CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM
ORDER NO. R5-2010-0805
FOR
CALIFORNIA RICE COMMISSION

UNDER RESOLUTION NO. R5-2006-0053
AS AMENDED BY R5-2006-0077
CONDITIONAL WAIVER OF
WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES FROM IRRIGATED LANDS

This Monitoring and Reporting Program (MRP) Order is issued pursuant to the California Water Code (Water Code) sections 13267 and 13269 which authorize the California Regional Water Quality Control Board, Central Valley Region, (hereafter Central Valley Water Board) to require preparation and submittal of technical and monitoring reports. Water Code section 13269 requires that a waiver of waste discharge includes as a condition the performance of monitoring and the public availability of monitoring results.

The Executive Officer is issuing this MRP Order to establish specific monitoring and reporting requirements for the California Rice Commission (CRC). The CRC is enrolled under *Amended Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands, Order No. R5-2006-0053* (Waiver). The CRC represents individual rice growers in the Sacramento Valley and covers approximately 500,000 acres.

This MRP Order meets or exceeds the minimum requirements of the Waiver. The MRP Order is additionally consistent with Monitoring and Reporting Program Order No. R5-2008-0005 for Coalition Groups Under Amended Order No. R5-2006-0053 (Coalition Group MRP Order). This Order rescinds MRP Order No. R5-2009-0809 and shall remain in effect until **31 December 2012**, or when replaced by a revised MRP Order approved by the Executive Officer. The Waiver and four years of primarily core monitoring to support the issuance of this MRP Order can be found in the Central Valley Water Board's public files. The Information Sheet for the CRC MRP Order (Attachment A), which provides the background for this order, is incorporated as part of this Order.

Pursuant to Water Code section 13269(a)(2), monitoring requirements must be designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the Waiver's conditions. The reports required by this MRP Order are needed to evaluate impacts of discharges of waste from irrigated agricultural operations to waters of the state, to determine compliance with the Waiver, and to support the development and implementation of the Waiver as it applies to the CRC Coalition and its members. As provided in the Waiver, this MRP Order is issued to the CRC Coalition, because the CRC Coalition represents irrigated agricultural facilities that discharge waste to waters of the State.

The CRC has been monitoring water quality and reporting monitoring results to the Central Valley Water Board's Irrigated Lands Regulatory Program since September 2004. The results indicate that water quality is impacted by unknown source(s) for aquatic algae toxicity and the Executive Officer has requested the preparation of a Management Plan to address the impact. The Management Plan sites are identified as Special Project monitoring sites.

The submittal of an acceptable Quality Assurance Program Plan (QAPP) that meets the requirements of this MRP Order is a condition of the Waiver. The QAPP must be submitted to the Central Valley Water Board by 1 May 2010.

Submittal of the QAPP and Management Plans is further clarified as follows:

ACTION	ACTION DEADLINE
Submittal of CRC QAPP	1 May 2010
Revised CRC Management Plan for algae toxicity	1 May 2010
Submittal of CRC proposed Management Plan for propanil	1 May 2010
Submittal of Rice Pesticide Matrix	1 November 2011

PART I. MRP ORDER OBJECTIVES

The Water Code mandates that monitoring requirements for a Waiver be designed to verify the adequacy and effectiveness of the Waiver's conditions. One of the conditions of the Waiver is that discharges of waste from irrigated lands to surface waters of the State shall not cause or contribute to an exceedance of an applicable water quality standard. Water quality standards are defined for the Irrigated Lands Regulatory Program (ILRP) in the Waiver for the Coalition Group and in Attachment B (Applicable Definitions and Acronyms) of this Order.

Implementation of this Order must provide information to determine whether discharges are in compliance with the conditions of the Waiver, including compliance with applicable water quality standards. The monitoring strategy for this MRP Order parallels the Coalition Group MRP Order for assessment and core monitoring. Assessment monitoring was used to provide supporting data for the 'representativeness' of the core monitoring sites. Assessment monitoring included coordinated monitoring with other programs such as the Rice Pesticide Program (RPP).

PART II. MRP COMPONENTS

A. MONITORING SITES

In 2009, core monitoring occurred at Colusa Basin Drain #5 (CBD5), Butte Slough (BS1), Colusa Basin Drain above Knights Landing (CBD1), and Sacramento Slough (SSB). These four sites have been monitored for over four years and are considered primary monitoring sites. Assessment monitoring was performed at secondary monitoring sites located at Lurline Creek (Site F), Cherokee Canal (Site G), and Obanion Outfall (Site H) as required by MRP Order R5-2009-0809. Information for the sites is shown in Table 1.

The three secondary sites (Sites F, G, and H) will only be monitored for dissolved copper, the monitoring parameter not analyzed in 2009 (see Attachment A for background). After one year of monitoring to complete the assessment monitoring requirements, sites F, G and H will be removed from monitoring unless exceedances of dissolved copper occur. After two years, the primary sites (CBD5, BS1, CBD1, and SSB) will repeat the assessment monitoring analytical regime. Pesticides to be monitored will be selected after evaluating any changes in rice operations, irrigation, pesticide use, application techniques and management practices.

Table 1. Monitoring Sites in 2010

Site Code	Site		Site Name*	GPS Coordinates	
	Primary (Core)	Secondary (Assessment)		Latitude	Longitude
CBD5	√		Colusa Basin Drain #5	39.1833 N	-122.0500 W
BS1	√		Butte Slough at Lower Pass Rd	39.1875 N	-121.9000 W
CBD1	√		Colusa Basin Drain above Knights Landing	38.8125 N	-121.7731 W
SSB	√		Sacramento Slough Bridge near Karnak	38.7850 N	-121.6533 W
F		√	Lurline Creek; upstream site of CBD5	39.2184 N	-122.1511 W
G		√	Cherokee Canal, upstream site for BS1*	39.3611 N	-121.8675 W
H		√	Obanion Outfall at DWR PP on Obanion Rd	39.0258N	-121.7272 W

* If there is no flow at the specified site, a site on Butte Slough will be sampled.

B. QUALITY ASSURANCE PROJECT PLAN (QAPP)

The CRC must submit a QAPP to include watershed and site-specific information, project organization and responsibilities, and the quality assurance components of Attachment C of this MRP Order. Attachment C presents the requirements and the guidelines for development of the CRC QAPP, including the laboratory and field requirements to be used for data evaluation. The Central Valley Water Board may conduct an audit of the CRC's contracted laboratories at any time in order to evaluate compliance with the QAPP. Quality control requirements are applicable to all the constituents listed in the Attachment C, as described in the appropriate method.

PART III. MONITORING STRATEGY AND SCHEDULE

A. MONITORING SCHEDULE

Monitoring periods for CRC sampling are based on the timing and frequency of discharge from rice fields that may contain constituents that affect water quality. The period with the greatest risk to water quality occurs during the peak pesticide application period from April through June. During this period into July, water may be released from the field. From mid-July to mid-August, water is held on rice fields to protect grain development. A top-dressing of nutrients may be added during the water hold. Rice drainage season, when the rice fields are drained prior to harvest, typically occurs from mid-August through September. After harvest, rice fields are generally flooded to decompose rice straw and to provide waterfowl habitat. No application of fertilizers or pesticides occurs on rice fields during the winter until the fields are drained in mid-February or March. Field preparation for the next season may include applications of herbicides and fertilizers.

To capture the peak application and release period, monitoring shall be conducted as shown in Table 2. Factors, such as weather conditions, may affect planting and pesticide application. Timing of monitoring will take into account these factors and may vary from year to year. The parameters to be monitored will depend on whether the site is under the core or assessment monitoring regime. Due to the unique schedule for rice activities, reporting of monitoring results will occur annually.

Table 2. Summary of Monitoring Periods

Rice Farming Calendar		Month	Parameters
Winter drainage		mid-February thru March	No monitoring
Irrigation season	Peak Pesticide Use Season	April thru May	Monthly sampling for dissolved copper (April and May); special monitoring and Rice Pesticides Program monitoring (April thru July)
		June thru July	
		July thru August	Monthly sampling in July for special monitoring and Rice Pesticides Program monitoring (July)
Fall drainage		mid-August thru September	No monitoring
Winter flood		October thru mid-February	No monitoring

B. MONITORING PARAMETERS

Water quality and flow monitoring shall be used to assess the wastes in discharges from rice fields to surface waters and to evaluate the effectiveness of management practice implementation efforts. Water quality is evaluated by both field-measured parameters and

laboratory analytical data. Table 3 lists the field measured parameters and laboratory analytical data required for this MRP Order for core and assessment monitoring regimes.

Table 3. CRC Monitoring Parameters

Constituent	Type of Monitoring	Frequency of Monitoring
General physical parameters Flow pH Electrical conductivity Dissolved oxygen Temperature Hardness Turbidity Total dissolved solids Total organic carbon (TOC)	Assessment and Core	All sampling events
Nutrient Analysis Total Kjeldahl nitrogen Nitrate + nitrite, as N Total ammonia Unionized ammonia (calculated) Total phosphorous as P Soluble orthophosphate	Assessment only	Monthly in July and August
Water column toxicity *Selenastrum capricornutum* *Ceriodaphnia dubia* *Pimephales promelas*	Assessment only	Monthly from April through August
Photo monitoring (digital)	Assessment and Core	To be taken initially, and as needed to document site changes that could affect monitoring results
Metals • Copper, dissolved	Assessment only	Monthly during April and May
Pesticides	Assessment only	To be determined
Sediment toxicity *Hyalella azteca*	Assessment	Once during fall drainage
Sediment Pesticides Lambda Cyhalothrin S-Cypermethrin	Assessment	Required only if sediment toxicity is observed
Sediment TOC	Assessment	Taken with sediment toxicity

Monitoring results for primary and secondary sites in 2009 did not show any constituents of concern other than propanil that is addressed by Special Monitoring. The 2009 monitoring results are discussed in Attachment A. Sites CBD1, CBD5, BS1, and SSB will rotate from core to assessment monitoring requirements in the third year of this MRP Order. During 2010, sites F, G, and H will be monitored only for dissolved copper, a parameter not reported in 2009. Table 4 shows the parameters to be monitored from 2010 to 2012. Monitoring results for each year will be evaluated by CRC and Central Valley Water Board staff to determine if the monitoring parameters and/or schedule need to be modified.

Table 4. Monitoring Sites, Frequency, Schedule and Parameters

Parameter	2010	2011	2012
Monitoring sites	Primary : CBD5, BS1, CBD1, and SSB Secondary: F,G, and H (one year to complete assessment monitoring)	Primary: CBD5, BS1, CBD1, and SSB	Primary: CBD5, BS1, CBD1, and SSB
Constituents monitored	Primary sites: General parameters, dissolved copper Secondary sites: dissolved copper	Primary sites: General parameters (all sites); dissolved copper	Primary sites: General parameters, pesticides[1], aquatic toxicity[2], sediment toxicity[3], nutrients, dissolved copper
Monitoring Period	General parameters: April to August Dissolved copper: April, May	General parameters: April to August Dissolved copper: April, May	General parameters: April to August Pesticides: April to August Aquatic toxicity: April to August Sediment toxicity: September Sediment TOC: September Nutrients: July, August Dissolved copper: April, May
Frequency	General parameters: monthly Dissolved copper: monthly	General parameters: monthly Dissolved copper: monthly	General parameters: monthly Pesticides: monthly Aquatic toxicity: monthly Sediment toxicity: monthly Nutrients: monthly Dissolved copper: monthly

1 Pesticides to be monitored will be selected after evaluating any changes in rice operations, irrigation, pesticide use, application techniques and management practices. This information and the pesticides properties will be incorporated into the *Rice Pesticide Matrix* and submitted by 1 November 2011.

2 Water column toxicity testing with *Selenastrum capricornutum*, *Ceriodaphnia dubia,* and *Pimephales promelas*.

3 Sediment toxicity testing with *Hyalella azteca*.

Acceptable methods for laboratory and field procedures and associated quantitation limits were described in the previous MRP Order. The Central Valley Water Board has received validation packages for new and modified methods used for pesticide analyses in the previous MRP Order. The information provided was reviewed by Central Valley Water Board staff and found to be in conformance with EPA protocols for performance-based method validation.[4, 5]

C. SPECIAL PROJECT MONITORING

Special project monitoring includes specific targeted studies that are incorporated into the MRP Plan to implement a TMDL, or to implement a Management Plan that results from exceedances. Management Plans are required when more than one exceedance of the same constituent occurs at a given site within a period of three years. The Executive Officer can require a written Management Plan for an exceedance of any constituent at any time. Management Plans may be required when monitoring from other Water Board programs result in exceedances. The schedule for any Special Project Monitoring will be determined through the approval by the Executive Officer or TMDLs or Management Plans.

D. TOXICITY PROCEDURES - TOXICITY IDENTIFICATION EVALUATION (TIE) AND DILUTION SERIES

Aquatic toxicity testing is used to: 1) evaluate compliance with the narrative toxicity water objective, 2) identify the causes of toxicity when and where it is observed; 3) evaluate any additive toxicity or synergistic effects due to the presence of multiple constituents; and 4) determine the sources of the toxicants identified. Aquatic toxicity tests, including sediment toxicity tests, will be performed during assessment and/or special project monitoring.

1. WATER COLUMN TOXICITY. Water column toxicity analyses shall be conducted on 100% (undiluted) sample for the initial screening with sufficient sample collected to allow the laboratory to conduct a Toxicity Identification Evaluation (TIE) on the same sample should toxicity be detected. The TIE shall be performed immediately if a 50% or greater difference in test organism mortality, as compared to the laboratory control, is detected at any time in an ambient sampled during an acceptable *Ceriodaphnia dubia* or *Pimephales promelas* test. A TIE shall be initiated immediately if a 50% or greater reduction in test organism growth is detected between an ambient sample and the laboratory control at the end of an acceptable *Selenastrum capricornutum* test. At a minimum, Phase 1 TIE[6] manipulation shall be conducted to determine the general class of the chemical causing toxicity. Phase II[7] may also be utilized to confirm and identify specific toxic agents.

---

4 USEPA, Protocol for EPA Approval of Alternate Test Procedures for Organic and Inorganic Analytes in Wastewater and Drinking Water, EPA 831-B-98-002, March 1999.

5 USEPA, Protocol for EPA Approval of New Test Procedures for Organic and Inorganic Analytes in Wastewater and Drinking Water, EPA 831-B-98-003, March 1999.

6 USEPA. 1991. Methods for Aquatic Toxicity Identification Evaluations. Phase I Toxicity characterization Procedures. Office of Research and Development, Washington D.C. EPA-600-6-91-003.

7 USEPA. 1989. Methods for Aquatic Toxicity Identification Evaluations. Phase II Toxicity Identification Procedures. Office of Research and Development, Duluth, MN. EPA-600-3-88-035.

At any point during the initial toxicity screening the mortality reaches 100%, a multiple dilution test shall be initiated in addition to the TIE. The dilution series must be initiated within 24 hours of the sampling reaching 100% mortality, and must include a minimum of five (5) sample dilutions in order to quantify the magnitude of the toxic response.

When a "statistically significant" reduction is observed for a sample at the end of an acceptable test (i.e., meets the EPA test acceptability criteria), and the reduction is ≥ 20% compared to the control, follow-up sampling for the site is required.

2. SEDIMENT TOXICITY. Sampling and analysis for sediment toxicity shall be carried at each monitoring site established by the CRC for water quality monitoring Sediment samples shall be collected and analyzed for toxicity in accordance with this MRP Order.

Sediment samples that are "statistically significant" (i.e., exhibit a ≥ 20% reduction in *Hyalella azteca* survival compared to the control at the end of an acceptable test) will require pesticide analysis of the same sample in an effort to determine the possible cause of toxicity. During collection of sediment samples, additional sample volume sufficient for the recommended chemical and physical analyses must be collected. The additional sample volume must be held in frozen storage until the results of the toxicity analysis are available. If the sample is not toxic to the test species, the additional sample volume can be discarded.

All sediment samples must be analyzed for total organic carbon (TOC). If the toxicity criterion described above is exceeded, then the additional sample volume must be analyzed for lambda-cyhalothrin and S-cypermethrin, the only two pyrethroids used in rice operations. Analysis at practical reporting limits of 1 ng/g on a dry weight basis for each pesticide is required to allow comparison to established lethal concentrations to the test species. The follow-up analysis must begin within five business days of when the toxicity criterion described above is exceeded.

PART IV. REPORTING REQUIREMENTS

A. ANNUAL MONITORING REPORTS

The annual monitoring report (AMR) shall be submitted by **31 December**, covering monitoring for the calendar year. The monitoring report shall include the following components:

1. Signed Transmittal Letter;
2. Title page;
3. Table of contents;
4. Executive Summary;
5. Description of the CRC Coalition Group geographical area;
6. Monitoring objectives and design;
7. Sampling site descriptions and rainfall records for the time period covered under the Annual Monitoring Report (AMR);

8. Location map(s) of sampling sites, crops and land uses;
9. Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible. Tabulated results shall include all available monitoring data generated by any Management Plans.
10. Discussion of data to clearly illustrate compliance with the Coalition Group Conditional Waiver, water quality standards, and trigger limits;
11. Electronic data submitted in a SWAMP comparable format;
12. Sampling and analytical methods used;
13. Copy of chain-of-custody forms;
14. Field data sheets, signed laboratory reports, laboratory raw data and any records of unusual occurrences and/or anomalies encountered during field sampling or by the laboratory;
15. Associated laboratory and field quality control samples results;
16. Summary of Quality Assurance Evaluation results necessary to evaluate for precision, accuracy and completeness;
17. Specify the method used to obtain flow at each monitoring site during each monitoring event;
18. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date.
19. Summary of Exceedance Reports submitted during the reporting period and related pesticide use information;
20. Actions taken to address water quality exceedances that have occurred, including but not limited to, revised or additional management practices implemented;
21. Status update on preparation and implementation of all Management Plans and other special projects; and
22. Conclusions and recommendations.

Additional requirements and clarifications necessary for the above annual report components are described below:

(1) Signed Transmittal Letter to Accompany AMR

A transmittal letter shall accompany each report. The transmittal letter shall be signed and contain a penalty of perjury statement by the CRC's authorized agent. This statement shall state:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment for violations."

(2) Location Maps
Location map(s) showing the sampling sites, crops, and land uses within the CRC's geographic area must be updated once per year and included in each annual report. An accompanying list or table of monitoring site information must include the site name and identification number, ILRP station code number, and Global Positioning System (GPS) coordinates. The map(s) must contain a level of detail that ensures they are informative and useful. GPS coordinates must be provided as latitude and longitude in the decimal degree coordinate system (at a minimum of five decimal places). The datum must be either WGS 1984 or NAD83, and clearly identified on the map. The source and date of all data layers must be identified on the map(s).

(3) Tabulated results
Data shall be reported in tabular form so that the required information is readily discernible. The data shall be summarized in such a manner to clearly illustrate compliance with the Coalition Group Conditional Waiver.

(4) Data Discussion to Illustrate Compliance
The annual report shall include a discussion of the year's data to illustrate compliance with the Coalition Group Conditional Waiver. Data discussion shall include an evaluation of any special monitoring performed, such as for propanil or the Algae Toxicity Management Plan, and assessment of dissolved copper and nutrient data.

