all samples taken and the analyses to be performed on these samples.

Make sure you include a COC for every laboratory you ship to, every time you send a shipment.

Include region and trip information as well as any special instructions to the laboratory.

The original COC sheet (not the copies) is included with the shipment (insert into zip lock bag); one copy goes to the sampling coordinator; and the sampling crew keeps one copy.

Samples collected should have the date/time collected on every COC.

Field QC Samples for Water Analyses:

Field duplicates are currently submitted at an annual rate of 5%. Field travel blanks are required for volatile organic compounds at a rate of one per cooler shipped. Field blanks are required for trace metals (including mercury and methyl mercury), DOC, and volatile organic compounds in water at a rate of 5%. See Appendix C for detailed Field QC requirements. One duplicate sample is collected per event.

Field Site Data Sheets:

Each visited field site requires a completed Field Data Sheet, even if no samples are collected (i.e. at a site which is found to be dry). Photo documentation of the visit is to occur at each visit, whether or not a sample is collected.

General Pre-Sampling Procedures:

Instruments. All instruments must be in proper working condition. Make sure all calibrations are current. YSI sondes should be calibrated every morning prior to sampling. Conductivity should also be calibrated between stations if there is a significant change in salinity. Appendix E contains detailed information on field measurements/instrument calibration.

Calibration Standards. Pack all needed calibration standards.

Sample Storage Preparations. A sufficient amount of cube ice, blue ice, or dry ice as well as coolers of appropriate type and size, must be brought into the field, or sources for purchasing these supplies identified in advance.

Sample Container Preparation. After arriving at the sample station, pack all needed sample containers for carriage to the actual collection site, and label them with a pre-printed label containing Station ID, Sample Code, Matrix info, Analysis Type info, Project ID and blank fields for date and time (if not already pre-labeled).

Safety Gear. Pack all necessary safety gear like waders, protective gloves and safety vests.

Walk to the site. For longer hikes to reach a sample collection site, large hiking backpacks are recommended for transport of gear, instruments and containers. Tote bins can be used, if the sampling site can be accessed reasonably close to the vehicle.

Collection of Water Samples

In most streams, near-surface water is representative of the water mass. A water sample for analysis of conventional constituents is collected by the grab method in most cases; immersing the container beneath the water surface to a depth of 0.1 m. Sites accessed by bridge can be sampled with a sample container-suspending device. Extreme care must be taken to avoid contaminating the sample with debris from the rope and bridge. Care must also be taken to rinse the device between stations. If the centroid of the stream cannot be sampled by wading, sampling devices can be attached to an extendable sampling pole.

Conventional Water Constituents:	pH, electroconductivity, dissolved oxygen, turbidity, color Total Suspended Solids (TSS) or Suspended Sediment Concentration (SSC), Total Dissolved Solids (TDS-especially if total metals requested), Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC), hardness (if trace metals analysis is requested).
Conventional Water Constituents Sample Volume:	Due to the potential for vastly different arrays of requested analyses for conventional constituents, please refer to the table at the end of this Appendix, as well as the Sample Handling Requirements Tables for information on the proper volume to collect for the various types of analyses.
Conventional Water Constituents Sample Container Type:	Due to the potential for vastly different arrays of requested analyses for conventional constituents, please refer to table at the end of this Appendix for information on the proper type of sample containers.

Collection of Water Samples for Analysis of Trace Metals

When deciding to measure total and dissolved metals in water (“metals-in-water”), the purpose of the sampling must be considered. Water quality standards for the protection of aquatic life are determined for the dissolved form of heavy metals in most cases. In order to budget inputs, transport, and accumulation of metals, it is necessary to know the concentration of total metals in the water column, sediments, effluent, etc.

Metals-in-water: General Information	Unless otherwise requested to collect for total metals analysis, dissolved metals are collected for all elements with the exception of mercury. Metals-in-water samples should not be collected during periods of abnormally high turbidity if at all possible. Samples with high turbidity are unstable in terms of soluble metals, and it is difficult to

	collect a representative grab sample. Special study sampling, however, may be an exception. For example, wet weather sampling is likely to include some samples with high turbidity.
Metals-in-water: Sample Collection Depth	Collect a metals sample from a depth of 0.1 m using a sub-surface grab method. In most streams, near-surface water is representative of the water mass. For the purpose of determining compliance with numerical toxic substance standards, a sample taken at the surface is adequate.
Metals-in-water: Sample Volume	Refer to table at end of this document for specific information on the proper volume to collect for trace metals analyses. Generally, for procedures most commonly used for analysis of metals in water (total or dissolved metals), one 60 ml polyethylene container is filled, if the salinity is less than 3.0‰ (parts per thousand). Three 60 ml containers are filled (180 ml total), if the salinity is greater than 3.0‰. Generally, for the procedures most commonly used for analysis of mercury in water (whether total or dissolved), one 250 ml glass or teflon container is filled, regardless of the salinity. All containers are pre-cleaned in the lab using HNO3.

