Exhibit 3
Quality Assurance Program Plan (QAPP)

for

Projects Requiring Water Quality and/or Water Temperature Monitoring

Prepared by

Pacific Gas and Electric Company
Environmental Services, Technical Project Support

QAPP Report Number: 026.11.06.12 **Version 4**

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Table of QAPP Revisions and Details

Number	Description of Revision and page numbers	New Version No. of QAPP
1	**Page 11, Field Staff "Hands-on" Training** A training session will be provided to all PG&E and Contractor personnel that will be required to sample for various trace metals as needed. Contractor must provide this training to Contractor personnel either with the help of knowledgeable PG&E personnel, through knowledgeable Contractor personnel (with methods approved by PG&E), or through ….	3
2	**Page 12, Hydro Generation Environmental Health and Safety Field Orientation** A copy of this document will be provided upon request by PG&E. The time commitment for this training is estimated to be 3-4 hours.	3
3	**PAGE 14, IN SITU WATER QUALITY MONITORING** All field instruments must be calibrated in a laboratory setting prior to use in the field (NOTE: it may be necessary to determine whether special calibration requirements are necessary for some projects based upon historical knowledge of the waters, such as use of low ionic strength water for calibration of pH). In cases where the portable instrument shows signs of malfunction or drift, a back-up sampling device or procedure must be used to validate the questionable measurement (back-up instruments or methods for monitoring all field parameters is necessary).	3
4	**Page 15, Analytical Water Quality Monitoring, Trace Metal Sampling Sensitivity** Potential sources of trace metals contamination during sampling include metallic or metal-containing sampling equipment, containers, labware (e.g. talc gloves that contain high levels of zinc, colored gloves), ….	3
5	**Page 16, second paragraph, Trace Metal Sampling Sensitivity** Appropriate gloves must still be worn during any analytical water quality sampling and care must be taken to prevent contamination of the samples during collection, transport, and analysis for all water quality sampling parameters.	3
6	**Page 16, 5th paragraph, Trace Metal Sampling Sensitivity** A non-metal boat is recommended for any lake or reservoir sampling that includes analysis for trace metals.	3
7	**Page 17, paragraph 3** The water temperature loggers must be calibrated in a laboratory setting before and after each field season. Calibration of the loggers will be performed by a PG&E representative, per the PG&E contract agreement with the Engineers and Scientists of California (ESC). All water temperature recorders must be returned to the PG&E Representative assigned to the project for recalibration at the end of the monitoring season. Once the recorders are calibrated, the recorders with all supporting calibration documentation will be returned to the Contractor prior to the next field monitoring season. A standard device with a traceable record to the National Standard must be used for calibration procedures. Calibration by the Manufacturer for new or re-batteried recorders is accepted by PG&E.	3
8	**Page 20** In some instances, low ionic strength standards may be necessary for calibration of pH due to the low ionic strength of surface waters found in some project areas. The Contractor must discuss the possibility of using low ionic strength standards with the PG&E Project Manager based upon historical data collection.	3
9	**Appendix A, page 2** The sample is generally collected by submerging the collection bottle into the stream or river using the "CLEAN HANDS–DIRTY HANDS" technique. This technique **requires** the use of polyethylene gloves or vinyl gloves; any other material contains trace metals at a level sufficient to contaminate the collected sample (i.e., no colored gloves, no powdered gloves). Contact the PG&E Project Manager for information regarding ordering proper gloves if necessary.	3
10	**Page 3** Changes and updates to the QAPP may be made after a review of the evidence for change by PG&E's Project Task Manager and QA Coordinator. PG&E's QA Coordinator will be responsible for making the	4

	changes, submitting drafts for review, preparing a final copy, and submitting the final for signature. Exceptions to the content of this document will be formalized in a table included with the transmittal of this document.	
11	**Page 9, Table 2** Data in table are based on HydroLab™ (HL) and YSI Precision™ (YSI) instrument specifications, other instruments may be used provided the specifications are comparable to or better than those listed in this table.	4
12	**Page 15, Trace Metal Sampling Sensitivity** PG&E is requiring the use of "clean hands/dirty hands" trace metal sampling, handling, and analytical protocols because a majority of the streams that are sampled as part of PG&E projects have extremely low naturally occurring levels of trace metals and are therefore highly susceptible to contamination during sampling and handling activities by both the field personnel and the analytical laboratory. This potential for contamination can have a profound impact on how these projects are managed in the future especially if every effort is not taken to preclude the potential for contamination. Potential sources of trace metals contamination during sampling include metallic or metal-containing sampling equipment, containers (especially plastic bottles that contain acid preservative prior to sampling), labware (e.g. talc gloves that contain high levels of zinc, colored gloves, nitrile gloves), reagents, and ….. For this reason, extreme care must be taken when collecting trace metals water samples for any PG&E project. The "Clean Hands-Dirty Hands" Trace Metal Sampling Procedure must be followed for all PG&E projects and individuals collecting samples must receive hands-on training in the "Clean Hands-Dirty Hands" technique from a qualified PG&E employee….	4
13	**Page 15-16** **Regardless of the analytical laboratory method used to analyze the metals samples, US EPA Method 1669 (sample collection and handling specifications) must be followed to ensure that the samples are not contaminated in the field or by the collection techniques (see Appendix A).**	4
14	**Page 16** **In addition, the analytical laboratory must be able to achieve the lowest possible reporting limits and method detection limits in order to ensure that very few or none of the metals samples will be flagged as estimates (J flag or detected but not quantified [DNQ], i.e., estimated sample concentration that is less than the reporting limit but above the method detection limit and subject to a high degree of uncertainty).** This is particularly important because the State Water Resources Control Board's (SWRCB) sampling criteria of section 6.1.5.5 of the *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy) specifically states that "When the sample value is less than the quantitation limit and the quantitation limit (reporting limit) is greater than the water quality standard, objective, criterion or evaluation guideline, the results shall not be used in the analysis."	4
15	**Page 19,** **In addition, the analytical laboratory must be able to achieve the lowest possible reporting limits and method detection limits in order to ensure that very few or none of the metals samples will be flagged as estimates (J flag or detected but not quantified [DNQ], i.e., estimated sample concentration that is less than the reporting limit but above the method detection limit and subject to a high degree of uncertainty).** This is particularly important because the SWRCB's sampling criteria of section 6.1.5.5 of the *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy) specifically states that "When the sample value is less than the quantitation limit (reporting limit) and the quantitation limit is greater than the water quality standard, objective, criterion or evaluation guideline, the results shall not be used in the analysis."	4
16	**Appendix A, 5th bullet** Acid cleaned sample bottles should be received from the analytical laboratory double-bagged without preservative. However, some analytical laboratories will send bottles that contain dilute acid solution that can be disposed of prior to collecting the sample (see methods below for sample collection). Samples should be stored in sealed coolers….	4
17	**Appendix A, Page 2** This technique **requires** the use of polyethylene gloves or vinyl gloves; any other material contains trace	4

	metals at a level sufficient to contaminate the collected sample (i.e., no colored gloves, no powdered gloves, and no nitrile gloves).	
18	**Appendix A, Page 2-3** During the filling process care must be taken that the bottle opening is held well beneath the water surface to ensure no airborne contaminants floating on the water surface enter the sample bottle. The sample bottle is then capped tightly under water to preclude any surface water floating debris or dust.	4
19	**Appendix A, Page 4** If permission is received from the PG&E Project Task Manager to preserve the samples prior to shipping (using trace clean reagent grade acid; contact QA Coordinator or PG&E Task Manager for specifications), then the hold time increases to 6 months. However, the sampler must have the appropriate supplies and equipment necessary for preservation in the field prior to shipping.	4
20	**Page 1, Title and Approval Sheets** Quality Assurance Project Plan (QAPP) for Module 4 Service Agreement projects requiring Water Temperature and/or Water Quality Monitoring. Prepared by Pacific Gas and Electric Company (PG&E), Environmental Sciences (ES), Technical Project Support, 3400 Crow Canyon Road, San Ramon, California, 94583. Note that Module 3 Service Agreement Projects for PG&E will be conducted according to the Module 3 Service Agreement (site remediation). This QAPP is to be used by both PG&E personnel and Contractor personnel for all Module 4 Service Agreement water temperature and/or water quality monitoring projects that are required for various PG&E projects including Federal Energy Regulatory Commission (FERC) Relicensing and Compliance monitoring activities	4
21	**Page 11, Field Staff "Hands-on" Training** A hands-on training session can be provided for both PG&E and Contractor personnel, as part of a regular field visit and billable to the project.	4
22	**Page 11, Field Staff "Hands-on" Training** A training session can be provided to all PG&E and Contractor personnel that will be required to sample for various trace metals as needed, and can be incorporated into the first field visit of the season – billable to the project.	4
23	**Cover Page, Title change** to reflect Module 4 Service Agreement PG&E project coverage only, Module 3 Service Agreement Project will be conducted per the Module 3 Service Agreement specifications.	4

GROUP A ELEMENTS: PROJECT MANAGEMENT

1. TITLE AND APPROVAL SHEETS

Quality Assurance Project Plan (QAPP) projects requiring Water Temperature and/or Water Quality Monitoring. Prepared by Pacific Gas and Electric Company (PG&E), Environmental Sciences (ES), Technical Project Support, 3400 Crow Canyon Road, San Ramon, California, 94583. This QAPP is to be used by both PG&E personnel and Contractor personnel for all water temperature and/or water quality monitoring projects that are required for various PG&E projects including Federal Energy Regulatory Commission (FERC) Relicensing and Compliance monitoring activities.