(5) Electronic Data Submittal
Electronic submittal of the field and laboratory data in a SWAMP comparable format must be included with the AMR. Exceptions to the due date for submittal of electronic data may be granted by the Executive Officer if sufficient rationale exists.

Electronic data packages are to be submitted to the Central Valley Water Board in either of two formats: 1) electronic submittal of data package in a spreadsheet format, or 2): electronic submittal of data package in a SWAMP database format. The first option requires that all laboratory data be entered and submitted within the ILRP SWAMP comparable data spreadsheets (EXCEL, or similar spreadsheet) provided by the Central Valley Water staff. Under the first option, field data will not be required as part of the electronic submittal, but the ILRP SWAMP comparable field sheets (paper copy) must be filled and submitted with the laboratory data.

Prior to submittal, the data shall be reviewed by the CRC and determined to the best of their knowledge to be free of errors and in conformance with the project quality assurance acceptance guidelines outlined in the CRC QAPP. The procedures for data entry and data review must follow those outlined in the QAPP.

(6) Copies of Laboratory Reports, Chain-of-Custody Forms and Raw Data.
Copies of all laboratory analytical reports must be included in the monitoring reports on a CD. For toxicity reports, all laboratory raw data must be included in the analytical report (including data for failed tests), including copies of all original bench sheets showing the results of

individual replicates, such that all calculations and statistics can be reconstructed. For chemistry data, analytical reports must include, at a minimum, the following: a lab narrative describing QC failures, analytical problems and anomalous occurrences; chain of custody (COCs) and sample receipt documentation; all sample results for contract and subcontract laboratories with units, RLs and MDLs; sample preparation, extraction and analysis dates; and results for all QC samples including all field and laboratory blanks, lab control spikes, matrix spikes, field and laboratory duplicates, and surrogate recoveries. Lab raw data such as chromatograms, spectra, summaries of initial and continuing calibrations, sample injection or sequence logs, prep sheets, etc., are not required for submittal, but must be retained for a minimum of five years and be provided to the Central Valley Water Board upon request. All original raw data must be maintained and available for a minimum of five years.

(7) Field Data Sheets

Copies of all field documentation must be included in the monitoring reports on a CD. The monitoring reports need to provide information on field conditions at sampling times including a description of the weather, rainfall, temperature, stream flow, color of the water, odor, and other relevant information that can help in data interpretation. Photo documentation, as necessary to record conditions that may affect monitoring results, shall accompany the field data sheets.

(8) Quality Assurance Evaluation (Precision, Accuracy and Completeness)

A summary of precision and accuracy results (both laboratory and field) is required in the annual monitoring report. The data quality indicators for precision and accuracy are listed in the QAPP with acceptance criteria. The CRC must review all QA/QC results to verify that protocols were followed and identify any results that did not meet acceptance criteria. A summary table or narrative description of all QA/QC results that did not meet objectives must be included in the annual report. The AMR must also include a discussion of how the failed QA/QC results affect the validity of the reported data and the corrective actions initiated.

In addition to precision and accuracy, the CRC must also calculate and report on Completeness that includes the percentage of all quality control results that met acceptance criteria, as well as a determination of project completeness.

(9) Summary of Exceedance Reports

A summary of the Exceedance Reports submitted during the monitoring period is required in the AMR. In the event of exceedances for pesticides or toxicity, pesticide use data must be included in the annual monitoring report. Pesticide use information will be acquired from the agricultural commissioner. This requirement is described further in the following section on Exceedance Reports.

B. EXCEEDANCE REPORTS

Exceedances for all parameters shall be reported in the Annual Monitoring Report and within the frequency developed in specific Management Plans. The CRC shall provide exceedance reports if monitoring results show exceedances of water quality standards or trigger limits. When a water quality standard is exceeded at a monitoring location(s), the CRC shall submit

an Exceedance Report to the Central Valley Water Board. The estimated flow at the monitoring location and photographs of the site must be included.

The CRC shall evaluate all monitoring data and make a determination of an exceedance no later than five (5) business days after receiving the laboratory analytical report. The Exceedance Report shall be sent by email or fax (916-464-4780) within the next business day, describing the exceedance, the follow-up monitoring, and analysis or other actions the CRC may take to address the exceedance.

When any pesticide or toxicity exceedance is identified, follow-up actions must include an investigation of pesticide use within the watershed area that is physically associated with the exceedance location. This includes all pesticides applied within the area that drains to the monitoring site during the four weeks prior to the exceedance date. The pesticide use information may be acquired from the agricultural commissioner, or from information received from agriculture practitioners within the same drainage area. Results of the pesticide use investigation must be summarized and discussed in the annual monitoring report. The development of an approved Management Plan may supercede this requirement.

C. MANAGEMENT PLANS

The Executive Officer has requested a Management Plan to address the impact of aquatic algae toxicity and the CRC has proposed a propanil Management Plan. Both Management Plans are incorporated into this Order. For other parameters, a Management Plan is required under this Order if more than one exceedance of the same parameter at the same location occurs within a three-year period. A schedule for Management Plan development and implementation shall be provided to the Central Valley Water Board staff within 10 business days following the occurrence triggering the requirement for the Management Plan. The CRC shall take affirmative steps to identify appropriate management practices. Such steps may involve conducting management practices workshops. Pesticide exceedances may require working with the Department of Pesticides Regulation on developing and/or implementing changes in use, application, or labeling.

At the request of the CRC or upon recommendation by Central Valley Water Board staff, the Executive Officer may provide authorization to exempt the development of a Management Plan if the Executive Officer determines that the exceedance is not likely to be remedied or addressed by a Management Plan.

The Executive Officer may also require the CRC and/or its member Dischargers to develop a Management Plan or to take additional actions if monitoring data or other information indicates that water quality may be jeopardized. The Executive Officer may also increase the monitoring requirements (e.g., frequency, constituents) where monitoring results, pesticide use patterns, or other indicators suggest that the increase is warranted.

MANAGEMENT PLAN FOR ALGAE TOXICITY

The Management Plan for Algae Toxicity (Management Plan) was submitted and approved by the Executive Officer on 21 May 2009. The Management Plan must be updated with the

findings from monitoring for that year and reported in the AMR. The AMR shall also evaluate the effectiveness of the Management Plan and recommend modifications for improvement for the next year's monitoring.

MANAGEMENT PLAN FOR PROPANIL

The CRC proposes a Management Plan be written for propanil, an herbicide used exclusively by rice. The Management Plan will include management practices implemented, or will be implemented, to protect water quality during propanil application and use on rice fields. The Management Plan must also include adequate monitoring during peak periods of propanil use and discharge to determine the effectiveness of the management practices.

D. RICE PESTICIDE MATRIX -- DUE 1 NOVEMBER 2011

The CRC shall submit an updated matrix that documents changes in pesticides being used on rice fields and any changes in rice operations, application methods and irrigation practices that may affect the application rates and/or time of pesticide application. This matrix shall also contain a summary of aquatic toxicity data for major rice pesticides. Information in the report will be used to determine the pesticides to be monitored in 2012.

The Central Valley Water Board Executive Officer may revise this MRP Order as necessary, and the CRC shall comply with the MRP Order as revised by the Executive Officer.

The CRC, on behalf of the individual member Dischargers, shall implement the above monitoring and reporting program as of the date of this Order.

Original signed by Pamela Creedon

PAMELA C. CREEDON, Executive Officer

Dated 10 March 2010

Date

Order Attachment A -- Information Sheet
Order Attachment B -- Definitions and Acronyms
Order Attachment C -- Requirements for a Quality Assurance Project Plan

ATTACHMENT A

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

INFORMATION SHEET
FOR
ORDER NO. R5-2010-0805

MONITORING AND REPORTING PROGRAM
FOR
CALIFORNIA RICE COMMISSION
UNDER AMENDED ORDER NO. R5-2006-0053
COALITION GROUP CONDITIONAL WAIVER OF
WASTE DISCHARGE REQUIREMENTS
FOR DISCHARGES FROM IRRIGATED LANDS

This attachment to the CRC MRP Order R5-2010-0805 is intended to summarize the monitoring results found during 2009 and the reasoning for the monitoring frequency, schedule, and parameters in the Order.

In 2009, four primary and three secondary sites as identified in Table 1 were monitored at the schedule and frequency described in MRP Order No. R5-2009-0809. The CRC has monitored the four primary monitoring sites (CBD5, BS1, CBD1, and SSB) under the Rice Pesticides Program for over 15 years. These sites have also been monitored since 2004 under the ILRP requirements.

Table 1. Monitoring Sites in 2009

Site Code	Site Name	Type of Monitoring
CBD5	Colusa Basin Drain #5	Core[1] & Special Monitoring
BS1	Butte Slough at Lower Pass Rd	Core[1] & Special Monitoring
CBD1	Colusa Basin Drain above Knights Landing	Core[1] & Special Monitoring
SSB	Sacramento Slough Bridge near Karnak	Core[1] & Special Monitoring
F	Lurline Creek; upstream site of CBD5	Assessment
G	Cherokee Canal, upstream site for BS1	Assessment
H	Obanion Outfall at DWR PP on Obanion Rd	Assessment

MONITORING RESULTS FOR 2009

In 2009, assessment and core monitoring occurred during the irrigation season, from April through mid-August, and the fall drainage, from mid-August to September. Previous monitoring data showed that constituents were only observed during pesticide applications (irrigation season) or releases from the rice fields (irrigation season and fall drainage). The 2009 MRP Order required four sampling events in the irrigation season, with another two

[1] Will rotate into assessment monitoring regime in 2012.

events to occur during the fall drainage. Sediment sampling at secondary sites were to be monitored in late September.

Toxicity Sampling- Aquatic and Sediment

Assessment monitoring included aquatic toxicity testing using algae (*Selenastrum capricornutum*), water flea (*Ceriodaphnia dubia*) and fathead minnow (*Pimephales promelas*), as well as sediment toxicity using *Hyalella azteca*. No significant toxicity (≥20% reduction compared to the controls) was found in the water column or sediment samples for the three upstream secondary sites (F, G, and H). Therefore, no aquatic or sediment toxicity testing will be required until the next assessment monitoring period in 2012.

Full aquatic toxicity monitoring was last completed in 2008 for CBD5, BS1, CBD1 and SSB. In the five years of sampling at these sites, one statistically significant event of aquatic toxicity for *Pimephales promelas* has been identified. Four statistically significant events of aquatic toxicity for *Ceriodaphnia dubia* were found at BS1 and CBD1. One of the two events for BS1 was identified as a non-rice pesticide and the other event occurred after fall drainage (25 October 2006). The two events at CBD1 occurred two years apart at the beginning and end of the fall drainage (23 September 2005 and 18 September 2007). With the past history of no aquatic toxicity except for *Selenastrum capricornutum* (algae), aquatic toxicity sampling at CBD5, BS1, CBD1 and SSB will be delayed one year until 2012. Monitoring of aquatic toxicity will then be concurrent with the general pesticide monitoring in 2012.

Dissolved Copper

All previous monitoring data for copper were based on total copper. Dissolved copper, though, is the form that affects aquatic life. Therefore, monitoring for dissolved copper is required in 2010, but only during the time of application and possible release. Copper compounds are applied to a flooded field only while the rice plant is submerged in order to eliminate algae and tadpole shrimp. These two pests reduce photosynthetic activity and growth of the young rice plant. Past monitoring data and studies[2,3] show a strong adsorption to organic materials and to clay and mineral surfaces.

Nutrient Analysis[4]

Nutrients sampling was not performed in 2009 pending the University of California (UC), Davis study using edge-of-field monitoring. The study would determine if nutrients, total dissolved solids (TDS), water column total organic carbon (TOC) and other parameters needed to be monitored as part of the assessment and core suite of analytes in the future. The final report on the grant findings was due 31 March 2009, but the grant was suspended before the report was completed.

---

2 Witter, A.E., Mabury, S. A., and Jones, A. D. "Copper (II) complexation in Northern California rice field waters: an investigation using different pulse anodic and cathodic stripping voltammetry," *Science of the Total Environment*, Vol. 212, No. 1, pp. 21-37, 1998.

3 EXTOXNET, Pesticide Information Profiles, Copper sulfate, 1996.

4 Includes analyses for total Kjeldahl nitrogen (TKN); nitrate + nitrite, as N; total ammonia, unionized ammonia (calculated), total phosphorous as P, soluble orthophosphate, and total organic carbon (TOC).

The grant study included four components: (1) monitoring and evaluation of TOC/DOC, TDS/EC, and turbidity outflows from rice fields cultivated under differing straw decomposition and winter flood practices, (2) monitoring of TOC/DOC, TDS/EC, and turbidity in rice field "peripheral drains", (3) monitoring and assessment to assess the impact of alternative seeding methods on pest management and pesticide outflows from rice fields, and (4) monitoring and assessment to assess the impact of alternative seeding methods on nitrogen and phosphorus outflows from rice fields. Water quality monitoring commenced in April 2006.

The CRC has provided a report on the UCD monitoring in its 2009 AMR. The report includes information on components 1, 2, and 4. Component 4 of the study is the nutrient monitoring at the field outflows of the rice fields. Monitoring data on dissolved inorganic nitrogen (DIN, defined as nitrate, nitrite, ammonia, and ammonium), nitrate (NO_3 - N), ammonia (NH_3 - N),dissolved phosphorus (P) and potassium (K) are presented in summary tables and graphed to show concentration at different times of the year. The highest concentrations for DIN, NO_3, P and K were found during the winter, when rice fields are generally flooded for rice straw decomposition and becomes habitat for waterfowl. The maximum nitrate concentrations found during this period was 9.52 mg/L, and the average concentration for all samples was 0.12 mg/L for the two years studied. Ammonia (NH_3-N) was found with a maximum value of 3.61 mg/L and an average of 0.10 mg/L.

The submitted report had two years of field outflow monitoring performed every one to two weeks. Over 300 samples were taken and analyzed for each parameter. Nitrate (NO_3) as N has a water quality objective for municipal and domestic use of 10 mg/L. The 9.52 mg/L maximum concentration was below this level at discharge from the field and would probably be diluted before entering waters of the State.

The maximum concentration found for ammonia (NH_3 - N) was 3.61 mg/L during the growing season. The analytical method measures both ionized ammonia (NH_4^+) and un-ionized ammonia (NH_3).[5] For flooded rice, nitrogen is generally in ionized form as aqua ammonia (NH_40H) or ammonium sulfate [$(NH_4)_2SO_4$] and applied by soil injection or incorporated to a depth of 2 to 4 inches before flooding.[6] The soil incorporation and immediate flooding minimizes losses through denitrification and volatilization (conversion to NH_3 gas). Under these conditions, the ionized ammonia should stay in this form rather than be converted to the non-ionized ammonia (NH_3) that is more toxic to aquatic life. The CRC also submitted additional information on temperature and pH on the fields that indicate the expected value for non-ionized ammonia (NH_3) will not exceed aquatic toxicity limits.

After reviewing the report, Central Valley Water Board staff finds the monitoring data equivalent to the nutrient analyses required by the 2009 MRP and concludes that nutrient

---

5 American Water Works Association. Standard Methods for the Examination of Water and Wastewater: 4500-NH_3-F (phenate).

6 UC Cooperative Extension. Rice Production in California (4/13). http://www.plantsciences.ucdavis.edu/uccerice/PRODUCT/rpic04.htm#nitrogen

monitoring need not be required until assessment monitoring commences at the primary sites in 2012.

Pesticides

Pesticides monitored under the 2009 MRP Order included carfentrazone ethyl, clomazone, glyphosate, pendimethalin, and penoxsulam. Carfentrazone ethyl, glyphosate, pendimethalin and penoxsulam, with minimum detection level of 0.1 – 0.2 μg/L, were not detected at primary or secondary sites. Based on the lack of detections, further monitoring for these pesticides is not required at this time. Clomazone was detected at a maximum value of 5.6 μg/L, but ECOTOX data show aquatic toxicity in the mg/L range for all species. Based on the low level of clomazone compared to available toxicity data, additional clomazone sampling is not required at this time.

These pesticides were selected after evaluating all rice pesticides based on the DPR Pesticide Use Report (PUR) data for 2007 and taking into account physical and chemical properties (e.g., short half-life, potential to bind to soil particles, aquatic toxicity). This evaluation was explained in detail in Attachment A of the 2009 MRP Order. Pesticide monitoring will not be required until 2012 when the primary sites will rotate into assessment monitoring. By 1 November 2011, the CRC is required to submit the Rice Pesticide Matrix that will document changes in pesticides being used on rice fields as well as changes in rice operations, application methods and irrigation practices that may affect the application rates and/or time of pesticide application. This report will also include an update of the evaluation used for the 2009 MRP Order for rice pesticides based on use, and physical and chemical properties. This report will be used to determine what pesticides should be analyzed for assessment monitoring.

Special Monitoring

Algae Toxicity

The primary sites, CBD5, BS1, CBD1 and SSB, are under an Algae Toxicity Management Plan due to toxicity to *Selenastrum capricornutum*. Sampling was performed with general parameters, including hardness, and total copper. No statistically significant toxicity was observed from the sampling that occurred monthly during May, June and July for 2009. Also analyzed during that time were triclopyr[7] and propanil, pesticides specified in the management plan. A revised Algae Toxicity Management Plan with proposed actions is required by 1 May 2010.

Molinate and Thiobencarb

The monitoring for molinate and thiobencarb is not required by the ILRP nor by this MRP Order, but as part of the Rice Pesticides Program (RPP). The RPP was formally established when the Central Valley Water Board established performance goals and a conditional prohibition of discharge for five rice pesticides in the Basin Plan. Of the five pesticides, only thiobencarb and molinate were applied to rice fields in 2009. Molinate use on rice is prohibited after this year and will not be monitored in the future. The five rice pesticides can

[7] Triclopyr is applied as a triethylamine salt (TEA), but decomposes into triclopyr acid in water.

not be discharged unless the discharger is following management practices approved by the Central Valley Regional Board and that implementation of those management practices must be expected to result in compliance with the Basin Plan performance goals. The schedule and frequency for RPP monitoring is based on the period of heaviest pesticide use. Analytical results and evaluation of monitoring for the RPP are submitted in a report to the Central Valley Water Board by 1 January for the previous year.

In 2009, the performance goal of 10 μg/L for molinate was not exceeded at any sampling event or site. Thiobencarb has a performance goal of 1.5 μg/L for all waters designated as freshwater habitat, and a water quality objective of 1.0 μg/L for waters designated for municipal and domestic supply. The 1.5 μg/L was exceeded three times at two sites in thirteen sampling events. The CRC will initiate additional management practices for thiobencarb to meet the performance goal for next year.

Propanil

Propanil monitoring was performed by the registrant in 2009 at the primary sites. Sampling at the primary sites was concurrent with the RPP monitoring for thiobencarb and molinate. The highest concentration detected was 12 μg/L at SSB on 14 July 2009. Propanil monitoring was not required at the secondary sites under the MRP or a Management Plan, but two sampling events did occur on 2 June and 7 July. For the June event, a high level of propanil (47 μg/L) was found at Site F with no detections at the other secondary sites. The second event showed no propanil detections (minimum detection level of 0.25 μg/L) at any of the secondary sites.

