Kings River Water Quality Coalition
Surface Water Monitoring Plan
Quality Assurance Program Plan

Revision
August 2016

Approvals

Casey Creamer — Date
Kings River Water Coalition Authority
Coordinator

Eric Athorp — Date
Kings River Water Coalition Authority
Project Manager, Technical Lead, Quality Assurance Manager,
Laboratory Coordinator

Brad Meadows, Laboratory Director — Date
BSK Associates
Laboratory Program Manager - Chemistry

Stephen L. Clark — Date
Pacific EcoRisk
Laboratory Program Manager - Toxicity

Approvals, cont.

David Sholes, Non-Point Source/AG Planning Date
California Regional Water Quality Control Board
QAPP Review

Renee Spears, Quality Assurance Officer Date
State Water Resources Control Board
QAPP Review

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ELEMENT 3: DISTRIBUTION LIST

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ELEMENT 4: PROJECT ORGANIZATION

Personnel

Casey Creamer
Coordinator
Kings River Water Quality Coalition

Mr. Creamer is the Coordinator for the Kings River Water Quality Coalition (KRWQC, Coalition), the Southern San Joaquin Valley Water Quality Coalition, and the Southern San Joaquin Valley Management Practices Effectiveness Program (MPEP) Committee. Mr. Creamer also serves as fiscal agent for the above entities. In addition, Mr. Creamer oversees, at the direction of the KRWQC Board of Directors, policy development and implementation for the above entities. Mr. Creamer handles all executive level decisions and contacts with the Regional and State Water Control Boards.

Eric Athorp
Project Manager, Technical Lead, QA Manager, Laboratory Coordinator
Kings River Water Quality Coalition

Mr. Athorp is responsible for the physical implementation of the General Order requirements for the KRWQC, including the selection of sample sites, proper collection and transport of samples, analysis of the laboratory data, and the preparation of required reports (Exceedance, Quarterly data, Annual reporting, and other reports/plans under the General Order). Mr. Athorp is also the point of contact for the laboratories in the event of toxicity or other issues with regards to the submitted samples.

Mr. Athorp, in cooperation with Brad Meadows and Stephen L. Clark, prepared this QAPP document.

Brad Meadows, Vice President / Laboratory Director
Program Manager, BSK Associates

Mr. Meadows is the Laboratory Director of BSK Associates' (BSK) analytical laboratory in Fresno, CA. For the purposes of this QAPP, Mr. Meadows will act as the Program Manager for the sampling and analytical services performed in accordance with this QAPP. Mr. Meadows responsibility in this role will be to understand the plan requirements and work in conjunction with the Coalition contacts to ensure those requirements are met by the primary and subcontract laboratories.

Stephane Maupas, Project Manager
Project Manager, BSK Associates

Mr. Maupas is the Project Manager at BSK's Fresno Analytical Laboratory (BSK Labs). He will be acting in the role of Laboratory Project Manager to ensure that each sampling and analytical event is performed in accordance with program requirements. Stephane will be the primary point of contact for the Coalition personnel, coordinating the field sampling events and analytical testing required by each monitoring event.

Stephen Clark, Vice President, Special Projects Director
Project Manager, Pacific EcoRisk

Mr. Clark is the Vice President at Pacific EcoRisk (PER) located in Fairfield, CA. He manages all agricultural monitoring projects at PER, and will be acting in the role as the Project Manager for the aquatic and sediment toxicity testing described in this QAPP. Mr. Clark will insure that all of the program requirements (e.g. initial testing, dilution series, and Toxicity Identification Evaluations (TIE, if required), subsampling of sediment samples for supporting analyses) are met for each sampling event.

Contracted Laboratories

The Kings River Water Quality Coalition has contracted with the following laboratories for chemical testing and toxicity testing. Sub-contracting laboratories are mentioned under each primary laboratory where applicable.

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

BSK provides the testing services for the chemistry and microbiology samples for the KRWQC.

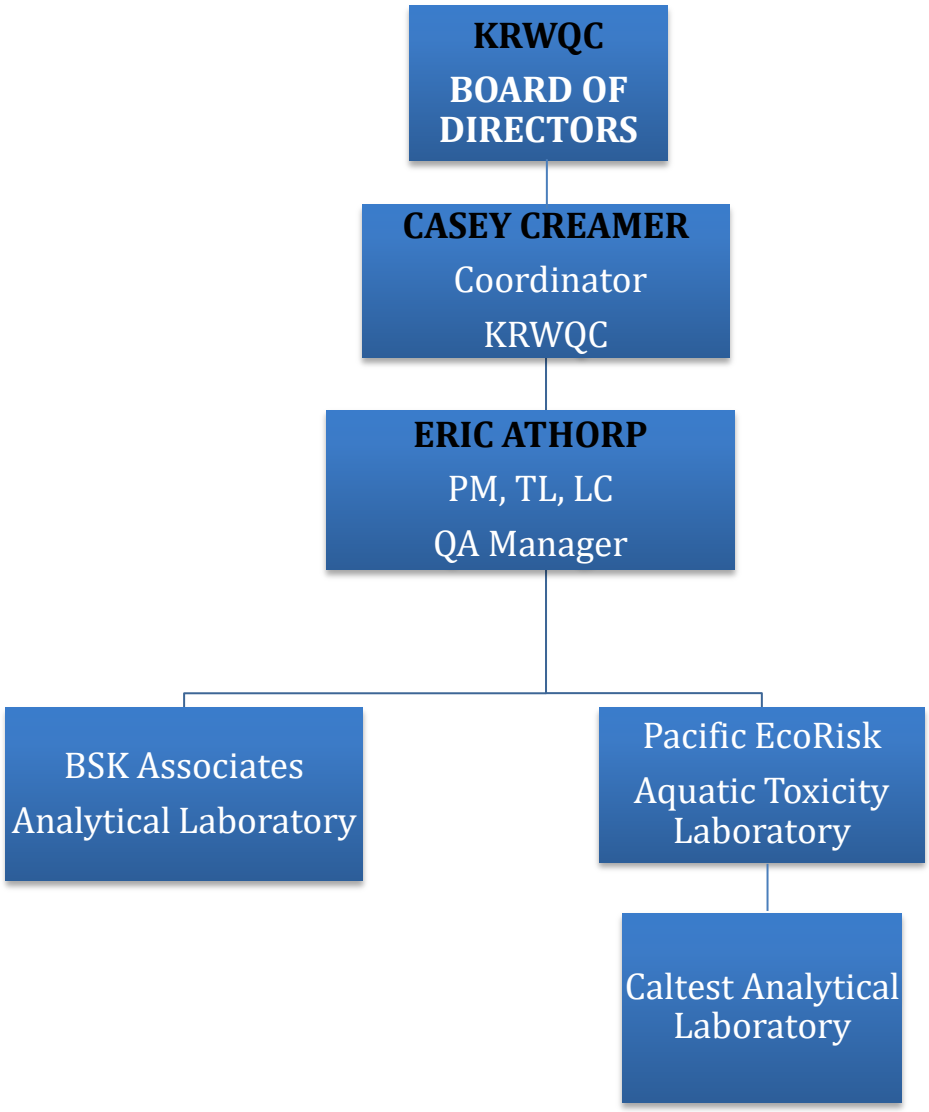
Pacific EcoRisk (PER)
2250 Cordelia Road
Fairfield, CA 94534
(707) 207-7760
(707) 207-7916 fax
www.pacificecorisk.com

Sub-contracting Laboratory
Caltest Analytical Laboratory
1885 N Kelly Road
Napa, CA 94558

PER will provide the aquatic toxicity and sediment testing for the Coalition. PER has been providing this service (sediment) for the KRWQC over the last several years and recently took over the water column toxicity testing for the KRWQC with the closure of Sierra Foothill Laboratory. PER will serve in a primary contract role to the KRWQC. PER subcontracts certain testing elements for the sediment testing to Caltest Laboratory (Napa, CA) including sediment grain sizing, Total Organic Carbon, and pyrethroid testing (if required due to toxicity).

Laboratories used by the Coalition will be certified at a minimum under the California Environmental Laboratory Accreditation Program (ELAP). 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.

Figure 1: Organizational Chart



ELEMENT 5: PROBLEM DESCRIPTION AND BACKGROUND

Introduction

It is known that some waters of the State are negatively impacted by discharges from agricultural lands. Said discharges may contain applied pesticides or chemical fertilizers that negatively impact the water quality and ecosystems present within the receiving waters. The Kings River Water Quality Coalition (KRWQC, Coalition) has conducted chemical and physical parameter testing since 2004 on representative waterways within its boundaries as part of the now dissolved Southern San Joaquin Valley Water Quality Coalition (SSJVWQC)

The hydrology of the Coalition is one where surface water supplies are frequently limited, and when available in the case of Kings River, are only released from Pine Flat Reservoir during peak periods of water demand according to agreed upon water rights. Groundwater is used where surface delivery infrastructure does not exist or when the irrigation districts are unable to deliver irrigation water on the farmer's irrigation schedule.

The Plan is designed to monitor the location for constituent exceedances in waters of the state, trace the source, and under the Surface Water Monitoring Plan, alter the Management Practices used to reduce/eliminate the exceedance.

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 Plan are to (1) categorize the current conditions of the waters of the state within the jurisdictional boundaries of the Coalition, to (2) identify any potential sources of pollutants that may contribute to the degradation of the waters of the State, and, if identified, to (3) prevent further degradation (if any) of such waters of the State as may be caused by irrigated agriculture through the 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.

Approaches Used

To achieve these objectives, the Coalition has implemented a Surface Water Monitoring Plan that selected representative monitoring sites within the waterways of the Coalition. 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 the beginning of irrigated agriculture, location of historic gaging stations, downstream of all sources of flow entering the waterway and other general conditions. When water is not present, monthly photo documentation of the monitoring sites are conducted.

To maximize the occasions where samples can be collected, Coalition personnel will monitor both the local agricultural irrigation schedules and the regional weather forecasts. During periods of active irrigation, regular stream flows or significant precipitation, the Coalition will conduct its monitoring events, but at the least monthly.

Regulatory Information

The Coalition covers essentially the north and central regions of the Tulare Lake Hydrologic 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 below provides the Basin Plan Objectives for the Tulare Lake Basin, as well as the spectrum of water quality parameters tested under the current monitoring and reporting program (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.

Table 1: MRP Water Quality Parameters Tested for and BPOs for Tulare Lake Basin

CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS	CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS
Field Measurements			**Pesiticides and 303(d) Parameters**		
Flow	-	cfs	Aldicarb	3	ug/L
EC	700	umhos/cm	Atrazine	1	ug/L
Temperature	Variable	ºC	Azinphos-methyl	0.01	ug/L
pH	6.5 – 8.3	pH units	Carbaryl	2.53	ug/L
Dissolved Oxygen	5-7 (W/C)	mg/L	Carbofuran	0.5	ug/L
			Chlorpyrifos	0.015	ug/L
Drinking Water			Cyanazine	1	ug/L
E. coli	235	MPN/100mL	DDD	0.001	ug/L
TOC	NA	ug/L	DDE	0.001	ug/L
			DDT	0.001	ug/L
General Physical			Diazinon	0.1	ug/L
Hardness	NA	mg/L	Dichlorvos	0.085	ug/L
TSS	NA	mg/L	Dicofol	NA	ug/L
Turbidity	Variable	NTU	Dieldrin	0.056	ug/L
			Dimethoate	1	ug/L
Metals			Demeton-s	NA	ug/L
Arsenic	10	ug/L	Disulfoton	0.05	ug/L
Arsenic (Dissolved)	150	ug/L	Diuron	2	ug/L
Boron	700	ug/L	Endrin	0.036	ug/L
Cadmium	Variable	ug/L	Glyphosate	700	ug/L
Copper	Variable	ug/L	Linuron	1.4	ug/L
Lead	Variable	ug/L	Malathion	0.1	ug/L
Molybdenum	10	ug/L	Methamidophos	0.35	ug/L
Nickel	Variable	ug/L	Methidathion	0.7	ug/L
Selenium	5	ug/L	Methiocarb	5	ug/L
Zinc	Variable	ug/L	Methomyl	0.52	ug/L
			Methoxychlor	0.03	ug/L
Nutrients			Methyl Parathion	0.08	ug/L
Ammonia-N	Variable	ug/L	Molinate	13	ug/L
Nitrate-N	10	mg/L	Oxamyl	50	ug/L
Nitrite-N	1	mg/L	Paraquat	3.2	ug/L
Orthophosphate-P	NA	mg/L	Phorate	0.7	ug/L
			Phosmet	140	ug/L
Water Toxicity			Simazine	4	ug/L
Ceriodaphnia dubia			Thiobencarb	3.1	ug/L
Pimephales promelas			Trifluralin	5	ug/L
Selenastrum capricornutum					

CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS	CONSTITUENT	BASIN PLAN OBJECTIVE	UNITS
Sediment Toxicity			**Pesticides and Sediment Parameters**		
Hyalella azteca			Bifenthrin	-	ng/g
			Chlorpyrifos	-	ng/g
			Cyfluthrin	-	ng/g
			Cypermethrin	-	ng/g
			Esfenvalerate	-	ng/g
			Fenpropathrin	-	ng/g
			Lambda cyhalothrin	-	ng/g
			Permethrin	-	ng/g
			Piperonyl Butoxide	-	ng/g

Decisions Made with Information Obtained

The purpose of any testing program is to determine if any constituent detections result in an exceedance of a BPO as the first step. The second step is to evaluate the seriousness of the exceedance. Once an exceedance has occurred, the approach of the Coalition is to trace the constituent to its potential source. This includes a physical survey of the waterways for possible points of entry of applied irrigation waters (pipes, culverts, and canal gates), evaluation and documentation of cropping patterns, and the eventual tracking of the application with the local Agricultural Commissioner. Once the likely source of the constituent exceedance has been identified, contact with the suspected grower(s) would begin so as to prevent future exceedances. A wide range of options are available, including improved irrigation waters management, changes in the chemicals applied, changes in application methods, or any other method that would prevent the offsite movement of the constituent of concern.

The data from the individual sampling points will be assessed according to the following beneficial use criteria:

Table 2: Coalition Sampling Points – Data Evaluation Criteria

Site name	Beneficial Use
Crescent Weir	Freshwater Habitat
Empire Weir #2	Freshwater Habitat
Gould Canal	Freshwater Habitat
Jackson Ave	Freshwater Habitat
Lemoore Weir	Freshwater Habitat
Manning Ave	Freshwater Habitat
Stinson Weir	Freshwater Habitat
Tivy Creek	Freshwater Habitat

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 adoption 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. Most recently, a new order (R5-2013-0120) has been adopted for the Tulare Lake Basin which has led to the dissolution of the SSJWQC and the establishment of numerous coalitions, each focus on those concerns specific to the sub-watersheds of the former combined coalitions.