Companion Samples for Metals-in-Water

A hardness analysis should be collected whenever metals-in-water are to be analyzed from an inland (freshwater) site. If a total metals sample is collected, it is recommended to submit a sample for TSS/SSC in a companion sample for "conventionals in water".

Field QC Sample Collection Requirements for Metals-in-Water

In order to assess contamination, "blanks" are submitted for analysis. Special projects may have other requirements for blanks. The same group of metals requested for the ambient samples are requested for the blank(s). Run a blank for each type of metal sample collected. Blanks results are evaluated (as soon as available) along with the ambient sample results to determine if there was contamination or not.

Field Equipment Blank:	Submit an equal volume (equal to the ambient sample) of metals-free deionized water that has been treated exactly as the sample at the same location and during the same time period. Use the same methods as described above (grab sample). At least one ambient blank per field trip is required each for Trace-Metal and Mercury samples in water. If contamination is detected in field equipment

	blanks, blanks are required for every metals-in-water sample until the problem is resolved.
Lab Equipment Blank:	Laboratory Equipment Blanks for pumping and sampling equipment (Metals-in-Water Sample Collection Kits and Blank Syringe Filtration Kits) are run by the laboratory that cleans and distributes the collection materials. It documents that the materials provided by the laboratory are free of contamination. When each batch of tubes, filters, bottles, acid and deionized water are prepared for a sampling trip, about five percent of the Mercury sampling materials are chosen for QC checks. Trace-Metal Equipment needs to be subjected to an initial blank testing series. If these blanks are acceptable only occasional re-testing is required for TM equipment. The QC checks are accomplished by analyzing metals-free water which has been pumped through the filter and tube; collected in a sample container; and preserved.
Field Duplicates:	Five percent Field Duplicates are submitted every sampling event. (If less than 20 samples are collected during an event, submit one set of duplicates per event.)

Collection of Water Samples for Analysis of Synthetic Organic Compounds

Collect organic samples at a depth of 0.1 m by submerging the sample container by hand. Since organic compounds tend to concentrate on the surface of the sampling device or container, the sampling device and sample container are ***not*** to be rinsed with ambient water before being filled.

Sample Containers and Collection

Pesticides/Herbicides:	The sample container for pesticides and herbicides is a new, clean, unused amber glass jar with a Teflon-liner inside the cap. Collect one liter of water for each of the three sample types (Organophosphorus Pesticides, Organochlorine Pesticides and Chlorinated Herbicides). **EACH ANALYSIS TYPE REQUIRES A SEPARATE JAR.** Minimize the air space in the top of the jar. Preserve immediately after collection by placing on ice out of the sunlight.
Semi-volatile Organics:	The sample container for semi-volatile organics must also be new, clean, unused amber glass bottles with a Teflon-liner inside the cap, and pre-rinsed with pesticide-grade hexane, acetone, or methylene chloride. Fill jars to the top and place on ice in the dark. In addition to other sample information, label the jar Semi-volatiles.

Volatile Organics:

The sample containers for volatiles are VOA vials. Fill the 40 ml VOA vials to the top and cap without trapping any air bubbles. If possible, collect directly from the water, keeping Carbon (VOC) the vial under water during the entire collection process. To keep the vial full while reducing the chance for air bubbles, cap the vials under the water surface. Fill one vial at a time and preserve on ice. The vials are submitted as a set.

If the vial has been pre-acidified for preservation, fill the vial quickly, without shaking using a separate clean glass jar. Fill the vial till the surface tension builds a meniscus, which extends over the top end of the vial, then cap tightly and check for bubbles by turning the vial on its head.

Ensure that the pH is less than 2. If the water may be alkaline or have a significant buffering capacity, or if there is concern that pre-acidified samples may have the acid wash out, take a few practice vials to test with pH paper. It may take more than two drops, and it will then be known how to preserve the other samples that are being submitted to the lab. If an alternative method has proven successful, continue with that method.