Propanil monitoring data, analyzed by the registrant, were submitted for 2006 through 2008 for primary sites CBD5, BS1, CBD1, and SSB, This monitoring was performed concurrent with the RPP monitoring for those years. The highest concentration found for each year was at CBD5 with 31.2 μg/L in 2006, 2.42 μg/L in 2007, and 1.34 μg/L in 2008. This compares with a high value of 11 μg/L found in 2009, also at CBD5.

The CRC also submitted a report on propanil evaluating aquatic toxicity data using species sensitivity distribution and performing a probabilistic risk assessment with 2006 to 2008 propanil monitoring results. Central Valley Water Board staff reviewed the report and found the report could not be relied upon to evaluate the potential effect of propanil on the aquatic environment. A separate staff memo is available that provides an evaluation of this report.

The CRC proposes submission of a Management Plan on the use and application of propanil that would incorporate management practices in place, or to be implemented, to ensure protection of beneficial use for waters of the state. The draft Propanil Management Plan was submitted to the Central Valley Water Board in December 2009 for review. The final Propanil Management Plan must be approved by the Executive Officer and submitted by 1 May 2010.

ATTACHMENT B

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM
ORDER NO. R5-2010-0805

APPLICABLE DEFINITIONS AND ACRONYMS
FOR
CALIFORNIA RICE COMMISSION
FOR DISCHARGES FROM IRRIGATED LANDS

The following information is presented to provide definition and clarification of terminology and acronyms used within the Monitoring and Reporting Program documents.

Definitions
The following definitions apply to the Monitoring and Reporting Program as related to discharges from irrigated lands as described in this Order and all attached documents.

1. **Accuracy** - The closeness or agreement of the observed value or test response to the true or acceptable reference value or the test response from a reference method. It is influenced by both random error (precision) and systematic error (bias). The terms “bias” and “precision” are often used in lieu of “accuracy”.
2. **Analytical Batch** - A group of 20 or fewer samples analyzed by the same method and instrument within a 24-hr period. An analytical batch may be comprised of several sample batches and therefore represent multiple collection and preservation/extraction dates, as long as holding time are met for each sample. Sample batches can be from different entities.
3. **Analytical Run** - The quantification of a single discrete sample or its associated quality control.
4. **Assessment Monitoring -** Parameters monitored under this regime will obtain a comprehensive characterization and evaluation of water quality conditions in different types of water bodies.
5. **Assessment** - A general evaluation process used to evaluate the performance, effectiveness, and processes of a management and/or technical system.
6. **Batch** - A group of samples, to include quality control samples, which is to be collected and/or analyzed in one, test run or inspected together within a specific time limit and traceable as a unit.
7. **Bias** - The constant or systematic distortion of a measurement process that manifests itself as a persistent positive or negative deviation from the known or true value. This can result from improper data collection, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

8. **Blank** - A specimen that is intended to contain none of the analytes of interest and which is subjected to the usual analytical or measurement process to establish method purity, a zero baseline, or background value.
9. **Calibration** - A comparison of a measurement standard, instrument, or item with one having higher accuracy to detect, quantify, and record any inaccuracy or variation; the process by which an instrument setting is adjusted based on response to a standard to eliminate the inaccuracy.
10. **Calibration Standard** - A reference solution or substance of known value or chemical concentration used to establish a correct instrument reading.
11. **Certified Reference Materials** - A substance or solution for which the composition or concentration of a particular chemical constituent is known, and which is traceable with documentation pertaining to its composition and uniformity to an established standardization organization such as the National Institute for Standards and Technology (NIST) or the American Association for Laboratory Accreditation (A2LA).
12. **Chain-of-Custody** - An unbroken, documented trail of accountability that ensures the physical security and/or integrity of samples, data, and records.
13. **Coalition Group** – A group of dischargers and/or organizations that choose to comply with the Conditional Waiver by forming a group which is approved by the Central Valley Regional Water Quality Control Board. Coalition Groups can be organized on a geographic basis or can be groups with other factors in common such as commodity groups.
14. **Coefficient of Variation** - The standard deviation divided by the mean; a unit-free measure of variability.
15. **Comparability** - A measure of the confidence with which one data set, element, or method can be considered as similar to another, e.g., taken from the same location, taken in a similar manner, etc.
16. **Completeness** - A measure of the amount of valid data obtained from a measurement system, compared to the planned or expected amount. For the ILRP, completeness goals will be evaluated with the submittal of each annual monitoring report. The completeness evaluation will include the number of samples successfully obtained and the proportion of quality control samples that are within acceptance criteria.
17. **Contamination** - The unintentional addition of analytical constituents to a sample or system.
18. **Continuing Calibration Verification** - A periodic standard used to assess instrument drift between calibrations.
19. **Control Chart** - A graphic representation of the variability in a measurement process generally plotted in order over time.
20. **Control Limit** - The upper and lower acceptable ranges of process data used to judge whether the process is within or outside of statistical limitations. Control limits are

determined by the variation in a process data set expressed as the mean value plus or minus a pre-determined number of standard deviations (typically three standard deviations from the mean).

21. **Core Monitoring** - Parameters monitored shall consist of general physical parameters, as well as other parameters specifically requested by the Central Valley Water Board. Assessment monitoring shall be repeated at the specified sites during every third year of monitoring.
22. **Corrective Action** - Any measures taken to rectify conditions adverse to quality and/or to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent reoccurrence.
23. **Data Quality Assessment** - A statistical and scientific evaluation of a data set to determine the validity and performance of the data collection design and execution, and to determine the adequacy of the data set for its intended use.
24. **Data Quality Indicators** - The quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of information to the user. The principal DQIs are precision, accuracy (or bias), representativeness, comparability, completeness, and sensitivity.
25. **Data Quality Objectives** - Qualitative and quantitative statements derived from the DQO Planning Process that clarify the purpose of the study, define the most appropriate type of information to collect, determine the most appropriate conditions from which to collect that information, and specify tolerable levels of potential decision errors.
26. **Data Quality Objectives Process** - A systematic strategic development tool based on the scientific method that identifies and defines the type, quality, and quantity of information needed to satisfy a specified use, including data precision, accuracy, and completeness requirements.
27. **Data Validation** - An analyte- and sample-specific process that evaluates analytical information after the verification process (i.e., determination of method, procedural, or contractual compliance) to determine analytical quality and any limitations on the data.
28. **Data Verification** - The process of evaluating the completeness, correctness, and conformance/compliance of a specific information set against the method, procedural, or contractual specifications for that activity.
29. **Discharger** - The owner and/or operator of irrigated lands or a Water District, which accepts or receives discharges from irrigated lands, who discharges or threatens to discharge: irrigation return flows, tailwater, operational spills, drainage water, subsurface drainage generated by irrigating crop land or by installing drainage systems to lower the water table below irrigated lands (tile drains) and/or stormwater runoff flowing from irrigated lands to waters of the State.
30. **Discharges from irrigated lands** - Include surface discharges (also known as irrigation return flows or tailwater), operational spills, drainage water discharges,

subsurface discharges through drainage systems that lower the water table below irrigated lands (also known as tile drains), stormwater runoff flowing from irrigated lands, and stormwater runoff conveyed in channels or canals resulting from the discharge from irrigated lands. For the purpose of this Coalition Group Monitoring and Reporting Program, stormwater discharges to surface waters resulting from any size storm can be covered by this Conditional Waiver.

31. **Drift** - The deviation in instrument response from its set or reference value over a period of time.
32. **Entity** – An organization, group, or contractor directly responsible for sample collection. Entities may include: laboratories, private consulting firms, and subwatershed groups.
33. **Equipment Blank** - An aliquot of reagent water that is subjected to all aspects of sample collection and analysis, including contact with all sampling devices and apparatus. The purpose of the equipment blank is to determine if the sampling devices and apparatus for sample collection have been adequately cleaned prior to use.
34. **Field Blank** - An aliquot of reagent water which is exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample. This blank is used to provide information about contaminants that may be introduced during sample collection, storage, and transport.
35. **Field Duplicate (Co-located) -** An independent specimen collected from (as closely as possible) the same point in time and space as the primary specimen. This would include duplicate sample containers filled simultaneously and in close proximity to one another from the same medium, or duplicate containers filled in rapid succession from the same location or source.
36. **Field Duplicate (Sub-sample) or Field Split -** A test specimen that is homogenized before being divided into two or more portions with the same laboratory analyzing all portions, to evaluate sampling and analysis precision. This type of field duplicate (or split) sample analysis can also be performed by more than one lab to evaluate inter-laboratory precision.
37. **Field Measurements -** Those activities associated with performing analyses or measurements in the habitat being examined.
38. **Holding Time -** The period of time a sample may be stored following collection, preservation, extraction, or analysis. While exceeding the holding time does not necessarily negate the validity of analytical results, associated analytical data are typically qualified as estimated.
39. **Indicators -** Items, elements, or measures used to determine or identify a basic condition or how well a process or program is meeting its objectives.
40. **Inter-comparison -** An exercise in which samples are prepared and split by a reference laboratory, then analyzed by one or more testing laboratories and the reference laboratory. The inter-comparison, with a reputable laboratory as the

reference laboratory, serves as a test of the precision and accuracy of the analyses from different laboratories at natural environmental levels.

41. **Interference -** An element, compound, or other matrix effect present in a sample, which disturbs the detection of a target analyte leading to inaccurate concentration results for the target analyte.

42. **Internal Standard -** Pure analyte (s) added to a sample, extract, or standard solution in known amount(s) and used to measure the relative responses of other method analytes that are components of the same sample or solution. The internal standard must be an analyte that is not a sample component.

43. **Irrigated Lands** - Lands where water is applied for the purpose of producing crops, including, but not limited to, land planted to row, vineyard, pasture, field and tree crops, commercial nurseries, nursery stock production, managed wetlands, rice production, and greenhouse operations with permeable floors that do not currently discharge under waste discharge requirements (WDRs), including Municipal Separate Storm Sewer System or other National Pollutant Discharge Elimination System permits are considered irrigated lands.

44. **Irrigation Season** - The time of year when water is applied to fields for the purpose of promoting crop growth, for distributing nutrients or other chemicals to crop lands or for the purposes of counteracting the effects of frost during cold season months.

45. **Irrigation Return Flow** - Surface and subsurface water that leaves the field following application of irrigation water.

46. **Laboratory Blank (also known as a Method Blank) -** An aliquot of reagent water (or for solid matrices, an inert solid similar to the sample matrix) that is prepared by the laboratory and treated exactly as a sample, including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with samples. The laboratory blank is used to determine if method analytes or interferences are present in the laboratory environment, the reagents, or the apparatus.

47. **Laboratory Duplicate -** Two or more representative portions taken from one homogeneous sample by the laboratory analyst and analyzed in the same testing facility to evaluate the effects of laboratory conditions on analytical precision.

48. **Laboratory Control Sample -** A specimen of known composition prepared using contaminant-free reagent water, or an inert solid, that is spiked with the analyte of interest at the midpoint of the calibration curve or at the level of concern; and then analyzed using the same preparation, reagents, and analytical methods employed for regular specimens and at the intervals set in the Quality Assurance Project Plan.

49. **Matrix -** The material of which the sample is composed or the substrate containing the analyte of interest, such as drinking water, waste water, air, soil/sediment, biological material, etc. Also called medium or media.

50. **Matrix Spike -** A test specimen that is prepared by adding a known concentration of the target analyte(s) to a specified amount of a specific homogenized specimen and is then subjected to the entire analytical protocol.
51. **Matrix Spike Duplicate -** A sample prepared simultaneously as a split with the matrix spike sample with each specimen being spiked with identical, known concentrations of targeted analyte.
52. **Measurement Quality Objectives -** The individual performance or acceptance goals (or requirements) for the individual Data Quality Indicators such as precision or bias.
53. **Metadata -** The information about a data set, which may include descriptive information about the context, quality and condition, or characteristics of a data set. For geographical data this may include the source of the data; its creation date and format; its projection, scale, resolution, and accuracy; and its reliability with regard to some standard.
54. **Method -** A procedure, technique, or tool for performing a scientific activity.
55. **Method Detection Limit -** The minimum concentration of an analyte that undergoes the entire measurement process and can be reported with a stated level of confidence that the analyte concentration is greater than zero.
56. **Method Linearity –** The ability of an analytical method to demonstrate an increase in sample concentration of a given analyte, as the instrument response also increases. Demonstration of instrument linearity, as well as the upper and lower limits of linearity, are considered part of a laboratory method validation procedure and should take place before the procedure is used to report analytical results.
57. **Monitoring -** All types of monitoring undertaken in connection with determining water quality conditions and factors that may affect water quality conditions, including but not limited to, in-stream water quality monitoring undertaken in connection with agricultural activities, monitoring to identify short and long-term trends in water quality, active inspections of operations, and management practice implementation and effectiveness monitoring.
58. **Negative Control -** Measures taken to insure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
59. **Operational Spill** – Irrigation water that is diverted from a source such as a river, but is discharged without being delivered to or used on an individual field.
60. **Parameter -** A statistical quantity, usually unknown, such as a mean or a standard deviation, which characterizes a population or defines a system. The term Parameter (or sometimes “Analytical Parameter”) can also be defined as a measured analytical constituent such as an individual chemical, a group of chemicals, or a physical property (i.e. Total Organic Carbon, electrical Conductivity, etc.).
61. **Performance Based Measurement System -** A set of processes wherein the data needs, mandates, or limitations of a program or project are specified and serve as

criteria for selecting appropriate methods to meet those needs in a cost-effective manner.

62. **Positive Control -** A prepared standard which undergoes an analytical procedure to provide comparison with an unknown specimen thereby monitoring recovery to assure that a test and/or its components are working properly and producing correct or expected results.

63. **Precision -** A measure of mutual agreement between two or more individual measurements of the same property, obtained under similar conditions.

64. **Primary Site** - Defined as one of four sites: CBD5 (Colusa Basin Drain #5), BS1 (Butte Slough at Lower Pass Road), CBD1 (Colusa Basin Drain above Knights Landing), or SSB (Sacramento Slough Bridge near Karnak).

65. **Proficiency Test -** A type of external assessment in which a stable sample, the composition of which is unknown to the analyst, is provided to determine whether the analyst/laboratory can produce analytical results within the specified acceptance criteria. Also known as a Performance Evaluation Test.

66. **Proficiency Test Sample -** A test specimen of known composition and/or chemical concentration that mimics an actual specimen in all possible aspects, except that its composition is unknown to the laboratory at the time of analysis, and which is used to assess the laboratory's capability to produce results within acceptable criteria.

67. **Qualified Data -** Any numerical information that may be of limited use for a specific function, and is identified (flagged) as such.

68. **Quality Assurance -** An integrated system of management activities (planning, implementation, assessment, reporting, and quality improvement) that focuses on providing confidence in the data or product by ensuring that it is of the type and worth needed and expected for its expressed, intended use.

69. **Quality Assurance Officer -** The individual designated within an organization having management oversight and responsibilities for planning, documenting, coordinating, and assessing the system effectiveness for ensuring the value of the work.

70. **Quality Assurance Project Plan -** A document that describes the intended technical activities and project procedures that will be implemented to ensure that the results of the work to be performed will satisfy the stated performance or acceptance criteria. The amount of information presented and the planned activities to ensure the value of the work will vary according the type of study and the intended use of the data.

71. **Quality Control -** The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established; operational techniques and activities that are used to fulfill requirements.

72. **Quality Control Sample -** One of any number of test specimens, such as a Proficiency Test or blank, intended to demonstrate that a measurement system or activity is in check.

73. **Quality Management Plan -** A document that describes an organization's system in terms of its organizational structure, policy and procedures, staff functional responsibilities, lines of authority, and interfaces for those planning, implementing, documenting, and assessing all activities conducted.

74. **Quality Objectives -** The combined characteristics of Data Quality Objectives and Measurement Quality Objectives; the overall criteria related to sample design and analytical measurements intended to assure that analytical data meet the requirements associated with the intended use.

75. **Quantitation Limit or Practical Quantitation Limit (PQL) -** The level above which numerical results may be obtained with a specified degree of confidence, the minimum concentration of an analyte, or category of analytes, in a specific matrix that can be identified and quantified within specified limits of precision and accuracy during routine analytical operating conditions. The manner of establishing the quantitation limit is method-specific, and typically involves the successful (within established acceptance criteria) analysis of calibration standards at the quantitation limit concentration -- either as part of the instrument calibration procedure, or as a routine control sample.

76. **QC Set (Quality Control Set) -** A group of quality control samples (i.e. a laboratory blank, a matrix spike and matrix spike duplicate, etc.) used to evaluate (control) a specific set or sample batch .Attachment C, Section B.5 provides further detail of what constitutes a QC Set for chemical, microbiological, and toxicity analyses.

77. **Receiving waters** - Surface waters that receive or have the potential to receive discharges from irrigated lands.

78. **Recovery -** The measure of accuracy for an analytical procedure, including determining whether or not the methodology measures all of the analyte contained in a sample, often expressed in percent recovered.

79. **Reference Toxicant -** A substance used as a positive control for toxicological analyses to test the sensitivity of the test organisms to a known toxic substance, and to assure appropriate lab procedures have been performed.

80. **Relative Percent Difference -** The absolute value of the difference of two measurements divided by the statistical mean of the same two measurements, used to evaluate the precision of duplicate samples analysis, or two repeated measurements.

81. **Relative Standard Deviation -** The standard deviation divided by the mean; a unit-free measure of variability.

82. **Repeatability -** The degree of agreement between independent test results produced by the same analyst, using the same test method and equipment on random aliquots of the same sample within a short time period.

83. **Reporting Limit (RL) -** the quantitation level required by the Irrigated Lands Program for reporting purposes. The RL is typically set at a laboratory quantitation level, but consideration may be made for lowering the level to the detection limit, if information about presence or absence of a contaminant is necessary. Similarly, if levels that are

protective of water quality prove to be lower than the routine quantitation limit at a given laboratory, then the CVRWQCB may require an RL that is lower than the PQL, providing achieving that limit is economically feasible. The RL can sometimes be raised to some default value above the PQL, if the PQL is much lower than necessary to protect water quality, and if it is approved by the CVRWQCB.