This project for the Coalition will largely follow the previous efforts of the SSJVWQC including the testing parameters. The Coalition chose to perform the sample collection using in house staff and outsource the analytical examinations to BSK and PER.

Limited laboratory testing (water column toxicity) along with physical parameter measurements (dissolved oxygen [DO], electrical conductivity [EC], pH, and temperature) were started on a systematic schedule in 2004. The water column toxicity tests included an evaluation of algae growth (*Selenastrum capricornutum*), and fathead minnow (*Pimephales promelas*) and water flea (*Ceriodaphnia dubia*) survival. Each represents an important step in the aquatic food chain, and therefore a problem with one or more, when combined with the physical parameters, could be indicative of some form of water contamination. Data collected were transmitted to the Regional Board as a base indicator of whether an exceedance existed in the waters of the State within the Coalition.

Starting in June 2006, the testing was expanded to include general chemistry (dissolved metals), nutrients, and pesticides that the Regional Board felt were important, and were also consistent 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 monitoring sites. Reporting requirements under the program were also adjusted to quarterly data reports (in a SWAMP compatible format) and one annual report instead of two reports per year. The increased frequency of quarterly data reporting was to help the Coalition and Regional Board determine trends sooner, and the single annual report was adopted to help reduce reporting costs to the Coalition.

The annual testing was categorized as either Assessment or Core monitoring, 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 the waterway of the watershed. Both type of sites are 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.

A third type of site to be monitored is a Special Project Monitoring 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.

ELEMENT 6: PROJECT DESCRIPTION

Summary of Work 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 although the increased frequency of monitoring will require a more real-time determination of the sampling windows. Sampling or site photograph reports will continue on a monthly basis for each monitoring site.

Sampling Procedures

Prior to the sampling event, field meters (e.g. pH meters, EC meters, and DO meters) will be calibrated using known laboratory standards and according to the manufacturer's instructions at the KRCD laboratory. Known standards will be brought to the field to recheck the calibration (pH, EC) at each site prior to sample collection. Equipment is rinsed with deionized water at the completion of each sample site visit.

Field samples of the water will be collected in specific bottles provided by the analytical chemistry laboratory or in one-gallon amber jugs (for water column toxicity). The containers will be marked with site identification description, date and time of collection along with any preservative added by the lab on water resistant labels. Photo documentation will be performed at each monitoring site during each sampling event.

Glass bottles will be wrapped to prevent breakage during transport to the collection sites, and after collection, "blue" or gel ice packs are placed in ice chests along with the samples to reduce the sample temperature as low as possible in the field. Once all sampling points are collected, the samples will be transported to a location where they will be repacked for transportation to the laboratory. Chemistry samples will then packed in "wet" ice and delivered to the laboratory on the same day of collection. The samples will be packed with sufficient ice to lower the sample temperature to ≤6°C but not frozen. Water column toxicity samples will be delivered the next day, within the 36-hour hold time window.

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

Analytical Procedures

Once received by the laboratory, the samples will be checked for temperature and preservation requirements. Bottles will be inspected for integrity and any deviations noted as part of the sample conditions on receipt documentation. Any anomalies will be communicated to the Project Manager and corrective actions taken as required. At a minimum, the discrepancies will be noted as part of the Case Narrative included with the laboratory results.

Samples will be processed according to the test methods required by the General Order and identified in this QAPP. All laboratory data will undergo a tertiary review process to ensure that the data meets the requirements of the method and the data quality objectives of the Order. The Laboratory Program Manager will create the Certificate of Analysis (Report) and combine this with the raw analytical data as required. The case narrative will be written to identify any anomalies, QC failures or other material issues that do not meet the quality objectives of the Order.

The report along with the supporting documentation will be sent via email to the Project Manager.

Finally, the laboratory will prepare the required electronic data deliverables (EDD) as required by the Surface Water Ambient Monitoring Program (SWAMP). Prior to delivery to the Project Manager, the laboratory personnel will evaluate the EDD using the data integrity validation program as provided by the California Environmental Data Exchange Network (CEDEN). Any critical failures observed will be addressed and the EDD will be reevaluated. Once complete with no critical errors, the EDD will be sent to the Project Manager along with a copy of the error log returned by the CEDEN validation program.

Data obtained from this project will be used to assess the waterways within the Coalition for compliance with the Tulare Lake Basin Plan Objectives. See Tables 1 and 2 for an indication of the beneficial use and subsequent criteria used for evaluating compliance.

Sample Site Descriptions

The Coalition has identified eight geographic areas in which it will conduct its monitoring program. The locations and schedule were identified as being the most reflective of the surface waters within the Coalition boundaries. For additional details concerning the choice of the individual monitoring locations and schedule, please refer to the KRWQC Surface Water Monitoring Plan (8/4/14) and its associated addendum (2/9/15). The Monitoring Plan required under Order R5-2013-0120 contains additional sites that are not scheduled to be sampled until Plan approval.

The monitoring locations are as follows:

Crescent Weir Site Description

Crescent Weir is located on the North Fork of the lower Kings River, northwest of Lemoore. It is the location of a gaging station used during flood events to determine levee patrol requirements and distribution of flood releases between the North and South forks of the lower Kings. Irrigation water can be diverted at this point into the Crescent Canal for distribution to irrigated agriculture. Cropping is primarily row and field crops at this point, with some conversion to orchards.

Empire Weir #2 Site Description

Empire Weir #2 is a holding pool for three separate canal systems and the terminal end of the South Fork of the lower Kings River. The pool is located south of Stratford on Hwy 41. Standing water is present year round, but is only scheduled for sampling when deliveries (as reported by the Kings River Water Association) are being made. Cropping is primarily row and field crops. The depth of the pool precludes sediment sampling.

Gould Canal Site Description

Gould Canal is one of three primary distribution canals for the Fresno Irrigation District. The sample site is where the canal crosses under Riverbend Ave. It is located between the Enterprise Canal (upper canal) and the Fresno Main (lower canal) and was selected because of ease of access. Gould Canal passes through several irrigated cropping patterns, with citrus being the dominant crop. Cobbles on the bottom of the channel preclude any sediment sampling, as no sediment is typically present.

Jackson Ave. Site Description

Jackson Ave. is a Special Study site on the South Fork of the Kings River. It is listed as impaired for toxaphene, electrical conductivity, and molybdenum. The site is located in the pool behind Empire Weir #1, and is sampled when water is present for the impairment constituents and physical parameters. Row and field crops are dominate in the region.

Lemoore Weir Site Description

Lemoore Weir is a major distribution site on the lower Kings River. Located above the split between the North and South Forks of the lower Kings, it is the site of a gauging station used to reevaluate river flows on the lower Kings. Water is typically available several times per year, and samples will be collected in one of two locations when available (behind the weir if water is only being diverted into Lemoore Canal or at the gauging station when water is being delivered to the North or South Forks). Row and field crops are dominant in the region, with some dairies and orchards.

Manning Ave. Site Description

Manning Ave. is an upper Kings River monitoring site located behind Reedley College. The site is downstream of the confluence of Wahtoke Creek. It, along with Lemoore Weir, is one of the oldest sampling sites within the KRWQC's monitoring program. Manning Ave. typically has water present year round due to the fisheries releases made at Pine Flat Dam. Mixed orchard production is the dominant cropping pattern in this region.

Stinson Weir Site Description

Stinson Weir is the next to last diversion point on the North Fork of the lower Kings River. Water usually only reaches this structure in very wet years or during flood releases. The site, along with Crescent Weir, was selected for sampling as a replacement for the James Weir sampling site, which is the last diversion point on the North Fork of the lower Kings. It was thought that these sites would have water available for sampling events more often. Row and field crops dominate the landscape, but orchards are present as well.

Tivy Creek Site Description

Tivy Creek is an ephemeral channel in the foothills downstream of Pine Flat Dam. Citrus is the dominate irrigated crop in this watershed, which also contains considerable grazing acreage. Flows are only present after prolonged periods of rainfall or after short, intense storms.

Maps and coordinates for the sample site locations are included in Element 10 (Sampling Process Design / Monitoring Points).

Resource and Time Constraints

There is no significant resource constraints associated with fulfilling the sampling requirements. Both the Coalition and the laboratories have adequate resources to effectively perform the tasks required under this Plan and the General Order. The chemistry laboratory, BSK, has an office in the Fresno area. The Fresno-based laboratory has extensive equipment and personnel to accommodate the workload generated under the SWMP.

Pacific EcoRisk's laboratory is located in Fairfield, CA. Shipments of samples to the Fairfield location are handled by Coalition staff for next day delivery (same day for sediment samples is normal). PER has extensive experience in the area of aquatic toxicity and is one of the primary contract laboratories for many coalitions in the ILRP.

Time does represent the most significant restraint for the surface water monitoring. Because of the monitoring frequency requirements, the sample collection will require the close coordination of both Coalition and laboratory personnel. Coalition personnel will closely monitor both the scheduled irrigation program and the regional weather forecast to

ensure a timely notification of sampling requirements. Laboratory personnel will have the required sampling materials (e.g. sample containers, ice chests, etc.) on hand as a matter of practice to minimize the time requirements for the commencement of field sampling.

ELEMENT 7: QUALITY OBJECTIVES AND CRITERIA

The primary goal of any sampling and analysis program is to produce data that is of known and documented quality and is suitable for its intended use. The data generated under the QAPP will be used to make decisions regarding water quality in the State of California, ensuring the preservation of the environment and the protection of human health. To that end, the data quality objectives set forth in this QAPP are established to ensure that (1) the collection of samples is representative of the environmental conditions associated with agricultural activities, that (2) the samples are handled and processed in a manner consistent with the requirements of the methods used and the practices set forth in this QAPP, and that (3) the data generated from this project are of sufficient quality to make sound decisions regarding the impact of agricultural activities on the waters of the State.

Performance Criteria Goals

The success of any given monitoring event will be determined based on the characteristic of completeness. The quality of completeness is a function of the number of successful checks or evaluations made on a project versus the total number of observations made. The overall completeness goal for each monitoring event is 90%. A discussion of completeness for both the sampling and the analytical requirements will follow below.

Quantitation Limits

The data generated as part of the QAPP must be at a level of sensitivity low enough to detect and quantify constituents of concern at levels needed for preservation of the environment and human health. With that, the majority of the chemical testing is done to the parts-per-billion level (i.e. ug/L). In some cases, the required levels of sensitivity are even greater, with levels of concern in the range of a part-per-trillion (i.e. ng/L).

Chemistry

The laboratory will establish reporting limits (RLs) at a level at or below the requirements of the General Order. These RLs will be based on a calibration point at or below the equivalent sample concentration. The laboratory will not report any value below the RL without qualification as an estimated value. All reported results will be bracketed by a calibration point.

To determine the low value at which the laboratory can detect the presence of a target analyte, the laboratory will conduct a method detection limit (MDL) study in accordance with the procedure set forth in 40 CFR Part 136 Appendix B. This value is the

lowest concentration at which the lab can state the compound is present with 99% confidence that it is truly non-zero.

Some methods are not amenable to conducting method detection limits studies. These methods are identified in Table 6 with a "-" in the column labeled MDL. This table reflects the MDLs in existence at the time this QAPP is approved. As per the requirements of the Order, the MDLs will be regenerated or verified by the laboratory at least every two years or when a material change in made in the method or equipment used to generate the original MDL study.

To provide the program with the most sensitive data possible but with the statistical confidence that a result is not a false positive, the laboratory will report results that exist between the MDL and the RL. As these values are outside of the calibration range of the equipment used, there exists some uncertainty as to the accuracy of the result return. For values reported between the MDL and RL, the laboratory will identify these as estimated values by applying a qualifier to indicate the uncertainty of the measurement (e.g. "J-Flagged").

Toxicity

Water toxicity tests will be considered significant at the 95% level of significance. A dilution series test is initiated within 24 hours of the observation of complete mortality in any sample. A Phase I Toxicity Identification Evaluation (TIE) will be initiated within 48 hours of the observation of a $\geq$ 50% reduction in the organism response compared to the lab control.

Table 7 summarizes the analytes, methods, ILRP PQLs, method detection limits and reporting limits for this project.

Quality Control Measurements

Every effort will be made to provide quality from both the field sampling activities and from the fixed facility laboratory activities. Field and laboratory personnel are trained on proper sampling and analysis techniques appropriate to the tasks performed. All activities will be performed in accordance with established standard operating procedures (SOPs). See the Table 6 for listing of the applicable SOPs.

The results of the field and analytical activities will be gauged on a number of characteristics. Those characteristics are:

1. Representativeness. The monitoring sites selected by the Coalition must be consistent with and indicative of the water quality within the watershed. The monitoring sites selected by the Coalition accurately represent the regions they are located within, reflecting the flow into and out of the watershed. Samples will be collected based on real-time assessments of water flow, including those associated with storm events.

Samples will be handled to ensure they maintain the conditions at they exist in the field and will be released to the laboratory in a timely manner to ensure that hold times are met.

2. Comparability. All samples are to be collected in the same manner, from approximately the same location at each monitoring site, allowing for variances due to water levels, flow rates, and safety concerns. With the exception of the variability induced by the frequency of the sampling, all conditions will be maintained as consistent as possible to ensure that testing performed across multiple monitoring events is comparable with variation only due to field conditions. Furthermore, tests used by the laboratory will be in accordance with the General Order requirements to ensure comparability to historical data generated for each of the sampling locations.

3. Sensitivity, Contamination, Accuracy, Recovery and Precision is determined based on the performance of the method on one or more quality control indicators.

   Sensitivity is an assessment of the ability of the method to detect the analytes of interest at levels that are significant to the Plan. Numerous factors can affect sample results such that the reporting limits would need to be elevated. These factors include dilutions due to target or non-target interferences, insufficient sample volumes, internal standard suppression, etc. Sensitivity will be assessed by comparing the Order required reporting limits to those actually observed for all samples.

   Contamination is an assessment of the field and laboratory background by the examination of a blank matrix known to be free of contaminants. The blank matrix (Method Blank) is carried through the entire analytical process and then assessed for the presence of the target constituent. The presence of such constituents in the blank indicates that the field conditions or laboratory background may be responsible for the presence of a target constituent in the sample.

   Accuracy is the ability of the method to generate a result within a prescribed range of its actual true value. For the test methods employed in this Plan, accuracy will be determined based on the use of a standard reference material (SRM) or Laboratory Control Sample (e.g. LCS, Blank Spike) that is free of interferences.