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3. PROJECT/TASK ORGANIZATION

3.1 Involved Parties and Roles

PG&E will organize the initiation and maintenance of a contract with the chosen Contractor for various PG&E projects.

The Contractor will be responsible for all aspects of the project including the organization of field staff, scheduling of sampling days, management of Contractor in-house QA/QC and analysis of data, and reporting and interactions with PG&E personnel.

3.2 Quality Assurance Coordinator and Project Task Manager Roles

Elizabeth Frantz is PG&E's ES Technical Project Support Quality Assurance (QA) Coordinator. The role of the QA Coordinator is to establish the quality assurance and quality control procedures found in this QAPP as part of the sampling, field analysis, and PG&E in-house analysis procedures. The QA Coordinator will review and assess all procedures outlined in the QAPP to ensure that the most up-to-date and best practices are included in the QAPP.

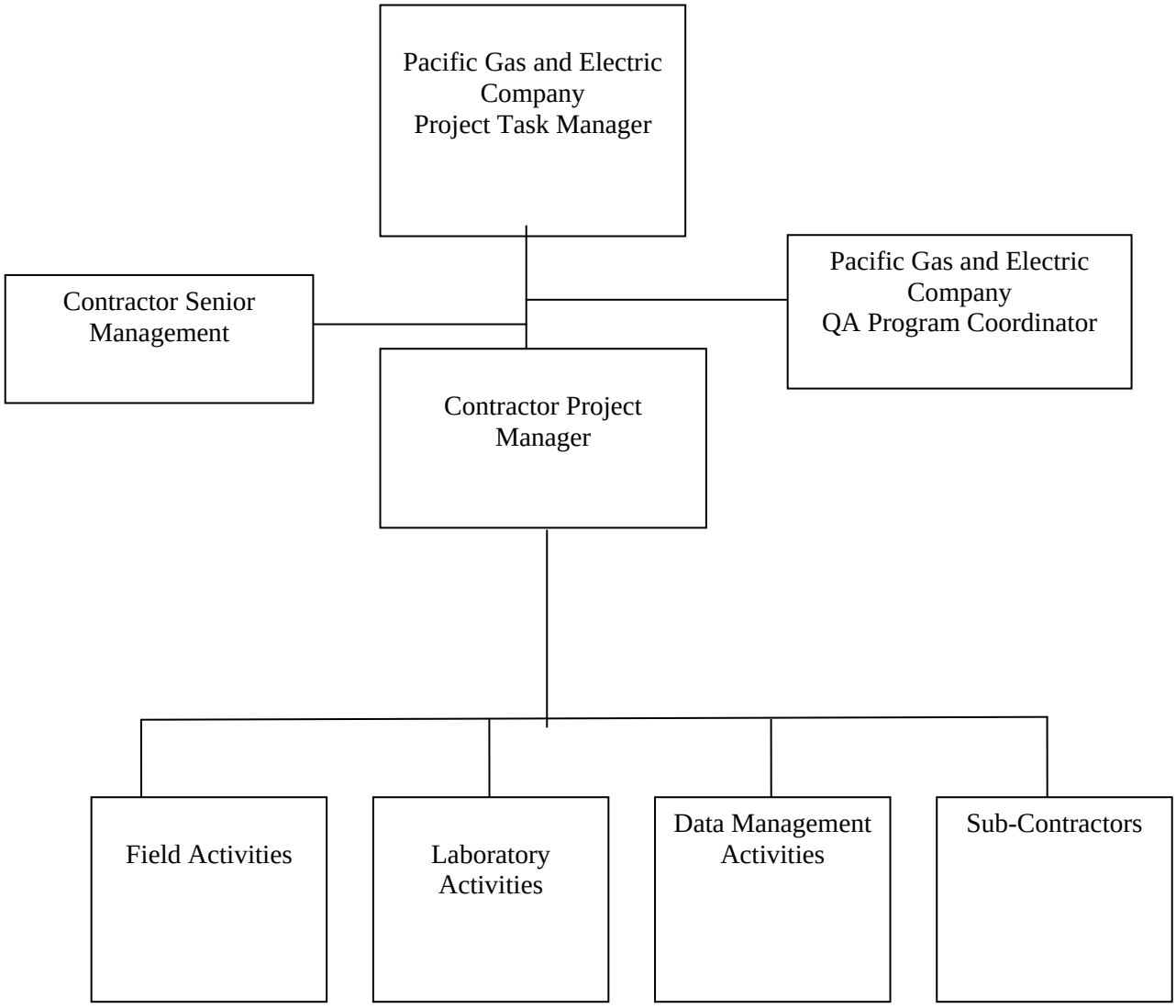
It is the role of the PG&E Project Task Manager to ensure that all elements of the QAPP are followed for their specific PG&E project(s). This may entail periodic QA Audits to be performed by the PG&E Project Task Manager. The Project Task Manager has the power to halt work by PG&E personnel, the Contractor, and/or any analytical laboratory under contract upon discovery of any discrepancies from this QAPP. More information regarding QA Audits and follow-up actions can be found in Section 19, *Assessments & Response Actions*.

3.3 Persons Responsible for QAPP Update and Maintenance

Changes and updates to the QAPP may be made after a review of the evidence for change by PG&E's Project Task Manager and QA Coordinator. PG&E's QA Coordinator will be responsible for making the changes, submitting drafts for review, preparing a final copy, and submitting the final for signature. Exceptions to the content of this document will be formalized in a table included with the transmittal of this document. The PG&E Project Task Manager and the Contractor must be in agreement to the exceptions and/or changes to the requirements of the QAPP specified in the cover letter and both parties must sign off on the agreement.

3.4 Organizational Chart and Lines of Communication

Figure 1. Organizational chart.



4. PROJECT DEFINITION/BACKGROUND

4.1 Project Statement

This QAPP has been developed to provide guidance and quality assurance for water temperature and water quality monitoring studies that are required for various PG&E projects including, but not limited to, FERC relicensing and compliance monitoring activities that are required by FERC licenses and/or specific maintenance/permitting conditions that PG&E holds for various hydroelectric facilities.

4.2 Decisions or Outcomes

The data that are collected will provide information about the physical and/or chemical state of various water bodies within the PG&E territory in the state of California. The data may ultimately be presented in annual monitoring reports (or at shorter intervals as determined by PG&E) which are provided to various regulating agencies and resource groups. The data may be integrated with previously collected information and used for trend analyses or for modeling exercises depending on the needs of the project. Use of any water temperature or water quality data will be determined on a project specific basis. Additional information and details will be provided in the RFP for each specific PG&E project.

4.3 Water Quality or Regulatory Criteria

Many of PG&E's FERC licensed and/or permitting projects must comply with specific license requirements and conditions that are determined by the appropriate resource agencies and by guidelines set forth by FERC and/or federal/state regulations. The studies that are conducted by the contractor on behalf of PG&E must comply with these license terms and conditions. Some of the PG&E projects will require timely notification to the PG&E Project Task Manager of any deviations from the required license terms and conditions. Notification of these deviations will be provided to the appropriate resource agencies by the PG&E's responsible personnel. More specific information relative to each project will be supplied in the RFP or monitoring plan for that project with regard to terms, conditions, and requirements for notification.

The water quality and water temperature data that are collected for the various PG&E projects will be used to compare to the water quality criteria outlined in the Regional Water Quality Control Board (RWQCB) Basin Plan and/or any specific permitting conditions stipulated in the study plan. Any deviations from the specific criteria should be promptly reported to the PG&E Project Task Manager in a timely manner or as specified in the project specific monitoring plan.

5. PROJECT/TASK DESCRIPTION

5.1 General Work Statement and Produced Products

In Situ Water Quality Monitoring

In situ water quality monitoring involves field measurements for various parameters including, but not limited to, pH, specific conductivity, instantaneous water temperature, dissolved oxygen (DO), DO percent saturation, turbidity, Secchi disk, black disk, velocity, settleable solids, and depth. The suite of measurements that will be required by specific projects will be outlined in the scope of work and monitoring plan specific to the project. Refer to Section 10.0, *Sampling Methods*, regarding information pertaining to sample collection requirements and methods.

Analytical Water Quality Monitoring

Analytical water quality monitoring can include but is not limited to monitoring for trace metals, hardness, bacteria, sediment, nutrients, minerals, and chlorophyll. The suite of analytes required for each project will be determined by the conditions set forth in the license and/or developed by collaboration

with resource agencies and non-governmental organizations (NGO's) for each specific project and can be found in the scope of work or monitoring plan for the project. Refer to Section 10.0, *Sampling Methods*, regarding information pertaining to sample collection requirements and methods.