84. **Representativeness -** A measure of the degree to which data accurately and precisely represent characteristics of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
85. **Rinse Blank -** A dilute acid solution used to flush an instrument between samples in order to reduce memory interferences.
86. **Sample Batch -** A group of samples collected during a sampling event and, if required, preserved or extracted together.
87. **Sampling Event -** A group of samples collected by the same entity in a day or within a multi-day consecutive collection period.
88. **Secondary Site -** Any other monitoring location other than core site used for assessment.
89. **Sensitivity -** The capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest.
90. **Spike -** A known quantity of an analyte added to a sample for the purpose of determining recovery or efficiency (analyst spikes), or for quality control (blind spikes).
91. **Split -** Two or more representative portions taken from one specimen in the field or in the laboratory and analyzed by different analysts, methods, or laboratories.
92. **Standard Deviation -** The measure of the dispersion or imprecision of a series of accepted results around the average, equal to the square root of the variance.
93. **Standard Operating Procedure -** A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps and that is officially approved as the method for performing certain routine or repetitive tasks.
94. **Stormwater runoff** – The runoff of precipitation from irrigated lands to surface waters from any size storm event.
95. **Subsurface drainage** – Water generated by installing drainage systems to lower the water table below irrigated lands. Subsurface drainage systems, deep open drainage ditches, or drainage wells can generate this drainage.
96. **Surrogate -** A pure substance with properties that mimics the analyte of interest (organics only) and which is unlikely to be found in environmental samples. It is added into a sample before sample preparation.
97. **Tailwater** – The runoff of irrigation water from an irrigated field.
98. **Travel Blank -** Analyte-free water placed in the same type of container as its associated field samples. It may be pre-preserved prior to shipment, but is not opened

during the sample collection. Consequently, it helps isolate contamination associated with sample transport.

99. **Waste** – As defined in California Water Code (Water Code) Section 13050. Includes sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation, including waste placed within containers or whatever nature prior to, and for the purposes of disposal. Waste specifically regulated by the Coalition Group Conditional Waiver includes: earthen materials, such as soil, silt, sand, clay, and rock; inorganic materials, such as metals, salts, boron, selenium, potassium, nitrogen, etc.; and organic materials, such as pesticides that enter or threaten to enter waters of the State. Examples of waste not specifically regulated by the Coalition Group Conditional Waiver include hazardous and human wastes.

100. **Water Quality Standards –** Water Quality Standards consist of narrative and numeric water quality objectives in the Central Valley Regional Water Quality Control Board's Basin Plans, water quality criteria in the California Toxics Rule and National Toxics Rule adopted by the USEPA, and/or water quality objectives in other applicable State Water Board plans and policies.

101. **Waters of the State –** As defined in Water Code Section 13050. Any surface water or groundwater, including saline waters, within the boundaries of the State. This Order and the Coalition Group Conditional Waiver currently regulate only discharges from irrigated lands to surface waters.

Acronyms

The following acronyms apply to the Monitoring and Reporting Program as related to discharges from irrigated lands as described in this Order and all attached documents.

AMR	Annual Monitoring Report
CAL-EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CFR	Code of Federal Regulations
COC	Chain of Custody
CTR	California Toxics Rule
CWA	Clean Water Act
DFG	Department of Fish and Game
DHS	Department of Health Services
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DPR	Department of Pesticide Regulation
DQO	Data Quality Objective
DWR	Department of Water Resources
GC/MS	Gas chromatography/mass spectrometry
IDL	Instrument Detection Limit
GIS	Geographic Information System
ILRP	Irrigated Lands Regulatory Program
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
LTMS	Long-term Monitoring Strategy
ML	Minimum Level
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MRP	Monitoring and Reporting Program
MRPP	Monitoring and Reporting Program Plan
MP	Management Practices
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MUN	Municipal use of a water body as a source of drinking water
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTR	National Toxics Rule
ppm	Parts per million (mg/kg sediment and tissue; mg/l water)
ppb	Parts per billion (ug/kg or ng/g sediment and tissue; ug/l water)
PQL	Practical Quantitation Limit
QAMP	Quality Assurance Management Plan
QAPP	Quality Assurance Project (or Program) Plan
QA/QC	Quality Assurance/Quality Control
QO	Quality Objective

REC1	Contract recreation as a beneficial use for a water body
RL	Reporting Limit
RPD	Relative Percent Difference
RWQCB	Regional Water Quality Control Board
SAMR	Semi-annual Monitoring Report
SD	Standard Deviation
SOP	Standard Operating Procedure
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
SVOC	Semi-volatile organic carbon compounds
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TRL	Target Reporting Limit
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WER	Watershed Evaluation Report
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compounds

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

QUALITY ASSURANCE PROJECT PLAN GUIDELINES FOR CALIFORNIA RICE COMMISSION

ORDER NO. R5-2010-0805
MONITORING AND REPORTING PROGRAM
UNDER AMENDED ORDER NO. R5-2006-0053
COALITION GROUP CONDITIONAL WAIVER OF
WASTE DISCHARGE REQUIREMENTS
FOR DISCHARGES FROM IRRIGATED LANDS

IRRIGATED LANDS CONDITIONAL WAIVER PROGRAM
QUALITY ASSURANCE PROJECT PLAN GUIDELINES

TABLE OF CONTENTS

Section	Title	USEPA QAPP Element Number	Page
I	**INTRODUCTION**		4
II	**OBJECTIVE**		4
III	**COMPONENTS OF A QAPP**		4
IV	**QAPP ELEMENTS AND GUIDELINES**		5
IVA	**Project Management**		5
1	Title and Approval Sheet	1	
2	Table of Contents	2	
3	Distribution List	3	
4	Project Organization	4	
5	Problem Definition/Background	5	
6	Project Description	6	
7	Quality Objectives and Criteria	7	
8	Special Training Needs/Certification	8	
9	Documents and Records	9	
IVB	**Data Generation and Acquisition**		12
1	Sampling Process Design	10	
2	Sample Collection Methods	11	
3	Sample Handling and Custody	12	
4	Analytical Methods and Field Measurements	13	
5	Quality Control	14	
6	Instrument/Equipment Testing, Inspection and Maintenance	15	
7	Instrument/Equipment Calibration and Frequency	16	
8	Inspection/Acceptance of Supplies and Consumables	17	
9	Non-Direct Measurements	18	
10	Data Management	19	
IVC	**Assessment and Oversight**		26
1	Assessments and Response Actions	20	
2	Reports to Management	21	
IVD	**Data Validation and Usability**		27
1	Data Review, Verification and Validation	22	
2	Verification and Validation Methods	23	
3	Reconciliation with User Requirements	24	
V	**REFERENCES**		29

LIST OF APPENDICES

Appendix A	LTMS Analytical Requirements
Appendix B	Summary Table of Quality Objectives and Criteria for Measurement Data
Appendix C	**FORM TEMPLATES** Field Data Sheet Discharge Field Sheet Chain of Custody
Appendix D	Summary of Sample Container, Volume, Initial Preservation, and Holding Time Recommendations for Water Samples
Appendix E	Summary of Sample Container, Volume, Preservation, and Storage Requirements for Bed Sediment
Appendix F	Corrective Action for ILRP Quality Control Samples Trace Metals and Conventional Analytes Corrective Action for ILRP Quality Control Samples Organic Compounds Corrective Action for ILRP Quality Control Samples Toxicity Testing Corrective Actions – Organic Compounds Corrective Actions – Trace Metals and Conventional Analytes
Appendix G	**TOXICITY EVALUATION IDENTIFICATION PROCEDURES**
Appendix H	**ONLINE RESOURCES**

IRRIGATED LANDS CONDITIONAL WAIVER PROGRAM
QUALITY ASSURANCE PROJECT PLAN GUIDELINES

I INTRODUCTION

A Quality Assurance Project Plan (QAPP) shall be developed by the California Rice Commission (CRC) and shall include site-specific information and field and laboratory quality assurance requirements. This document identifies the major elements of the quality assurance and quality control (QA/QC) components that need to be described in the QAPP. The QAPP shall be submitted to the staff of the Central Valley Water Board Irrigated Lands Regulatory Program (ILRP) for review and approval by the Central Valley Water Board Quality Assurance Officer.

II OBJECTIVE

The purpose of this document is to identify the QA and QC components that must be described in the QAPP for the CRC monitoring. A QAPP contains the requirements and criteria for the field and laboratory procedures used during planning and implementation of the monitoring program. The QAPP shall identify the procedures that will be used to assure that the monitoring data represents, as closely as possible the water quality conditions of the water body that is being sampled at the time of sampling. This will be achieved by using accepted methodologies (e.g., U.S. Environmental Protection Agency, USEPA) for sample collection and analysis of water, sediment, and biota. Chemical, bacteriological, and bioassay analyses shall be conducted at a laboratory certified for such analyses by the State Department of Health Services. In the event a certified laboratory is not available to the CRC, analyses performed by a non-certified laboratory will be accepted provided a Quality Assurance/Quality Control Program is instituted by the laboratory. A manual containing the steps followed in this program must be kept in the laboratory and shall be available for inspection by Board staff. The CRC's ability to meet this objective will be assessed by evaluating the monitoring detection limits, precision, accuracy, comparability, representativeness, and completeness. A QAPP must contain adequate detail for project and Water Board staff to identify and assess the technical and quality objectives, measurement and data acquisition methods, and limitations of the data generated under the project. This document provides a description of major elements of a QAPP that are also required under the guidelines provided by the USEPA and the State Surface Water Ambient Monitoring Program (SWAMP).

Note: This document provides a compilation of USEPA, SWAMP and ILRP guidelines. Language has been taken and used directly from the following documents:

> USEPA. 2001 (2006) USEPA Requirements for Quality Assurance Project Plans (QA/R-5) Office of Environmental Information, Washington, D.C. USEPA QA/R-5
>
> SWAMP Quality Assurance Management Plan (SWAMP QMP version 1 dated 12/22//2002 and Draft Version 2 dated 08/09/2006) http://www.swrcb.ca.gov/swamp/qapp.html

III QAPP COMPONENTS

The U.S. Environmental Protection Agency details the components, content, and format required for a QAPP. Following the guidelines provided by the USEPA, a QAPP must contain specific information regarding four main components:

A. PROJECT MANAGEMENT
This component addresses basic project management, including the project history and objectives, roles and responsibilities of the participants, and other aspects. These elements ensure that the project has a defined goal, that the participants understand the goal and the approach to be used, and that the planning outputs have been documented.

B. DATA GENERATION AND ACQUISITION
This component addresses all aspects of project design and implementation. Implementation of these elements ensures that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities are employed and are properly documented.

C. ASSESSMENT AND OVERSIGHT
This component addresses the activities for assessing the effectiveness of the implementation of the project and associated QA and QC activities. The purpose of the assessment is to provide project oversight that will ensure that the QA Project Plan is implemented as prescribed.

D. DATA VALIDATION AND USABILITY
This component addresses the QA activities that occur after the data collection, laboratory analysis and data generation phase of the project is completed. Implementation of these elements ensures that the data conform to the specified criteria, thus achieving the project objectives (USEPA 2001).

These four main components are further subdivided into twenty-four (24) specific elements as required by the USEPA. The State SWAMP QAPP guidelines further define items required under each component to ensure that adequate detail is presented within the project's QAPP. The ILRP has additional requirements under each component. In order to provide more information in preparing the QAPP, all required components, elements, and subsections are discussed in the ensuing sections of this document. A QAPP that is submitted for compliance with the ILRP must contain all of the components, elements, and requirements that are described in this document.

IV QAPP ELEMENTS

This section identifies the elements that further describe the four key QAPP components required by the ILRP Program.

A. PROJECT MANAGEMENT

1 TITLE AND APPROVAL SHEET (USEPA Element 1)
The Title and Approval Sheet element provides the basic project information including the project title, QAPP version number and date, identifies key project staff, and official approval signatures. The Title and Approval Sheet must include the following components:

1.1 Project title.
1.2 Revision number.
1.3 Organization name.
1.4 Signature and date block for project lead.
1.5 Signature and date block for project manager(s).
1.6 Signature and date block for project QA officer(s).

2 TABLE OF CONTENTS (USEPA Element 2)

The Table of Contents element provides for organized index of all QAPP components and must include the following components:

2.1 List of QAPP sections.
2.2 List of tables and figures.
2.3 List and description of appendices.
2.4 List and description of attached SOPs.
2.5 SOPs revision number and date for each referenced SOP.

3 DISTRIBUTION LIST (USEPA Element 3)

The Distribution List element provides for a comprehensive list of individuals and organizations that will require a copy of the approved QAPP and subsequent revisions. This element also provides for a list of those responsible for implementation of the approved QAPP as well as assessment of compliance of the terms within. The Distribution List element must include the following components:

3.1 List of contact staff, organization, phone numbers, email addresses.
3.2 List of names of individuals and organizations that will receive and retain a copy of the QAPP.

4 PROJECT ORGANIZATION (USEPA Element 4)

The Project Organization element provides for a detailed breakdown of key participating individuals and organizations identifying their individual roles and responsibilities within the project. This element also provides information about the chain of authority and at what level key decisions and project assessment reviews will take place. Outside data sources should also be included. The Project Organization element must include the following:

4.1 Identify key individuals involved in any major aspect of the project.
4.2 Discuss each individual's responsibility.
4.3 Describe organizational chart detailing lines of authority.
4.4 Designate a QA Manager.
4.5 Identify (if applicable) the individual(s) responsible for maintaining the official, approved QAPP.
4.6 Identify (if applicable) any advisors to the project.

5 PROBLEM DEFINITION/BACKGROUND (USEPA Element 5)

The Problem Definition/Background element provides for a statement of the Project objectives and an overview of historical background for the problem the project is addressing. Existing and applicable regulatory information should also be identified within this section. The Problem Definition/Background element must include the following:

5.1 Describe project objectives.
5.2 Describe approaches to meet the objectives.
5.3 Identify applicable regulatory information, applicable criteria, action limits, TMDLs, and Basin Plan objectives.
5.4 Describe the decisions to be made, actions to be taken, or outcomes from the information to be obtained.
5.5 Describe the project background or historical information for initiating this project.

The requirements in Sections A.5.4 and A.5.5 need to be placed in the Project's MRP Plan. However, the QAPP should identify the sections and pages where this information can be found in the specific MRP Plan.

6 PROJECT DESCRIPTION (USEPA Element 6)

The Project Description element provides for a summary of all work that is to be performed and the schedule for implementation. This element also provides for a detailed description of the geographical area where sampling is to be performed. The Project Description element must include the following:

6.1 Detailed summary of work to be performed.
6.2 Detailed schedule of major project work benchmarks.
6.3 Detailed geographical information.
6.4 Photo reconnaissance of the monitoring sites.
6.5 Discussion on resource and time constraints.

Photo reconnaissance of all monitoring sites must be submitted to Central Valley Water Board once a year along with the target GPS coordinates. At a minimum four pictures should be taken and included in the Project report. These pictures should include:

(a) A general site overview.
(b) Upstream view.
(c) Downstream view.
(d) Entrance to location where the samples will be collected.

7 QUALITY OBJECTIVES AND CRITERIA (USEPA Element 7)

The Quality Objectives (QOs) and Criteria element provides for the QC objectives as well as performance criteria to achieve those objectives. Objectives and criteria for meeting the objectives should be defined at both the sampling design and analytical measurement levels (see Appendices). The analytical measurement levels must meet the requirements defined for a particular method (Appendix A). The completeness criteria (90%) should be calculated and reported with the submittal of each monitoring report (Appendix B). The following tables and definitions must be included within the QOs and Criteria element of the Project's QAPP:

7.1 Data quality objectives (Appendix B).
7.2 Performance criteria goals.
7.3 Monitoring parameters table with practical quantitation limits (PQLs) and analytical methods.

7.3.1 Parameters Table

The monitoring parameters table should include all parameters that are likely or have a reasonable potential to be monitored by the CRC. For parameters that were not anticipated prior to QAPP approval, the CRC may submit an amended monitoring parameters table for approval

7.3.2 Quantitation Limits.

Laboratories must establish quantitation limits (QLs) that are reported with the analytical results; these may also be called reporting limits. These laboratory QLs must be less than or equal to the PQLs that are identified in the ILRP Monitoring and Reporting Program (MRP) requirements (Appendix A). The laboratories must have documentation to support quantitation at the required levels. Any modification in

reported QLs must be identified and discussed in the laboratory data report. For example, the reported QL for a measurement will change due to sample dilution. The dilution factor, reason for dilution, and other relevant information must be described in the data report.

Laboratories must also report analytical results with measurements equal to or higher than the Method Detection limit (MDL) and lower than the QL. These results must be reported as numerical values and qualified as estimated. Reporting such values as "trace" or "<QL" is not acceptable.

Each laboratory performing analyses for the ILRP program must routinely conduct MDL studies to establish the maximum sensitivity (lowest concentration detectable) for each chemical constituent (Appendix A), and to document that the MDLs are less than the PQLs. The MDL studies must be thoroughly documented and conducted in accordance with Revision 1.1, Code of Federal Regulations (CFR), Title 40, Part 136, Appendix B (1984), "Definition and Procedure for the Determination of the Method Detection Limit." New MDL studies should be conducted whenever there is a significant change in methods, reagent type or procedures, or within two years of the date the most recent study was conducted.

An MDL is developed from seven aliquots of a standard containing all analytes of interest spiked at approximately five times the expected MDL, which are taken through the analytical method sample processing steps. The data are then evaluated and used to calculate the MDL. If the calculated MDL is less than one-third the spiked concentration, the MDL study must be repeated using a lower concentration.

Project samples may not be analyzed and reported until the MDL study has been completed according to the CFR requirements. MDL study results must be available for review during audits, data review, or as requested. Current MDL study results must be reported at the beginning of every project for review and inclusion in project files.

If any analytes have MDLs that are higher than the project QLs, the following steps must be taken:

(a) Optimize the sensitivity of the analytical system (as allowed under the appropriate method), and perform a new MDL study sufficient to establish analyte identification at concentrations less than the project-specified QLs.
(b) If MDLs below required PQLs still could not be achieved for the required constituents using the methods identified in the MRP, the ILRP staff must be contacted. If an alternate method (accredited, modified or performance based) may be used to meet the desired MDLs, a written request to use that method must be provided to the ILRP. The request to use an alternate method must be approved by the Executive Officer and Quality Assurance Officer prior to sample analysis.
(c) If methods or laboratories that meet the QL requirements are not available, or cannot be feasibly accessed, a variance or exception to a specific QL may be requested in writing. Variances will only be approved on a case-by-case basis, and after consideration of the impact of the variance, and the documentation provided.

7.3.2 Quality control measurements.
The collection of samples and evaluation of data shall provide data that are representative, comparable, complete, precise, and accurate.

(a) Representativeness: Sampling locations should be selected that adequately represent all of the discharges from the farm/ranch, or project area, and the affected water bodies. Samples must also be collected during times and at locations that are representative and that meet the objectives described in the ILRP's MRP. Objectives include adherence to sampling Standard Operating Procedures (SOPs), holding times, decontamination procedures, etc.

(b) Comparability: Data collected under the ILRP must be comparable in content and quality to the statewide consistency goals outlined by the SWAMP program. An acceptable, approved MRP Plan and project QAPP ensures comparability with other State monitoring programs and projects.

(c) Completeness: Data completeness is defined as a measure of the amount of valid data obtained from a measurement system as compared to the planned amount, usually expressed as a percentage. Factors that affect data completeness include sample breakage during transport or handling, insufficient sample volume, laboratory error, QC failure and equipment failure. The dischargers should strive to meet a goal of 90% data completeness per sample batch (Appendix B) and must be calculated and reported with the completion of each monitoring report.

Project completeness can be divided into two areas: Field & Transport Completeness and Laboratory Completeness. Completeness goals should be applied to all aspects within these two areas to meet the 90% total requirement.