Note: If vigorous foaming is observed following acidification, discard that sample and collect another set. Do not acidify the second set. Mark the sample clearly “not acidified” and the lab will run them immediately. Holding time is 14 days with acid, 24 hours without acid.

Collect two vials, if only VOC is required. The vials may be taped together to keep them together.

Bacteria and Pathogens in Water Samples

Summary of Collection Procedure (Based on EPA water quality monitoring procedures): Make sure the containers are sterilized; either factory-sealed or labeled.

Screw cap containers

- Label the bottle as previously described for.
- Remove the cap from the bottle just before sampling. Avoid touching the inside of the bottle or cap. If you accidentally touch the inside, use another bottle.
- If wading into the stream, try to disturb as little bottom sediment as possible. Be careful not to collect water that has sediment from bottom disturbance. Stand facing upstream. Collect the water sample on your upstream side,

in front of you. You may also tape your bottle to an extension pole to sample from deeper water.

- If taking sample from a boat, carefully reach over the side and collect the water sample on the upstream side of the boat.
- Hold the bottle near its base and plunge it (opening downward) below the water surface. If you are using an extension pole, remove the cap, turn the bottle upside down, and plunge it into the water, facing upstream. Collect a water sample 2 inches beneath the surface. You can only use this method if the sample bottles do not contain sodium thiosulfate.
- Turn the bottle underwater into the current and away from you. In slow moving stream reaches, push the bottle underneath the surface and away from you in an upstream direction.
- Alternative sampling method: In case the sample bottle contains preservatives/chlorine removers (i.e. sodium-thiosulfate), it cannot be plunged opening down. In this case hold the bottle upright under the surface while it is still capped. Open the lid carefully just a little to let water run in. Fill the bottle to the fill mark and screw the lid tight while the bottle is still underneath the surface.
- Leave a 1-inch air space so that the sample can be shaken just before analysis. Recap the bottle carefully, remembering not to touch the inside.
- If the samples are to be analyzed in the lab, place them in a cooler with ice or cold packs for transport to the lab.

24-hr maximum sample hold time. Sample collection must be coordinated with the laboratory to guarantee appropriate scheduling.

Toxicity in Water

Sample Collection: Using the standard grab sample collection method described previously for water samples, fill (for typical suite of water toxicity tests conducted) the required amount of 2.25 liter amber glass bottles with water, put on ice, and cool to 4 °C. Label the containers as described above and notify the laboratory of the impending sample delivery, since there is a 36-hour maximum hold time (up to 48 hours is valid as well). Sample collection must be coordinated with the laboratory to guarantee appropriate scheduling.

Field Collection Procedures for Sediment Samples

Bed sediment (hereafter termed "sediment") samples are collected after any water samples have been collected. Care must be taken not to sample sediments that have been walked on or disturbed in any manner by field personnel collecting water samples. Sediment samples are collected into a composite jar, where they are thoroughly homogenized in the field, and then aliquoted into separate jars for chemical or biological analysis. Sediment samples for metals and organics are submitted to the respective analytical laboratories in separate glass jars, which have been pre-cleaned according to laboratory protocol. Sediment chemistry samples give information regarding both trends in contaminant loading and the potential for adverse effects on sediment and aquatic biota. In order to compare samples over time and from site to site, they must be collected in a consistent manner. If a suitable site for collecting sediments cannot be found at a station, sampling personnel should not collect the sediment sample, and should instead attempt to reschedule the sample collection. If this is not possible, make a note so that the missing sample is accounted for in the reconciliation of monitoring events during preparation of sample collection "cruise reports". Sites that are routinely difficult to collect should be considered for elimination from the sample schedule, if appropriate.

Characteristics of Ideal Sediment Material to be Collected

Many of the chemical constituents of concern are adsorbed onto fine particles. One of the major objectives in selecting a sample site, and in actually collecting the sample while on site, is to obtain recently deposited fine sediment, to the extent possible. Avoid hard clay, bank deposits, gravel, and disturbed and/or filled areas. Any sediment that resists being scooped by a dredge is probably not recently deposited fine sediment material. In following this guidance, the collection of sediment is purposefully being biased for fine materials, which must be discussed thoroughly in any subsequent interpretive reporting of the data, in regards to representativeness of the collected sample to the environment from which it was collected.

Characteristics of an Ideal Site

Quiescent areas are conducive to the settling of finer materials (EPA/USACOE, 1981). Choose a sampling site with lower hydrologic energy, such as the inner (depositional) side of bends or eddies where the water movement may be slower. Reservoirs and estuaries are generally depositional environments, also.

