IRRIGATED LANDS CONDITIONAL WAIVER PROGRAM
QUALITY ASSURANCE PROJECT PLAN GUIDELINES

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I INTRODUCTION

A Quality Assurance Project Plan (QAPP) shall be developed by the Discharger 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 Conditional Waiver 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 Discharger 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 discharger, analyses performed by a noncertified 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 Discharger'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 dated08/09/2006)
> 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 who 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 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 <u>Quality control measurements</u>.
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 who 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 discharger 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.

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 field team or monitoring agency shall provide the Project 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 fail 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 2-4 degrees Celcius. 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) Laboratory number.
(f) Field number.
(g) Lab storage.
(h) Sample identification.
(i) Analysis required.
(j) Number of containers of each type (i.e. plastic, glass, vial, whirlpak).
(k) Sample collection date and time.
(l) Comments/special instructions.
(m) Samples relinquished by (signature, print name, date).
(n) Samples received by (signature, print name, date).

An example of a Chain of Custody form including all the items described above is attached in the Appendices of this document.

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.

If field measurements cannot be collected photo documentation is suggested.

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 preceeded 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, or in the absence of overlying water, when the sediment is moist. Analysis results from sediment samples collected in the absence of overlying water should be flagged as potential outlying data points. 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 the both the field notes and photographs for every successful and non-successful monitoring event (IE 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 Appendices to this document. 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

At a minimum, one "QC Set" must be included per analytical method batch per Sampling Event. The minimum required samples for chemical analyses must include:

1. Field blank
2. Field duplicate
3. Matrix spike (MS) and matrix spike duplicate (MSD)
4. Laboratory control spike (LCS) and laboratory control spike duplicate (LCSD)
5. Laboratory blank
6. Laboratory duplicate (MS/MSD or LS/LSD pair may serve this function)

(b) For Microbiological and Toxicity Analyses

The minimum required QC samples for microbiological tests must include:

1. Field blank
2. Field duplicate
3. Negative control

4. Positive control

The minimum required QC samples for toxicity tests must include:

1. Field duplicate
2. Negative control
3. Reference toxicant

Optional QC samples that might be utilized by project management include travel blanks, equipment blanks, laboratory duplicates, equipment blank/rinsate samples, and field split samples. Definitions for all quality control samples described here are included in the Appendices to this document.

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:

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

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:

$$RPD = \left| \frac{V_{LCS} - V_{LCSD}}{Mean} \right| x 100\ \%$$

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

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 for the test 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 for the test 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, 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 5% for each analysis (or one set per sampling event, whichever is more frequent). 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 an identification and discussion of the types of data needed for project implementation or decision making that are 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
Flow	USGS (R2Cross 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
Fecal coliform	SM 9221B/E or 9223	2	MPN/100ml
E-coli	SM 9221B/E (MUG) or 9223	2	MPN/100ml
Algae -*Selenastrum capricornutum*	USEPA-821-R-02-013	NA	Cell/ml and % Growth
Water Flea - *ceriodaphnia*	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

Constituents, Parameters, and Tests	Analytical Methods	Reporting Limit	Reporting Unit
Carbamate Pesticides	USEPA 8321 or 632		
Aldicarb	"	0.5	µg/L
Carbaryl	"	0.5	µg/L
Carbofuran	"	0.5	µg/L
Methiocarb	"	0.5	µg/L
Methomyl	"	0.5	µg/L
Oxamyl	"	0.5	µg/L
Organochlorines Pesticides	USEPA 608, 8081A or B, 8272, or 8081		
DDD	"	0.02	µg/L
DDE	"	0.01	µg/L
DDT	"	0.01	µg/L
Dicofol	"	0.1	µg/L
Dieldrin	"	0.01	µg/L
Endrin	"	0.01	µg/L
Methoxychlor	"	0.05	µg/L
Organophosphorus Pesticides	USEPA 8141A, 614, 8321, 625m, or 8270		
Azinphos-methyl	"	0.1	µg/L
Chlorpyrifos	"	0.015	µg/L
Diazinon	"	0.02	µg/L
Dichlorvos	"	0.1	µg/L
Dimethoate	"	0.1	µg/L
Dimeton-s	"	0.1	µg/L
Disulfoton (Disyton)	"	0.05	µg/L
Malathion	"	0.1	µg/L

Constituents, Parameters, and Tests	Analytical Methods	Reporting Limit	Reporting Unit
Methamidophos	“	0.2	µg/L
Methidathion	“	0.1	µg/L
Parathion-methyl	“	0.1	µg/L
Phorate	“	0.2	µg/L
Phosmet	“	0.2	µg/L
Herbicides			
Atrazine	USEPA 619 or 507	0.5	µg/L
Cyanazine	USEPA 619 or 507	0.5	µg/L
Diuron	USEPA 8321 or 632	0.5	µg/L
Glyphosate	USEPA 547	5	µg/L
Linuron	USEPA 8321 or 632	0.5	µg/L
Paraquat dichloride	USEPA 549.1	0.5	µg/L
Simazine	USEPA 619, 8141, 625, 8270C, or 507	0.5	µg/L
Triflularin	USEPA 8141	0.05	µg/L
Arsenic	USEPA 200.7, 200.8, 6020, 1639 or 206.3	1	µg/L
Boron	USEPA 200.7 or 200.8	10	µg/L
Cadmium (total and dissolved)	USEPA 200.7, 200.8, 213.2, 6020, SM 3113, 3113B, or Modified USGS 1996	0.1	µg/L
Copper (total and dissolved)	USEPA 200.7, 200.8, 213.2, 6020, SM 3113,	0.5	µg/L