Continuous Water Temperature Monitoring

Continuous water temperature monitoring involves placement of a single digital thermograph or duplicate digital thermographs (with miniature microprocessor that stores data in non-volatile memory) in an appropriate section of stream to record water temperatures at project specified intervals. Water temperature data are typically downloaded and saved on regular intervals (to be specified by the project) to a computer. An *in situ* water temperature is collected with a hand-held device at the time of water temperature recorder servicing for quality assurance (to compare instantaneous measurement of water temperature with that recorded by the digital thermograph at the specific date and time for recorder validation during each field trip). The data are used to generate hourly average and daily statistics. The specific requirements for each project with respect to continuous water temperature monitoring will be outlined in the scope of work and monitoring plan specific to the project. Refer to Section 10.0, *Sampling Methods*, regarding information pertaining to sample collection requirements and methods.

Progress Reports

The contractor will provide progress reports or other required products (raw data, field notes, statistics, details regarding any problems associated with site visits or sampling, etc) at a timeline specified by the project scope of work, including collected data, during the term of the project contract. At the end of the project, the contractor will provide a full listing and summary of the data collected including a list of any discrepancies, missing data with explanations, and any other information that may be pertinent to understanding the data. Any additional products and requirements necessary for the project that will be completed by the contractor will be outlined in the scope of work and RFP for the project. Some projects may require notification to the PG&E Project Task Manager of any exceedances of objectives that are set forth in the project specific license within a prescribed amount of time.

Resource Agency Meeting Attendance and/or Presentations of Data

Some projects may require the Contractor to attend and present data at resource agency meetings. Specific requirements will be outlined in the project specific RFP. The Contractor will present the data on behalf of PG&E including, but not limited to, methods, schedule, data collected and/or statistical analysis of data as required by the project, and any problems associated with data collection.

5.2 Project Schedule

The project schedule will be specified in the project specific monitoring plan. Typically, water temperature studies are initiated in spring (or specific to project) and continue through October 31 (or specific to project); exact schedules for each project will be specified in the project specific RFP. Water temperature recorders are typically serviced on a monthly basis (or at a schedule specified by the project) to minimize any extended period of missing data due to malfunction or vandalism and that the location of the recorders is appropriate given likely changes in flow throughout the sampling period.

Water quality sample collection timing varies by project, but typically can occur in spring, summer, and fall at a designated project specific frequency. Samples may be collected monthly or quarterly depending on the requirements for the specific project.

5.3 Geographical Setting

PG&E's project territory covers a large geographic area within California from northern California near Redding to the southern territory as far south as Bakersfield. A wide range of elevations and geographical

conditions can be encountered by individual projects. Some sites are remote and may require helicopters, or long drives, and/or hiking for access. Contractor personnel are expected to be in good physical health and able to work in a wide variety of geographical locations. Water temperature and water quality sampling may occur in streams, lakes (boat use required), high elevation locations during snow conditions, and in the heat of the summer in low lying elevations.

5.4 Constraints

Water temperature and/or water quality monitoring may occur at various elevations and a wide range of weather conditions (rain, snow, sun, wind, high heat, and cold weather). Stream flow may be high or low, lake and reservoir sampling may require the use of a boat at different stages of lake or reservoir surface elevation. Remote sites may be accessed by helicopter or require 4-wheel driving or long hikes carrying equipment. Permission may need to be received from landowners prior to any work (PG&E will initiate the request for permission, but some sites may require notification by the Contractor each time the site is visited prior to the site visit depending on the project specifications). All of these conditions require that the Contractor has the proper training and resources to be able to complete the required sampling. Training requirements are outlined in Section 7.0, *Special Training Needs/Certification*.

6. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Table 1. Example Data Quality Objectives for PG&E Projects

Measurement or Analyses Type	Applicable Data Quality Objective
Field Measurements	Accuracy, Completeness, Representativeness
Water Temperature Measurements	Accuracy and Completeness, Representativeness
Analytical Laboratory Analyses	Accuracy, Precision, Recovery, Completeness, Representativeness

Accuracy for field measurements is defined as the degree of conformity of a measured/calculated quantity to its actual (true) value. Accuracy for water temperature measurements involves collecting an *in situ* instantaneous water temperature with a hand-held instrument; and the *in situ* water temperature will serve as a check for the specific date and time for the continuous water temperature data logger. The state certified analytical laboratory under contract must have established protocols for determining accuracy on analytical analyses. The analytical laboratory will report on accuracy for the analytical analyses that are requested.

Precision measurements will be determined on laboratory replicates. Individual laboratories must have QA/QC protocols established for precision measurements.

Recovery measurements will be determined by laboratory spiking of a replicate sample with a known concentration of the analyte. The target level of addition is at least twice the original sample concentration. Individual laboratories must have QA/QC protocols established for recovery measurements.

Completeness is the number of analyses generating useable data for each analysis divided by the number of samples collected for that analysis.

Representativeness refers to the location of the sample collection site in the stream/lake; ensuring that the location is representative of the condition that requires study.

Method sensitivity is dealt with by the inclusion of the required Target Reporting Limits, where such values exist. Target Reporting Limits will be specified by the project specific RFP or study plan. Data quality objectives for field measurements are included in Table 1.

Data collected from previous studies and held in PG&E's database will be assessed against the same data quality objectives listed above when necessary to the specific project.

Table 2. Data quality objectives for field measurements

Group	Parameter	Accuracy	Resolution	Target Reporting Limits	Completeness
Field Analyses	pH	± 0.2 pH units (both HL and YSI)	0.01 pH units (both HL and YSI)	Refer to specific project study plan	90%
	Specific Conductivity (SpC)	± 0.5% of reading, or + 0.001 micromhos (both HL and YSI)	0.001 to 0.1 micromhos (both HL and YSI)	Refer to specific project study plan	90%
	Dissolved oxygen (DO)	± 0.2 mg/L for 20 mg/L or less (both HL and YSI)	0.01 mg/L (HL) 0.1 mg/L (YSI)	Refer to specific project study plan	90%
	DO Percent Saturation	Calculated	Calculated	NA	90%
	Turbidity	1% up to 100 NTU; 3% from 100-400 NTU	0.1 NTU from 0-400 NTU	Refer to specific project study plan	90%
	Instantaneous *in situ* Water Temperature	± 0.1 °C (HL) 0.15°C (YSI)	0.01 (HL) 0.1 °C (YSI)	Refer to specific project study plan	90%
	Depth	+ 0.1 m up to 200 meters (HL)	0.1 meter (HL)	NA	90%
Water Temperature Recorder *	Continuous water temperature	± 0.1 °C	0.01 °C	Refer to specific project study plan	90%

NA = Not applicable

Data in table are based on HydroLab™ (HL) and YSI Precision™ (YSI) instrument specifications, other instruments may be used provided the specifications are comparable to or better than those listed in this table.

7. SPECIAL TRAINING NEEDS/CERTIFICATION

7.1 Specialized Training or Certifications

Proper training of field personnel (PG&E and Contractor personnel) represents a critical aspect of quality control. Field technicians are trained to conduct a wide variety of activities using standardized protocols to ensure comparability in data collection among crews and across geographic areas.

Information for recommended training, safety guidelines for field activities, recommended training and proficiency documentation for laboratory personnel is included. Proficiency requirements must be established for field and lab staff. Training must be documented and updated in training records, available for review during audits. Laboratories must maintain a lab safety manual (LSM) in compliance with OSHA or equivalent state or local regulations.

Minimum Field Crew Requirements

Pacific Gas and Electric Company Field Crew Requirements

At a minimum it is recommended that each PG&E field crew consist of a Scientist and one technician. Minimum recommended qualifications for Field Lead should include a B.S. degree in biological/water quality sciences or similar related field, and at least three years of experience in field sampling/field data collection activities, or at least five years experience. The remaining crew member is recommended to hold B.S. degree in the appropriate disciplines as just described, and/or, at least one year's experience in field sampling/field data collection activities.

Contractor Field Crew Requirements

Appropriate field crew requirements for individual Contractors will be determined by the Contractor and agreed to by the PG&E Project Task Manager for the specific project. It is expected that the Contractor will send field crews that have the appropriate background and level of experience to ensure that the best data collection practices are followed as outlined in this QAPP.

Boat Handling Requirements

Pacific Gas and Electric Company Boat Handling Requirements

When a boat is required for sample collection activities by PG&E personnel, the vessel operator should be an experienced boat handler, and should be ES certified as well as having completed at least minimal U.S. Coast Guard boating safety training for the appropriate respective vessel, and be well-versed in the safe and correct operation of on-board sample collection equipment and processes, including navigation skills and the use of GPS equipment. The vessel itself shall contain all proper U.S. Coast Guard-required personal floatation devices and other safety gear, have current state registration, and be in good operation and maintenance condition.