Selecting the Appropriate Sediment Type for Analysis

Sediment will vary from site to site and can vary between sample events at a particular site.

Streams and Rivers: Sediment collection in flowing streams is often a challenge. In areas of frequent scouring there may not be sufficient sediment for collection during or following periods of high flow. Sediment collection during these times may prove unsuccessful and may have to be rescheduled. When the suspended load in rivers and streams precipitates due to reduction of velocity, most of the resulting sediment will be fine-grained. More often than not, a dredge or mechanical grab device does not function well for collection of sediment in smaller streams. In many cases, sediment will have to be collected using a pre-cleaned Teflon scoop. Collect the top two (2) cm for analysis. Five or more (depending on the volume of sediment needed for conducting analyses) fine-sediment sub-sites within a 100 meter reach are sampled into the composite jar.

After choosing an appropriate site, and identifying appropriate fine-grained sediment areas within the general reach, collect the sample using one or more of the following procedures, depending on the setting:

Sediment Scoop Method—Primary Method for Wadeable, Shallow Streams

The goal is to collect the top 2 cm of recently deposited fine sediment only.

1) Wear gloves and protective gear, per appropriate protocol (make sure gloves are long enough to prevent water from overflowing gloves while submerging scoop).
2) Survey the sampling area for appropriate fine sediment depositional areas before stepping into the stream, to avoid disturbing possible sediment collection sub sites.
3) Carefully enter the stream and start sampling at the closest appropriate spot, after rinsing the homogenizing jar and lid with ambient water. Then continue sampling UPSTREAM. Never advance downstream, as this could lead to sampling disturbed sediment.
4) Use a clean polyethylene scoop for each site (pre-cleaned beforehand in the laboratory, with Micro™ detergent and acid, rinsed, dried and double-bagged). Scoop can be transported from vehicle to site inside the homogenizing jar. Gently lead the scoop under water and towards the sediment. Run scoop slowly underneath sediment at about 2 cm depth till about ½ to ¾ filled. Then carefully lift the scoop out of the water and slowly poor off most of the overlying water over one of the BACK corners of the scoop. Make sure that the top layer of fine sediment is not discarded. Fill homogenizing jar as far as necessary to fill all required sample volumes. I-CHEM 4000mL tall clear 300 Series glass jars are used to collect and homogenize sediment samples.
5) Cap homogenizing jar, put on ice, and transport to site where sample containers are to be filled.
6) Make sure all containers are capped tightly.
7) Write date and time on each container label (container bag label for TM [trace metals] and Hg [mercury] prior to aliquoting.
8) Single bag all containers (except TM [trace metals]) in zip lock bags.
9) Store in cooler on cube ice at 4 °C.
10) Check cooler temperature and record in log book every 8-12 hours or whenever sampler suspects that the temperature has not been maintained at 4 °C.

General Procedure for Processing of Bed Sediment Samples, Once they are Collected

Sediment Homogenization, Aliquoting and Transport

For the collection of bed sediment samples, the top 2 cm is removed from the scoop, or the grab, or the core, and placed in the 4 liter glass compositing/homogenizing container. The composited sediment in the container is homogenized and aliquoted on-site in the field. The sample is stirred with a polycarbonate stirring rod for at least 5 minutes, but longer if necessary, until sediment/mud appears homogeneous. All sample identification information (station numbers, etc.) will be recorded prior to homogenizing and aliquoting. All pre-labeled jars will be filled using a clean plastic scoop. The sediment sample is then aliquoted into appropriate containers for trace metal chemistry, organic chemistry, and bioassay testing. Four-liter sample containers will be packed surrounded by enough ice to keep them cool for 48 hours. Each container will be sealed in one large plastic bag to prevent contact with other samples or ice or water.

Sediment Sample Size

A sufficient volume of sediment must be collected to allow for proper analysis, including possible repeats, as well as any requested archiving of samples for possible later analysis. Sediment Toxicity Testing requires: 1-Liter I-Chem wide-mouth polyethylene jars with Teflon lid-liner; Pre-cleaned 2-Liters (two jars filled completely). Cool to 4 °C Holding time: 14 days
Do Not Freeze

Label the jars with the station ID, sample code, matrix type, project ID, and date of collection, as well as the type of analysis requested (i.e., metals, conventionals, organics, or archives). Also write ***"Do Not Freeze"*** on the label. Immediately place the labeled jar on ice, cool to 4 °C, and keep in the dark at 4 °C until delivery to the laboratory. Record the depth at the location where the sample was taken in the field logbook. Record a gross description of the sample, i.e., color, texture, number of grabs, and thickness of grab sample that was composited. Samples may be kept up to 14 days at 4 °C, dark. This information can be reported as comments with the sediment analytical results.