Constituents, Parameters, and Tests	Analytical Methods	Reporting Limit	Reporting Unit
	3113B, or Modified USGS 1996		
Lead (total and dissolved)	USEPA 200.7, 200.8, 239.2, 6020, 1639, SM 3111B, 3113 or Modified USGS 1966	0.5	µg/L
Nickel (total and dissolved)	USEPA 200.7, 200.8, 249.2, 6020, 1639, or Modified USGS 1996	1	µg/L
Molybdenum	USEPA 200.7, 200.8, 6010, 6020, and 3015A	1	µg/L
Selenium	USEPA 200.7, 200.8, 6020, 270.3, or Modified USGS 1996 0.8, or 270.3	1	µg/L
Zinc (total and dissolved)	USEPA 200.7, 200.8, 289.2, 6020, 1639, SM3113B, or Modified USGS 1996	1	µg/L
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	0.01	mg/L

Constituents, Parameters, and Tests	Analytical Methods	Reporting Limit	Reporting Unit
	SM 4500-P		
Sediment Toxicity			
Hyalella Azteca	USEPA 600-R-99-064	NA	% Survival
Pesticides	USEPA 1660, 8081 8081A or 8270		
Bifenthrin	"	1.0	ng/g
Cyfluthrin	"	1.0	ng/g
Cypermethrin	"	1.0	ng/g
Esfenvalerate	"	1.0	ng/g
Lambda-Cyhalothrin	"	1.0	ng/g
Permethrin	"	1.0	ng/g
Fenpropathrin	"	1.0	ng/g
Chlorpyrifos	USEPA 8141A, 614, 8321, 625m, or 8270	3.0	ng/g
Other sediment parameters			
TOC	USEPA 415.1, USEPA 9060, Wakley Black, and SW-846	200	mg/kg
Grain Size	ASTM D-422, USEPA 1995, and U. S. Army Corps of Engineers 1981.	1	% sand, % silt, % clay, % gravel

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 attirubted 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

Section C

PROBE MEASUREMENTS

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

Section D

SAMPLES TAKEN (# of containers filled)

	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	

LEAVE

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	Batch ID
Address (Customer)		Lab Storage (refrigerator or freezer number)
City	Phone Number	
Ice Chest Temperature at Log-in	Analysis Requested	

Sample identification	Collection		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			
	Date	Time																	Plastic	Glass	Vial	Whirlpak

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 4°C, dark	14 days at 4°C, dark
Chloride (Cl), Sulfate (SO_4) and Fluoride (F)	"	300 ml	"	28 days at 4°C, dark
Ortho-phosphate (OPO_4)	"	150 ml	"	48 hours at 4°C, dark
Nitrate + Nitrite (NO_3 + NO_2)	"	150 ml	"	48 hours at 4°C, dark
Total Keldjahl Nitrogen (TKN)	"	600 ml	"	Recommend: 7 days Maximum: 28 days Either one at 4°C, dark
Total Dissolved Solids (TDS)	"	1000 ml	"	7 days at 4°C, dark
Ammonia (NH_3)	"	500 ml	"	48 hours at 4C and in the dark or if acidified 28 days at 4C and in the dark
Total Phosphorus (TPO_4)	"	300 ml	"	28 days at 4°C, dark
Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC)	"	40 ml (one vial)	"	28 days at 4°C, dark
Total Suspended Solids (TSS)	"	1000 ml (two jars)	"	7 days at 4°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 4°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 4°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 4°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 4°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 4°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 4°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 4°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 4°C, dark 6 months at 4°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 4°C, dark If chlorine is present, add 0.1g sodium thiosulfate	Keep at 4°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 4°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 4°C; dark.	STAT: 24 hours at 4°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 4°C; dark	STAT: 24 hours at 4°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 4C, dark, up to 48 hours	12 months(1) (-20C)
Sediment TOC	125 ml(2) clear glass jar; Pre-cleaned	125 ml (one jar)	Cool to 4C, dark, up to 48 hours	12 months(1) (-20C)
Sediment Grain Size	125 ml(2) clear glass jar; Pre-cleaned	125 ml (one jar)	Cool to 4C, dark, up to 28 days	28 days (4C) *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 4C, dark, up to 14 days	14 days (4C) *Do not freeze*

(1) Sediment samples for Synthetic Organic Compounds and Sediment TOC analysis can be held at 4C for up to 48 hours (of sample collection), and should be analyzed within this 48 hours period, but can be frozen at any time during the initial 48 hours, for up to 12 months maximum at minus (-) 20C.

(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 4C 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