   Recovery is the ability of the method to produce an accurate result given the potential interferences of a sample matrix. This is accomplished by fortifying a sample matrix with a small amount of the target compounds. The fortified matrix (or matrix spike [MS]) is carried through the analytical process to determine if the sample matrix somehow interferes with the method itself, either via suppression or enhancement of the matrix spike result.

   Precision is the ability of the method to reproduce the same result within a prescribed acceptance range. For the test methods employed, precision will be assessed by the analysis of a Laboratory Control Spike Duplicate, a Matrix Spike Duplicate or a

Laboratory Sample Duplicate. The laboratory duplicate differs from a field duplicate in that the lab duplicate will be a secondary aliquot taken from the same container as the parent sample. A field duplicate is a second sample collected from the source and is treated as a separate unique sample that is "blind" to the laboratory.

Precision in the water column toxicity and sediment tests are measured during the statistical analysis of the replicated tests performed.

4. Completeness. Completeness will be determined based on the measurement of the amount of valid data obtained per monitoring event (by site) versus the amount planned. The target of the Plan 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 and laboratory losses (errors, QC failures, and equipment failure). The laboratory shall determine 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.

   Completeness will be determined at two levels: Field and Transport, and Laboratory with levels reported within each quarterly report. The following describes the Completeness calculation to be used.

   Field and Transport completeness will include: completion of the site inspection report elements as specified on the Field Data Sheet, results of field instrument calibration checks, actual test results for physical parameters, completion of the Chain of Custody with the requested analyte list with no broken sample containers, and all samples received within temperature requirements. Chain of Custody forms are provided by the lab and are pre-populated to include the analyses requested as determined by the Core vs. Assessment sampling schedule. The samples are inspected prior to packing with ice for breakage. Bottle counts are done when the labels are affixed to the containers. The Field and Transport evaluation program ends with the signed Chain of Custody and the reporting of the conditions of the samples as they are unpacked by the lab. Laboratory failures (e.g. breakage of sample container, samples received out of hold time, temperature exceedance, etc.) would be documented. All other measures beyond this point are associated with the Laboratory Completeness assessment.

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

   The logbook sheets used for documentation of the Field and Transport portion of the monitoring event is included in Appendix A.2. An example of the spreadsheet used for the determination of the Field and Transport completeness is provided in Appendix A.4.

Completeness for the Field and Transport activities will be determined based on the number of assessment points satisfying the expected criteria versus the total number assessed per sample site (22 individual assessment criteria per location).

Laboratory Completeness is achieved via an exhaustive examination of the results of both the field samples and the quality control indicators for each of the laboratory analyses. The laboratory completeness assessment is based on the characteristics of laboratory data listed above: sensitivity, contamination, accuracy, recovery and precision.

Completeness for the Laboratory activities will be determined based on the number of sample results that are not materially impacted by a data quality issue. The calculation is the number of unaffected sample results versus the total number of data points generated for the sampling event.

An example of the spreadsheet used in the determination of Laboratory Completeness is included in Appendix A.3.

Table 3: Data Quality Objectives

Measurement or Analysis Type	Sensitivity	Contamination	Accuracy	Recovery	Precision	Completeness
Physical Parameters (EC, pH, DO, temp)	X		X		X	X
Toxicity	X	X	X	NA	X	X
Pathogens	X	X			X	X
Nutrients/Anions	X	X	X	X	X	X
Metals	X	X	X	X	X	X
Carbamates	X	X	X	X	X	X
Organochlorines	X	X	X	X	X	X
Organophosphates	X	X	X	X	X	X
Pyrethroids	X	X	X	X	X	X
Herbicides	X	X	X	X	X	X

ELEMENT 8: SPECIAL TRAINING NEEDS / CERTIFICATIONS

The Coalition personnel involved in the field sampling aspects of the program have been performing sample collection procedures for many years. They are familiar with the maintenance and calibration of the equipment used and the sampling techniques involved.

The laboratory's' Quality Assurance Manager is responsible for the oversight of training. The QA Manager will ensure that adequate training is provided to the laboratory personnel on the requirements of this Program. The training will consist of both written review and hands-on training, all documented and contained within the Laboratory's record keeping system. The training files are maintained by the Laboratory's Quality Assurance Department.

The laboratory's' Project Manager will undergo initial training on the details of the QAPP and other project requirements. The training will be conducted by the Laboratory Program Manager or his designee. The training will consist of a reading of the QAPP and a follow up review with the Program Manager. Following this training, the first work order handled by the Project Manager will be reviewed by the Program Manager as well, both on the initial receipt of samples and also at the time of reporting. This final stage of training will include a review of the final work product, the case narrative, the field logs and any other program requirements associated with the QAPP. Once the Project Manager has demonstrated sufficient knowledge and understanding of the project, the training will be documented and included in the laboratory's training records.

For the toxicity laboratory, documentation of a Demonstration of Capabilities worksheet and supporting records will be maintained at the lab.

ELEMENT 9: 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 according to each laboratory's standard record retention requirements.

Record Handling

Copies of the data submitted by the labs to the Coalition are kept at the Coalition office in electronic and, where necessary, hardcopy format. Additional copies of the data are submitted to the Regional Board with the quarterly reports. Copies of this data are kept at the local Board office in Fresno.

Any data submitted to the Coalition by the labs in PDF format are stored electronically. The files are stored on the KRCD network, and are backed up on a regular basis offsite. This is more efficient than paper copies of the reports, given the voluminous amounts of data generated (e.g. sample data, calibration data, bench sheets, etc.). CD's containing the data are routinely made and stored in a secure manner.

Electronic data submission is to be in a CEDEN compatible excel spreadsheet prepared by the individual laboratories (in addition to the additional data formats submitted), which will be combined into a single spreadsheet for submission to the

Regional Board. Staff at the Regional Board will be responsible for the upload of data into the CEDEN database.

Data collected and held by the Coalition will be stored for a minimum of seven years at the Coalition office. Records are held electronically (backed up to a remote site) and complete records (submitted with Quarterly and Annual Reports) are held on CD within the Kings River Conservation District's data vault. How long the data submitted to the Regional Board is held is unknown. The Laboratories will store the raw data in both hardcopy and electronic format in accordance with their respective record retention requirements. For CA ELAP certified laboratories – a required credential for this program – laboratories are required to maintain all records for a minimum of 5 years. Sufficient records must be maintained to allow complete reconstruction of the data.

Documents retained by the Coalition may include: paper copies of the field data sheets, executed Chains of Custody, purchase orders for lab services, and printed copies of the chemistry, microbiology and water column toxicity results. All of which are also backed up electronically.

Each data submission to the Regional Board will be a standalone file stored electronically at the Coalition. Once submitted and accepted by the Regional Board, the data will be integrated into the CEDEN database.

The QAPP will be submitted to the Regional Board on a CD. Two versions will be submitted, one containing proprietary information regarding testing and the other for public viewing (i.e. excludes proprietary SOPs). They will be clearly labeled. A paper copy of each version will be provided to the Regional Board for review on request.

Once the QAPP is approved by the Regional Board and signed by all required parties, an official copy will be maintained and controlled by the Coalition Quality Assurance Manager. The QA Manager will be responsible for distributing the official copy to the recipient list specified in Section 3 (Element 3). Due to its size, the official copy will be distributed via CD, sent either in the mail (or similar delivery) or hand delivered to each recipient's location. In the event of a change in the QAPP, the QA Manager will be responsible for ensuring the timely delivery of the latest revision.

Report Format

Reports for the chemistry, microbiology and water column toxicity will be provided in a manner consistent with the SWAMP QAPP required content.

Documentation of the field activities will include copies of the field logs with anomalies noted, calibration records for any field equipment, results for field measurements, executed chains of custody, and any additional forms, records, or logs that contain information critical to the quality of the data obtained from the sampling event.

Analytical Reports or Certificates of Analysis will contain the following information:

a. Project Name
b. Sample Description
c. Sample Date and Time of Collection
d. Collection Technique (e.g. grab, composite)
e. Sample Type (e.g. field sample, field blank, field duplicate)
f. Preparation and Test Method
g. Parameter
h. Result
i. Dilution Factor
j. Reporting and Detection Limit
k. Units
l. Date / Time Prepared and Analyzed
m. Data Qualifies
n. Quality Control Data including Blanks, Spikes, Duplicates, Surrogates
o. Case Narrative explaining all data anomalies or deficiencies
p. Chain of Custody
q. Sample Conditions on Receipt Summary

Record Distribution

The Project QA Manager will have the responsibility of ensuring that the stakeholders have the current version of all relevant documentation including the QAPP. The QA Manager will issue control copies of the current QAPP to each QAPP recipient listed in Element 3 of this QAPP. On a change or revision, the QA Manager will retract the old version of the document and replace with the most current version of the QAPP. The same process will be used for all other documents required by this Plan. Due to the proprietary nature of some of the information contained within the QAPP, the individual labs will be provided with the PUBLIC review copy.

ELEMENT 10: SAMPLING PROCESS DESIGN

Sampling will be conducted according to the schedule mandated within the MRP, with visits to all monitoring sites on a monthly basis. The date for the sampling event is held open with Coalition as the uncertainty of the presence of water at each sampling location is uncertain. This allows the contracted lab to work with the Coalition staff to determine the appropriate date for sample collection to maximize the chance of collecting a sample at a point of adequate water flow. Adjustments in sampling dates are made to accommodate holidays or other factors as needed.

The sampling design is to test for the specified chemistries at each of the identified monitoring sites, thus creating defined areas that can be easily addressed should detection

occur. 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 Plan is designed to detect any occurrence of chemical contamination of these waterways, and then to trace the source. The method for the connection of any chemical contamination to its source and, ultimately, the management practices or runoff related events is outlined in the SWMP for the KRWQC.

All monitoring sites listed within the MRP will be visited during each month. It is anticipated that several of the sample sites will only require photo documentation for the majority of the sample dates. This is due to infrequent flow in the waterway. Specific sampling points at each location have been identified and the rationale for each point is detailed in the SWMP.

Should a site become inaccessible due to field conditions that prevent a Coalition representative to safely access the site, the condition of the site will be documented and the sampling site revisited as soon as conditions allow. This documentation will be included with the report submitted for the follow up (or make up) sampling event. Resampling due to accessibility problems will be addressed on a case by case basis and coordinated between by the Coalition. However, as noted in the SWMP, part of the rationale for the selection of the sampling points was the reliability of each to be accessible at all but the most extreme conditions.

However, in some cases, resampling may not be an option due to inclement weather or some other water management constraint. In the event that it is determined a sample must be collected, the specific sampling point may need to be modified. The Coalition's Program Manager will make the determination if this modification is required. If so, the Program Manager will have the responsibility of informing the Board if the sampling point is modified and the rationale for doing so.

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 waterway. The exact course of action will depend upon the chemistry detected, and the conditions that were present when the sample was collected.

One or more of the sampling sites may be wet during the full course of the year. For these samplings, a full set of chemical tests (as specified by the MRP) will be run during the first year of the program. Samples will be grab samples of ambient water.

A duplicate sample will be randomly collected from those sites with water present. However, given that some sites are more likely to be dry a portion of the time, those sites having water most of the year will likely be disproportionately chosen during most

sampling events for the field duplicate. One duplicate will be collected for each event. The duplicate sample will be collected at the most comprehensive level of testing conducted.

The only sources of natural variation within the testing program are the physical parameter values (dissolved oxygen, pH, electrical conductivity, and temperature). 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 (day of sampling event) and rechecked at the field during the course of the day, as necessary. The laboratories constantly recalibrate their instrumentation as per method, so that source of variation is minimized as well, the resultant data having no more variation than that inherently contained within the test methods employed.

The sampling points for the coalition are identified as follows**:**

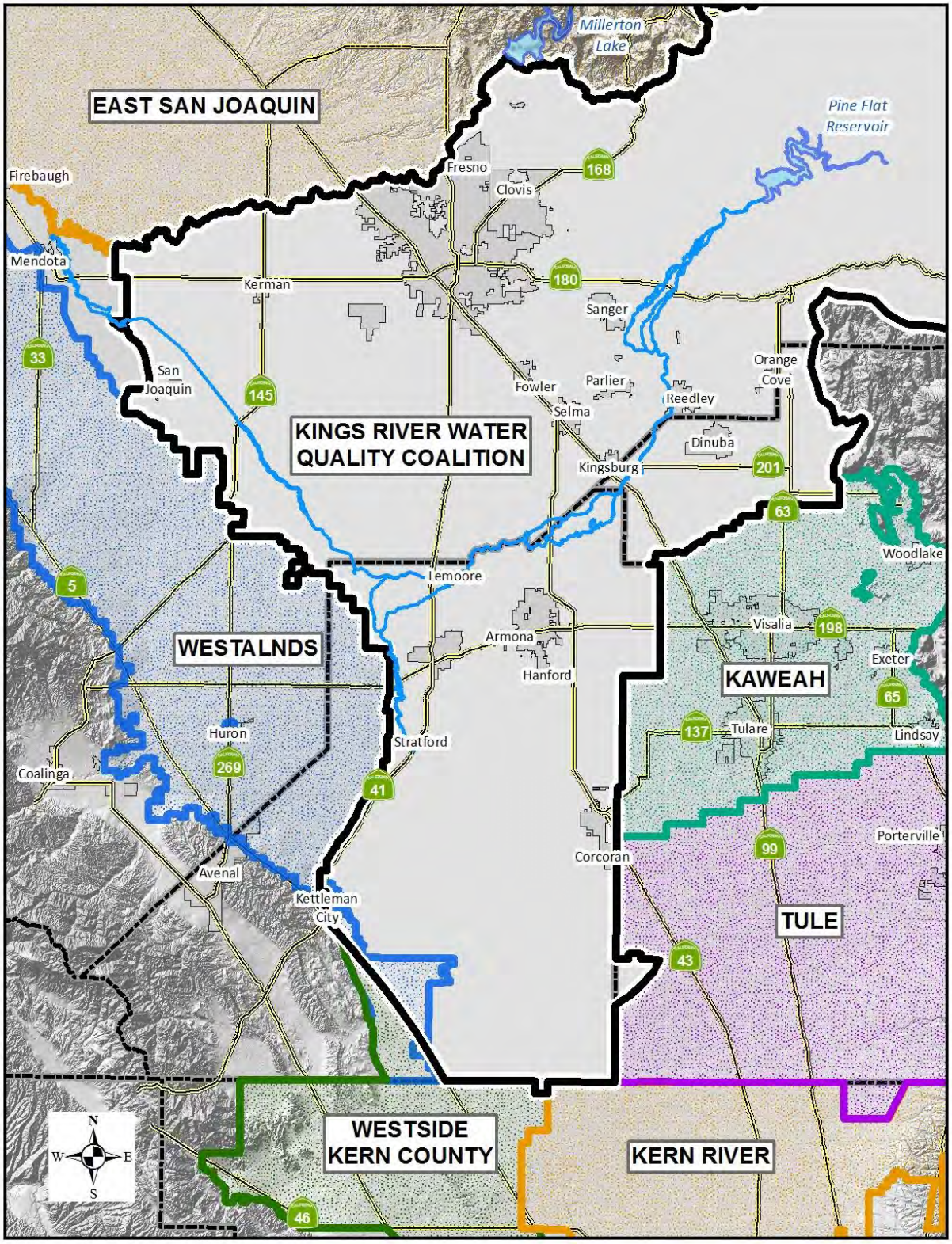
Table 4: Coalition Sampling Point Coordinates

Site name	CEDEN Code	Latitude	Longitude
Crescent Weir	551KRACRW	36.388533	-119.878135
Empire Weir 2	551KREMPH41	36.178595	-119.834144
Gould Canal	551GCARBA	36.760544	-119.513003
Jackson Ave	551KRAJAV	36.257634	-119.852619
Lemoore Weir	551KRALMW	36.419421	-119.724432
Manning Ave	551KRAMAV	36.612805	-119.462119
Stinson Weir	551KRASTW	36.460309	-119.993024
Tivy Creek	551TVCPR	36.779116	-119.408262

All data collected as part of the sampling (pH, EC, temperature, turbidity, flow) would be considered critical to the program. All will be used in the assessment of ambient conditions of the overall water quality. Field observations such as outside temperature, wind directions, time of the day, etc. will be considered informational and not critical to the Plan. However, observations such as these should be documented as they may help explain any possible anomalies in the analytical data such as unexpected detections for parameters that are historically low or absent in the watershed.