Contractor Boat Handling Requirements

When boat use is required by a Contractor, the Contractor must have any specialized training or certifications as required by their QA Coordinator for their company as outlined in their company's safety guidelines. It is expected that the Contractor send field crews that have the appropriate background and level of experience with respect to boat handling and to ensure that the best data collection and safety practices are followed as outlined in this QAPP.

Driver Training Recommendations

Documentation of completion of a driver safety training course is highly recommended for PG&E field staff, including the safe use and operation of a vehicle, boat/trailer towing and maneuvering to back-up, 4-wheel drive operation, etc. All vehicles shall have current registration and be in good operation and maintenance condition. All documentation of driver training for Contractor personnel is the responsibility of the Contractor and will be determined by the individual Contractor.

Field Staff "Hands-on" Training

A hands-on training session can be provided for both PG&E and Contractor personnel, as part of a regular field visit and billable to the project. The hands-on session will involve training for use of all sampling equipment required to complete the job as well as pertinent sampling protocols for water quality sampling. PG&E personnel will provide hands-on training specific to sampling equipment (e.g., boat use and safety practices, field instruments and field data equipment, grab water samples, GPS, etc.) for any PG&E personnel that are required to work on a specific job; specifically if the PG&E employee has not had any prior experience with the equipment.

The Contractor must provide this equipment use hands-on training to Contractor employees as necessary for each project. It is expected that only trained Contractor personnel will be allowed to work in the field on PG&E projects. All PG&E and Contractor personnel must demonstrate proficiency in the use of the required sampling equipment for the specific PG&E project by the end of the training session as certified by the Field Lead for the project. Documentation of all training must be maintained by the Field Lead for the project and will be available to the PG&E Project Task Manager upon request.

A training session can be provided to all PG&E and Contractor personnel that will be required to sample for various trace metals as needed, and can be incorporated into the first field visit of the season – billable to the project. All pertinent sample collection protocols ("clean hands-dirty hands" for metals analyses – refer to Section 10.0, *Sampling Methods* and Appendix A) will be used during a hands-on training session (actual field sample collection trip). By the end of the sampling trip, all crew members must demonstrate proficiency in all the required sampling activities, as certified by the Field Lead for the training session, as documented in training records developed and maintained for all field and lab personnel. The clean hands-dirty hands training session must be provided by trained PG&E personnel to PG&E personnel and the Contractor must provide this training to Contractor personnel either with the help of knowledgeable PG&E personnel, through knowledgeable Contractor personnel (with methods approved by PG&E), or through the use of an outside company as agreed to by PG&E. The estimated time commitment for the above hands-on trainings is 1 day.

Valley Elderberry Longhorn Beetle Environmental Compliance

The valley elderberry longhorn beetle (VELB) is a longhorn wood borer that feeds exclusively on elderberry shrubs. In 1980 the U.S. Fish and Wildlife Service (US FWS) listed the beetle as threatened, under the Endangered Species Act (ESA). Because of the extensive geographic nature of PG&E facilities, frequent encounters with elderberry can occur. The ESA and guidelines published by the US FWS (in 1999) prohibited disturbance of VELB habitat (elderberry) and prescribed costly mitigation, making sustained environmental compliance prohibitively costly, particularly for state-mandated GO95 vegetation management. Avoid and minimize impacts whenever possible. All impacts to VELB habitat need to be tracked and reported. The VELB Compliance Brochure shall be kept in all PG&E and contractor vehicles when performing operations and maintenance on PG&E projects within the VELB range. A copy of this brochure will be provided by PG&E upon request. The time commitment for this training is estimated to be 1 hour.

Hydro Generation Environmental Health and Safety Field Orientation

All non-Hydro personnel (Contractors and PG&E personnel) that will be conducting field work in support of PG&E's Hydro facilities must successfully complete the *Hydro Generation Environmental Health and Safety Field Orientation* training prior to entering and performing work in Hydro Powerhouse and Switchyard facilities. This training includes information on Hydro facility entry procedures, field work notifications (example field work notification and list of generation supervisors is contained in Appendix B), helicopter safety, description of hydropower, code of safe work practices, emergency response and evacuation, hazard communication, personal protective equipment, heat and cold stress prevention, environmental protection, and a few other topics with regard to safety. The training will prepare personnel to protect themselves from the hazards associated with Hydro facilities and implement the necessary safeguards to provide a safe work environment. A copy of this document will be provided upon request by PG&E. The time commitment for this training is estimated to be 3-4 hours.

Safety Guidelines for Field Activities

Personnel conducting any field activities for PG&E will be well-versed in standard safety procedures for such activities. It is the responsibility of the contractor conducting field activities to ensure that safety training is mandatory for all field personnel, and that such training is documented in training certifications/records maintained and updated for all participating field staff. Each contracting entity conducting field activities is responsible for preparing and maintaining a current Field Safety manual (FSM) in compliance with the Occupational Safety and Health Administration (OSHA), or equivalent state or local regulations. The FSM will be readily available to field personnel, including all appropriate Material Safety Data Sheets (MSDS) information for chemicals that may need to be used while in the field. Proper procedures for safe storage, handling, shipping, transport, and disposal of chemicals and other materials will be followed at all times in the field; each chemical or field sample will be treated as a potential health hazard and good field safety practices will be implemented accordingly. Proper notification (calling in /out to generation supervisor, notifying landowner(s) if necessary) will be utilized for each field visit.

7.2 Training and Certification Documentation

Contractors must provide documentation to the PG&E Project Task Manager showing that all required training has been completed prior to the initiation of work or document that training will occur concurrently (hands-on training). Updates must be received only if new employees are added to the project or if the specific training requires timely updates.

7.3 Training Personnel

Training may be provided by the Contractor in-house or by PG&E personnel if applicable (Clean Hands-Dirty Hands trace metal sampling may be provided by the Contractor if proficiency in the method is demonstrated; it may be provided by knowledgeable PG&E personnel; or it may be provided by a knowledgeable outside company/representative).

8. DOCUMENTS AND RECORDS

The Contractor will collect records for sample collection, field analyses, analytical testing, and water temperature monitoring as applicable to each individual PG&E project. Field records will include names of personnel collecting data and organization name, date, time, weather conditions, GPS locations, notification call log (call-in and call-out to appropriate generation supervisor, additional notifications to land owners if applicable), any problems, general site conditions and any deviations from the study plan with reasons why. Samples sent to any state certified analytical laboratory must include a Chain of

Custody (COC) form. The analytical laboratory will generate records for sample receipt and storage, analyses, and reporting.

All records generated by this project will be stored by the Contractor and will be sent to the PG&E Project Task Manager at a frequency to be determined by the project requirements. Analytical laboratory reports will be kept by the Contractor and by the analytical laboratory. Copies of all documents and records held by the analytical laboratory and the Contractor will be provided to the PG&E Project Task Manager and stored in the project file. The Contractor is responsible for maintaining appropriate back-up files (electronic or other) to ensure no loss of data through computer malfunction or other factors.

Copies of this QAPP will be distributed to all parties involved with the project, including field collectors and the Contractor in-house laboratory analyst. Copies will be sent to the Analytical Laboratory Manager for distribution within the analytical laboratory. Any future amended QAPPs will be held and distributed in the same fashion. All originals of the first and subsequent amended QAPPs will be held at PG&E in San Ramon. Copies of versions, other than the most current, will be discarded so as not to create confusion.

A complete list of Contractor personnel responsible for maintaining records for each project will be sent to the PG&E Project Task Manager along with current phone numbers and task descriptions. Copies of the records will be maintained by the Contractor for five years after project completion.

GROUP B: DATA ACQUISITION

9. SAMPLING PROCESS DESIGN

Sample collection points and a justification for selection sites are described in the Monitoring Plan for each specific project. In brief, sample points were selected meeting these criteria: a point previously selected in prior studies, additional points within the project boundaries to further investigate conditions within the project reaches, and monitoring points required by the specific license conditions or by collaboration with the respective governing resource agencies. A map is provided with the sampling points located.

10. SAMPLING METHODS

In Situ Water Quality Monitoring

In situ water quality monitoring for field water quality parameters (pH, specific conductance, turbidity, DO, DO percent saturation, water temperature, and depth) typically involves the use of a portable field instrument that meets a minimum response time and accuracy such as a HydroLab™ water quality sonde, SonTek/YSI™ Environmental Monitoring System (EMS), Bathythermograph, or equivalent monitoring system. Additional *in situ* monitoring parameters may also include Secchi disk, transparency tube, or black disk measurements depending on individual project specifications.

All field instruments must be calibrated in a laboratory setting prior to use in the field (NOTE: it may be necessary to determine whether special calibration requirements are necessary for some projects based upon historical knowledge of the waters, such as use of low ionic strength water for calibration of pH). Recalibration of the portable monitoring system in the field is necessary if the instrument shows signs of malfunction or drift in readings or if more than 10 locations will be sampled in one day. Written documentation of all calibration is required to be kept for each field visit and supplied to the PG&E Project Manager upon request or at the time that the data is submitted for periodic progress reviews (i.e., monthly, quarterly, semi-annual, or at frequency determined for the specific project). In cases where the portable instrument shows signs of malfunction or drift, a back-up sampling device or procedure must be used to validate the questionable measurement (back-up instruments or methods for monitoring all field parameters is necessary). For example, a water sample could be collected and preserved for analysis of DO using Winkler titration, or a second portable device such as a SonTek/YSI™ EMS could be used to validate the questionable DO concentration. Extra sample bottles should be available for collection of water that could be analyzed by a state certified analytical laboratory if secondary measurements are needed to validate a questionable water quality measurement measured in the field. Appropriate personal protective equipment must be utilized during any sample collection activities (gloves should be worn for collection of water samples).