Field & Transport Completeness refers to the complete event process of successful planned site visit, conditions documentation, in-field measurements, sample collection technique and volume, in-field quality assurance and control sample preparation, chain-of-custody documentation, preservation, and successful transport of samples to the receiving agencies. Note that if a site is inaccessible or dry, the adequate documentation of these conditions through field sheets, photos, and other means meets the completeness goal for that site and event. Meeting this requirement does not supersede any further requirements outlined in the MRP order that would determine site re-visitation or site location changes.

Laboratory Completeness refers to the complete event process of sample reception, chain-of-custody documentation, storage and in-house preservation, extraction, analysis, and laboratory quality assurance and control samples and measures.

The Project must provide a narrative describing this assessment for each area as well as outline goals for improvement or maintenance of the 90% completeness requirement.

(d) Precision and Accuracy: The evaluation of precision and accuracy takes place at the analytical measurement level for values obtained both in the field and

in the laboratory. These are further defined in the Appendices of this document, and the calculations to determine the precision and accuracy values are described in Section IV.B.5 of this document.

8 SPECIAL TRAINING NEEDS/CERTIFICATION (USEPA Element 8)

The Special Training Needs/Certification element provides for information regarding any training that will be required for field, laboratory, and other project staff and states the individuals or organizations that are responsible for ensuring that the training is adequate and is completed. The Special Training Needs/Certification element must include the following components:

8.1 Identify project personnel with specialized training or certification.
8.2 Identify project field personnel training.
8.3 Identify QA manager and Training Officer.
8.4 Discuss renewal or how new training/certifications will be provided.
8.5 Discuss how training is provided.
8.6 Identify how training is documented.
8.7 Identify the location for staff training records.

All staff performing field, laboratory, data entry, and data quality assurance procedures shall receive training to ensure that the work is conducted correctly and safely. At a minimum, all staff shall be familiar with the field guidelines and procedures and the laboratory standard operating procedures (SOPs) included in the project QAPP. It is the responsibility of the CRC and project management to ensure that training is mandatory for all personnel, and that such training is documented through training certifications or records. The QA officer for the project is responsible for training but others may conduct training. These records must be maintained and updated for all participating field and laboratory staff.

Field personnel from all entities that conduct field sampling for the CRC must receive annual training from the designated Training Officer to ensure project-wide consistency of field methodologies and data quality.

9 DOCUMENTS AND RECORDS (USEPA Element 9)

The Documents and Records element describes the required documents and records necessary for project quality assurance, including the Project QAPP. The Documents and Records element must include the following components:

9.1 Identify reporting format as required by the MRP.
9.2 List all other project documents.
9.3 Discuss where project information will be kept and length of retention.
9.4 Discuss paper and electronic backup methods.
9.5 Discuss how documents will be updated and the responsible party for the update and distribution.
9. 6 Discuss how those on the distribution list will receive the most current version of the approved QAPP.

Copies of field logs, chain-of-custody forms (Section B.3), sample integrity forms for the contract and subcontract laboratories, original preliminary and final laboratory reports, and electronic media reports must be kept for review by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) ILRP staff. The project field crew must retain original field logs with copies submitted to ILRP staff. The project contract laboratory shall

retain original chain-of-custody forms and copies of the preliminary and final data reports for a period of no less than five years.

For each sampling event, the CRC shall provide the Central Valley Water Board Lead Staff with copies of the field data sheets, relevant pages of field logs, toxicity laboratory sheets (replicate and in house water quality data) including failed tests, and copies of the chain-of-custody (COC) forms for all samples submitted for analysis. At minimum, the following sample-specific information must be provided for each sampling event:

(a) Site name.
(b) Site code.
(c) GPS coordinates taken with each sampling event.
(d) Sample type, e.g. grab or composite type (Cross-sectional, flow-proportional, etc.).
(e) QC sample type and frequency.
(f) Date and time of sample collection (first sample taken).
(g) Results of field measurements.
(h) Sample preservation.
(i) Requested analyses (specific parameters or method references).
(j) Results of samples collected and all laboratory QC samples (calibrations, blanks, surrogates, laboratory spikes, matrix spikes, reference materials, etc.) and the identification of each analytical sample batch.
(k) Results of measurements for tests run prior to toxicity analyses, such as dissolved oxygen, temperature, electrical conductivity, hardness, and ammonia.
(l) A description of any unusual occurrences, noted by the field personnel, associated with the sampling event - particularly those that may affect sample or data quality.
(m) Any anomalies regarding sample condition noted by the laboratory.
(n) Report of any adjustments made to samples prior to running analyses, such as adjustments to dissolved oxygen, alkalinity, de-chlorination, or other.
(o) Records of exceedance reports or exception reports when results exceed standards or do not meet QC criteria.

For data connectivity purposes all samples taken at a site for one sample event should be assigned one designated sampling time. This time designation is the time assigned to the first sample collected, and must be consistent with the time assigned in the chain of custody, field data sheet, and laboratory report forms. An example of a field data sheet form including all the items described above is included in (Appendix C, Example Form I) at the end of this document.

In the case of field parameters that are continuously monitored through a data logger (e.g. EC, flow, DO, water temperature) field logs are still required as described in items (a) through (n) of this section. The field data should be submitted in the format example provided in Appendix C, Form I. A similar format to the example provided in Appendix C, that contains the required items (see above items (a) through (o)) might be submitted upon Regional Water Quality Control Board approval.

Before measuring field pH a daily check standard is required before the pH measurements are taken. This procedure will help demonstrate that the meter is within acceptable limits.

B. DATA GENERATION AND ACQUISITION

This section describes the elements that are necessary to complete the Data Generation and Acquisition component of the QAPP requirements.

1 SAMPLING PROCESS DESIGN (USEPA Element 10)

The Sampling Process Design element provides for discussion on the Project's data collection design in relation to the Project's objectives. This section should include a description of the monitoring approach as well as follow up methods when water quality problems are detected. The Sampling Process Design element must include the following:

1.1 Discuss the experimental and data collection design.
1.2 Discuss the rationale for the design.
1.3 Indicate the expected monitoring schedule for each monitoring location.
1.4 Discuss exceedance follow-up plan for each site.
1.5 Indicate the type and total number of samples, matrices, and runs/trials expected or needed for the project.
1.6 Indicate where samples should be taken, and how sites should be identified. A map may be included.
1.7 Describe the course of action should sampling sites became inaccessible.
1.8 Differentiate project data that is critical and data that is for informational purposes only.
1.9 Identify sources of natural variability and how their influence on project data can be minimized.
1.10 Identify potential sources of bias or misrepresentation, and describe how their contribution can be minimized.

The requirements in Sections B.1.5 through B.1.10 need to be described in the Project MRP Plan. The QAPP must identify the sections and pages where this information can be found in the specific MRP Plan.

2 SAMPLE COLLECTION METHODS (USEPA Element 11)

The Sample Collection Methods element provides for information regarding how samples will be collected consistently between all locations and by all sampling staff. The methods for sample collection preparation, physical collection, handling, and transportation must include measures to avoid contamination, ensure accurate tracking, and preserve sample integrity for analysis.

This element also includes a list of applicable field and laboratory Standard Operation Procedures (SOPs) identified by number, date, and regulatory citation. The identified SOPs must be attached to the QAPP as appendixes. Sample Collection Methods element must also include the following components:

2.1 Identify criteria for acceptable versus unacceptable water and sediment samples.
2.2 Identify pre-sample (Appendices D and E) collection preparation methods.
2.3 Identify sample collection method SOPs.
2.4 Identify sample container sizes, preservation, and transportation.
2.5 Discuss sampling equipment cleansing and decontamination.
2.6 Discuss corrective action measures for problematic situations.
2.7 Discuss, if applicable to the project, how samples are homogenized, composited, split, and/or filtered.
2.8 Describe field procedures including the following items:

(a) Photo documentation will occur during all monitoring events as well as GPS coordinates (actual coordinates at the time of sampling). Any changes, in monitoring locations, during monitoring events must be photo-documented and accompanied by GPS coordinates.
(b) Field personnel must be instructed in the proper collection of samples prior to the sampling event and in how to recognize and avoid potential sources of contamination.
(c) Field personnel must be able to distinguish acceptable versus unacceptable water and sediment samples in accordance with pre-established criteria.
(d) Sample containers must be pre-cleaned and certified to be free of contamination according to the USEPA specification for the appropriate methods.
(e) All field and sampling equipment that will come in contact with field samples must be decontaminated after each use in a designated area to minimize cross-contamination. These details (proper procedures for how and when to clean the equipment) must be specified in the sampling SOP.
(f) All samples must be identified with a unique number to ensure that results are properly reported and interpreted. Samples must be identified such that the site, sampling location, matrix, sampling equipment, and sample type (i.e., normal field sample or QC sample) can be distinguished by a data reviewer or user.
(g) A field activity coordinator must be responsible for ensuring that the field sampling team adheres to proper custody and documentation procedures. A master sample logbook or field datasheets shall be maintained for all samples collected during each sampling event.
(h) All field activities must be adequately and consistently documented to ensure defensibility of any data used for decision-making and to support data interpretation. Pertinent field information, including (as applicable), the width, depth, flow rate of the stream, the surface water condition, location of the tributaries, and the actual GPS coordinates where the sample was taken must be recorded on the field sheets, along with field measurements.

All sampling events must include flow information. When possible the USGS method should be used at all wadeable and nonwadeable stream sites for accurately determining flow during each specific monitoring event. If the USGS method cannot be used then flow measurements should be taken near the stream bank of the site or the float method can be used. The approximate location and number of stream flow measurements should be documented on the data sheets. Photo documentation should also be used at all sites for every sample event. Data files for flow data should contain a comment column that will allow a flag for flow measurements that have a high degree of uncertainty. Flow data with a high degree of uncertainty should not be used for pesticide (or other constituent) instantaneous loading calculations. More rigorous load calculations might be required for TMDL or other programs needs.

3 SAMPLE HANDLING AND CUSTODY (USEPA Element 12)

The Sample Handling and Custody element provides for a discussion of the sample integrity maintenance requirements as well as tracking and chain-of-custody procedures. The components of this element must describe the efforts that will be taken to ensure the physical and chemical integrity of a sample from collection to disposal.

Sample Handling Custody element must include the following components:

3.1 Identify sample holding times, integrity, and storage measures (both before and after extraction). See Appendices D and E for sample handling details.
3.2 Identify corrective action for samples that do not meet preservation and/or holding times (Appendix F).
3.3 Identify the physical transport of samples from the field.
3.4 Discuss sample handling and custody documentation.
3.5 Identify sample Chain-of-Custody procedures.
3.6 Identify the individuals responsible for verifying procedures.
3.7. Describe Field Custody Procedures including the following items:

(a) Sample custody must be traceable from the time of sample collection until results are reported. Sample custody procedures provide a mechanism for documenting information related to sample collection and handling.
(b) A chain-of-custody form must be completed after sample collection and prior to sample shipment or release. The chain-of-custody form, sample labels, and field documentation must be cross checked to verify sample identification, type of analyses, number of containers, sample volume, method of preservation, and type of containers.
(c) All sample shipments are accompanied with the chain-of-custody form, which identifies the contents. The original chain-of-custody form accompanies the shipment and a copy is retained in the project file.
(d) All shipping containers must be secured with chain-of-custody seals for transportation to the laboratory. The samples must be transported in ice to maintain sample temperature between 0-6 degrees Celsius. The samples must be sealed in zip lock bags and shipped to the contract laboratories according to Department of Transportation standard.
(e) Samples that do not meet preservation and/or holding times need to be re-sampled.

3.8. Chain of custody forms
Chain of custody forms should include the following items:
(a) Sampler name.
(b) Address (where the results need to be send).
(c) Ice chest temperature at log-in.
(d) To whom the laboratory results need to be sent.
(e) Lab storage.
(f) Sample identification.
(g) Analysis required.
(h) Number of containers of each type (i.e. plastic, glass, vial, whirlpak).
(i) Sample collection date and time.
(j) Comments/special instructions.
(k) Samples relinquished by (signature, print name, date).
(l) Samples received by (signature, print name, date).

3.9. Sample control activities
Sample control activities must be conducted at the laboratory as well as in the field. Project laboratory custody procedures must include the following conditions:

(a) Verify initial sample log-in and verification of samples received with the chain-of-custody form.
(b) Document any discrepancies noted during log-in on the chain-of-custody.

(c) Initiate internal laboratory custody procedure.
(d) Verify sample preservation (e.g., temperature).
(e) Notify the project coordinator if any problems or discrepancies are identified.
(f) Identify proper sample storage, including daily refrigerator temperature monitoring and sample security.

4 ANALYTICAL METHODS AND FIELD MEASUREMENTS (USEPA Element 13)

The Analytical Methods and Field Measurements element provides for information regarding the specific methods and procedures used to extract, analyze, and/or take measurements of the samples as well as the performance criteria. Analytical Methods and Field Measurements element must include the following components:

4.1 Identify methods and SOPs that will meet ILRP requirements.
4.2 Identify instrumentation and kits associated with field measurements and laboratory measurements.
4.3 Describe sample disposal procedures (or refer to Section B.4.1).
4.4 Identify method and instrument performance criteria, detection, and QLs.
4.5 Identify corrective action measures and documentation for test/measurement failure.
4.6 Describe how instruments should store and maintain raw data. Methods or SOPs may be referenced and attached to the QAPP.
4.7 Specify laboratory turnaround times needed.
4.8 Provide method validation and information for all non-standard SOPs and performance based methods (PBMs).
4.9 Indicate where PBMs development records are stored and how they can be accessed.

With the inclusion of the above components laboratory analyses discussion in the Project QAPP must also identify the following:

(a) Laboratory Corrective Actions

Corrective action measures should also be discussed in the event of instrument failure or performance criteria exceedances. Specific activities that will take place when a failure occurs must be discussed for chemical measurements, toxicity, and microbiological analyses. Project leads must ensure that the laboratory follow the corrective action procedures stated in their QAPP. At a minimum, the approach for corrective action should state the following in the Project QAPP:

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

(*b) Laboratory Calibration Curves*

Laboratory adjustments to calibration curves and also to recovery acceptance limits are method dependent. However, when these adjustments are changed during Project implementation, these changes need to be communicated to the ILRP Staff in order to ensure that new limits will meet the Program requirements.

For the ILRP Program, only calibration with a linear regression is acceptable for organic analyses. Non-linear calibration is not allowed due to the fact that using a non-linear option creates a potential for poor quantitation or biased concentrations of compounds at low or high concentrations (near the high and low ends of the calibration range). In order to conduct the linear regression, laboratories shall prepare an initial 5-point calibration curve, where the low level standard concentration is less than or equal to the analyte quantitation limits.

(c) Pesticide Analyses
Pesticide analyses must be conducted on unfiltered (whole) fractions of the samples. Prior to the analysis of any environmental samples, the laboratory must have demonstrated the ability to meet the minimum performance requirements for each analytical method. Initial demonstration of laboratory capabilities includes the ability to meet the Project specified quantitation limits (QL), the ability to generate acceptable precision and recoveries, and other analytical and QC parameters as stated in this document.

(d) Algae Toxicity Testing
Algae toxicity testing shall not be preceded with treatment of the chelating agent, EDTA. The purpose of omitting this reagent is to ensure that metals used to control algae in the field are not removed from sample aliquots prior to analysis.

(e) Sediment Toxicity Testing
The time frame for sediment sample collection, as well as a definition of a "Classified Storm Event" relevant to the project area, shall be described in Section A.6 Project Description of the QAPP. At the time of reporting sediment sample results (exceedance reports and/or SAMR), the project shall also detail the site conditions previous to the sampling event to aid in the analysis of those results. (i.e., details of the last storm in terms of duration and hydrographs or last irrigation details in terms of time, duration, flow and others).

Sediment samples shall be collected using a standardized methodology. Methodology to be used shall be identified and detailed in the Project QAPP Section B.2 Sample Collection Methods. Example protocols can be found in references Section V (USGS Guidelines, 1994).

Sediment samples shall be collected with overlying water present at a collection site. Sampling of dry sediment shall not be required, however alternative sampling events should be planned to meet the minimum sample collection requirements as outlined in the MRP.

Sampling conditions shall be documented in both the field notes and photographs for every successful and non-successful monitoring event (i.e., including planned events when the site is dry upon arrival). The documentation of field conditions at all attempted events aids the project in meeting completeness goals as outlined by the QAPP as well as establishes a continuous documented history of field conditions for monitoring locations.

(f) Alternative Analytical Methods
Analytical methods should be identified by number, date, and regulatory citation. Analytical methods used for chemistry analyses must follow a procedure approved by USEPA or

provided in Standard Methods for the Examination of Water and Waste Water 19th Edition. When there is a program need to analyze for contaminants that do not have USEPA or Standard Methods procedures, then United States Geological Survey (USGS), American Society of Testing Materials (ASTM), and Association of Official Analytical Chemist (AOAC) methods may be used by accredited laboratories.

If ILRP requirements are provided in the referenced documents, then laboratories may still achieve compliance by submitting a performance-based evaluation of their procedure for the Central Valley Water Board Executive Officer's approval. This will require a peer-reviewed published method or performance-based validation method based upon the protocol described by USEPA "Guide to Methods Flexibility and Approval of USEPA Water Methods" (USEPA, 1996).

Laboratory development of a performance-based method (PBM) validation package and Standard Operating Procedures (SOP) are required when analytes or quantification levels are outside the analyte list or differ by ten times the measurement levels stated in the published method. The validation package must include all data for the "Initial Demonstration of Laboratory Capability," which includes:

1. MDL studies (the analyst shall determine the MDL for each analyte according to the procedure in Code 40 of Federal Regulation (CFR) 136, Appendix B using the apparatus, reagents, and standards that will be used in the practice of this method).
2. Initial precision and recovery (IPR)
3. QC samples, where applicable
4. Linear calibration ranges

(g) References for Analytical Methods

The analysis of any material required by this Program shall be performed by a laboratory that has accreditation or certification pursuant to Article 3 (commencing with Section 100825) of Chapter 4 of Part 1 of Division 101 of the Health and Safety Code. General guidance for analytical methods is provided in a list of references in Section V of this document. Specific method modifications may be approved by the Executive Officer of the Central Valley Water Board if sufficient justification is provided.

5 QUALITY CONTROL (USEPA Element 14)

The QC element provides information regarding the QC activities that will take place for the Project. Definitions for all quality control samples described here are included in the Attachment B to the MRP Order. A summary table must be provided, which includes required and optional QC and the frequency. The QC summary table should address all sampling, measurement, and analysis techniques. The following must be included within the QC element of the Project QAPP:

(a) For Chemical Analyses

Field Duplicate and Field Blank

At a minimum, one field duplicate and one field blank must be included per sampling event. Analyses of field duplicates and field blanks must include all individual analytes intended to be measured from the successfully collected samples during an event. See Attachment B of the MRP Order for the definition of 'entity' for the ILRP.

Quality Control (QC) Set
At a minimum, one "QC Set" must be included per 20 samples or per analytical batch, whichever is more frequent. The minimum required samples for chemical analyses must include:

1. Matrix spike (MS) and matrix spike duplicate (MSD)
2. Reference material or laboratory control spike (LCS) and laboratory control spike duplicate (LCSD)
3. Laboratory blank

All samples must be submitted to the laboratory and preserved or extracted (if required) within appropriate holding times.