The sampling schedule for each location is included in the SWMP.

Figure 2: Kings River Water Coalition Authority Boundary Map



The watershed above Pine Flat extends to the crest of the Sierra Nevada and was omitted here for clarity.

Figure 3: Crescent Weir Aerial Site Map

Figure 4: Empire Weir #2 Aerial Site Map

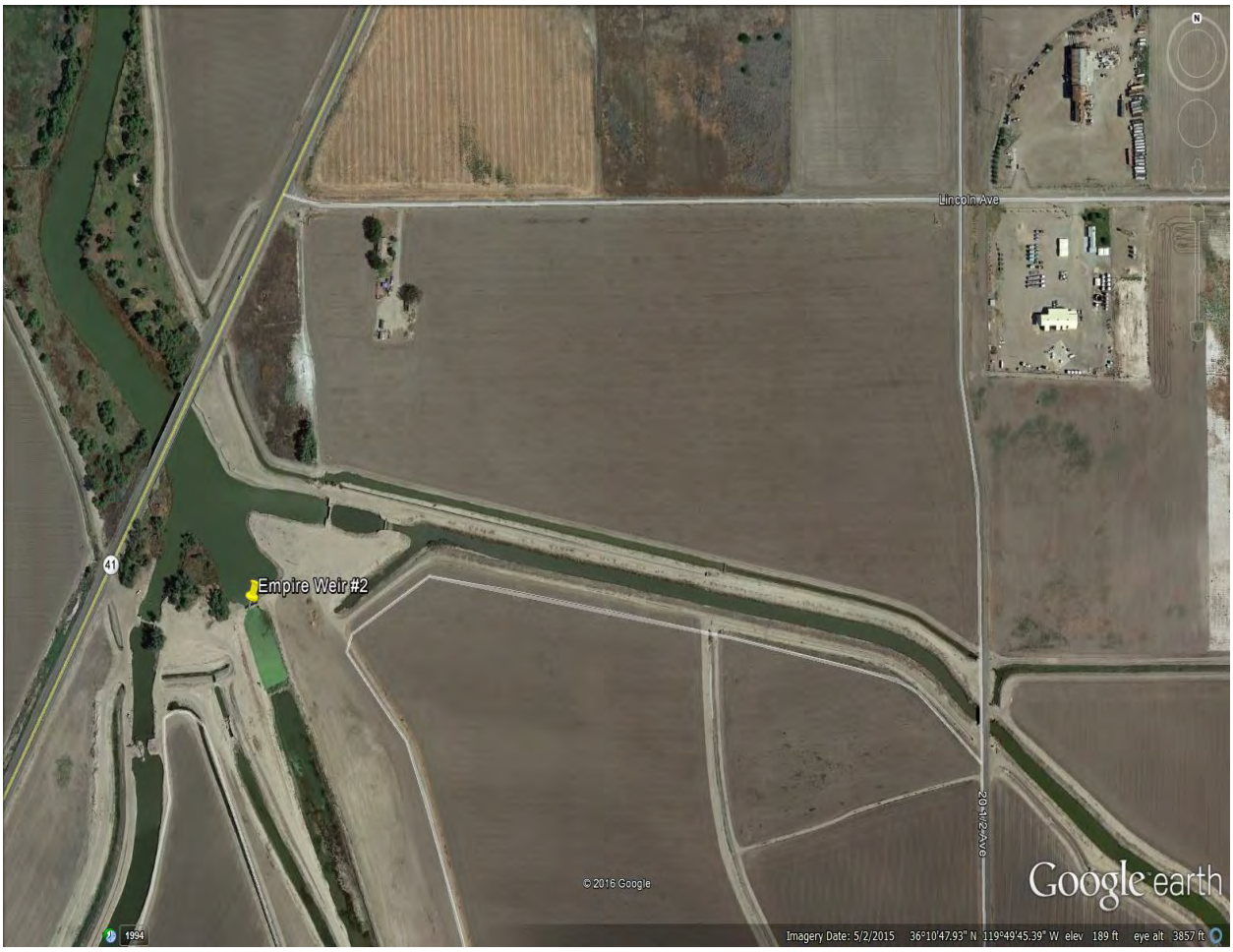


Figure 5: Gould Canal Aerial Site Map

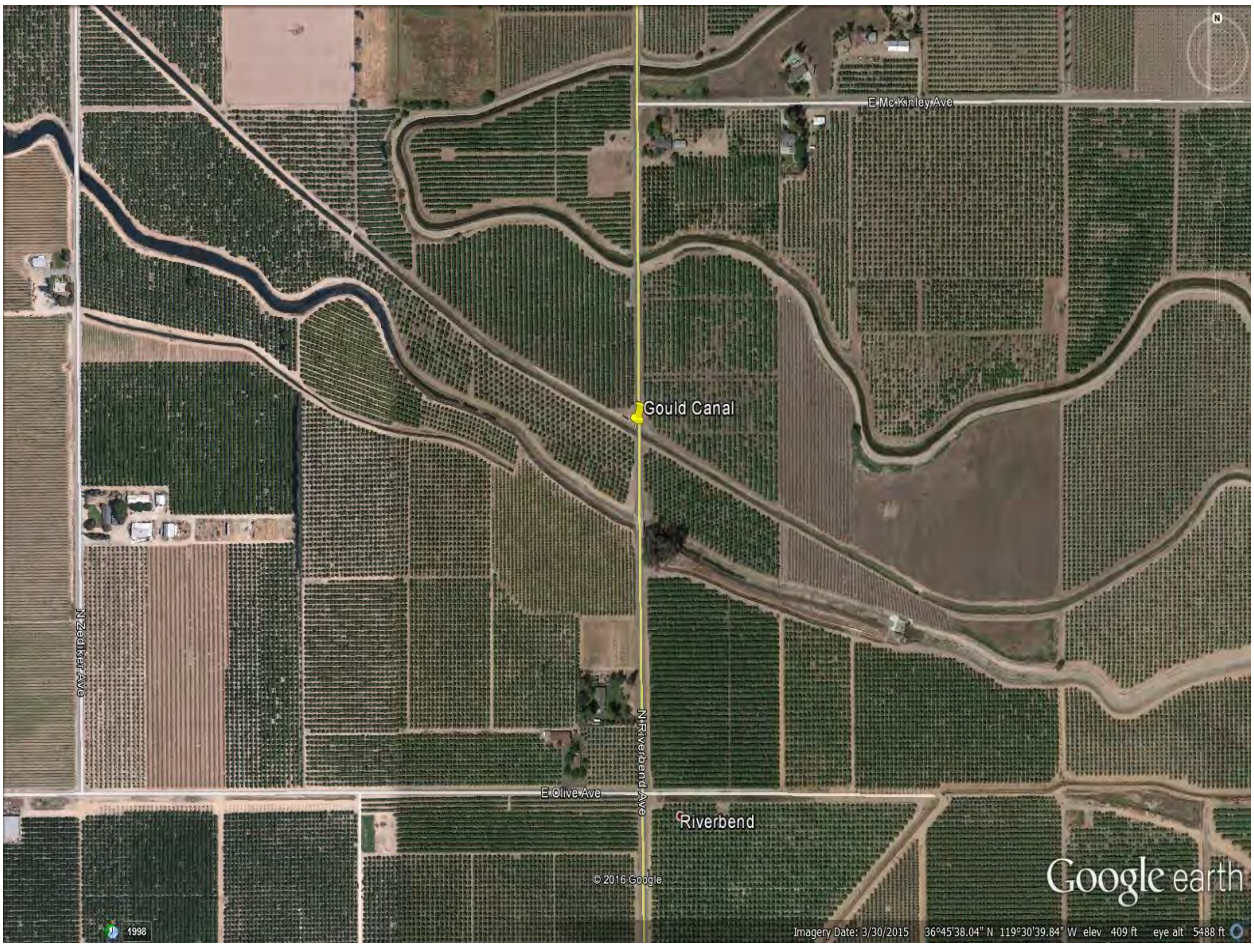


Figure 6: Jackson Ave. Aerial Site Map

Figure 7: Lemoore Weir Aerial Site Map

Figure 8: Manning Ave. Aerial Site Map

Figure 9: Stinson Weir Aerial Site Map

Figure 10: Tivy Creek Aerial Site Map

ELEMENT 11: SAMPLING METHODS

A more detailed description of the sample collection procedures is listed in the SOP in Appendix B.1. As part of the sample collection, photo documentation of the monitoring site will occur. Field technicians will photo log the location at each sampling event, looking upstream. GPS coordinates will be confirmed and, if the point of collection changes, new GPS coordinates will be recorded. A change in the location will only occur on notification and approval of the Project Manager.

In the event the sampling crew is responding to a storm water event and cannot sample at the exact coordinates indicated in this QAPP, samples will be collected and the Project Manager will be notified as soon as possible. Sample analysis will not begin until the location has been approved by the Project Manager or his designee. If there is a material difference in the location of actual collection versus the targeted location (>75 yds.), the Coalition Project Manager will be responsible for notifying the RWQCB.

General Sampling Requirements

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

1. Water must be present at the sampling location.
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 water that is too shallow to completely submerge the sample container without excessive disturbance of the sediment. Stagnant water will not be collected.

Sediment Sample Collection Requirements

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 monitoring 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.

Sample Collection Volumes

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 all samples, which is impractical for all concerned.

Sample Collection Procedures

Pre-Collection

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 monitoring sites. Battery issues with field instruments are addressed at this time.
3. The day of the sample, ice chests are loaded into the vehicles along with a chest filled with "blue ice" sample temperature maintaining blocks.

During Collection

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 monitoring site where the sample is collected does not change from event to event 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. Field instruments are checked against the standard solutions (pH and EC) where appropriate, and the data recorded.
4. Field sampling technician will don powder free, nitrile gloves to guard against contamination.
5. If entry into the water is required, the field technician is to approach the sampling point from downstream to minimize the chance of sediment in the collection field. If sediment is materially disturbed, the zone must be allowed to clear before collecting an sample.
6. Samples will be taken with a large carboy to minimize the number of bottles carried into the water body. Once filled, the contents of the carboy will be transferred into the actual sample containers.

7. After all bottles have been filled, a fresh sample is analyzed for the field parameters: pH, EC, temperature and dissolved oxygen. The stream velocity is also measured and recorded on the field log.
8. Water samples are collected until all bottles are filled. Care is exercised to repack the bottles to prevent breakage.
9. If a duplicate sample is to be collected at the site, steps 5 – 9 are repeated.
10. Site photos are taken, with photos of the sampling point, upstream and downstream.
11. "Blue" or gel ice is placed in the chests once they are carried back to the vehicle.

Following Collection

After the samples are returned to the office, and offloaded from the vehicle, cubed ice is packed into the chests (blue ice is removed). Chemical test samples are then transported to the lab. Water column toxicity and/or sediment toxicity samples are stored within the office on ice for transport the next morning if the sampling crew returns too late in the day to package and ship to the aquatic toxicity laboratory.

The Laboratory will provide additional sample containers for the Field duplicate and site specific QC (MS/MSDs). The laboratory will identify the bottles by location and by sample type (Dup, MS/MSD). It is critical that the sampling crew fill ALL bottles provided in the manner specified by the laboratory. Failure to fill all containers may result in insufficient quality control data to meet the project data quality objectives.

There is limited sampling equipment required for the collection of both aqueous and sediment samples. For the aqueous samples, a large 3-L carboy is the only container that may be reused between sampling location. To that end, the carboy will be triple rinsed between sampling locations using 300mL of laboratory grade deionized water. The use of any detergent as a cleansing agent could be problematic given the low reporting limit requirements of the program. Once triple rinsed, the carboy will be sealed and remain closed until the next sampling location. Prior to collection at the next site, the carboy will be rinsed with the matrix itself prior to collecting any samples.

Alternatively, the laboratory may elect to use virgin bottleware for the collection of samples. If so, no decontamination procedures are required. Additional carboys and any other sampling devices will accompany the sampling team in the event there is a problem with the carboy or other device that might be shared between locations.

For the sediment samples, the trowel or large scoop is the only device that may be in contact with each sample. Therefore, after use it will be first rinsed with water from the stream where the sample was collected. This is done to remove any

remaining solids. It will then be triple rinsed with deionized water, stored in a clean Zip-lock bag and kept sealed till the next sampling site. Once at the next location, it is rinsed in the river or stream prior to the collection of the next sample.

Post Collection Handling

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.

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. Headspace is left at top of bottle to reduce risk of bottle breakage at lab.

As stated in the SOP section (Appendix B.1), 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 in a manner that will not substantially affect data usability. However, technical failures will result in the loss of all data generated by the field 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 and by maintaining backup supplies for field activities

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

Access restrictions to the monitoring 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. Cross training procedures are in place so that sampling occurs in the same manner as with the primary team members.