All *in situ* water quality monitoring data will be recorded in a field notebook or other suitable format and will include information pertaining to date, time, weather conditions, name(s) of people collecting samples, units of measurements, depth (if sampling in a lake or reservoir), GPS coordinates for sample site, and any problems or concerns associated with sampling including information regarding questionable samples and back-up measurements or water sample collection for analysis at an analytical laboratory. Special sampling conditions may also need digital photo documentation if warranted. All field notes should be clearly written and in a format that can be reproduced, either scanned sheets (pdf) or entered into electronic format (Word or Excel). The Contractor is responsible for maintaining back-up copies of all electronic files that are generated by the Contractor to prevent data loss due to computer malfunction or other causes.

Analytical Water Quality Monitoring

Analytical water quality monitoring can include but is not limited to monitoring for trace metals, hardness, bacteria, sediment, nutrients, minerals, and chlorophyll. Appropriate personal protective equipment must be utilized during any sample collection activities. However, care must be taken when sampling for different analytical parameters in order to prevent contamination during collection, shipping and handling, and analysis of analytical water samples.

Trace Metal Sampling Sensitivity

PG&E is requiring the use of "clean hands/dirty hands" trace metal sampling, handling, and analytical protocols because a majority of the streams that are sampled as part of PG&E projects have extremely low naturally occurring levels of trace metals and are therefore highly susceptible to contamination during sampling and handling activities by both the field personnel and the analytical laboratory. This potential for contamination can have a profound impact on how these projects are managed in the future especially if every effort is not taken to preclude the potential for contamination.

Trace metals samples are extremely sensitive to contamination from a wide variety of sources. There are numerous routes by which samples may become contaminated. Potential sources of trace metals contamination during sampling include metallic or metal-containing sampling equipment, containers (especially plastic bottles that contain acid preservative prior to sampling), labware (e.g. talc gloves that contain high levels of zinc, colored gloves, nitrile gloves), reagents, and deionized water; improperly cleaned and stored equipment, labware (glass and plastic), containers (cardboard boxes), and reagents; and atmospheric inputs such as dirt and dust from automobile exhaust, cigarette smoke, nearby roads, bridges, wires, and poles. Even human contact can be a source of trace metals contamination. For example, it has been demonstrated that dental work (e.g., mercury amalgam fillings) in the mouths of laboratory personnel can contaminate samples that are directly exposed to exhalation.

For this reason, extreme care must be taken when collecting trace metals water samples for any PG&E project. The "Clean Hands-Dirty Hands" Trace Metal Sampling Procedure must be followed for all PG&E projects and individuals collecting samples must receive hands-on training in the "Clean Hands-Dirty Hands" technique from a qualified PG&E employee prior to collecting samples in the field (see Section 7, Special Training/Certification Needs), PG&E personnel, Contractor personnel (with demonstrated proficiency), or an outside company/representative can supply applicable clean hands-dirty hands training if necessary. This requirement may be waived provided that the Contractor (and all associated field sampling personnel) can demonstrate a thorough knowledge of the "Clean Hands-Dirty Hands" sampling protocol and associated concerns. A copy of PG&E's "Clean Hands-Dirty Hands" Trace Metal Sampling Procedure is contained in Appendix A and has been adopted from US Environmental Protection Agency (US EPA) Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (US EPA 1996a).

Sources of contamination are not limited to the field, but can also be found in the state certified analytic laboratory or reagents that are used to analyze the water samples for trace metals. Therefore, US EPA Method 1638, Determination of Trace Elements in Ambient Waters by Inductively Coupled Plasma — Mass Spectrometry (US EPA 1996b) or equivalent method must be used for analyzing trace metals water samples; and US EPA Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry, (US EPA 2002) or equivalent method must be used for mercury analyses in water. Comparable methods may only be used if they are shown to provide the same or greater protection from contamination and are shown to achieve the same or better reporting limits and method detection limits required to satisfy the requirements specified in the project study plan or the relevant water quality criteria (California Toxics Rule [CTR] and US EPA Ambient Water Quality Criteria). **Regardless of the analytical laboratory method used to analyze the metals samples, US**

EPA Method 1669 (sample collection and handling specifications) must be followed to ensure that the samples are not contaminated in the field or by the collection techniques (see Appendix A). It is recommended that a "trace clean" state certified analytical laboratory be used to analyze all trace metals and mercury water samples to ensure the best possible results will be achieved (some example "trace clean" laboratories include Brooks/Rand [Seattle, Washington], Frontier GeoSciences, Inc. [Seattle, Washington], and Marine Pollution Studies Laboratory [Moss Landing, California], in no specific order). More information can be obtained regarding "trace clean" laboratories by contacting the PG&E Project Task Manager.

The Contractor will need to ensure that the state certified analytical laboratory that is contracted to perform any "trace clean" analyses conducts the analyses at the appropriate level to meet the needs of the specific project study plan. This is particularly important for the metals that have hardness adjusted criteria (e.g., cadmium, copper, lead, silver, and zinc). The Contractor must also ensure that the analytical laboratory analyzes the appropriate fraction (dissolved versus total) as specified in the specific project study plan. **In addition, the analytical laboratory must be able to achieve the lowest possible reporting limits and method detection limits in order to ensure that very few or none of the metals samples will be flagged as estimates (J flag or detected but not quantified [DNQ], i.e., estimated sample concentration that is less than the reporting limit but above the method detection limit and subject to a high degree of uncertainty).** This is particularly important because the State Water Resources Control Board's (SWRCB) sampling criteria of section 6.1.5.5 of the *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy) specifically states that "When the sample value is less than the quantitation limit and the quantitation limit (reporting limit) is greater than the water quality standard, objective, criterion or evaluation guideline, the results shall not be used in the analysis."

All other analytical water quality monitoring and analyses (mineral, bacterial, chlorophyll, and hardness) do not require the same level of protection from contamination as mentioned above; however, if a combination of parameters are required for a project, the most stringent sampling and analysis requirements will apply. Appropriate gloves must still be worn during any analytical water quality sampling and care must be taken to prevent contamination of the samples during collection, transport, and analysis for all water quality sampling parameters. Trace clean samples should be collected first (trace metals and mercury) and all sampling equipment should be trace clean as described in the "Clean Hands-Dirty Hands" Trace Metal Sampling Procedure provided in Appendix A and as described in US EPA Method 1638 (US EPA 1996).

When analytical water quality monitoring will be occurring in conjunction with other types of monitoring, such as water temperature monitoring or *in situ* field monitoring, care must be take to prevent contamination from sampling equipment (rust from metal chains and temperature recorder housings) and standards that are used in locations where analytical samples will be collected.

Analytical Sample Collection

Samples will be collected as grab samples from approximately midstream and mid depth. The bottle shall be placed in the stream upstream of the sampler if standing in the stream is feasible and downwind of the sampler if feasible. Samples for dissolved constituents may be filtered in the field. It is recommended that water sample containers that are provided by the respective analytical laboratory (based on the parameter to be measured) be used to collect water samples. For example, a trace clean laboratory will provide trace clean (pre-cleaned in the analytical laboratory with HNO_3) 60-mL polyethylene bottles for trace metal analyses. Mercury samples shall be collected in 250 mL glass (pre-cleaned by analytical lab using HNO_3) bottles that are supplied by the trace clean laboratory. Appropriate sample bottles shall be used for additional water quality parameters and information regarding bottle type can be obtained from

the analytical laboratory or in Appendix A of this document. Date, time, project name, stations location and/or station ID, name(s) of persons collecting water samples, analytical test, preservation, and Contractor ID must be included on all sample bottles.

Appropriate gloves will be worn during all water sample collection and handling (refer to "Clean Hands-Dirty Hands" technique). A sample blank will be collected for each analytical parameter using trace clean deionized water supplied by the trace clean analytical laboratory if metals and/or mercury samples are to be collected. One sample blank is required per 10 stations or per field visit. A blind duplicate sample should also be collected and analyzed for the project specific analytic water quality parameters from at least one station per every 10 stations or one per field visit. In addition, an equipment blank should be collected if sampling requires the use of special equipment such as with lake and reservoir sampling (trace clean Teflon™ nisken bottle – no metal parts that come in contact with water sample allowed). A non-metal boat is recommended for any lake or reservoir sampling that includes analysis for trace metals. The sampling equipment must be acid cleaned with trace clean HNO_3 prior to each field visit if trace metal analysis is required. Refer to Appendix A for more information regarding trace clean sampling procedures.