Appendix B

THIS APPENDIX CONTAINS PROPRIATARY INFORMATION

THE PUBLIC COPY OF THIS DOCUMENT WILL NOT CONTAIN THE TEXT OF THIS APPENDIX PER THE REQUEST OF THE LABORATORY(s) THAT SUBMITTED THE INFORMATION

Index of Proprietary Information

- B.1 APPL QAPP
  - B.1.1 CALTEST QA MANUAL
- B.2 APPL INORGANICS
  - B.2.1 SM 4500 NO3-F (CalTest equivalent of SM 4500 P E)
  - B.2.2 EPA 160.1
  - B.2.3 EPA 5310B
  - B.2.4 SM 2540D
  - B.2.5 SM 2120B
  - B.2.6 EPA 351.2
  - B.2.7 SM 4500 C (CalTest)
  - B.2.8 EPA 180.1
- B.3 APPL METALS
  - B.3.1 EPA 6020
  - B.3.2 EPA SM 4500 P E (CalTest)
  - B.3.3 EPA 2340B
  - B.3.4 EPA 200.8 (CalTest)
- B.4 APPL ORGANICS
  - B.4.1 EPA 8081A
  - B.4.2 EPA 619
  - B.4.3 EPA 8141A
  - B.4.4 EPA 549.2
  - B.4.5 EPA 8321A
  - B.4.6 EPA 547 (North Coast Labs)
- B.5 SIERRA FOOTHILL LAB QAPP
  - B.5.1 EPA 821-R02-012, -013
- B.6 BSK QAPP
  - B.6.1 SM 9223
- B.7 PACIFIC ECORISK QAPP
  - B.7.1 EPA 600-R-99-064
  - B.7.1.1 HYALELLA SOP Appendix
  - B.7.2 PYRETHROIDS IN SEDIMENT
  - B.7.3 ASTM D422-63
  - B.7.4 WALKLEY-BLACK

Second Binder

Appendix C

Sample Hold Times

Analytical Parameter	Sample Volume (per site)	Containers # Size and Type	Initial Preservation/Holding Requirements	Maximum Holding Time
Total Dissolved Solids	500 ml	500 ml plastic	Store at 4ºC	7 days
Total Suspended Solids	500 ml	500 ml plastic	Store at 4ºC	7 days
Turbidity	500 ml	500 ml plastic	Store at 4ºC	48 hours
Soluble Orthophosphate	500 ml	500 ml Amber glass	Store at 4ºC	48 hours
TKN, Ammonia, Total Phosphorus, Nitrate-Nitrite as N	250 ml	250 ml plastic	H2SO4, Store at 4°C	28 days
Metals/Trace Elements, Hardness	500 ml, 250 ml	500 ml plastic, 250 ml plastic	HNO3, Store at 4ºC	180 days
E. coli	100 ml	125 ml plastic	Store at 4ºC	24 hours
Fecal coliform	100 ml	125 ml plastic	Store at 4ºC	24 hours
Total Organic Carbon			Store at 4ºC	28 days
Carbamates	1 L	1 L Amber glass	Store at 4°C	40 days
Organophosphates	1 L	1 L Amber glass	Store at 4°C	40 days
Herbicides	1 L	1 L Amber glass	Store at 4°C	40 days
Herbicides-Paraquat dichloride	1 L	1 L Amber plastic	Store at 4°C	21 days
Herbicides-Glyphosate			Store at 4°C	6 months
Aquatic Toxicity	6 gal	(6) 1 gal Amber glass	Store at 4°C	36 hours
Sediment Toxicity	2 L (2 x 1 L)	(2) 1 L plastic	Store at 4°C, do not freeze	14 days
Sediment Grain Size	From above	From above	Store at 4°C, do not freeze	28 days
Sediment TOC	From above	From above	Store at 4°C, do not freeze	12 months
Sediment Chemistry	From above	From above	Store at 4°C, do not freeze	12 months
Sediment Total Solids	From above	From above	Store at 4°C, do not freeze	7 days