The only samples that require homogenization are the sediment samples, which are collected across the entire main waterway. Individual containers of approximately 1L will be collected with a sufficient number filled to cover all the testing required. Once transported back to the laboratory, all individual containers will be emptied and combined into a single sample. This sample will be homogenized in a large stainless steel container and, once thoroughly mixed, returned to the original containers. These individual containers will then be distributed to the primary contract Laboratory as well as any subcontract laboratories.

ELEMENT 12: SAMPLE HANDLING AND CUSTODY

Samples are to be collected only in containers provided by the laboratory. Substitute containers are strictly forbidden as the integrity of such containers is unknown. Any alternative containers provided to the laboratory will be rejected unless otherwise authorized in writing by the Project Coordinator and Program QA Manager.

Using the correct container is critical as each test method has a specific preservation requirement. Some samples are preserved to ensure that the condition of the sample at the time of analysis is consistent with the conditions as it existed in the field. The laboratory uses a variety of conditions to inhibit bacterial growth that would degrade target analytes, to prevent certain constituents from precipitating and falling out of solution, to prevent oxidation/reduction of the various constituents, and to prevent parameters from evolving off as a gas. The preservation technique and well as storage requirements for each test method is listed below in Table 5.

Once collected, each sample and analysis has a finite amount of time before it must be prepared or analyzed. If this time period known as the holding time expires, the results may be considered invalid and would normally be cause for rejection of the subsequent data. The holding times for each test method are listed in the following table.

Table 5: Method Preservation, Storage and Holding Time Requirements

Parameter	Preservative	Container	Storage	Hold Time to Prepare	Hold Time to Analyze
Ammonia/Ammonium	H2SO4	Plastic	<6°C	28 Days	-
Carbamates	None	Clear Glass	<6°C	7 Days	-
Glyphosate	Na2S2O3	Amber Glass	<6°C	14 Days	-
Hardness (Calc)	HNO3	Plastic	Ambient	-	180 Days
Herbicides	None	Amber Glass	<6°C	7 Days	-
Metals	HNO3	Plastic	Ambient	-	180 Days
Metals (Dissolved)	None	Plastic	Ambient	-	180 Days
Nitrate, Nitrite	None	Plastic	<6°C	-	48 Hours
OCl Pesticides	None	Amber Glass	<6°C	7 Days	40 Days
OP Pesticides	None	Amber Glass	<6°C	7 Days	40 Days
o-Phosphate	None	Plastic	<6°C	-	48 Hours
Paraquat	Na2S2O3	Amber Plastic	<6°C	7 Days	21 Days
Pathogens	Na2S2O3	Acrylic	<6°C	8 Hours	-
Pyrethroids	None	Amber Glass	<6°C	7 Days	40 Days
Solids (TSS)	None	Plastic	<6°C	-	7 Days
TOC	H3PO4	Clear Glass	<6°C	-	28 Days
Water Toxicity	Chilled to <6° C/wet ice	Amber Glass	<6°C	-	36 Hours

Parameter	Preservative	Container	Storage	Hold Time to Prepare	Hold Time to Analyze
Sediment Toxicity	Chilled to <6° C/wet ice	Clear Glass	<6°C	-	
Triazine Pesticides	None	Amber Glass	<6°C	7 Days	40 Days
Turbidity	None	Plastic	<6°C	-	48 Hours

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 (chemistry samples. Water and sediment toxicity samples have water-proof labels attached to the container indicating site name and time/date of collection).

Storage once the samples are released to the lab will be at the condition specified above. Any exceptions to the holding times listed above are noted in the laboratory report and are addressed on a case by case basis. Any required sample preservation is effectively handled by the chemistry lab as the bottles supplied are pre-treated with the proper preservation (if required, see above Table 5). Samples with pH preservation will be checked on receipt to verify that the sample has reached the proper pH. Any deviations from the method preservation requirements will be brought to the attention of the Project Manager at the laboratory affected. The laboratory will not proceed with the analysis of any improperly preserved samples without the approval of the Project Manager. Any samples analyzed that were not received under proper preservation will be noted in the report case narrative.

Records are maintained within the contracted lab that includes the checking in and out of samples during the analytical process as well as the disposal of samples following completion of the analytical process and archival. Samples are held under proper storage conditions until all analyses are conducted. Once complete, samples will be moved to a

temporary archive where they await disposal. Samples are held by the laboratory for 60 days prior to being disposed.

ELEMENT 13: ANALYTICAL METHODS AND FIELD MEASUREMENTS

Standard Operating Procedures

The contract laboratory utilizes a number of EPA or Standard Methods preparation and determinative methods. The laboratory has SOPs for each method employed as well as SOPs for the procedural activities in the laboratory. The method specific SOPs for this project are listed in Table 6.

Table 6: Standard Operating Procedures

Parameter	Method Description	Doc ID	Rev. Date
Ammonia	Ammonia by Gas Diffusion and Automated Phenate	IO-SP-0036-01	1/16/15
Anions	Anions by Ion Chromatography	IO-SP-0085-00	
Carbamates, Herbicides	Carbamates, Herbicides by LC-MS/MS (DAI)	OR-SP-0046-01	4/20/15
Glyphosate	Glyphosate by HPLC, Post Column Derivitization	OR-SP-0009-05	12/17/13
Grain Size	Grain Size by ATSM D4464M		5/2010
Hardness	Hardness by Calculation	IO-SP-0044-01	5/11/11
Metals	Metals by ICP-MS	MT-SP-0008-00	4/23/15
	Total Recoverable Metals Preparation	MT-SP-0001-00	4/22/15
Ortho-Phosphate	o-Phosphate by Ascorbic Acid Reduction	IO-SP-0072-03	3/27/15
Paraquat	Paraquat by SPE, HPLC-UV	OR-SP-0011-05	2/16/14
Pathogens	Multi-Tube Fermentation for Total and Fecal Coliform, and *E. coli*	WM-SP-0002-03	4/22/15
Pesticides – N,P	Nitrogen, Organophosphorous	OR-SP-0034-01	4/14/15
Pyrethroids	Pyrethroid Pesticides by GC/MS	O-Pyrethroidsrev6	5/2011
Pesticides – OCl	Organochlorine Pesticides by GC-ECD	OR-SP-0019-03	6/4/15
Solids (TSS)	Solids by Gravimetric Determination	IO-SP-0020-04	5/22/14
Total Organic Carbon	TOC by…		
Toxicity – Algae	Chronic toxicity	Chronic*Selenastrum*SOP Rev7	4/22/15
Toxicity – Flea	Acute toxicity	AcuteCerioSOP Rev6	12/9/13
Toxicity - Minnow	Acute toxicity	AcuteFHMSOP Rev4	11/17/08
Toxicity – *Hyalella*	10 Day Sediment Survival and Growth Test – *Hyalella azteca*	10dHyalellaSedSOP Rev5	4/22/15
Turbidity	Turbidity by Nephelometry	IO-SP-0029-04	4/20/15

Copies of these SOPs can be found in Attachment B. These SOPs are considered proprietary information by the laboratory and will be redacted for the purpose of the public version of this QAPP.

Instrumentation

The contract laboratory will utilize a wide range of equipment in the performance of the analytical testing. While not exhaustive in content, the following list of equipment represents the minimal amount of instrumentation required to perform the testing under this Plan. The list does not indicate each individual piece of equipment as the laboratory maintains redundant equipment in many cases.

Tables 10, and 11 contain a listing of field and laboratory instrumentation used under this QAPP, and will be discussed in further detail under Element 15.

Field Monitoring

All field measurements will be performed at the time of sampling. There will be no *in situ* or continuous monitoring of field conditions at the specific monitoring sites. Any information about the conditions at the sampling points between sampling events would need to be inferred from other indirect sources such as water flows at points upstream or downstream or measurements made or samples collected and analyzed for other purposes. Otherwise, there are no other requirements for the deployment, maintenance, calibration or storage of related data for field equipment.

Method and Instrument Performance Criteria

The contract laboratory performs testing for several watersheds in support of their ILRP monitoring requirements. The test methods employed have been tailored to meet the requirements of this Plan to ensure compliance with the General Order, MRP and SWAMP QAPP guidelines. All methods utilized are based on approved, standardized methods. There are no other "in-house" or non-standardized methods used for this Plan.

The contract laboratory will observe the following Methods, Reporting Limits, and Detection Limits as shown in Table 7.

Quantitation and Detection Limits

Table 7: Methods, Reporting Limits and Detection Limits

		Reporting Information			
Constituent	**ILRP PQL**	**RL**	**MDL[1]**	**Units**	**Method**
Physical Parameters					
Flow	1	-	-	cfs	Field
pH	0.1	0.1	-	pH Units	Field
EC	100	5	-	umhos/cm	Field
DO	0.1	0.1	-	mg/L	Field
Temp	0.1	-	-	°C	Field
Turbidity	1	0.1	-	NTU	SM 2130B
TSS	10	10	-	mg/L	SM 2540D
Hardness	10	0.41	0.19	mg/L	SM 2340B
TOC	-	50	-	mg/kg	Walkley-Black
Percent Solids / Moisture	-	0.1	-	%	SM 2540B
Pathogens					
E. coli	2	1.1	-	MPN/100mL	SM 9221F
Water Column Toxicity					
Algae	NA	NA	NA	cells/mL, (as growth)	EPA 821-R-02-013 (aka EPA 1003.0)
Water Flea	NA	NA	NA	% Survival	EPA 821-R-02-012 (aka EPA 2002.0)
Fathead Minnow	NA	NA	NA	% Survival	EPA 821-R-02-012 (aka EPA 2000.0)
Sediment					
Hyalella azteca	NA	NA	NA	% Survival	EPA 600-R-99-064 (aka EPA 100.1)
Carbamates					
Aldicarb	0.5	0.4	0.08	ug/L	EPA 8321A
Carbaryl	0.5	0.07	0.0014	ug/L	EPA 8321A
Carbofuran	0.5	0.07	0.0014	ug/L	EPA 8321A
Methiocarb	0.5	0.4	0.08	ug/L	EPA 8321A
Methomyl	0.5	0.07	0.0014	ug/L	EPA 8321A
Thiobencarb	-	0.5	0.10	ug/L	EPA 8270C
Oxamyl	0.5	0.4	0.08	ug/L	EPA 8321A
Organochlorines					
DDD	0.02	0.01	0.00072	ug/L	EPA 8081A
DDE	0.01	0.01	0.00061	ug/L	EPA 8081A
DDT	0.01	0.01	0.0007	ug/L	EPA 8081A

		Reporting Information			
Constituent	**ILRP PQL**	**RL**	**MDL[1]**	**Units**	**Method**
Dicofol	0.1	0.1	0.015	ug/L	EPA 8270C
Dieldrin	0.01	0.01	0.00097	ug/L	EPA 8081A
Endrin	0.01	0.01	0.00081	ug/L	EPA 8081A
Methoxychlor	0.05	0.01	0.0009	ug/L	EPA 8081A
Toxaphene	-	0.5	0.035	ug/L	EPA 8081A
Organophosphates					
Azinphos-methyl (Guthion)	0.1	0.1	0.032	ug/L	EPA 8270C
Chlorpyrifos	0.015	0.02	0.0029	ug/L	EPA 8270C
Diazinon	0.02	0.02	0.0036	ug/L	EPA 8270C
Dichlorvos	0.1	0.1	0.0048	ug/L	EPA 8270C
Dimethoate	0.1	0.1	0.0075	ug/L	EPA 8270C
Demeton-S (Demeton [O,S])	0.1	0.1	0.025	ug/L	EPA 8321A
Disulfoton	0.05	0.1	0.024	ug/L	EPA 8321A
Malathion	0.1	0.1	0.0046	ug/L	EPA 8270C
Methamidophos	0.2	0.2	0.021	ug/L	EPA 8321A
Methidathion	0.1	0.1	0.011	ug/L	EPA 8270C
methyl Parathion	0.1	0.1	0.003	ug/L	EPA 8270C
Phorate	0.2	0.1	0.0033	ug/L	EPA 8270C
Phosmet	0.2	0.2	0.029	ug/L	EPA 8270C
Herbicides					
Atrazine	0.5	0.5	0.028	ug/L	EPA 8270C
Simazine	0.5	0.5	0.024	ug/L	EPA 8270C
Cyanazine	0.5	0.5	0.036	ug/L	EPA 8270C
Diuron	0.5	0.4	0.0072	ug/L	EPA 8321A
Molinate	-	0.5	0.004	ug/L	EPA 8270C
Glyphosate	5	5	2.1	ug/L	EPA 547
Paraquat	0.5	0.4	0.21	ug/L	EPA 549.2
Linuron	0.5	0.4	0.0061	ug/L	EPA 8321A
Trifluralin	0.05	0.05	0.0056	ug/L	EPA 8270C
Metals (Total /Dissolved)					
Arsenic	1	0.2	0.045	ug/L	EPA 200.8
Boron	10	10	4.45	ug/L	EPA 200.8
Cadmium	0.1	0.1	0.025	ug/L	EPA 200.8
Copper	0.5	0.5	0.23	ug/L	EPA 200.8
Lead	0.5	0.2	0.045	ug/L	EPA 200.8
Molybdenum	1	0.5	0.0358	ug/L	EPA 200.8

		Reporting Information			
Constituent	**ILRP PQL**	**RL**	**MDL[1]**	**Units**	**Method**
Nickel	1	0.5	0.051	ug/L	EPA 200.8
Selenium	1	1	0.45	ug/L	EPA 200.8
Zinc	1	1	0.46	ug/L	EPA 200.8
Nutrients					
Nitrate-N	0.05	0.06	0.0145	mg/L	EPA 300.0
Nitrite-N	0.05	0.05	0.043	mg/L	EPA 300.0
Ammonia	0.1	0.1	0.029	mg/L	EPA 350.1 or SM 4500-NH3 G
Orthophosphate (as P)	0.01	0.01	0.0051	mg/L	SM 4500-P E
Pyrethroids / Chlorpyrifos					
Chlorpyrifos	-			ng/g	EPA 8270C
Bifenthrin	1.0			ng/g	EPA 8270C
Cyfluthrin	1.0			ng/g	EPA 8270C
Cypermethrin	1.0			ng/g	EPA 8270C
Deltamethrin	-			ng/g	EPA 8270C
Esfenvalerate (+Fenvalerate)	1.0			ng/g	EPA 8270C
Fenpropathrin	1.0			ng/g	EPA 8270C
Permethrin (cis-Permethrin)	1.0			ng/g	EPA 8270C
Lamda Cyhalothrin	1.0			ng/g	EPA 8270C
Piperonyl Butoxide	-			ng/g	EPA 8270C

1. The MDLs listed are those in existence at the time this QAPP was written. MDLs may change over time as the laboratory conducts ongoing studies due to changes in the method or equipment or is required to do so as per the SWAMP requirements.