A COC must be filled out for each analytical water quality monitoring field visit. The COC is the official document that will be used during transport and handling of the water quality samples from the field to the analytical laboratory. Refer to Section 11, *Sample Handling and Custody*, for additional information.

Continuous Stream Water Temperature Monitoring

Continuous water temperature monitoring involves collection of water temperature data at project specified intervals with a water temperature data logger such as VEMCO™ brand or Starmon mini, or equivalent instrument.

The water temperature loggers must be calibrated in a laboratory setting before and after each field season. Calibration of the loggers will be performed by a PG&E representative, per the PG&E contract agreement with the Engineers and Scientists of California (ESC). All water temperature recorders must be returned to the PG&E Representative assigned to the project for recalibration at the end of the monitoring season. Once the recorders are calibrated, the recorders with all supporting calibration documentation will be returned to the Contractor prior to the next field monitoring season. A standard device with a traceable record to the National Standard must be used for calibration procedures. Calibration by the Manufacturer for new or re-batteried recorders is accepted by PG&E.

Water temperature loggers must have an accuracy of equal to or better than 0.1ºC for use on any PG&E project unless otherwise specified in the project study plan or RFP. The data loggers are typically placed in metal housings with protective foam inserts and are placed in an appropriate section of stream using metal chain and locks. All water temperature recorders should be marked with an individual serial number so that accuracy of individual recorders can be tracked throughout the project. The digital recorders should also be marked with a contact name and phone number in the event that they are removed from the water by curious individuals.

The water temperature data logger should be placed in the active flow channel that is representative of the river flow condition at the deepest point in the stream if feasible to ensure that the recorder will remain in the water during all stream flow conditions. An instantaneous water temperature measurement is collected (using a portable device) during each monthly servicing of the digital thermographs in order to validate the continuous water temperature data for the date of servicing.

Additionally, field data such as DO, pH, specific conductance, and turbidity may be required monitoring during field servicing of water temperature recorders. Specific monitoring requirements will be outlined

in the project specific monitoring plan. Efforts are made to hide the water temperature data loggers to prevent vandalism. The location is marked by a small flag, digital pictures of the location, and the location is mapped by GPS. A written description of the location of the data logger is recorded and any incidental information about the location is included (directions to site, number of steps or distance from nearest road, type of property, keys required for entrance to site, location of chain in stream, permission from landowner, etc).

Lake and Reservoir Profiling

Reservoir water temperatures and depth are typically measured and recorded at decimeter depth increments (depending on the specific project requirements) using an Ocean Seven™ 304 CTD, SeaBird Electronics™ SBE91Plus, TSK MICOM Bathythermograph (BT) or similar instrument. These bathythermographs and CTD are microprocessor-controlled depth/temperature loggers that store data in non-volatile memory and have manufacturer's stated response times of less than 0.1 seconds and an accuracy of equal to or better than 0.05ºC within the range of -5 to 35ºC. Data are downloaded and stored to disk after each profile. Quality control calibrations are typically performed on the BT prior to deployment. Coordinates of temperature profiling stations are determined using a Trimble Pathfinder Pro XRS™ differentially corrected GPS receiver or similar device. Additionally, notes pertaining to date, time, weather conditions, names of samplers, company name, and problems or concerns should be noted at the time of data collection.

11. SAMPLE HANDLING AND CUSTODY

All samples will be handled, prepared, transported and stored in a manner so as to minimize bulk loss, analyte loss, contamination or biological degradation. Sample containers will be clearly labeled with an indelible marker. Water samples will be kept in the lab specified sampling containers and kept cool at a temperature of 4ºC until analyzed, or will be preserved in the field if specified by the project. Maximum holding times for specific analyses can be obtained from the analytical laboratory.

Sample bottles will be placed in an ice chest, which will be sealed with tape prior to shipping. Samples are placed in the ice chest with enough ice to completely fill the ice chest. The COC forms are placed in a plastic Ziploc bag and taped the inside of the ice chest lid. It is assumed that samples in tape-sealed ice chests are secure whether being transported by staff vehicle, by common carrier, or by commercial package delivery. The receiving laboratory has a sample custodian who examines the samples for correct documentation, proper preservation and holding times.

Contract laboratories will follow sample custody procedures outlined in their QA plans. Contract QA plans are on file with the respective laboratory.

All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of the personnel of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals.

COC procedures require that possession of samples be traceable from the time the samples are collected until completion and submittal of analytical results. A complete COC form is to accompany the transfer of samples to the analyzing laboratory. Field crews shall be required to keep a field log for each sampling event.

12. ANALYTICAL METHODS

As stated in Section 10, *Sampling Methods*, US EPA Method 1638, Determination of Trace Elements in Ambient Waters by Inductively Coupled Plasma — Mass Spectrometry (US EPA 1996b) or equivalent method must be used for analyzing trace metals water samples; and US EPA Method 1631, Revision E:

Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry, (US EPA 2002) or equivalent method must be used for mercury analyses in water. Additional analytical constituents may be analyzed by an analytical method appropriate to meet the needs of the project specified Reporting Target Limits. Analytical method reporting limits should be sufficient to meet Regional Board Basin Plan Objectives and/or any other limits imposed by the project. **In addition, the analytical laboratory must be able to achieve the lowest possible reporting limits and method detection limits in order to ensure that very few or none of the metals samples will be flagged as estimates (J flag or detected but not quantified [DNQ], i.e., estimated sample concentration that is less than the reporting limit but above the method detection limit and subject to a high degree of uncertainty).** This is particularly important because the SWRCB's sampling criteria of section 6.1.5.5 of the *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy) specifically states that "When the sample value is less than the quantitation limit (reporting limit) and the quantitation limit is greater than the water quality standard, objective, criterion or evaluation guideline, the results shall not be used in the analysis."

13. QUALITY CONTROL

Sampling

Quality assurance and quality control (QA/QC) activities for sampling processes include the collection of field replicates for bacterial and chemical testing, and the preparation of field blanks and/or equipment blanks if necessary. The number of replicates should be one per every ten stations sampled or one per field visit for each analyte.

Blanks will be prepared by pouring water known to be free of the substance of interest into a sample collection container then subsampling into the appropriate number of replicate sample containers. Ultrapure water (ASTM Type III) will be used for hardness and metals.

Field Sampling

Projects that require pH and DO sampling also require a method of back-up for inconsistent or questionable measurements collected in the field. For example, if a pH less than 6 or greater than 8.5 is measured in the field; the pH probe must be recalibrated and a second measurement must be taken to verify the value. If there is still some question as to the accuracy of the measurement, a grab sample could be collected and analyzed at a state certified analytical laboratory (the sampler is required to be aware of holding times and availability of a lab to analyze the sample). This information must be recorded in the field notes as well with explanations for the activity.

Projects that require DO sampling also require methods for back-up measurements. For example, if a DO reading of less than 7 mg/L, for waters designated as COLD in the Basin Plan, is measured; then the instrument should be recalibrated and the sample collected again. If the reading is still questionable, then a sample must be collected for Winkler titration to verify the DO content of the water. Accurate field notes must be kept for any additional or back-up monitoring required in the field.

Analytical Laboratory

Any state certified analytical laboratory that is contracted to work for any PG&E project must have a QA/QC plan in place; and must adhere to the standard protocols for accuracy, precision, instrument bias, and analytical bias. The appropriate QC checks must be included with each sampling event and supplied to the entity that holds the contract (Contractor or PG&E). Any inconsistencies or problems associated with the sample run(s) must be reported to the party responsible for the contract (e.g., contaminated reagents, equipment malfunction, lost or broken sample bottles upon receipt, etc.).

14. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field measurement equipment will be checked for operation in accordance with the manufacturer's specifications. This includes battery checks, routine replacement of membranes, and cleaning of conductivity electrodes. All equipment will be inspected when first handed out and when returned from use for damage. Calibration reports must be maintained for all sample equipment that is used on a project. The Contractor is responsible for ensuring that only maintained field equipment is used for sampling. The Contractor is responsible for maintaining spare parts, extra equipment (back-up instruments or methods), and special equipment (boats and nisken bottles) as necessary to the needs of individual projects.

15. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Field instruments will be calibrated according to manufacturer's instructions immediately before use in the field. Field instruments will be calibrated for all *in situ* parameters that are required monitoring for the individual projects. pH measurement devices will be calibrated against standards and then checked against a standard from a different source than the calibration standard. Dissolved oxygen devices will be checked against aerated water whose oxygen content is determined by Winkler. Timely replacement of expired calibration standards will occur and no expired calibration standards may be used for instrument calibration. Documentation of all calibration procedures (including expiration date of standards) prior to each field visit will be maintained by the Contractor and supplied to the PG&E Project Task Manager upon request.

16. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Supplies will be examined for damage as they are received. pH and conductivity standards (including any additional standards) will be checked by comparing their readings with those generated by the current lot of standards. Standards must agree. In some instances, low ionic strength standards may be necessary for calibration of pH due to the low ionic strength of surface waters found in some project areas. The

Contractor must discuss the possibility of using low ionic strength standards with the PG&E Project Manager based upon historical data collection.