APPENDIX D

Completeness Checklist

Coalition Section
Field and Transport

Data Point	**Completed**	**Not Completed**	**Comments**
Photo Documentation			If no water present at sample site, digital photo counts as 100 % complete
Office Calibration- pH			
Field Calibration- pH			
Office Calibration- EC			
Field Calibration- EC			
Office Calibration- DO			
COC w/analyte list			
Broken Containers			No broken containers must occur for a Completed to be recorded

Data Sheet

Data Point	**Completed**	**Not Completed**	**Comments**
Coalition Name			All fields on Field Sheet filled in
Site ID			
Project ID			
Arrival Time			
Departure Time			
Sample Crew			
Date			
First Sample Time			
GPS Coordinates			
Datum			
Accuracy			
Dominant Substrate			
Site Odor			
Other Presence			
Water Odor			
Water Clarity			
Observed Flow			
Wadeable			
Picture Name			
Sky			
Precipitation			
Precipitation last 24 hrs			
Water Color			
Water Temp			
pH			
pH duplicate			
EC			
EC duplicate			
DO			
DO duplicate			
Bank of Sample Site			
Occupation Method			
Sampling Equipment			
Sample Location			
Hydro Modification			
Duplicate Collected			
Counts			Minimum value 40 for Satisfactory Completeness
Completeness Satisfactory			Total points 44 (Field and Transport plus Data Sheet)

Laboratory Section

Data Point	**Completed**	**Not Completed**	**Comments**
Signed COC			
Hold Time Met			
Blank Run			
Sample reported in proper format			nd, J-flag, or value
Exception Report			
Lab Issues	**Completed**	**Not Completed**	**Comments**
Breakage			No breakage for Completed
Instrument Failures			No Instrument Failures for Completed unless redundant instrument employed
Duplicate Samples run			
Current MDL Study on file			
Tests Run and Method	**Completed**	**Not Completed**	**Comments**
Color, SM2120B			Method must match to count as completed
Turbidity, 180.1			
TDS, 160.1			
TOC, 415.1			
Aldicarb, 8321A			
Carbaryl, 8321A			
Carbofuran, 8321A			
Methiocarb, 8321A			
Methomyl, 8321A			
Oxamyl, 8321A			
Diuron, 8321A			
Linuron, 8321A			
8321A spike			Results within PQL Range as specified in Appendix C
Paraquat, 549.2			
Atrazine, 619			
Cyanazine, 619			
Simazine, 619			
619 spike #1			Results within PQL Range as specified in Appendix C
619 spike #2			Results within PQL Range as specified in Appendix C

Laboratory Section (cont)

Tests Run and Method	**Completed**	**Not Completed**	**Comments**
Azinphosmethyl, 8141A			
Chlorpyrifos, 8141A			
Diazinon, 8141A			
Dimethoate, 8141A			
Disulfoton, 8141A			
Malathion, 8141A			
Methidathion, 8141A			
Molinate, 8141A			
Methyl Parathion, 8141A			
Phorate, 8141A			
Phosmet, 8141A			
Thiobencarb, 8141A			
8141A spike #1			Results within PQL Range as specified in Appendix C
8141A spike #2			Results within PQL Range as specified in Appendix C
DDE, 8081A/8082			
DDD, 8081A/8082			
DDT, 8081A/8082			
Bifentrhin, 8081A/8082			
Cyfluthrin, 8081A/8082			
Cypermethrin, 8081A/8082			
Dicofol, 8081A/8082			
Dieldrin, 8081A/8082			
Endrin, 8081A/8082			
Esfenvalerate, 8081A/8082			
Lambda Cyhalothrin, 8081A/8082			
Methoxychlor, 8081A/8082			

Laboratory Section (cont)

Tests Run and Method	**Completed**	**Not Completed**	**Comments**
Permethrin, 8081A/8082			
8081A/8082 spike #1			Results within PQL Range as specified in Appendix C
8081A/8082 spike #2			Results within PQL Range as specified in Appendix C
Methamidophos, 8141A			
8141A spike #1			Results within PQL Range as specified in Appendix C
8141A spike #2			Results within PQL Range as specified in Appendix C
Arsenic, 6020			
Boron, 6020			
Cadmium, 6020			
Copper, 6020			
Lead, 6020			
Molybdenum, 6020			
Nickel, 6020			
Selenium, 6020			
Zinc, 6020			
Phosphorus, 6010B/3010A			
Hardness, SM2340B/Z			
Nitrate, 300			
Nitrite, 300			
Orthophosphate, 300			
Ammonia, 350.1			
TKN, 351.2			
Glyphosate, 547			