Method Performance

The laboratory will observe the following method and instrument criteria for this project. It will be discussed in further detail under Element 20.

Table 8: Laboratory Method QC Criteria

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spikes(LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Ammonia	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 20%, Continuing Verification every 10 field samples, %Diff ≤ 20%*	*<RL*	*1 per batch of 20 samples, 80-120%*	*1 per batch of 20 samples, 20% RPD*	*1 per batch of 20 samples, 80-120%*	*1 per batch of 20 samples, 20% RPD*	*≤25% RPD*	*N/A*
Carbamates	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 10 field samples, %Diff ≤ 15%*	*<MDL*	*1 per Batch of 20 Samples, 50-150%*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, 50-150%*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*Applied to all samples and QC, 50-150%*
Glyphosate	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 20%, Continuing Verification every 10 field samples, %Diff ≤ 20%*	*<MDL*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*Applied to all samples and QC, 70-130% Rec*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spikes(LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Hardness (Calc)	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*<RL*	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*Performed by Calculation. See Metals QC Criteria.*	*≤25% RPD*	*N/A*
Herbicides	*5 Pts Min. (Linear Fit, R≥0.995 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples, %Diff ≤ 15%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 10 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*
Metals	*Single Point calibration plus Calibration Blank, multi-point curves must be fit using Linear Regression, R≥0.995*	*2nd Source Verification following calibration, %Diff ≤ 10%, Reporting Limit Verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<2.2x MDL*	*1 per batch of 20 samples, 85-115%*	*1 per batch of 20 samples, 20% RPD*	*1 per batch of 20 samples, 70-130%*	*1 per batch of 20 samples, 20% RPD*	*≤25% RPD*	*N/A*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spikes(LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Nitrate, Nitrite	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*1 per batch of 20 samples, 90-110%*	*1 per batch of 20 samples, 20% RPD*	*1 per batch of 10 samples, 80-120%*	*1 per batch of 10 samples, 20% RPD*	*≤25% RPD*	*N/A*
OCl Pesticides	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples, %Diff ≤ 15%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*
OP Pesticides	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples or 12 hours , %Diff ≤ 20%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spikes(LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
o-Phosphate	*5 Pts Min. (Linear Fit, R≥0.995)*	*2nd Source verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*1 per batch of 20 samples, 90-110%*	*1 per Batch of 20 Samples, 20% RPD*	*1 per batch of 20 samples, 80-120%*	*1 per Batch of 20 Samples, 20% RPD*	*≤25% RPD*	*N/A*
Paraquat	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 20%, Continuing Verification at the beginning of the run, every 8 hours or 20 samples minimally thereafter, %Diff ≤ 20%*	*<MDL*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*1 per batch of 20 samples, 70-130%*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*N/A*
Pathogens	*N/A*	*N/A*	*<RL[1]*	*N/A[1]*	*N/A*	*N/A*	*N/A*	*≤25% RPD*	*N/A*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spikes(LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Pyrethroids	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples or 12 hours , %Diff ≤ 20%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*
Solids (TSS)	*N/A*	*N/A*	*<RL*	***(TDS Only)** 1 per Batch of 20 Samples, 70-130%*	*N/A*	*N/A*	*<20% RPD (Lab Dup)*	*≤25% RPD*	*N/A*
Toxicity	*N/A*	*N/A*	*Laboratory Control Samples*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
Triazine Pesticides	*5 Pts Min. (Linear Fit, R≥0.995) 6 Pts Min. (Non-linear fit. R^2≥0.99)*	*2nd Source verification following calibration, %Diff ≤ 30%, Continuing Verification every 20 field samples or 12 hours , %Diff ≤ 20%*	*<MDL*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*1 per Batch of 20 Samples, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*	*1 per Batch of 20 Samples, 30% RPD*	*≤25% RPD*	*Applied to all samples and QC, Rec Range Varies, Avg. Rec ± 3SD, See attached specification sheet*

Parameter	Calibration	Calibration Verification	Method Blank	Laboratory Control Spikes(LCS)	LCS Duplicate	Matrix Spike (MS)	Matrix Spike Duplicate (MSD), Lab Duplicate	Field Duplicate	Surrogate Recovery
Turbidity	*Single Point calibration plus Calibration Blank, dependent on expected range of use*	*2nd Source Verification following calibration, %Diff ≤ 10%, Reporting Limit Verification following calibration, %Diff ≤ 10%, Continuing Verification every 10 field samples, %Diff ≤ 10%*	*<RL*	*N/A*	*N/A*	*N/A*	*<20% RPD (Lab Dup)*	*≤25% RPD*	*N/A*

1. Pathogen analysis requires a daily positive control and negative control. BSK also performs a daily sterility check on prepared media.

Disposal Procedures

Much of the sample collected for any given monitoring event will be consumed as part of the analysis. However, as noted above, the analytical laboratory will retain the remaining sample volume for a period of 60 days from receipt of the samples, approximately 45 days from the completion based on the standard turnaround time of 10 business days.

The aquatic toxicity testing laboratory retains samples for a 30 day period, which is approximately 10 days from the report submittal based on a 14 day turnaround time from test termination.

For samples sent for chemical analysis, samples are segregated into groups according to their waste classification once identified for disposal. Any samples identified as hazardous based on the outcome of their testing will be put into the laboratory's waste streams and handled in accordance with EPA and DTSC regulations. Samples that are not determined to be hazardous based on the results of their testing will be disposed of according to their preservation type. Acidic and caustic samples will be neutralized and discarded down the sanitary sewer according to the local and Federal pre-treatment guidelines. Samples that are neutral (e.g. analytical and toxicity) are poured directly into the drain and flushed with plenty of water. Sample containers are rinsed and then recycled according to their material classification, with the exception of the toxicity sample containers which are cleaned and re-used per the procedures described in the EPA toxicity testing manuals.

The laboratory maintains disposal records to indicate when each set of samples has been disposed.

Corrective Action Measures

The laboratory will take a variety of corrective actions for material failures related to sample conditions, holding time failures, preservation problems and quality control failures. All failures and corrective actions will be documented in the form of a data qualifier and/or addressed in detail in the Case Narrative at the beginning of the laboratory report. The details of these responses are included in the various method SOPs and other related supporting documentation. However, the general corrective actions related to a number of common QC failures are listed below.

Calibration Linearity failures are often caused by instrumentation that is in need of maintenance. If a calibration curve fails to meet linearity criteria, the instrument will be repaired and likely a new set of calibration standards prepared. Once complete, the instrument will be recalibrated.

Initial (ICV) and Continuing Calibration (CCV) failures occur periodically on the laboratory instrumentation. Often times these failures are associated with running large

numbers of dirty samples which deteriorate the performance of the equipment. ICV failures will generally be handled by the preparation of a new set of calibration standards and ICV standard. This is often done in conjunction with maintenance performed consistent with that tied to linearity problems.

Method Blank Contamination failures indicate that the ambient laboratory background may be contributing to sample contamination. The response to specific methods will vary but in general, any detection over a Reporting Limit (RL) will result in the re-preparation and reanalysis of the associated samples unless the sample results are greater than 10x that found in the blank. Certain methods have corrective action requirements for detections above the MDL or at a multiple of the MDL. Those will be addressed on a case by case basis. All detections in the Method Blanks having a material impact on the data as defined by the ILRP QAPP guidelines will be addressed in the report case narrative.

Laboratory Control Spike Recovery and Precision failures are indicative of a problem in the analytical procedure. Recovery failures are generally addressed by a re-preparation and reanalysis of all samples and QC indicators. Several exceptions may be made where recoveries exceed the upper control limit and samples are non-detected for the failed compound. Precision failures will generally follow the same corrective action plan unless the RPD limit is narrower than the acceptance range for Recovery performance. Under those circumstances, the laboratory will not reject the results but will qualify the data to note the failure.

Matrix Spike Recovery and Precision failures indicate that the sample matrix itself may have some adverse effect on the method performance. However, if the LCS/LCSD recoveries meet control criteria, no corrective action will take place. The problem at that point is assumed to be associated with the sample matrix itself and beyond the reasonable control of the laboratory. Sample results will be qualified and a note will be made in the case narrative. However, repeated failures for the same analyte will trigger an investigation as the ongoing failure may indicate that the method is poorly suited for a particular sample type and should be modified to address the performance issue.

Laboratory Duplicate failure may indicate a problem with sample homogeneity. On a Lab Duplicate failure, the sample itself will be examined for obvious matrix homogeneity issues. If there are no obvious reasons for the nature of the failure, the samples will be re-prepared and reanalyzed. If an obvious cause is determined, the sample results will be qualified and a note made in the case narrative. However, laboratory duplicate failures that occur when the sample result is less than 10x the RL will be ignored as the magnitude of the RPD can be disproportionately affected by low sample results.

Field Duplicate failures indicate homogeneity or sampling issues that occur in the field. No corrective action is taken with such failures with the exception of qualifying the data and making a notation in the case narrative.

Surrogate Recovery failures will be addressed on a case by case basis. Samples with failing surrogate recoveries may be biased either high or low. Surrogate failures on clean matrices with no obvious sample interferences will be re-extracted if possible. Repeated failures will be assumed to be caused by matrix interference. If no re-extraction is possible, the data will be qualified. High surrogate failures on non-detected samples will be treated as immaterial to data usability and qualified only to call attention to the failure.

ELEMENT 14: QUALITY CONTROL

The laboratory will perform the follow QC measures provided in Table 9.

Table 9: Required Quality Control by Method

	Samples per Batch	Method Blank	LCS / LCSD	MS / MSD	Lab Dup	Surr. Spike	Field Dup
Ammonia	20	X	X	X		N/A	X
Carbamates	20	X	X	X		X	X
Glyphosate	20	X	X	X		X	X
Hardness (Calc)	20	X[3]	X[3]	X[3]		N/A	X
Herbicides	20	X	X	X		X	X
Metals	20	X	X	X		N/A	X
Nitrate, Nitrite	20	X	X	X		N/A	X
OCl Pesticides	20	X	X	X		X	X
OP Pesticides	20	X	X	X		X	X
o-Phosphate	20	X	X	X		N/A	X
Paraquat	20	X	X	X			X
Pathogens	-	X[1]	X[1]	N/A		N/A	X
Pyrethroids	20	X	X	X		X	X
TOC	20	X	X	X		N/A	X
TSS	20	X			X	N/A	X
Triazine Pesticides	20	X	X	X		X	X
Turbidity	20	X	N/A	N/A	X	N/A	X
Toxicity	NA	X[4]	X[4]	N/A	NA	N/A	X

1. Laboratory performs a sterility check, positive and negative control per day
2. Laboratory analyzes a certified standard reference material for TDS
3. QC for Hardness performed in analysis of Calcium and Magnesium which are used to determine Hardness by calculation
4. Laboratory performs a laboratory control per test batch and reference toxicant per test batch or monthly depending on the species.

QC Definitions and Specifications - Chemistry

Method Blank

The method blank is a simulated sample comprised of a clean, interference-free matrix (typically deionized water) that is carried through the sample preparation and analysis procedure. It is used to determine if the ambient laboratory background is free from contaminants that may influence sample results. The results of the Method Blank are assessed against the MDL and RL, depending on the method. Contamination in a method blank may require corrective action as described in Element 13.

Laboratory Control Spike / Duplicate (Blank Spike / Duplicate)

The Laboratory Control Spike – sometimes referred to as Blank Spike – is an interference-free matrix that is fortified with the target analyte at a level reasonably expected to be found in the field sample. Alternatively, laboratories typically fortify at a level that is roughly the midpoint of the calibration range. The result obtained for this "spike" is compared to the level of fortification that results in a recovery value. The recovery is compared to a set of control limits to determine if the method is performing as expected.

LCS or BS recovery is determined according to the following calculation:

$$\% \text{ Recovery} = \frac{Result\ Observed}{Fortification\ Level} \times 100$$

LCS or BS Duplicate results are evaluated not only for recovery but also for Relative Percent Difference (RPD), a measure of precision. RPD is determined by the following calculation:

$$Relative\ Percent\ Difference = \frac{|LCS\ Res - LCSD\ Res|}{Avg\ (LCS,\ LCSD)} \times 100$$

Matrix Spike / Duplicate

The Matrix Spike (MS) is a sample that has been fortified in the same manner as the LCS or BS. The MS result demonstrates the impact of the sample matrix on the method performance. MS performance is also based on recovery that is calculated as follows:

$$\% \text{ Recovery} = \frac{(MS\ Result - MS\ Parent\ Sample\ Result)}{Fortification\ Level} \times 100$$

The matrix spike is also performed in duplicate to provide the data user with an indication of the impact of the sample matrix on the precision or reproducibility of the method. The MS Duplicate is assessed by RPD which is calculated as follows:

$$Relative\ Percent\ Difference = \frac{|MS\ Res - \ MSD\ Res|}{Avg\ (MS,\ MSD)} \times 100$$

Laboratory and Field Duplicates

A Laboratory Duplicate is a second aliquot of a sample taken from the same container as the original sample that is run in parallel with the original parent sample. The duplicate performance will indicate if the method and / or sample have some inherent variability that is atypical for the method. Like the LCSD or MSD, the Laboratory Duplicate is assessed based on RPD that is calculated in the sample manner, comparing the result of the parent sample to that of the duplicate and dividing by the average of the two observations.

$$Relative\ Percent\ Difference = \frac{|Parent\ Res - Duplicate\ Res|}{Avg\ (Parent, Duplicate)}\ X\ 100$$

A Field Duplicate is a second collection of a sample, captured in its own unique container. The Field Duplicate is treated in the same manner as all other samples and is likewise assessed based on the same RPD calculation shown for the laboratory duplicate.

A failure of either the Laboratory or Field Duplicate indicates a potential lack of homogeneity in the sample collection or subsampling procedures.

- On failure of a Field Duplicate, the laboratory will inspect the sample containers for any observable differences between the primary and duplicate samples. If a material differences is observed (e.g. significant suspended or settled matter, differences in color or other physical characteristics), the laboratory will review both the field logs and the sampling procedure for any potential sources of variation. If there is an indication that a sampling error occurred, then the Coalition will be notified to make a determination regarding the usability and representativeness of the sample. If no problems are identified, the data will be qualified to indicate the discrepancy between results and reported to the Coalition.
- On failure of a Laboratory Duplicate, the laboratory will inspect the individual sample container used for the duplicate to ensure a correct subsampling occurred. If there is no obvious source of error, the laboratory will reanalyze the sample in duplicate to assess the situation. If a repeated error occurs, then the original data will be qualified and reported to the Coalition. If the error is no longer observed, then the original results will be discarded and the reanalysis will be reported. If there is an observable homogeneity issue that the laboratory cannot overcome, the results will be qualified as estimated values and reported to the Coalition.