(b) For Toxicity Analyses in the Original Sample

Field Duplicate
At a minimum, one field duplicate must be included per sampling event. These samples must represent every type of bioassay organism tested for toxicity within the entire sampling event.

Quality Control (QC) Set
At a minimum, one "Laboratory QC Set" must be included per analytical batch. The minimum required samples for toxicity analyses must include:

1. Negative Control
2. Positive Control

All samples must be submitted to the laboratory and initialized within the appropriate holding times.

Optional QC samples that might be utilized by project management include travel blanks, equipment blanks, equipment blank/rinsate samples, and field split samples. Definitions for all quality control samples described here are included in Attachment B of the MRP Order.

All samples must meet the approved method-specific field (e.g., preservation, collection, holding time) and laboratory procedures (e.g., extraction, analysis). All data will be flagged, where appropriate, when quality control and assurance measures fall outside of the required limits.

If at any time a problem is detected within the field QC (e.g., blank contamination, RPD outside of recommended precision range), the CRC will attempt to identify the source of the problem and proceed with appropriate corrective actions. Corrective actions for field QC are described in the MRP Attachment C, Appendix F. However, more specific and appropriate correction actions may be required on a case-by-case basis.

5.1 Method blank specifications
Methods blanks, and all laboratories positive and negative controls for other media and analytes, should be conducted, when necessary (depending on the method), upon initiation of sampling.

Although laboratory blanks are important for all analyses, method blanks for low-level analyses can be conflictive. Improvements in analytical sensitivity have lowered detection limits down to the point where some amount of analyte may be detected in even the

cleanest laboratory blanks. In these circumstances, the magnitude of a contaminant found in blanks should be compared to the concentrations found in the samples. ***Subtracting method blank results from sample results is not permitted***. However, any blank contamination should be discussed with project management, and must be reported in the monitoring reports that are submitted to the ILRP Staff.

When laboratories obtain detectable concentrations of a specific analyte in the method blanks as part of their laboratory quality control, they need to re-extract and re-analyze in the following circumstances:

"METALS: If any analyte concentration in the method blank is above the PQL, the lowest concentration of that analyte in the associated samples must be 10 times the method blank concentration. Otherwise, all samples associated with that method blank with the analyte's concentration less than 10 times the method blank concentration and above the PQL must be re-digested and re-analyzed for that analyte. The sample concentration is not to be corrected for the method blank value.

ORGANICS: If any analyte concentration in the method blank is above the PQL, all samples associated with that method blank must be re-extracted and re-analyzed for that analyte. The exception to the above requirement is for common laboratory contaminants such as volatile solvents and phthalates where all samples associated with that method blank, with an analyte concentration less than 10 times the method blank concentration and above the PQL must be re-digested and re-analyzed for that analyte."

5.2 Matrix spike and spike duplicate specifications
An MS and MSD set must be prepared in the laboratory using sample water collected specifically by the project and be analyzed within the same analytical batch as the original samples. Certified Reference Materials shall be used to prepare MS. After measurement of the MS/ MSD, the Accuracy and Precision must be calculated and noted on the monitoring report and electronic record.

(a) Accuracy of MS Recovery is measured as the percent recovery and provides the accuracy of an analytical test measured against an analyte of known concentration that has been added to an actual field sample. Percent recovery for MS/MSD is calculated as follows:

$$\%\ Recovery = \left(\frac{V_{MS} - V_{Ambient}}{V_{Spike}} \right) x\ 100$$

Where:
V_{MS} = is the measured concentration of the spiked sample.
$V_{Ambient}$ = is the measured concentration of the original (unspiked) sample.
V_{Spike} = is the concentration of the spike added.

If the percent recovery for any analyte in the MS or MSD is less than the recommended warning limit, the chromatograms and raw data quantitation reports must be reviewed. Corrective action that is taken and verification of acceptable instrument response must be included in the cover letter discussion as well.

(b) Precision of the MS/MSD pair is measured as the RPD between two spiked samples and is calculated as follows:

$$RPD = \left| \frac{V_{MS} - V_{MSD}}{Mean} \right| x\,100 \quad \%$$

Where:
RPD = is the relative percent difference
V_{MS} = is the measured concentration for the matrix spike.
V_{MSD} = is the measured concentration of the matrix spike duplicate.
Mean = is the average of the two concentrations, calculated as follows:

$$Mean = \left[\left(V_{MS} + V_{MSD} \right) \Big/ 2 \right]$$

The Data Quality Objective (DQO) for Precision in MS/MSDs is 25% or less. If results for any analytes do not meet this DQO, calculations and instruments must be checked, and the analyst may be required to repeat the analysis to confirm the results. If the results repeatedly fail to meet the objectives indicating inconsistent homogeneity, unusually high concentrations of analytes, or poor laboratory precision, then the laboratory is obligated to:

- Halt the analysis of samples,
- Identify the source of the imprecision, and
- Make corrections where appropriate before proceeding.

If an explanation for a low or high percent recovery value is not discovered, the instrument response may be checked using a calibration standard. Low or high matrix spike recoveries may be a result of matrix interferences and further instrument response checks may not be warranted. An explanation for low or high percent recovery values for MS/MSD results must be discussed in a cover letter accompanying the data package to project management and included in the monitoring report to the Central Valley Water Board.

Failure to meet the designated QOs for MS and MSD is indicative of poor laboratory performance. In this case, the laboratory is obligated to halt the analysis of the samples and to identify the source of the problem and make corrections before proceeding.

5.3 Laboratory control spike and spike duplicate specifications
Laboratory Control Spike (LCS) & Laboratory Control Spike Duplicate (LCSD) provides information on the analytical accuracy, precision, and instrument bias. After measurements of the LCS and LCSD, the Percent Recovery (Accuracy) and Relative Percent Difference (Precision) must be calculated and noted on the report and electronic record.

(a) Accuracy as LCS Recovery is the measured as the test measured against the analyte of known concentration that had been added to laboratory purified water. Recovery for Laboratory Control Spikes is calculated as follows:

$$\%\ Recovery = \left(\frac{V_{LCS}}{V_{Spike}} \right) x\,100$$

Where:
V_{LCS} = is the measured concentration of the spike control sample.
V_{LCSD} = is the concentration resulting from the spike amount added.

If the percent recovery for any analyte in the LCS, LCSD is outside the recommended control limit, the chromatograms and raw data quantitation reports must be reviewed. Corrective action that is taken and verification of acceptable instrument response must be included in the cover letter discussion as well.

(b) Precision of the LCS/LCSD pair is measured as the RPD between two laboratory control samples, and is calculated as follows:

$$RPD = \left| \frac{V_{LCS} - V_{LCSD}}{Mean} \right| x100 \quad \%$$

Mean is the average of the results from the two LCS samples, calculated as follows:

$$Mean = \left[\left(V_{LCS} + V_{LCSD} \right) / 2 \right]$$

The Data Quality Objective (DQO) for Precision in LCS/LCSDs is 25% or less. If results for any analytes do not meet this DQO, calculations and instruments must be checked, and the analyst may be required to repeat the analysis to confirm the results. If the results repeatedly fail to meet the objectives indicating inconsistent homogeneity, unusually high concentrations of analytes or poor laboratory precision, then the laboratory is obligated to:

- Halt the analysis of samples,
- Identify the source of the imprecision, and
- Make corrections where appropriate before proceeding.

If an explanation for a low or high percent recovery value is not discovered, the instrument response may be checked using a calibration standard. Low or high matrix spike recoveries may be a result of matrix interferences and further instrument response checks may not be warranted. An explanation for low or high percent recovery values for LS/LSD results must be discussed in a cover letter accompanying the data package to project management and included in the monitoring report to the Central Valley Water Board.

Failure to meet the designated QOs for LS/LSD is indicative of poor laboratory performance. In this case, the laboratory is obligated to halt the analysis of the samples and to identify the source of the problem and make corrections before proceeding.

5.4 Test acceptability criteria for toxicity tests

Test acceptability criteria specified in the USEPA manuals (USEPA 2002) for acute and chronic toxicity tests are applicable to toxicity identification evaluations (TIEs) as well.

Decision Step 1: If the Control treatment meets all USEPA Test Acceptability Criteria (TAC), then proceed to statistical analyses for determination of the presence of statistically significant reductions in organism survival or algal growth. For samples that exhibit toxicity, the follow-up requirements in the ILRP MRP must be followed.

Proposed Decision Step 2a: If the control exhibits <90% survival, an acute test of a water sample exhibits 90-100% survival, and the program completeness standard is met (e.g., ≥90% of testing performed successfully to meet ILRP Completeness Objective), the test result should be "flagged" to denote <90% survival in the Control treatment. ILRP completeness must be evaluated with each submittal of Annual or Semi-Annual Monitoring Reports.

If an acute test of a water sample exhibits 90-100% survival, and the program completeness objective is not met, then a re-test of the original sample must be initiated within 24 hours of the observation of a Control treatment with <90% survival.

For the fathead minnow test, the laboratory must take the steps to procure test species within one working day, and the re-test must be initiated within one day of fish being available from a supplier. In all cases, both the original test results and the re-test results must be reported by the Project; the re-test results should be flagged to note that the re-test was initiated outside of the holding time limit. New samples must be collected within five working days of the laboratory identifying a second failure in TAC, if the re-test does not meet USEPA TAC.

Proposed Decision Step 2b: A water sample is not considered toxic if all of the following is true:

- The algal test control does not meet the USEPA TAC for variability (i.e., coefficient of variation >20%), and
- A water sample exhibits an algal cell density that is greater than the algal cell density in the control, and
- The average algal growth in the replicates does not overlap with that in the control (i.e., all test sample replicates exhibit greater algae growth than all control replicates), and
- The Program completeness objective is met.

If the program completeness objective is not met, then a re-test of the original sample must be initiated within 24 hours of the termination of the initial algal test. In all cases, both the original test results and the re-test results must be reported by the Project; the re-test results should be flagged to note that the re-test was initiated outside of the holding time limit. New samples must be collected if the re-test does not meet USEPA TAC.

If an algal test Control treatment does not meet the minimum growth TAC of ≥ 200,000 cells/mL, then a retest of the original sample must be initiated within 24 hours of the termination of the initial algal test. Both the original test results and the re-test results must be reported by the Project; the re-test results should be flagged to note that the re-test was initiated outside of the holding time limit. New samples must be collected within five working days of the laboratory identifying a second failure in TAC, if the re-test does not meet USEPA TAC.

Proposed Decision Step 3: If a Control treatment does not meet USEPA TAC, and the associated ambient water sample(s) have <90% survival (for an acute toxicity test) or the algal growth is less than the Control, then the Regional Board will be notified within 1 business day of the observation of the results in question so that an agreement can be reached regarding how to proceed. At a minimum, re-testing of the original sample within 24 hours of the observed test failure will be required and test results should be "flagged."

For the fathead minnow test, the laboratory must take the steps to procure test species within one working day, and the re-test must be initiated within one day of fish being available from a supplier. If re-testing does not begin within 24 hours, then re-sampling must be conducted within 48 hours of the observed test failure. Re-test results should be flagged to note that the re-test was initiated outside of the holding time limit. New samples must be collected within five working days of the laboratory identifying a second failure in TAC, if the re-test does not meet USEPA TAC.

Note: it is important to recognize that when re-testing a sample beyond the 36-hour holding time prescribed in the test method manual, there is a possibility that toxicity will be reduced or completely gone. In addition, when re-sampling at a site, the new sample does not represent the same conditions under which the original sample was collected (this is particularly important to note when sampling is meant to characterize a specific event such as stormwater runoff).

The reporting of data that do not meet USEPA TAC must also include an assessment from the laboratory as to what may have caused the test control performance issue, the laboratory's corrective measures to prevent future control failures, a comparison of the data against the USEPA test performance measures, and a comparison of the data against the ILRP required completeness criteria in the Project's QAPP.

5.5 Toxicity procedures - toxicity identification evaluation (TIE)

Water Column toxicity procedures and triggers for initiating TIEs are described in more detail in Section E.1 of the MRP. At a minimum, Phase I TIE procedures shall be conducted to determine the general class (e.g., metals, non-polar organics, and polar organics) of the chemical causing toxicity. Phase II TIEs may also be utilized to confirm and identify specific toxic agents. The TIE report to the Water Board must include a detailed description of the specific TIE procedures that were utilized. Some of the currently known and used TIE procedures are summarized in Appendix G.

5.6 Field duplicate specifications

A field duplicate or field split sample will be collected at the rate of one set per sampling event. The evaluation of field precision must be addressed in the project QAPP. QAPP acceptance criteria for laboratory precision shall be based only on laboratory-based duplicate samples such as duplicate matrix spikes, blank spikes, laboratory control materials, or certified reference materials. For bacterial analyses, no assessment of field precision is required but laboratories are required to meet methodological precision requirements. Field duplicates with failed results (RPD >25%) do not require re-sampling. However, this data should be flagged and field teams should be notified so that the source of error can be identified and corrective actions taken before the next sampling event.

If a field duplicate result is found to be over the water quality trigger limit an exceedance report must be submitted. Results for field samples and field duplicates must be reported independently and not be averaged for determining an exceedance of water quality trigger limits.

6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE (USEPA Element 15)

The Instrument/Equipment Testing, Inspection and Maintenance element provides for information regarding how personnel can assure that equipment will function properly when

needed, as well as the methods for recording equipment failure to track problematic units. The Instrument/Equipment Testing, Inspection, and Maintenance element must include the following components:

6.1 Identify field and laboratory equipment that require periodic maintenance and the schedule.
6.2 Identify equipment testing criteria and procedures.
6.3 Identify the individual(s) responsible for instrument/equipment testing, inspection, and maintenance.
6.4 Note the availability and location of spare parts.
6.5 Identify pre-use equipment inspection procedures.
6.6 Identify corrective action measures and documentation for equipment failure.

7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY (USEPA Element 16)
The Instrument/Equipment Calibration and Frequency element provides for information regarding how continual quality performance of equipment and instruments will be ensured. The Instrument/Equipment Calibration and Frequency element must include the following components:

7.1 Identify field and laboratory equipment that require calibration.
7.2 Identify the calibration procedure and schedule.
7.3 Identify calibration documentation methods.
7.4 Identify corrective action measures and documentation for equipment deficiencies.

Routine field instrument calibration must be performed at least once per day prior to instrument use to ensure instruments are operating properly and producing accurate and reliable data. Calibration should be performed at a frequency recommended by the manufacturer, if more frequent than once per day and in case of instrument failure. The calibration should be recorded within a field calibration log or directly on the corresponding field sheet.

8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES (USEPA Element 17)
The Inspection/Acceptance of Supplies and Consumables element provides for information regarding how supplies and consumables (e.g., standard materials and solutions, sample bottles, calibration gases, reagents, hoses, DI water, potable water, electronic data storage media) shall be inspected and accepted for use in the project if applicable. All stock standards and reagents used for extraction and standard solutions must be tracked through the laboratory. The preparation and use of all working standards must be recorded in bound laboratory notebooks that document standards traceable to USEPA, A2 LA or National Institute for Standards and Technology (NIST) criteria.

Records must have sufficient detail to allow determination of the identity, concentration, and viability of the standards including any dilutions performed to obtain the working standard. Date of preparation, analyte or mixture, concentration, name of preparer, lot or cylinder number, and expiration date, if applicable, must be recorded on each working standard. The Inspection/Acceptance of Supplies and Consumables element must include the following components:

8.1 Identify critical supplies and consumables for the field and laboratory.

8.2 Identify the source, acceptance criteria, and procedures for the tracking, storing, and retrieving of the above materials.
8.3 Identify the individual responsible for these tasks.

9 NON-DIRECT MEASUREMENTS (USEPA Element 18)
The Non-Direct Measurements element provides for identification and discussion of the types of data needed for project implementation or decision making that is obtained from non-measurement sources such as computer data bases, programs, literature files, and historical data bases. The Non-Direct Measurements element must include the following components:

9.1 Identify non-direct sources of data that will be used within the project.
9.2 Discuss the intended use of this information.
9.3 Identify the acceptance criteria for the data used.
9.4 Identify any required resources and support facilities (e.g. Data Logger, Controllers).
9.5 Describe the process by which the project determines limits to validity and operating conditions.

10 DATA MANAGEMENT (USEPA Element 19)
The Data Management element provides for a detailed discussion of the data management process, tracing the path of the data from their generation to their final use and storage.

Data generated shall be converted to a SWAMP comparable format and maintained by the responsible party and available for electronic data submission to the Central Valley Water Board staff. With the inclusion of the above requirement, the Data Management element must include the following components:

10.1 Identify the data management scheme from field to final use and storage for all data types.
10.2 Identify standard record keeping and tracking practices and the corresponding SOPs where applicable.
10.3 Discuss how field data and laboratory data will be entered or uploaded into the required data submission format.
10.4 Discuss the control mechanism for detecting and correcting errors and for preventing loss of data during data reduction, data reporting, and data entry to forms, reports, and/or database.
10.5 Identify the individual(s) responsible for data management.
10.6 Verify that continuous monitoring data will be stored in its original Sonde file.
10.7 Include any checklists or forms used in data management.

Procedures for data reduction with respect to significant figures must incorporate the following conventions:

A digit is significant if it is required to express the numerical value of a measurement. The number of significant digits in a measurement must be restricted by the least accurate of its input measurements. These input measurements include all of those associated with sample processing, including aliquots measured during sampling, preparation, and laboratory analysis.

Results of mathematical calculations shall have the same number of significant figures as the calculation's least precise input value. Results of addition and subtraction of measurements shall reflect the decimal position of the calculation's least precise input value. The number of

significant figures can vary during these calculations. The final digit in an expressed measurement inherently possesses an uncertainty. This is especially relevant in the discussion of MDLs and reporting limits (RLs). In these instances, the number of reported significant digits must realistically reflect the laboratory's analytical precision.

When the result of a calculation contains too many significant digits, it must be rounded. If a result's trailing digit is less than five, the last significant digit is not changed. If this trailing digit is equal to or greater than five, the last significant digit is rounded up.

C. ASSESSMENT AND OVERSIGHT

1 ASSESSMENT AND RESPONSE ACTIONS (USEPA Element 20)
The Assessments and Response Actions element provides information regarding how a project's activities will be assessed during the project to ensure that the QAPP is being implemented as approved. The Assessments and Response Actions element must include the following:

1.1 The number, frequency, and type of project assessment activities that will be conducted.
1.2 The individual(s) responsible for conducting assessments and indicate their authority to stop work as necessary.
1.3 How and to whom assessment information should be reported.
1.4 Corrective action measures and documentation for assessment conclusions.

For existing data use projects, data may be assessed to determine suitability for their intended use and to identify whether project specifications were met. Field operation audits, laboratory performance evaluations, and technical system audits should also be included in a project's assessment element. The Central Valley Water Board staff may also audit laboratories during sample analyses for this program.

The contractor should routinely observe field operations to ensure consistency and compliance with sampling specifications presented in this document and QAPP that will be developed later. An audit checklist should document field observations and activities.