17. NON-DIRECT MEASUREMENTS (EXISTING DATA)

(If this section is applicable to your project, provide information on data that will be obtained from existing data sources. Include how the types of data mentioned will be used and its relevance to the project.)

Some projects may require the use of existing data in the data analysis. Use of existing data and the purpose of its use will be outlined in the project specific RFP. Any data supplied by PG&E will remain the property of PG&E and must be returned upon completion of the project. Refer to the General Contract for additional terms and conditions; this document does not supersede or override the terms and conditions stated in the General Contract.

18. DATA MANAGEMENT

Contractor personnel are required to maintain correct and complete field notes and laboratory results in an electronic form (word, excel, or pdf) and in hardcopy that can be transmitted to the PG&E Task Manager upon request. It is recommended that field notes be updated within 2 to 3 weeks of returning from the field. Specific timing of data transmittal to the PG&E Task Manager will be determined on a project by project basis. Data transmittal includes raw data, transformed or reduced data (statistical analyses), presentations, QA/QC audits, and any other project specific data requests. The Contractor is responsible for ensuring that proper data storage is maintained (hard copies, electronic copies, and back-up copies). Refer to the General Contract for additional terms and conditions; this document does not supersede or override the terms and conditions stated in the General Contract.

GROUP C: ASSESSMENT AND OVERSIGHT

19. ASSESSMENTS & RESPONSE ACTIONS

Periodic (to be determined on a project specific basis) QA Audits will be performed by the PG&E Task Manager at a frequency specified by the project or at his/her discretion. The audit may consist of reviewing field sampling procedures, review of analytical laboratory results (if applicable), and review of data collected as of the date of the audit.

If an audit discovers any discrepancy, the PG&E Task Manager will discuss the observed discrepancy with the appropriate person (Contractor or PG&E personnel) responsible for the activity. The discussion will begin with whether the information collected is accurate, what were the cause(s) leading to the deviation, how the deviation might impact data quality, and what corrective actions might be considered.

The PG&E Task Manager has the power to halt all sampling and analytical work by PG&E personnel, the Contractor, and/or any analytical laboratory under contract if the deviation(s) noted are considered detrimental to data quality. All actions conducted by the Contractor may stop if there are significant deviations from required practices or if there is evidence of a systematic failure. Corrective actions will be determined and discussed with the appropriate Contractor representative. Work will resume when the deviation(s) is/are resolved by both PG&E and the Contractor.

20. REPORTS TO MANAGEMENT

Progress reports will be provided by the Contractor to the PG&E Task Manager at a frequency specified in the project specific RFP. Timing and schedule for draft data reports and summaries will be determined on a project by project basis and will be specified in the RFP. Final reports and transmittal of all applicable data will occur at a schedule outlined in the project study plan or RFP. Refer to Section 5.1, *General Work Statement and Produced Products*, for more information regarding progress reports.

GROUP D: DATA VALIDATION AND USABILITY

21. DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly. That includes, for example, checking for data entry, transcription, calculation, reduction, and transformation errors. It may also mean ensuring that there is a complete list of sample information available, such as sample matrixes, blanks, duplicates, shipping dates, preservatives, holding times, etc., and ensuring that there are no programming errors. Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual specifications. Data validation is an analyte– and sample– specific process that extends the evaluation of data beyond method, procedure, or contractual compliance to determine the quality of a specific data set relative to the end use.

Data verification is generally done first, internally by those generating the data (PG&E or Contractor) or by an organization external to that group. Data validation is generally performed on the verified data later in the process and by someone independent or external to the data generator and the data user. These processes may occur both during and at the end of the project.

Data generated by project activities will be reviewed against the data quality objectives cited in Element 6 and the quality assurance/quality control practices cited in Elements 13, 14, 15, and 16. Data will be separated into three categories: data meeting all data quality objectives, data meeting failing precision or recovery criteria, and data failing to meet accuracy criteria. Data meeting all data quality objectives, but with failures of quality assurance/quality control practices will be set aside until the impact of the failure on data quality is determined. Once determined, the data will be moved into either the first category or the last category.

Data falling in the first category is considered usable by the project. Data falling in the last category is considered not usable. Data falling in the second category will have all aspects assessed. If sufficient evidence is found supporting data quality for use in this project, the data will be moved to the first category, but will be flagged with a "J" as per EPA specifications.

22. VERIFICATION AND VALIDATION METHODS

All data records will be checked visually and recorded as checked by initials and dates by the Contractor; or by PG&E personnel if PG&E personnel collected the data. Issues and concerns will be noted.

23. RECONCILIATION WITH USER REQUIREMENTS

Element Description

Describes how validated data will be evaluated to see if it answers the original questions asked. This is the final assessment of the data quality and the culmination of the entire QA process for the project.

The Contractor will describe how the project results have been evaluated to determine whether the project's objectives have been satisfied as stated in the project specific RFP. The Contractor will provide an outline of methods used to analyze the data and will determine possible anomalies or departures from assumptions made when the project was planned. The Contractor will describe what statistical and scientific analyses have been made as required by the project. Statistical analyses may include tests for outliers, trends, and dispersion. The Contractor will describe how data will be or has been presented, such as tables or charts, to illustrate trends, relationships, and anomalies. Limitations in data use will be reported to the PG&E Task Manager. This element assumes that the data has already met all data quality

objectives and other quality issues. The outcome here is whether the data does or does not support the original hypothesis or whether the data does not have the power to make the determination.

Appendix A

Trace Metal Sampling Procedure
"Clean Hands-Dirty Hands"

Trace Metal Sampling Procedure

"Clean Hands-Dirty Hands"

General sampling procedures for contamination-free collection of trace metal samples

GENERAL RULES FOR SAMPLING AND THINGS TO BE AWARE OF TO PREVENT CONTAMINATION

Trace metal samples are extremely sensitive to contamination from a wide variety of sources. The act of breathing on a sample by an individual that has mercury fillings in their teeth can cause mercury contamination in a water sample at the detection limits currently being used. This level of care needs to be taken when handling the trace metal sample collection bottles to ensure the collection of a sample that will produce the best and most representative data. When sampling, individuals should be aware of things that can cause contamination at each sampling location:

- The metal housings and chains used to secure temperature recorders are likely to contaminate the trace metal sampler's hands. Temperature recorders should be serviced after the water sampling is completed at each site and the individual that serviced the temperature recorder should ensure their hands are as clean as possible before the next sampling event (i.e., wear gloves to service recorders).

- The metal housing and chains of the temperature recorders will also contaminate backpacks used to shuttle them to and from each site. A separate backpack should be used for transporting water sample bottles.

- The surrounding environment that the water quality stations are located in is the source of trace metals in the stream. Take care to not touch anything but the sample bottles once gloved with polyethylene gloves. This includes balancing on rocks, picking up pens, scratching your nose. If you do come into contact with anything besides the sample bottle and associated bags change your gloves before handling the sample bottle and associated bags.

- Cigarette smoke is a significant source of trace metals and should not be introduced to the trace metal sample collection bottles. It is preferred that individuals do not smoke on days that water quality samples are collected because the smoke is very volatile, but if you need to smoke during a sample collection day it is important that you do not smoke at sampling sites and take care to ensure your hands are cleaned before sampling occurs.

- Acid cleaned sampled bottles should be received from the analytical laboratory double-bagged without preservative. Some analytical laboratories will send bottles that contain

dilute acid solution that can be disposed of prior to collecting the sample (see methods below for sample collection). Samples should be stored in sealed coolers before used at each sampling site and then returned to a sealed cooler with ice placed in double-bagged Ziploc type bags after a sampling event. The storage areas of most sampling vehicles used during the sampling events contain a significant amount of dirt that becomes airborne once the vehicle is in motion. It is important to reduce the contact of this dirt with the samples as much as is possible to reduce the potential for contamination.

These are just a few things that can introduce contamination to samples and are listed here to give the sampling teams an idea of what types of environmental factors and personal activities may introduce contamination to the samples. It is important to remember we are almost exclusively sampling in very clean and pristine environments that make our water quality sampling very sensitive to contamination. The "cleaner" the techniques used to collect the water samples, the better and more representative the data from the sampling will be. These general sampling rules and the following sampling techniques add very little time to previous sampling techniques, but will help ensure we are producing data that is representative of the environments being sampled.

COLLECTION OF UNFILTERED SAMPLES FOR TOTAL TRACE METAL ANALYSIS

The sample is generally collected by submerging the collection bottle into the stream or river using the "CLEAN HANDS–DIRTY HANDS" technique. This technique **requires** the use of polyethylene gloves or vinyl gloves; any other material contains trace metals at a level sufficient to contaminate the collected sample (i.e., no colored gloves, no powdered gloves, and no nitrile gloves). Contact the PG&E Project Manager for information regarding ordering proper gloves if necessary.