QC Definitions and Specifications – Microbiology

Method Blank (Sterility Check)

The "method blank" for microbiology is a sterility check conducted on all the materials used in the analysis of all field samples. The sterility check confirms there to be no ambient microbial background which could contribute to the presence of bacteria in the field samples. Positive growth in a sterility check would indicate that the materials used in the analysis of the samples may be contaminated and therefore all associated results should be rejected as suspect.

Negative Control

A Negative Control is used to ensure that the media used in the analysis of samples does not support growth for any pathogen other than that specifically targeted by the method. Should a Negative Control exhibit growth, it would indicate that the media in use is not specific enough for the pathogen and that growth observed for the samples may be attributable to species other than that of interest for the project.

Positive Control

The Positive Control sample ensures that the media used in the analyses of a pathogen is suitable for growing the species of interest. If a positive control exhibits no growth, then sample results are suspect as potential false negatives. The positive control must exhibit some growth to prove that the media can support the culturing of the target species.

QC Definitions and Specifications – Toxicology

Laboratory Control

The Laboratory Control is used to assess the cleanliness of the laboratory environment and the quality of the laboratory grade water used for sample dilution. The control should meet the test acceptability criteria (TAC) for each test method, as not achieving the minimum TAC would be indicative of poor organism quality, dilution water preparation errors, or other potential problems (e.g. contaminated glassware, poor food quality, etc.).

Reference Toxicant

The Reference Toxicant is a known toxicant that is tested using the test organisms to evaluate their response against the response profile for the last 20 tests performed in the lab. Acceptable reference toxicant test results would meet the performance criteria of plus or minus two standard deviations from the mean of past 20 tests conducted with a particular organism.

ELEMENT 15: INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

The ready availability of equipment shall be maintained by the contract laboratory as they will be responsible for both the field and in-house laboratory analyses.

Field Instrumentation / Equipment

Field units used for this project are provided in Table 10 and are maintained constantly as they are subject to use on applications other than under this Plan. The instruments are used for non ILRP activities, and any indication of failure can quickly be addressed as the need arises. Batteries are replaced on a regular schedule to insure against failure in the field. Backup batteries and other parts subject to failure will be maintained in supply to ensure no material downtime. The instruments are regularly checked for calibration against known standards. Calibration will be documented as required below.

The field sampling crew will be responsible for ensuring that all support equipment is maintained and in good working order. Equipment that is damaged in a way that will adversely affect usage will be replaced. The equipment will be cleaned according to standard operating procedures in place for environmental field sampling prior to the sampling event and between sample monitoring sites.

Table 10: Field Instrumentation

Instrument	Make	Model
DO Meter	YSI	Pro Series 20
EC, Temperature	YSI	Pro Series 30
pH Meter, Temperature	YSI	Pro Series 10

Laboratory Instrumentation

The laboratory instruments used for this project are provided in Table 11. The contract laboratories have sufficient redundancy in their instrumentation to recover from the failure of any particular instrument. Calibrations are ongoing, as are MDL studies and other indicators of method performance. The laboratory maintains service contracts for key pieces of equipment where redundant equipment is not feasible to due to the substantial cost of replacement.

Compliance with method procedures is a must. Instrument failures or anomalous data are documented in the lab report either in the form of a data qualifier or in the case narrative at the beginning of the laboratory report.

Table 11: Laboratory Instrumentation

Instrument	Make	Model
pH, EC, Alkalinity Titrator	Mansci	PC-Titrate
Nutrient Analyzer	Westco	SmartChem 200
Segmented Flow Analyzer	Skalar	SAN^{++}
Ion Chromatograph	Metrohm	930 Compact IC Flex
HPLC-UV/Vis, Fluor, PDA	Thermo Separations	AS 3000
HPLC-MS/MS	AB Sciex	4000
GC-ECD	Agilent	7890
GC-MS	Agilent	6890/5975, 6890/5973
TOC Analyzer	Tekmar	Phoenix 8000
Turbidimeter	HF Scientific	DRT-15CE
ICP	Perkin Elmer	Optima 8300 RL
ICP-MS	Perkin Elmer	ELAN DRC IIe

ELEMENT 16: INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Field Instrumentation

Coalition field technicians are responsible for ensuring the inspection, maintenance, and where appropriate, the calibration of field instruments and equipment.

Field instruments are calibrated (or verified as being in calibration) 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 above. Calibration procedures will be conducted according to the contract laboratory SOPs and consistent with manufacturer recommendations.

See Section 15 for a listing of equipment requiring calibration.

Laboratory Instrumentation

Laboratory analysts and technicians are responsible for the inspection, maintenance, operation and, where appropriate, calibration of their assigned laboratory instrumentation.

Calibration at the laboratory is conducted according to method requirements. Specific schedules are outlined in the laboratory specific SOPs provided in Appendix B (Proprietary copy only). Checks include initial and continuing calibration verifications to demonstrate the instrumentation remains in calibration and operating normally. The laboratory will run a calibration point or a calibration verification check at or below the equivalent of the project reporting limit. This ensures that the instrumentation has adequate sensitivity to achieve the levels needed for the project.

All calibration runs are documented and maintained by the laboratory in a manner consistent with its standard record retention requirements. Any deficiencies will be addressed according to the laboratory standard operating procedures. Corrective actions and additional details will be maintained in the laboratory's log books and raw data. Where applicable, these deficiencies will also be documented in the report Case Narrative should they have any material impact on data usability.

See Section 15 for a listing of the equipment requiring calibration.

ELEMENT 17: INSPECTION / ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The contract laboratory will be solely responsible for the procurement, inspection and acceptance of supplies and consumables. Given the substantial volume of samples processed and the requirements of the laboratories' quality system, the laboratory has policies and procedures in place to qualify and determine the suitability of each material for use. Suppliers of reagents, standards, consumables, parts and other supplies are limited by the laboratory purchasing system to ensure that the laboratory always receives supplies it has determined are suitable for use. A single person within the contract laboratory is responsible for the ordering and receiving of supplies.

Standards and reagents are tracked within the laboratory using a system of identification numbers. This system allows the laboratory to be able to trace the source of all measurements to a specific lot for any given critical supply. This is especially true of all standard and reference materials that serve as the basis for all laboratory calibrations. Certificates of Analysis for analytical standards and reagents are collected and retained by the Laboratory Quality Assurance Manager according to the Laboratory's record retention requirements.

Bottles and sampling supplies are included in this tracking system. Reagents used for preservatives are tracked and each bottle includes a lot number that can be traced to the day it was produced, the person who added the preservative where applicable, and the identity of the preservative used on that day. This allows the lab to trace any potential problems with a sample container back to the production source, permitting a retraction of sample container by lot number if required.

ELEMENT 18: NON-DIRECT MEASUREMENTS

There are no non-direct measurements used in this program. All flow rates within the system are obtained from the hydrologists or Watermaster that supervises the delivery of irrigation water and monitors waterway flows. These values are derived based on the known discharges into the designated waterways and validated using flow measurements at key points with defined flow channels along the flow path. The flow rates are accurate to within 10% of the actual flows and deemed sufficiently accurate for the purposes of the program. Flow rates in the form of velocity measurements are one of the field parameters

to be determined at the time of sample collection and will be the primary point of comparison when evaluating water flows at the time of collection.

ELEMENT 19: DATA MANAGEMENT

Presently, there are no *in situ* or continuous measurements being made related to this Plan. Data production begins with field measurements and sample collection. All notes will be recorded on bound logbooks. Copies of the field documentation will be provided to the analytical laboratory for inclusion into the laboratory reports. The office where the sample crew originates will maintain the original records for a period of no less than five years, the same as the record retention policy of the laboratory.

The data generated by the laboratory will exist in both electronic and hardcopy records, each held for a minimum of five years from the date of generation. This includes the Laboratory Information Management System database that houses all the results and supporting data associated with the samples. The contracted laboratory scans all hardcopy records into an electronic archival which is also maintained consistent with the record retention policy.

Hardcopy data is held in a secure location controlled by the laboratory. Access is limited and records are disposed based on standard operating procedure. Electronic data – raw data files, scanned images, Adobe PDF reports, etc. – are held on secure company servers that are backed up daily. Backup media is rotated off sight on a scheduled basis, a responsibility of the IT Department.

Data will be provided to the Coalition in electronic format. The analytical report will be an Adobe PDF that includes all results, QC, case narrative, chain of custody and, where required, raw data or data summaries. In addition, the laboratory will create a CEDEN compliant electronic data deliverable (EDD) that includes all required data for the program. This EDD will be verified against the CEDEN data checker (http://ceden.org/CEDEN_checker/Checker/CEDENUpload.php) for content and structure. A copy of the error report will be provided in conjunction with the file. Data from both the chemical laboratory and the toxicity laboratory will be produced in separate files and sent via email to the Coalition once evaluated.

Data received by the Coalition will be given a cursory review for correct format and completeness. All data, electronic or paper copy, will be filed according to sample date and monitoring site. Electronic format data will be filed in a manner that allows for historical trends and summaries to be analyzed along with quick retrieval for quarterly and annual submittals. The Coalition will work with the contracted laboratory if any issues regarding data are encountered.

ELEMENT 20: ASSESSMENT AND RESPONSE ACTIONS

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. Both the QA Manager and the Laboratory Coordinator have "stop work" authority should a situation arise that necessitates an immediate corrective action.

The Laboratory Coordinator will have the responsibility of managing the contracted laboratories. 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 Coordinator will work directly with the Laboratory Project Manager to resolve issues as they occur on any given monitoring event. For ongoing performance issues or to address matters related to the adherence to the QAPP, the Laboratory Coordinator will work directly with the Laboratory Program Manager. These two will meet on at least on an annual basis to review the contract lab performance and to address any procedural changes required to ensure ongoing success of the program.

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 for standard laboratory practices and corrective actions.

A copy of the most recent MDL study is to be obtained on at least an annual basis along with a listing of the current SOPs. Material changes in any of the quality control practices, SOPs or other significant procedures may require a revision to this QAPP.

ELEMENT 21: REPORTS TO MANAGEMENT

Activities of the sampling staff are documented and reviewed as part of the submission to the laboratory for the monthly monitoring events. The Laboratory Program Manager will have the responsibility to address any performance issues with a branch office where sample crew originates. Anomalies or other failures will trigger a Non-Conformance Report ultimately leading to a Corrective Action / Preventative Action event. This will include a root cause determination and a remedial corrective action where necessary. These corrective action reports will be made available to the Laboratory Coordinator on request.

As a result of the meetings between the Laboratory Coordinator and the Laboratory Program Manager, the Coordinator will prepare a summary report of the outcomes of the

meeting. The report will contain details on the performance of the contract laboratory, improvements or enhancements to be made that will improve the overall success of the Plan, and any remedial measures taken to address potential performance issue leading to deficiencies in data deliverables.

Quarterly reports (CEDEN formatted data) are prepared by the Laboratory Coordinators and submitted to the QA Manager for final review. Once the review is completed, the Project Coordinator will prepare a cover letter to accompany the data to the Regional Board. The Project Coordinator is responsible for the drafting of the yearly report for submission to the Regional Board.

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.

ELEMENT 22: DATA REVIEW, VERIFICATION AND VALIDATION

Data submitted to the Coalition has undergone a thorough review process 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.

The laboratories follow a three tier review process. The primary analyst conducting the analysis is responsible for the generation of results. This analyst performs a double check of their work as part of the reporting process. On completion, the data package is then handed off to a peer review, most often the immediate supervisor or another qualified peer reviewer. The peer review consists of a check against all method requirements with documentation applied to any deficiencies. Once all results have undergone a peer or secondary review, the Laboratory Project Manager will review the report in its entirety, looking for agreement within the results and consistency with project requirements.

For this QAPP, the report will undergo a final review by the Laboratory Program Manager or his designee. This person checks reports against the requirements of the QAPP and prepares the case narrative. This person generates the CEDEN electronic deliverable and evaluates the content using the CEDEN electronic data checker. Once complete, the report is finalized and sent to the Coalition.

Once received by the Coalition, the data is further reviewed by the QA Manager for any exceedance. The appropriate communication reports are prepared, if necessary, to the Regional Board.

ELEMENT 23: VERIFICATION AND VALIDATION METHODS

The Coalition QA Manager is responsible for the final review and determination of the validity and usability of the data. The determination of completeness is performed at both the level of the field activities and the in-house laboratory activities. Any questions or anomalies resulting from this review will be addressed directly with the laboratory prior to making the final determination. The overall completeness goal for the project is 90%.

ELEMENT 24: RECONCILIATION WITH USER REQUIREMENTS

The purpose of the sampling program is to determine if any constituents of concern exceed water quality standards in 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 identified within the laboratory report and case narrative. In the event that the laboratory data quality indicators do not meet the criteria listed in Table 8 (or exceed other requirements listed in the cited analytical method), then the data will be annotated with data qualifiers that identify the deficiency. Laboratory reports containing notations that indicate QC failures or other issues that do not meet QAPP requirements will need to be assessed for impact. Not all failures result in the rejection of data but scrutiny will be applied to all failures or QAPP deviations. It is the responsibility of the QA Manager to make the final determination of data usability and its suitability for intended use. All QC failures or other known deficiencies will be indicated on the laboratory Certificate of Analysis, either in the form of a data qualifier and/or noted in the detailed Case Narrative provided therein. These deficiencies represent the possible limitations on the use of the data but will nonetheless be reported in order for the Coalition and Board to determine their suitability for use.

All data will be uploaded into the SWAMP Information Management System. At this point the Board may use the data in the overall evaluation of the surface water quality in the Coalition's watershed. Future decisions for water regulations will be made, in part, on the information provided under this Plan.

Questions will always arise when a toxicity level shows an exceedance, but the chemistry data taken at the same time fails to show a toxic substance that might cause the problem. Given the relatively limited list of monitoring parameters versus the number of both known and unknown potential contaminants, it is not inconceivable that a constituent could contribute to toxicity but fail to be identified from the chemistry testing. Persistent discrepancies between the outcome of the toxicity testing and the chemistry testing should

be further evaluated in an attempt to determine the possible presence of a persistent, harmful parameter.

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.