Performance evaluation (PE) audits quantitatively assess the data produced by a measurement system. Performing an evaluation audit involves submitting certified samples for each analytical method. The matrix standards are selected to reflect the concentration range expected for the sampling program. Any problem associated with PE samples must be evaluated to determine the influence on field samples analyzed during the same time period. The laboratory must provide a written response to any PE sample result deficiencies.

A technical system audit is a quantitative review of a sampling or analytical system. Qualified technical staff members perform audits. The laboratory system audit results are used to review operations and ensure that the technical and documentation procedures provide valid and defensible data.

2 REPORTS TO MANAGEMENT (USEPA Element 21)
The Reports to Management element provides for information regarding how management will be kept informed of project oversight, assessment, activities, scheduling, and findings. The Reports to Management element must include the following components:

2.1 Identify which project QA status reports will be needed and frequency.
2.2 Identify individual(s) responsible for composing the reports and the individual/s who will receive and respond to the reports.

The element will identify those responsible for writing reports, when and how often these reports will be written, and identify who will be notified of audit findings. The element will also include the actions project management will take in response to the reports.

D. DATA VALIDATION AND USABILITY

1 DATA REVIEW, VERIFICATION AND VALIDATION (USEPA Element 22)
The Data Review, Verification, and Validation element provides the criteria used to review and validate data. These steps help ensure that the data satisfies the quality criteria detailed and required by the ILRP. The Data Review, Verification, and Validation element must include the following:

ASSESS THE CRITERIA USED TO VALIDATE PROJECT DATA (refer to element A.7)
Data must be consistently assessed and documented to determine whether project QOs have been met, quantitatively assess data quality, and identify potential limitations on data use. Assessment and compliance with QC procedures should be under-taken throughout the project to ensure the accuracy of sample collection, laboratory analysis, exceedance communications, and the submitted monitoring reports. Data communicated to Central Valley Water Board staff will be considered draft until the receipt of the monitoring report, which will include copies of signed laboratory data sheets.

The Project QAPP must be used to accept, reject, or qualify the data generated by the laboratory. The Project Manager shall convey the QA/QC acceptance criteria to the laboratory management. The laboratory management will be responsible for validating the data generated by the laboratory. The laboratory personnel must verify that the measurement process was “in control” (i.e., all specified data quality objectives were met or acceptable deviations explained) for each batch of samples before proceeding with analysis of a subsequent batch. In addition, each laboratory will establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data.

The laboratory will submit only data which have met QO’s, or which have deviations that are thoroughly evaluated and described, as final results. When QA requirements have not been met, the samples will be reanalyzed when possible and only the results of the reanalysis will be submitted, provided they are acceptable. The Project Manager will be responsible for determining if the validated laboratory data meets the project acceptance criteria.

After data entry or data transfer procedures are completed for each sample event, data should be inspected for data transcription errors, and corrected as appropriate. After the final QA checks for errors are completed, the data should be added to the final database.

Quality assurance checks shall be performed at a project level prior to submission within monitoring reports and electronic data submittals.

2 VERIFICATION AND VALIDATION METHODS (USEPA Element 23)

The Verification and Validation Methods element provides for the identification of methods or processes for verifying and then validating project information. The Verification and Validation Methods element must include the following components:

2.1 Identify the methods and processes used to verify and validate project data.
2.2 Identify the individual(s) responsible for verification and validation of each type of data (e.g., Field Logs, Chain-of-Custodies, Calibration Information, Completeness).
2.3 Identify documentation and or corrective action for discrepancies.
2.4 Attach any checklists, forms, and calculations that will be used.

The methods to be used or processes to be followed can be identified as SOPs, if available, or described in the text.

3 RECONCILIATION WITH USER REQUIREMENTS (USEPA Element 24)

The Reconciliation with User Requirements element provides for a discussion on how validated data will be evaluated to see if it answers the original questions asked within the monitoring objectives. The Reconciliation with User Requirements element must include the following components:

3.1 Discuss the procedures to evaluate the uncertainty of the validated data.
3.2 Discuss how limitations on data use should be reported to data users.

This element outlines the proposed methods to analyze the data and determine possible anomalies or departures from assumptions established in the planning phase of data collection. The element will also describe how reconciliation with user requirements will be documented, issues will be resolved, and how limitations on the use of the data will be reported to decision makers.

V REFERENCES

Church, P. E., G. E. Granato, and D. W. Owens. 1999. Basic requirements for collecting, documenting, and reporting precipitation and stormwater-flow measurements. United States Geological Survey. Report 99-255, Northborough, Massachusetts.

Guidelines for Collecting and Processing Samples of Stream Bed Sediment for Analysis of Trace Elements and Organic Contaminants for the National Water-Quality Assessment Program; Open-File Report 94-458; U.S. Geological Survey: Sacramento, CA, 1994.

Harrington, J. and M. Born. 2000. Measuring the health of California streams and rivers – A methods manual for water resource professionals, citizen monitors and natural resource students. Report. Sustainable Land Stewardship International Institute, Sacramento, California.

Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association, Water Environment Federation.

SWAMP 2002. Surface Water Ambient Monitoring Program. Quality Assurance Management Plan.

SWAMP 2006. Surface Water Ambient Monitoring Program. Draft Quality Assurance Management Plan.

U. S. Army Corps of Engineers 1981. Procedures for handling and chemical analysis of sediment and water samples. Report. Author: Plumb, R. H. 1981.

USEPA 2001. Laboratory Documentation Requirements for Data Evaluation (R9QA/004.1)

USEPA. 1983. Methods for Chemical Analysis of Water and Wastes. USEPA-600/4-79-020, Third edition.

USEPA.1988. Methods for Determination of Organic Compounds in Drinking Water (USEPA-600/4-88/039).

USUSEPA. 1998. Methods for Aquatic Toxicity Identification Evaluations. Phase I Toxicity Characterization Procedures. Office of Research and Development, Duluth, MN. USEPA-600-3-88-034.

USEPA. 1998. Methods for Aquatic Toxicity Identification Evaluations. Phase II Toxicity Identification Procedures. Office of Research and Development, Duluth, MN. USEPA-600-3-88-035.

USEPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition. Office of Water, Washington, D.C. USEPA-821-R-02-012.

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition. Office of Water, Washington, D.C. USEPA-821-R-02-013.

USEPA. 2001 (2006). USEPA Requirements for Quality Assurance Project Plans (QA/R-5) Office of Environmental Information, Washington, D.C. USEPA QA/R-5.

USEPA. 1994. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. Office of Research and Development, Washington, D.C. USEPA-600-R-94-024. Modifications to the procedure for *Hyallela azteca* with respect to the growth endpoint for may be requested in the Project QAPP. TRIGGERS FOCUS GROUP RECOMMENDATION.

USEPA. 1998. Methods for Aquatic Toxicity Identification Evaluations. Phase I Toxicity Characteristics Procedures. Office of Research and Development, Duluth, Minnesota. USEPA-600-3-88-034.

USEPA Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW 846.

APPENDIX A: LTMS ANALYTICAL REQUIREMENTS

Constituents, Parameters, and Tests	Analytical Methods	Reporting Limit	Reporting Unit
General Parameters			
Flow	USGS (R2 Cross streamflow Method)	1	cfs
pH	SM 4500 H+B, AS 3778 or USEPA 150.1	0.1	pH units
Electrical Conductivity	USEPA 9050A or 120.1	100	µmhos/cm
Dissolved Oxygen	SM 4500-O	0.1	mg/L
Temperature	SM 2550	0.1	° Celsius
Turbidity	SM 2130B or 180.1	1	NTUs
Total Dissolved Solids	SM 2540C or 160.1	10	mg/L
Total Suspended Solids	SM240D or 160.2	10	mg/L
Hardness	USEPA 200.7, 130.1, 130.2, SM 2340C	10	mg/L
Total Organic Carbon	SM 5310C, USEPA 415.1, 415.2	0.5	mg/L
Aquatic Toxicity			
Algae -*Selenastrum capricornutum*	USEPA-821-R-02-013	NA	Cell/ml and % Growth
Water Flea - *Ceriodaphnia dubia*	USEPA 821-R-02-012	NA	% Survival
Fathead Minnow - *Pimephales promelas*			% Survival
Toxicity Identification Evaluation	USEPA-600-3-88-034 and 600-3-88-0355	NA	Stressor Type
Pesticides			
As determined by Pesticide Evaluation Report; may include the following			
Herbicides			
Carfentrazone ethyl	--	--	--
Clomazone	--	--	--
Glyphosate	USEPA 547	5	µg/L
Pendimethalin	--	--	--
Penoxsulam	--	--	--
Propanil	USEPA 632.1	0.5	µg/L
Triclopyr TEA	--		
Metals			

Constituents, Parameters, and Tests	Analytical Methods	Reporting Limit	Reporting Unit
Copper (total and dissolved)	USEPA 200.7, 200.8, 213.2, 6020, SM 3113, 3113B, or Modified USGS 1996	0.5	µg/L
Zinc (total and dissolved)	USEPA 200.7, 200.8, 289.2, 6020, 1639, SM3113B, or Modified USGS 1996	1	µg/L
Nutrients			
Total Kjeldahl Nitrogen	USEPA 351 or SM 4500-NH_3	0.5	mg/L
Nitrate plus Nitrite as Nitrogen	USEPA 300, 300.1 351.3, 353.2,or SM 4500	0.05	mg/L
Total Ammonia	USEPA 350 or SM4500 NH_3	0.1	mg/L
Unionized Ammonia (calculated value)			
Total Phosphorous (as P)	USEPA 365.1, 365.4, or SM 4500-P	0.01	mg/L
Soluble Orthophosphate	USEPA 300.1, 365.1, or SM 4500-P	0.01	mg/L
SEDIMENT SAMPLING			
Sediment Toxicity			
Hyalella Azteca	USEPA 600-R-99-064	NA	% Survival
Pesticides			
Cyhalofop butyl	--	--	--
S-Cypermethrin	"	1.0	ng/g
Lambda-Cyhalothrin	"	1.0	ng/g
Permethrin	"	1.0	ng/g
Other sediment parameters			
TOC	USEPA 415.1, USEPA 9060, Wakley Black, and SW-846	200	mg/kg

a The method reporting limits (MDLs) and Program Reporting Limits (ILRP RLs) are reasonable goals in terms of laboratory availability and capability, and Project Groups should strive to meet them. If the Project Group contract laboratory proposes alternative methods or RLs, the proposed alternatives and rationale for the changes must be detailed in the QAPP. Any alternative RL must be approved by the Executive Officer prior to use.

b Sampling sites that are selected at waterbodies that are direct tributaries to CWA 303(d) listed waterbodies must be monitored for those listed constituents where they are attributed in the CWA 303(d) list as resulting from agriculture, or if the source is unknown.

c. The sampling volume submitted to the laboratory shall be of sufficient volume to allow for a TIE, if results show TIE is required.

d. Assuming 1% organic carbon.

e. Chloride is only required to be sample in the areas where the Water Quality Control Plan for the Tulare Lake Basin applies.

APPENDIX B: SUMMARY TABLE OF QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Group	Parameter	Element 7 Requirements			
		Accuracy	Precision	Recovery	Completeness
Field Testing	Dissolved Oxygen	± 0.5 mg/L	± 0.5 or 10%	NA	90%
	Temperature	± 0.5 °C	± 0.5 or 5%	NA	90%
	Conductivity	± 5 %	± 5%	NA	90%
	pH by Meter	± 0.5 units	± 0.5 or 5%	NA	90%
	Turbidity	± 10% or 0.1%, whichever is greater	± 10% or 0.1 %, whichever is greater	NA	90%
Laboratory Analyses	Conventional Constituents in Water (Additionally see Table II)	Standard Reference Materials (SRM, CRM, PT) within 95% CI stated by provider of material. If not available then with 80% to 120% of true value	Laboratory duplicate, Blind Field duplicate, and MS/MSD ± 25% RPD if Result >10X the MDL. Laboratory duplicate minimum.	Matrix spike 80% - 120% or control limits at ± 3 standard deviations based on actual lab data.	90%
	Synthetic Organic Analytes (including PCBs, PAHs, pesticides)	Standard Reference Materials (SRM, CRM, PT) within 95% CI stated by provider of material. For LCS and LCSD 50% to 150% of true value.	Field duplicate, MS/MSD, and LCS/ LCSD ± 25% RPD, if Result > 10X the MDL. Minimum requirements are: field duplicate, MSD, and LCD. .	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	90%
	Trace metals in water, including mercury	Standard Reference Materials (SRM, CRM, PT) 75% to 125%.	Field duplicate, laboratory duplicate, and MS/MSD ± 25% RPD, if Result >10X the MDL.	Matrix spike 75% - 125%.	90%
	Organic compounds (PCBs, PAHs, pesticides) in sediment and semi-volatiles & volatiles in sediment only	Standard Reference Materials (SRM, CRM, PT) within 95% CI stated by provider of material. If not available then with 50% to 150% of true value	Field duplicate, MS/MSD, and LCS/ LCSD ± 25% RPD. Minimum requirements are: field duplicate, MSD, and LCD.	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	90%
	Trace metals (including mercury) in sediment	Standard Reference Materials (SRM, CRM, PT) 75% to 125%.	Field duplicate, laboratory duplicate, MS/MSD, and LCS/LCSD ± 25% RPD, if Result > 10 X the MDL except Hg in sediment at ± 35%. Minimum requirements are: field duplicate, MSD, and LCD.	Matrix spike 75% - 125%.	90%
	Total organic carbon in sediment and sediment grain size	CRM within the 95% CI stated by the provider. Laboratory Control Material (LCM) ± 20% to 25% of stated value. No accuracy criteria for grain size.	Duplicate within ± 20% if Result > 10X the MDL	± 25% recovery (75% - 125%)	90%
	Bacteria/ Pathogens	Laboratory positive and negative cultures - proper positive or negative response. Bacterial PT sample --within the stated acceptance criteria.	Rlog within 3.27*mean Rlog (reference is section 9020B of 18th, 19th, or 20th editions of Standard Methods	NA	90%
	Toxicity testing	Meet all performance criteria in methd relative to reference toxicant.	Meet all performance criteria in method relative to sample replication.	NA	90%
	Trace Methylmercury in Water	Because no Standard Reference Material for methylmercury in water is available, samples of the tissue SRM DORM-2 are analyzed with the water samples to assess accuaracy. Data Quality Objectives are 70-130% of true value.	Field Duplicate or Digestion Duplicate ± 25% RPD, if Result > 10X the MDL. MS/MSD ± 25% RPD	Matrix spike 75% - 130%.	90%

APPENDIX C: FORM TEMPLATES
EXAMPLE FORM I (a): FIELD DATA SHEET FORM INCLUDING ALL THE MINIMUM ITEMS REQUIRED.

Irrigated Lands Conditional Waiver Program

Coalition:

Section A
Page____of____
Date:_____

Site Name _____
Site Code _____
Sampling Crew Names _____
(first initial and last name)
Wadeability: yes / no

Time for the first Sample Taken _____
Monitoring Event: _____
Comments: _____

GPS Position	Lat (dd.ddddd)	Long (dd.ddddd)
GPS/DGPS		
Target		
Actual		
GPS Model		

Section B

FIELD OBSERVATIONS	**CIRCLE YOUR OBSERVATIONS**
Dominant Substrate	Concrete,Cobble,Gravel,Sand,Mud,Other
Site Odor	None,Sulfides,Sewage,Petroleum,Mixed,Other
Other Presence	Vascular,Nonvascular,OilySheen,Foam,Trash,Other
Water Odor	None, Sulfides, Sewage, Petroleum, Mixed, Other
Water Clarity	Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)
Water Color	Clear, brown, green, Grey
Sky Code	Clear, Partly Cloudy, Overcast, Fog, Hazy
Precipitation	None, Foggy, Drizzle, Rain
Precipitation (last 24 hrs)	Unknown, <1", >1", None

PROBE MEASUREMENTS **Section C**

	Flow (cfs)	**pH**	**Electrical Conductivity (uS/cm)**	**DO (mg/L)**	**Water Temp (°C)**	**Turbidity (NTU)**	
Measurement							
Instrument							
Calibration Date							

SAMPLES TAKEN (# of containers filled) **Section D**

	Physical Parameters (Inorganics) 2 x 1L Plastic*	Total Organic Carbon (TOC) 1 x 40 ml vials*	Nutrients (Inorganics) 1 x 1L Plastic*	Metals (Inorganics) 1 x 60 mL Plastic*	Hardness 1 x 250 mL Plastic*	Pesticides Collected (1 L amber bottles)				
Samples										
Duplicate										
Blank										
Matrix Spike										
Total # Containers										

(*) Modified by using the specific characteristics of the containers that are being used

Preserved time and conditions	

EXAMPLE FORM I (b): FIELD DATA SHEET FORM INCLUDING ALL THE MINIMUM ITEMS REQUIRED.

Irrigated Lands Conditional Waiver Program

Coalition:

Page____of____
Date:_____

Section A

Site Name _____ Time for the first Sample Taken _____
Site Code _____
Sampling Crew Names _____ Monitoring Event: _____
(first initial and last name)
Wadeability: yes / no Comments: _____

GPS Position Same as Water Quality Sample? YES / NO	Lat (dd.ddddd)	Long (dd.ddddd)
GPS/DGPS		
Target		
Actual		
GPS Model		

Section B

FIELD OBSERVATIONS	**CIRCLE YOUR OBSERVATIONS**
Sediment Composition	Coarse Sand, Fine Sand, Silt/Clay, Cobble, Gravel, Mixed, Hard Pan Clay,Other
Sediment Odor	None,Sulfides,Sewage,Petroleum,Mixed,Other
Other Presence	Vascular,Nonvascular,OilySheen,Foam,Trash,Other
Water Odor	None, Sulfides, Sewage, Petroleum, Mixed, Other
Water Clarity	Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)
Water Color	Clear, brown, green, Grey
Sky Code	Clear, Partly Cloudy, Overcast, Fog, Hazy
Precipitation	None, Foggy, Drizzle, Rain
Precipitation (last 24 hrs)	Unknown, <1", >1", None
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

Section C

SAMPLES TAKEN (# of containers filled)

	Toxicity	Pyrethroids	Chlorpyrifos *	TOC	Grain Size		
Samples							
Duplicate							
Matrix Spike	Non Applicable			Non Applicable	Non Applicable		
Total # Containers							

(*) Preserved time and conditions

EXAMPLE FORM II: DISCHARGE FIELD DATA SHEET FORM FOR OBTAINING FLOW MEASUREMENTS.

Irrigated Lands Program

Discharge Field Sheet

Name (Coalition , Individual, water District): _____

Date _____
Sampling Crew _____
Site Code _____
Site Name _____
Method (circle one) wading/ other (specify) _____
Record units of the meter on sheet _____
Comments _____

Right Edge Water (REW) _____
Left Edge Water (LEW) _____
Total lWidth _____
Start Time (24 hr) _____
Ending Time (24 hr) _____
Spin test (# Sec) _____

Number of measurements	Angle (only for discharge of bridge)	Numbers on measuring tape (meters/feet)	Observation depth from water surface (0.2, 0.6, 0.8)	Revolutions/ velocity

EXAMPLE FORM III: CHAIN OF CUSTODY FORM AND THE MINIMUM ITEMS NEEDED

REQUEST FOR ANALYSIS AND CHAIN OF CUSTODY RECORD Page___of___

Name (Customer)	Send Results To																		BatchID			
Address (Customer)																			LabStorage (refrigerator or freezer number)			
City	Phone Number																					
Ice Chest Temperature at Log-in	Analysis Requested		Physical Parameters	Nutrients	Pathogens	THM's	Trace Elements	Hardness	Water Column Toxicity	Sediment Toxicity	TOC	Others (specify)	OCH Pesticides	OP Pesticides	Pyrethroids	Carbamates	Herbicides (specify)	Others (Specify)	Number of Containers			
Sample identification	Collection																		Plastic	Glass	Vial	WhirlPak
	Date	Time																				
Comments/Special Instructions																						

Samples Reliquished By (signature)	Print Name	Date	Received By (signature)	Print Name	Date

APPENDIX D: SUMMARY OF SAMPLE CONTAINER, VOLUME, INITIAL PRESERVATION, AND HOLDING TIME RECOMMENDATIONS FOR WATER SAMPLES

Parameters for Analysis in WATER Samples	Recommended Containers (all containers pre-cleaned)	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time (analysis must start by end of max)
Conventional Constituents in Water				
Alkalinity	Polyethylene bottles (see **NOTE**[(1)] below)	100 ml	Cool to 6°C, dark	14 days at 6°C, dark
Chloride (Cl), Sulfate (SO_4) and Fluoride (F)	"	300 ml	"	28 days at 6°C, dark
Ortho-phosphate (OPO_4)	"	150 ml	"	48 hours at 6°C, dark
Nitrate + Nitrite ($NO_3 + NO_2$)	"	150 ml	"	48 hours at 6°C, dark
Total Keldjahl Nitrogen (TKN)	"	600 ml	"	Recommend: 7 days Maximum: 28 days Either one at 6°C, dark
Total Dissolved Solids (TDS)	"	1000 ml	"	7 days at 6C, dark
Ammonia (NH_3)	"	500 ml	"	48 hours at 4C and in the dark or if acidified 28 days at 6°C and in the dark
Total Phosphorus (TPO_4)	"	300 ml	"	28 days at 6°C, dark
Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC)	"	40 ml (one vial)	"	28 days at 6°C, dark
Total Suspended Solids (TSS)	"	1000 ml (two jars)	"	7 days at 6°C, dark
Trace Metals in Water Samples				
Dissolved Metals (except Dissolved Mercury)	60 ml polyethylene bottle, pre-cleaned in lab using HNO_3	60 ml (one bottle) if salinity <0.5 ppt 180 ml (three bottles) if	Filter at sample site using 0.45 micron in-line filter, or syringe filter. Cool to 6°C, dark. Acidify in lab, within 24 hrs, using pre-acidified container (ultra-pure HNO3 for pH<2)	Once sample is filtered and acidified, can store up to 6 months at room temperature
Dissolved Mercury	250 ml glass or Teflon bottle, pre-cleaned in lab using HNO_3	250 ml (one bottle)	Cool to 6°C, dark. Filter in lab within 48 hours, using bench top Hg filtration apparatus. Acidify in lab within 48 hrs, with pre-tested HCL to 0.5%	Once sample is filtered and acidified, can store up to 6 months at room temperature
Dissolved Methylmercury	250 ml glass or Teflon bottle	250 ml (one bottle)	Cool to 6°C, dark. Filter in lab within 48 hours, using bench top Hg filtration apparatus. Acidify in lab within 48 hrs, with pre-tested HCL to 0.5%.	Once sample is filtered and acidified, can store up to 6 months at room temperature
Total Metals (except Total Mercury)	60 ml polyethylene bottle, pre-cleaned in lab using HNO_3	60 ml (one bottle) if salinity <0.5 ppt 180 ml (three bottles) if salinity >0.5 ppt	Cool to 6°C, dark. Acidify in lab within 48 hrs, with pre-acidified container (ultra-pure HNO_3), for pH<2	Once sample is acidified, can store up to 6 months at room temperature
Total Mercury	250 ml glass or Teflon bottle, pre-cleaned in lab using HNO_3	250 ml (one bottle)	Cool to 6°C, dark. Acidify in lab within 48 hrs, with pre-tested HCL to 0.5%	Once sample is acidified, can store up to 6 months at room temperature
Methylmercury	250 ml glass or Teflon bottle	250 ml (one bottle)	Cool to 6°C, dark. Filter in lab within 48 hours, with pre-tested HCL to 0.5%	Once sample is filtered and acidified, can store up to 6 months at room temperature
Hardness	200 ml polyethylene or glass bottle	200 ml (one bottle)	Cool to 6°C, dark OR Filter and add 2 ml conc. H_2SO_4 or HNO_3 to pH < 2; Cool to 4°C, dark	48 hours at 6°C, dark 6 months at 6°C, dark

(1)NOTE:
The volume of water necessary to collect in order to analyze for the above constituents is typically combined in four 1-liter polyethylene bottles, which also allows enough volume for possible re-analysis and for conducting lab spike duplicates. This is possible since the same laboratory is conducting all of the above analyses; otherwise, individual volumes apply.

APPENDIX D: SUMMARY OF SAMPLE CONTAINER, VOLUME, INITIAL PRESERVATION, AND HOLDING TIME RECOMMENDATIONS FOR WATER SAMPLES

Parameters for Analysis in WATER Samples	Recommended Containers (all containers pre-cleaned)	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time (analysis must start by end of max)
Synthetic Organic Compounds in Water Samples				
PESTICIDES & HERBICIDES* □Organophosphate Pesticides □Organochlorine Pesticides □Chlorinated Herbicides	1-L amber glass bottle, with Teflon lid-liner (per each sample type)	1000 ml (one container) *Each sample type requires 1000 ml in a separate container	Cool to 6°C, dark If chlorine is present, add 0.1g sodium thiosulfate	Keep at 6°C, dark, up to 7 days. Extraction must be performed within the 7 days; analysis must be performed within 40 days of extraction
Toxicity Testing Water Samples				
Toxicity in water	Four 2.25 L amber glass bottles (recommended volume 4 gallons)	9000 ml	Cool to 6°C, dark	36 hours at 6°C, dark
Toxicity Testing Water Samples				
E. Coli	Factory-sealed, pre-sterilized, disposable Whirl-pak® bags or 125 ml sterile plastic (high density polyethylene or polypropylene) container polyethylene or polypropylene) container	100 ml volume sufficient for both E. coli	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 6°C; dark.	STAT: 24 hours at 6°C, dark; lab must be notified well in advance
Fecal Coliform	Factory-sealed, pre-sterilized, disposable Whirl-pak® bags or 125 ml sterile plastic (high density polyethylene or polypropylene) container	100 ml volume sufficient for both fecal and total coliform analyses	Sodium thiosulfate is pre-added to the containers in the laboratory (chlorine elimination). Cool to 6°C; dark	STAT: 24 hours at 6°C, dark; lab must be notified well in advance

APPENDIX E: SUMMARY OF SAMPLE CONTAINER, VOLUME, INITIAL PRESERVATION, AND HOLDING TIME RECOMMENDATIONS FOR BED SEDIMENT SAMPLES

Parameters for Analysis in WATER Samples	Recommended Containers	Typical Sample Volume (ml)	Initial Field Preservation	Maximum Holding Time
Bed Sediment Samples				
Synthetic Organic Compounds	250 ml amber glass jar with Teflon lid-liner; Pre-cleaned	500 ml (two jars)	Cool to 6 ºC, dark, up to 48 hours	12 months(1) (-20 ºC)
Sediment TOC	125 ml(2) clear glass jar; Pre-cleaned	125 ml (one jar)	Cool to 6 ºC, dark, up to 48 hours	12 months(1) (-20 ºC)
Sediment Grain Size	125 ml(2) clear glass jar; Pre-cleaned	125 ml (one jar)	Cool to 6 ºC, dark, up to 28 days	28 days (4 ºC) *Do not freeze*
Sediment Toxicity Testing	1-Liter wide-mouth olyethylene jar with Teflon lid-liner; Pre-cleaned"	2-Liters (two jars filled completely)	Cool to 6 ºC, dark, up to 14 days	14 days (4 ºC) *Do not freeze*

(1) Sediment samples for Synthetic Organic Compounds and Sediment TOC analysis must be frozen at minus (-) 20 ºC within the initial 48 hours of sample collection. During the initial 48 hours, samples must be kept at 6 ºC until they are frozen. Once frozen, samples may be stored for a maximum time period of 12 months at minus (-) 20 ºC. After thawing, the samples must be extracted within 48 hours and must be analyzed within 40 days.

(2) Sediment samples for TOC AND grain size analysis can be combined in one 250 ml clear glass jar, and sub-sampled at the laboratory in order to utilize holding time differences for the two analyses. If this is done, the 250 ml combined sediment sample must be refrigerated only (not frozen) at 6 ºC for up to 28 days, during which time the sub-samples must be aliquoted in order to comply with separate storage requirements (as shown above).

APPENDIX F: CORRECTIVE ACTIONS

ILRP CONTROL SAMPLES – ORGANIC COMPOUNDS	
Laboratory Quality Control	**Required Corrective Actions for Failures**
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.
Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last acceptable continuing calibration verification must be reanalyzed.
Laboratory Blank LAB ROUND TABLE RECOMMENDATION 3.0	If any analyte concentration in the method blank is above the PQL, all samples associated with that method blank must be re-extracted and re-analyzed for that analyte. The exception to the above requirement is for common laboratory contaminants such as volatile solvents and phthalates, where all samples with an analyte concentration less than 10 times the method blank concentration and above the PQL must be re-digested and re-analyzed for that analyte.
Reference Material/LCS/LCSD	Affected samples and associated quality control must be reanalyzed if acceptance criteria are exceeded.
Matrix Spike	Results should be reviewed to evaluate matrix interference. If matrix interference is suspected, and reference material recoveries are acceptable, the matrix spike and the matrix spike duplicate result must be qualified.
Matrix Spike Duplicate	Appropriately spiked results should be compared to the matrix spike and evaluated for matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.
Laboratory Duplicate	For duplicates with a heterogeneous matrix and/or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.
Internal Standard	The instrument must be flushed with rinse blank. If, after flushing, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.
Surrogate	If holding times prevent reanalysis, affected results should be qualified. The analytical method or quality assurance project plan must detail procedures for updating surrogate measurement quality objectives.
Field Quality Control	**Required Corrective Actions for Failures**
Field Duplicate	For duplicates with a heterogeneous matrix and/or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the sampling team so that the source of error can be identified and corrective measures taken before the next sampling event.
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.
Periodic Quality Control	**Required Corrective Actions for Failures**
Method Detection Limit Study	If results do not meet analytical method requirements and the requirements of 40 CFR Part 136 Appendix B, a new MDL study must be performed before sample analysis begins. Participants wishing to exceed mandated method detection limits or reporting limits must obtain written prior to sample analysis.
Proficiency Test, Intercomparison	Results should be subjected to troubleshooting and/or reanalysis. If allowed by the vendor or referee, results may be resubmitted. To further examine the analytical failure, a follow-up proficiency test or intercomparison study should be completed as soon as possible.

APPENDIX F: CORRECTIVE ACTIONS

ILRP CONTROL SAMPLES – TRACE METALS AND CONVENTIONAL ANALYTES	
Laboratory Quality Control	**Required Corrective Actions for Failures**
Calibration Standard	Affected samples and associated quality control must be reanalyzed following successful instrument recalibration.
Continuing Calibration Verification	The analysis must be halted, the problem investigated, and the instrument recalibrated. All samples after the last acceptable continuing calibration verification must be reanalyzed.
Laboratory Blank LAB ROUND TABLE RECOMMENDATION 3.0	If any analyte concentration in the method blank is above the PQL, all samples associated with that method blank must be re-extracted and re-analyzed for that analyte. The exception to the above requirement is for common laboratory contaminants such as volatile solvents and phthalates, where all samples with an analyte concentration less than 10 times the method blank concentration and above the PQL must be re-digested and re-analyzed for that analyte. The sample concentration is not to be corrected for the method blank value.
Reference Material/LCS/LCSD	Affected samples and associated quality control must be reanalyzed if acceptance criteria are exceeded.
Matrix Spike	Results should be reviewed to evaluate matrix interference. If matrix interference is suspected, and reference material recoveries are acceptable, the matrix spike and the matrix spike duplicate result must be qualified.
Matrix Spike Duplicate	Appropriately spiked results should be compared to the matrix spike and evaluated for matrix interference. If matrix interference is suspected and reference material recoveries are acceptable, the matrix spike duplicate result must be qualified.
Laboratory Duplicate	For duplicates with a heterogeneous matrix and/or ambient levels below the reporting limit, failed results may be qualified. Other failures should be reanalyzed as sample volume allows.
Internal Standard	The instrument must be flushed with rinse blank. If, after flushing, the responses of the internal standards remain unacceptable, the analysis must be terminated and the cause of drift investigated.
Surrogate	If holding times prevent reanalysis, affected results should be qualified. The analytical method or quality assurance project plan must detail procedures for updating surrogate measurement quality objectives.
Field Quality Control	**Required Corrective Actions for Failures**
Field Duplicate	For duplicates with a heterogeneous matrix and/or ambient levels below the reporting limit, failed results may be qualified. All failures should be communicated to the sampling team so that the source of error can be identified and corrective measures taken before the next sampling event.
Field Blank, Travel Blank, Equipment Blank	If contamination of the field blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the sampling team so that the source of contamination can be identified and corrective measures taken prior to the next sampling event.
Periodic Quality Control	**Required Corrective Actions for Failures**
Method Detection Limit Study	If results do not meet analytical method requirements and the requirements of 40 CFR Part 136 Appendix B, a new MDL study must be performed before sample analysis begins. Participants wishing to exceed mandated method detection limits or reporting limits must obtain written prior to sample analysis.
Proficiency Test, Intercomparison	Results should be subjected to troubleshooting and/or reanalysis. If allowed by the vendor or referee, results may be resubmitted. To further examine the analytical failure, a follow-up proficiency test or intercomparison study should be completed as soon as possible.

APPENDIX F: CORRECTIVE ACTIONS

ILRP CONTROL SAMPLES – FIELD PARAMETERS	
Field Measurement	**Required Corrective Actions for Failures**
Depth, Dissolved Oxygen, pH, Salinity, Specific Conductance, Temperature, Turbidity, Velocity	The instrument should be recalibrated following its manufacturer's cleaning and maintenance procedures. If measurements continue to fail measurement quality objectives, affected data should not be reported and the instrument should be returned to the manufacturer for maintenance. All troubleshooting and corrective actions should be recorded in the calibration and field data logbooks
ILRP CONTROL SAMPLES – TOXCITY TESTING	
Negative Controls	**Required Corrective Actions for Failures**
Laboratory Control Water	See Toxicity Trigger's Focus Group Recommendation 8
Conductivity Control Water	Flag the data for samples with similar electrical conductivities (EC) and for the EC control and ensure that EC was within the species tolerance range.
Additional Control Water (Method Blank)	Flag the data for samples affected or compared to the failed method blanks.
Positive Controls	**Required Corrective Actions for Failures**
Reference Toxicant Tests	Immediately re-set up within 48 hours of failure and investigate source of failure.
Field Quality Control	**Required Corrective Actions for Failures**
Field Duplicate	Flag the data for samples affected and the source of the failure should be identified to prevent future failures. All QC failures should be reported immediately. If QC samples do not meet completeness criteria the data will be flagged

APPENDIX G: TOXICITY EVALUATION IDENTIFICATION PROCEDURES

Phase I Procedures	*Ceriodaphnia*	*Selenastrum*	*Pimephales*	Purpose of Procedure
Addition of piperonyl butoxide	X	NA	NA	Inactivates metabolically activated organophosphorous compounds. Increases toxicity of pyrethroids insecticides.
Aeration	X	X	X	Remove volatile chemicals, surfactants and sublatable compounds.
AG2-X8 Solid Phase Extraction (SPE)	X	X	X	Remove multivalent anions.
Antibiotic Amendment	X	Unknown	X	Reduces pathogen infections.
C8 (C18) SPE	X	X	X	Removes non-polar organic chemicals
C 8 SPE eluate add-back	X	X	X	Confirms presence of non-polar organic compound (s).
Centrifugation	X	X	X	Removes particle-bound chemical and biological contaminants.
Chelation (addition of EDTA)	X	X	X	Inactivates cationic metals (Al, Cd, Cu, Zn, Pb, Fe, Ni).
Chelex SPE	X	X	X	Remove multivalent cations.
Filtration	X	NA	X	Removes particle-bound chemicals and biological contaminants.
Graduated pH adjustment	X	NA	X	Increased pH. Increases ammonia toxicity.
Hardness manipulation	X	Unknown	X	Decreases solubility/speciation of metals (bioavailability).
Oxidation Reduction (addition of sodium thiosulfate)	X	Unknown	X	Inactivates Cu, Se, Ag,Hg, Cd, Mn ions, Br, I, O_3(Ozone).
Temporary pH shift to 3	X	Unknown	X	Breaks down hydrolizable organic compounds, may increase metal solubility/speciation (bioavailability).
Temporary pH shift to 11	X	X	X	Precipitates metals (may decrease metal bioavailability). Breaks down hydrolizable organic compounds.
Ultraviolet Light	X	Unknown	X	Activates polyaromatic hydrocarbons, inactivates biological contaminants.
Zeolite	Unknown	X	X	Removes unionized ammonia
Phase II Procedures	*Ceriodaphnia*	*Selenastrum*	*Pimephales*	Purpose of Procedure
Solvent fractionation of SPE eluate	X	X	X	Identifies specific non-polar organic compounds causing toxicity.
Phase III Procedures	*Ceriodaphnia*	*Selenastrum*	*Pimephales*	Purpose of Procedure
Side-by- side dilution series	X	X	X	Determines the contribution of suspected chemical (s) to toxicity.

NA = Manipulation not compatible for series X = manipulation compatible for series

APPENDIX H: ONLINE RESOURCES

Hosted by the State Water Resources Control Board

SWAMP Quality Assurance Management Plan:
http://www.waterboards.ca.gov/swamp/qamp.html
This QAMP and associated appendices in Adobe PDF and Microsoft Word formats

SWAMP Quality Assurance Project Plan Template:
http://www.waterboards.ca.gov/swamp/docs/swampqapp_template032404.doc
Template for SWAMP-comparable QAPP creation

SWAMP Quality Assurance and Quality Control:
http://www.waterboards.ca.gov/swamp/qapp.html
SWAMP quality assurance homepage and links

Hosted by the Moss Landing Marine Laboratories

SWAMP Standard Operating Procedures:
http://mpsl.mlml.calstate.edu/swsops.htm
SWAMP data management and quality assurance SOPs

SWAMP Quality Assurance Comparability:
http://mpsl.mlml.calstate.edu/swqacompare.htm
Guidelines and links pertaining to SWAMP quality assurance comparability

SWAMP Data Management Comparability:
http://mpsl.mlml.calstate.edu/swdbcompare.htm
Guidelines and links pertaining to SWAMP data management comparability