ELEMENT 25: DEFINITIONS

Term	Definition
BPO	Basin Plan Objective
BS/BSD	Blank Spike / Blank Spike Duplicate
CEDEN	California Environmental Data Exchange Network
CV RDC	Central Valley Regional Data Center
EDD	Electronic Data Deliverable
General Order (Order)	CA Central Valley Regional Board Order #R5-2013-0120 (Amended by R5-2014-0143 and R5-2015-0115)
ISO	International Organization for Standardization
IT	Information Technology
LCS/LCSD	Laboratory Control Spike / Laboratory Control Spike Duplicate. Often used interchangeably with BS/BSD.
ILRP	Long Term Irrigated Lands
MDL	Method Detection Limit
MRP	Monitoring and Reporting Program
MS/MSD	Matrix Spike / Matrix Spike Duplicate
PQL	Practical Quantitation Limit
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
RDC	Regional Data Center
RL	Reporting Limit
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
SSJVWQC	Southern San Joaquin Valley Water Quality Coalition
SWAMP	Surface Water Ambient Monitoring Program
SWMP (Plan)	Surface Water Monitoring Plan (Kings River Water Quality Coalition SWMP)
KRWQC	Kings River Water Quality Coalition
TIE	Toxicity Identification Evaluation

BSK Associates Engineers & Laboratories
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ANALYTICAL CHAIN OF CUSTODY

*Required Fields Temp:

Company/Client Name*:	Report Attention*:	Invoice To*:	Phone*:	Fax*:
	Additional cc's:	PO#:	E-mail*:	

Address*:	City*:	State*:	Zip*:	Regulatory Carbon Copies
				CDPH ☐ ☐ Fresno Co Merced Co ☐ ☐ Tulare Co Madera Co ☐ ☐ Other: _____

Project:	Project #:

Reporting Options:	How would you like your completed results sent?*	Regulatory Compliance
☐ Trace (J-Flag) ☐ Swamp ☐ EDD Type: _____	☐ E-Mail ☐ Fax ☐ Mail	☐ EDT to California DPH

Sampler Name (Printed/Signature)*:	TAT* **Surcharge	System Number*: _____
	☐ Standard - 10 Business Days ☐ **Rush: Date Needed _____	☐ Geotracker #: _____

Matrix Types: SW=Surface Water BW=Bottled Water GW=Ground Water WW=Waste Water STW=Storm Water DW=Drinking Water SO=Solid

#	Sample Description*	Sampled* Date	Sampled* Time	Matrix*	Comments / Station Code / WTRAX

Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Relinquished by: (Signature and Printed Name)	Company	Date	Time	Received by: (Signature and Printed Name)	Company
Received for Lab by: (Signature and Printed Name)		Date	Time	Payment Received at Delivery: Check / Cash Date: Amount: PIA#: Init.	

Shipping Method: ONTRAC UPS GSO WALK-IN FED EX Courier: _____ Custody Seal: Y / N

Cooling Method: Wet Blue None Chilling Process Begun: Y / N

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for laboratory services unless contractually bound otherwise. BSK's current terms and conditions can be found at www.bskassociates.com/BSKLabTermsConditions.pdf

SR-FL-0012-05 Analytical Chain of Custody

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

CHAIN-OF-CUSTODY RECORD

Results To:	Kings River Water Quality Coalition	**Invoice To:**	Same
Address:	4886 E Jensen Ave	**Address:**	
	Fresno, CA 93725		
Phone:	559-237-5567 ext 117	**Phone:**	
Attn:	Eric Athorp	**Attn:**	Yvonne Ovalle
E-mail:	eathorp@krcd.org	**E-mail:**	yovalle@krcd.org
Project Name:	Surface Water Monitoring Program		
P.O.#/Ref:			

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Grab/ Comp	Container Number	Container Type	*Selenastrum capricornutum* Growth, EPA 1003.0	96-h Acute *Ceriodaphnia dubia* Toxicity Test, EPA 2002.0	96-h Fathead Minnow Acute Survival, EPA 2000.0	10-Day *Hyalella azteca* Sediment Exposure, EPA 100.1							
								REQUESTED ANALYSIS										
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Samples collected by: KRCD Staff

Comments/Special Instruction:

RELINQUISHED BY:	**RECEIVED BY:**
Signature:	**Signature:**
Print:	**Print:**
Organization:	**Organization:**
Date: **Time:**	**Date:** **Time:**
RELINQUISHED BY:	**RECEIVED BY:**
Signature:	**Signature:**
Print:	**Print:**
Organization:	**Organization:**
Date: **Time:**	**Date:** **Time:**

***Example Matrix Codes**: (**EFF** - Effluent) (**FW** = Freshwater); (**SW** = Saltwater); (**WW** = Wastewater); (**STRMW** = Stormwater); (**SED** = Sediment); or other

APPENDIX A.2

Field Sample Collection Logs

ILRP/SWAMP 2.5 Field Data Sheet - Water Sample Collection			Pg of Pgs
Coalition Name:			DATE (mm/dd/yyyy):
StationID & Name :			FIRST SAMPLE TIME:
ProjectID:	Arrival Time:	Departure Time:	Target Lat. & Long.:
Sampling Crew (and Agency):			Actual Lat & Long.:
			Datum: / Accuracy (ft / m):

OBSERVATIONS	WADEABLE: YES / NO	PICTURE NAME/S:
DOMINANT SUBSTRATE: Concrete, Cobble, Gravel, Sand, Mud, Unk., Other		
SITE ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other	SKY CODE: clear, partly cloudy, overcast, fog, hazy	
OTHER PRESENCE: Vascular, Nonvascular, OilySheen, Foam, Trash, None, Other	PRECIPITATION: None, Foggy, Drizzle, Rain, Snow	
WATER ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other	PRECIPITATION (last 24 hrs): Unknown, <1", >1", None	
WATER CLARITY: Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)	WATERCOLOR: colorless, green, yellow, brown, other	
OBSERVED FLOW: NA, Dry Waterbody Bed, No Observed Flow, Isolated Pool, 0.1 - 1cfs, 1 - 5 cfs, 5 - 20 cfs, 20 - 50 cfs, 50 - 200 cfs, >200cfs		

Comments:

PHYSICAL PARAMETERS	SAMPLE COLLECTION Sample Depth (circle one): 0.1 m (subsurface grab) -88 (integrated)		
Water Temp (Celsius):	STARTING BANK: LB / RB/ NA		
Air Temp (Celsius):	OCCUPATION METHOD: Walk-in, Bridge, Other		
*pH>8.5 or <6.5 pH:	SAMPLING EQUIPMENT: Indiv bottle by hand, By pole, Other		
*EC>700 EC (uS/cm):	SAMPLE LOCATION: Bank, Near Bank, Thalweg, Midchannel, Open Water		
*DO<7.0 DO (mg/L)	HYDRO-MODIFICATION: None, Bridge, Pipes, Concrete Channel, Grade Control, Culvert, Other		
TDS:	HYDROMODLOC: US / DS / NA		
CALCULATED SITE DISCHARGE (cfs):		Wet Channel Width (m):	Wet Channel Width (m):
Transfer Calculated Value From Discharge Worksheet		Midchannel depth (m):	Stage:

√	Sample ID	Analyte	Container	Number	Notes

APPENDIX A.2

Field Sample Collection Logs

ILRP/SWAMP 2.5 Discharge Worksheet						
Coalition Name:						DATE (mm/dd/yyyy):
StationID & Name :						FIRST SAMPLE TIME:
ProjectID:			Method: USGS (bridge), USGS (wading), culvert, other:			
Left Edge Water (LEW):			Start Time (24 hr):			Discharge (cfs):
Right Edge Water (REW):			End Time (24 hr):			Discharge calculated by:
#	Angle (if from bridge)	Interval Midpoint (meters or feet)	Interval Depth (meters or feet)	% Depth (from surface)*	Revolutions/Velocity (m/s or f/s)	Notes
1				0.2 / 0.8 or 0.6		
2				0.2 / 0.8 or 0.6		
3				0.2 / 0.8 or 0.6		
4				0.2 / 0.8 or 0.6		
5				0.2 / 0.8 or 0.6		
6				0.2 / 0.8 or 0.6		
7				0.2 / 0.8 or 0.6		
8				0.2 / 0.8 or 0.6		
9				0.2 / 0.8 or 0.6		
10				0.2 / 0.8 or 0.6		
11				0.2 / 0.8 or 0.6		
12				0.2 / 0.8 or 0.6		
13				0.2 / 0.8 or 0.6		
14				0.2 / 0.8 or 0.6		
15				0.2 / 0.8 or 0.6		
16				0.2 / 0.8 or 0.6		
17				0.2 / 0.8 or 0.6		
18				0.2 / 0.8 or 0.6		
19				0.2 / 0.8 or 0.6		
20				0.2 / 0.8 or 0.6		
21				0.2 / 0.8 or 0.6		
22				0.2 / 0.8 or 0.6		
23				0.2 / 0.8 or 0.6		
24				0.2 / 0.8 or 0.6		
25				0.2 / 0.8 or 0.6		
26				0.2 / 0.8 or 0.6		
27				0.2 / 0.8 or 0.6		
28				0.2 / 0.8 or 0.6		
29				0.2 / 0.8 or 0.6		

*two measurement should be taken (0.2 and 0.8 from the surface of the water) if the depth is greater than 0.76m (2.5ft).

APPENDIX A.2

Field Sample Collection Logs

ILRP/SWAMP 2.5 Field Data Sheet - Sediment Sample Collection			Pg of Pgs
Coalition Name:			DATE (mm/dd/yyyy):
StationID & Name :			FIRST SAMPLE TIME:
ProjectID:	Arrival Time:	Departure Time:	Target Lat. & Long.:
Sampling Crew (and Agency):			Actual Lat & Long:
			Datum: / Accuracy (ft / m):

OBSERVATIONS	WADEABLE: YES / NO	PICTURE NAME/S:
DOMINANT SUBSTRATE: Concrete, Cobble, Gravel, Sand, Mud, Unk., Other		
SITE ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other	SKY CODE: clear, partly cloudy, overcast, fog, hazy	
OTHER PRESENCE: Vascular, Nonvascular, OilySheen, Foam, Trash, None, Other	PRECIPITATION: None, Foggy, Drizzle, Rain, Snow	
WATER ODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other	PRECIPITATION (last 24 hrs): Unknown, <1", >1", None	
WATER CLARITY: Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)	WATERCOLOR: colorless, green, yellow, brown, other	
OBSERVED FLOW: NA, Dry Waterbody Bed, No Observed Flow, Isolated Pool, 0.1 - 1cfs, 1 - 5 cfs, 5 - 20 cfs, 20 - 50 cfs, 50 - 200 cfs, >200cfs		
DOMINANTSUBSTRATE: Bedrock, Concrete, Cobble, Gravel, Sand, Mud, Unk, Other_____		
SEDODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other_____		
SEDCOLOR: Colorless, Green, Yellow, Brown		
SEDCOMPOSITION: Silt/Clay, Fine Sand, Coarse Sand, Gravel, Cobble, Mixed, Hard Pan Clay		

Comments:

PHYSICAL PARAMETERS		SAMPLE COLLECTION	Sample Depth (circle one): 1 cm, 2 cm, -88 (integrated depth or core)
Water Temp (Celsius):		STARTING BANK: LB / RB/ NA	
Air Temp (Celsius):		OCCUPATION METHOD: Walk-in, Bridge, Other	
*pH>8.5 or <6.5	pH:	SAMPLING EQUIPMENT: Hand trowel, Eckman Sampler, Other	
*EC>700	EC (uS/cm):	SAMPLE LOCATION: Bank, Near Bank, Midchannel Bed	
*DO<7.0	DO (mg/L)	HYDRO-MODIFICATION: None, Bridge, Pipes, Concrete Channel, Grade Control, Culvert, Other	
	TDS:	HYDROMODLOC: US / DS / NA	

√	Sample ID	Analyte	Container	Number	Notes

APPENDIX A.3

Example Laboratory Data Completeness Worksheet

Lab Data Completeness Worksheet

Sampling Event Month, Year

Method	Analyte	Sample Results		Acceptable Data Quality Indicators								Total DQIs			DQI Success Rate
		Total	Adversely Impacted	Sensitivity	Contamination	Accuracy (LCS)	Precision (LCS)	Recovery (MS)	Precision (MS)	Precision (Lab Dup)	Hold Time	# Acceptable	# Performed	Percent Sample Completeness	
ASTM D422	Grain size											0			
EPA 200.7, Calc	Hardness (as CaCO3)											0			
EPA 200.8	Arsenic (Total)											0			
EPA 200.8	Boron (Total)											0			
EPA 200.8	Cadmium (Dissolved)											0			
EPA 200.8	Cadmium (Total)											0			
EPA 200.8	Copper (Dissolved)											0			
EPA 200.8	Copper (Total)											0			
EPA 200.8	Lead (Dissolved)											0			
EPA 200.8	Lead (Total)											0			
SM 2540C	Total Dissolved Solids (TDS)											0			
SM 2540D	Total Suspended Solids (TSS)											0			
SM 4500-NH3 G	Ammonia											0			
SM 4500-P E	Orthophosphate											0			
SM 5310C	Total Organic Carbon (TOC)											0			
SM 8010F	Unionized Ammonia (calculated value)											0			
SM 9221 B,F	E. Coli											0			
SM 9221 E	Fecal Coliform											0			
Walkley Black	Total Organic Carbon (TOC)											0			
	Totals	0	0	0	0	0	0	0	0	0	0	0	0		

APPENDIX A.4

Example Field and Transport Completeness Worksheet

Field Data Completeness Worksheet					
	Date Sampled				
		Sampling Locations			
Activity		**Sample Point 1**	**Sample Point 2**	**Sample Point 3**	**Sample Point 4**
Field Sampling					
	Water Present at Location?				
	Photo documentation captured?				
	Field Equipment Rinsed?				
	All containers for all samples filled?				
	Sample Labels Verified to COC?				
	Lat. / Long. Recorded?				
	Field Conditions Recorded?				
Field Measurements Collected					
	Flow				
	Temp				
	pH				
	EC				
	Dissolved Oxygen				
Sample Transport					
	Were samples packed on ice?				
	COC signed by sampler?				
	Was COC included in cooler?				
Sample Receipt					
	Samples received within temperature?				
	If no, received on ice on date collected?				
	All bottles unbroken and intact?				
	Bottle labels agree with COC?				
	Were bottles correct for tests requested?				
	Sufficient sample received for all tests?				
	Arrived at lab within hold times?				
	Passing Criteria	0	0	0	0
	Total Assessments	0	0	0	0
	% Complete				
	% Completeness - Field Activities				