Two people are **required** for sample collection; first determine which person is designated as the "CLEAN HANDS" individual and which person is designated as "DIRTY HANDS" individual. These chosen assignments will remain constant for the duration of the sampling event. The sample collection personnel are required to wear polyethylene gloves. Gloves should be discarded and replaced with new gloves during sampling if anything occurs which may compromise the cleanliness of the gloves (gloves come into contact with anything but the sample bottle and associated bag, glove tears, etc.).

During the sample collection: (1) the "DIRTY HANDS" person opens the outer bag. (2) The "CLEAN HANDS" person opens the inner plastic bag (avoiding contact with the outside surface of the outer bag), removes the sample collection bottle and replaces the inner bag completely into the outer bag. The "DIRTY HANDS" person then seals the outer bag until the sample bottle is full and ready to be placed back into the inner bag.

With the sample collection bottle removed from the bags the "CLEAN HANDS" person begins the sampling process. The bottle is opened and the storage solution is discarded to the stream. The bottle is rinsed, **upstream** of the sampler, with sample water three times making sure all inner surfaces of the bottle, the bottle cap, and the bottle threads are rinsed each time. The sample bottle is then filled to the top with water **upstream** of the sampler and in a representative portion of the stream. During the filling process care must be taken that the bottle opening is

held well beneath the water surface to ensure no airborne contaminants floating on the water surface enter the sample bottle. The sample bottle is then capped tightly under water to preclude any surface water floating debris or dust.

The "DIRTY HANDS" person again opens the outer bag and the "CLEAN HANDS" person opens the inner bag and places the bottle into it. The "CLEAN HANDS" person closes the inner bag and replaces it completely into the outer bag. The "DIRTY HANDS" person can now close the outer bag without contaminating the inner bag (**any contact from the "DIRTY HANDS" person to the inner bag may cause the sample to be contaminated**).

The sampling process should be conducted in as little time as is feasible to minimize the chance for contamination by ambient particles, both from the water and air.

COLLECTION OF SAMPLES FOR DISSOLVED TRACE METAL ANALYSIS USING THE SYRINGE/FILTER METHOD

Two people are **required** for sample collection; first determine which person is designated as "CLEAN HANDS" and which person is designated as "DIRTY HANDS." The chosen assignments will remain constant for the duration of the sampling event. The sampling personnel are both **required** to wear polyethylene gloves. Gloves should be discarded during sampling if anything happens which may compromise the cleanliness of the gloves (come into contact with anything beside the sample bag/bottle, glove tears, etc.).

The "DIRTY HANDS" person opens the outer bags of the sample bottle, the syringe and the filter. The "CLEAN HANDS" person opens the inner bags and executes all of the sampling steps listed below.

First the syringe and the filter are removed from their respective bags. The syringe is rinsed three times with sample water and then completely filled **upstream** of the sampler. The filter is then attached and a small amount of water is pressed through the filter for rinsing (1-2 ml).

With the syringe and filter rinsed the sample collection bottle is removed from the inner bag and the storage solution is discarded from the bottle to the stream. The bottle is then rinsed three times with ambient water and then rinsed three times with a small amount of filtered ambient water, making sure all the inner surfaces of the bottle, the bottle cap, and the bottle threads are rinsed. The sample bottle is then completely filled with filtered sample water from the syringe. To refill the syringe with ambient water, remove the syringe plunger, fill the syringe with water **upstream** of the sampler, re-insert the syringe plunger, expel a small amount of water (1-2 ml) through the filter and rinse the filter tip. Several filters may be used to fill a single sample bottle. Make sure every new filter is rinsed by expelling a small amount of water through it.

When the sample bottle is completely filled the bottle is capped by the "CLEAN HANDS" individual and placed into the inner bag. The "CLEAN HANDS" person then seals the inner bag and completely replaces the inner bag into the outer bag. The "CLEAN HANDS" individual will also need to seal the inner bags of the syringes and filters. The "DIRTY HANDS" person then seals the all the outer bags and the sampling is complete.

When the sampling event is complete the filled sample bottles should be labeled on the outer bag with a separate label and then placed into a sealed cooler with ice placed into double-bagged Ziploc type bags. The samples have a 48 hour hold time (unpreserved) established by the US EPA so they need to be shipped overnight to an appropriate state certified "trace clean" laboratory to ensure the quality of the analysis. If permission is received from the PG&E Project Task Manager to preserve the samples prior to shipping (using trace clean reagent grade acid; contact QA Coordinator or PG&E Task Manager for specifications), then the hold time increases to 6 months. However, the sampler must have the appropriate supplies and equipment necessary for preservation in the field prior to shipping. More information may be obtained by contacting the PG&E QA Coordinator. The samples need to be shipped in a manner that will ensure the samples will arrive before 10:30 am Monday-Friday (this means sampling can not occur on Friday-Sunday). This completes the trace metal sampling event.

Appendix B

Sample Field Work Notification Form
and
List of Hydro Generation Supervisors

Power Generation Field Work Notification

Submit to Generation Supervisor 3 Working Days Prior To Start Of Work
Hydro Work Week is Monday – Thursday 0700 – 1730

Emergency Contacts (List in order of Notification)		**PG&E Contacts** **Notify Switching Center Daily Upon Entry and Exit**	
1st Contact:	**Field Lead**		
Name:		**Switching Center:**	
Title/Organization:		**Co. Phone:**	
Office:		**PT&T Phone:**	
Company Cell Phone:		**Fax:**	
Pager:			
Lodging Name/Phone		**Generation Supervisor(s):**	
Home Phone:		**PT&T Phone:**	
Satellite Phone:		**Fax:**	
Radio #		**Cell:**	
Personal Cell Phone:		**Pager:**	
2nd Contact:	**Employee's Supervisor**	**Other Agency Notification Required:**	**Yes** **No**
Name:		**Agency/Partnership:**	
Title/Organization:		**Phone:**	
Office:		**Fax:**	
Cell Phone:			
Pager:			
Home:			
3rd Contact:	**Employee's Director**	**Other Information**	
Name:			
Title/Organization:			
Office:			
Personal Cell Phone:			
Pager:			
Home:			
24 Hour Service Line:			

Power Generation Field Work Notification

Job Information

Dates and Specific Locations of Work	
Purpose of Work	
Safety Issues/Concerns	

Personal Information On Persons Entering Work Area

Name	Age	Company/ Personal Cell Phones	Pager	Home	Radio #'s issued	Vehicle Description/License	Known Medical Conditions
							None
							None

Switching Center Tracking Log

Group Leader Responsible for In/Out Notification	Location	Expected Start Date-Time	Actual Start *To be filled in by S.C. Operator* Date-Time	Other Agency Notified?	Expected Return Date-Time	Initiate Search and Rescue Procedure if not contacted by: Date-Time	Actual Return *To be filled in by S.C. Operator* Date-Time	Other Agency Notified?

Power Generation Field Work Notification

Instructions:

Emergency Contacts: 1st Contact - List the Field Lead for the work group that is to be contacted first in the event of emergency. This would be a supervisor that will not be part of the work group. This would be a PG&E Supervisor if the work group consisted of PG&E employees or a Contractor Supervisor if the work group consists of contract workers.

Emergency Contacts: 2nd Contact - This would be a supervisor that will not be part of the work group. This would be the TES Supervisor if the work group consisted of PG&E employees or a Contractor Supervisor if the work group consists of contract workers.

Emergency Contacts: 3rd Contact - List the Field Lead's Director at TES that would be available in case the 1st and 2nd contact could not be located.

Switching Center: List the appropriate Rivershed Switching Center here. This will be the Switching Center that the work group will make in and out notifications to each day. A list of Switching Center locations and phone numbers is shown in PG-SO71- Hydro Entry Procedures.

Generation Supervisor: List the appropriate Rivershed Generation Supervisor information here. A list of Generation Supervisor locations and phone numbers is shown in PG-SO71, Hydro Entry Procedures.

Other Agency Notification Required: Check yes or no here. A yes box checked here means the Rivershed Switching Center will also inform the Other Agency listed that the work party members have entered and exited the work area. The Rivershed Switching Center will make these notifications at the time they occur.

Other: Enter any other significant information here.

Job Information Section:

Dates and Specific Locations of Work: List dates of work and describe work locations sufficiently to provide rescue workers with enough information to properly search for missing persons.

Purpose of Work and Specific Work Activities: Describe purpose of work and specific work activities. Example - Plant surveys, approximately 50 ft. each side of rivers edge.

Safety Issues / Concerns: List any items here that must have special precautions taken in order to maintain a safe work environment. Examples would include having the work group wear orange vests for easy aerial spotting, satellite phone will be carried at all times, etc.

Personal Information Section: Fill out all boxes if they apply. List cell phone numbers if cell phone is on site, list radio call numbers if radios are on site. Vehicle description and license may be helpful in locating missing persons. List any known medical conditions that may be helpful to rescue personnel.

Power Generation Field Work Notification

Switching Center Tracking Log Section:

Group Leader Responsible for In/Out Notification: List Person responsible for daily in/out notification to Switching Center.

Location: List location person or group will be working in. Exact location detail should be outlined in **Location of Work** section, page 1.

Expected Start: List date and time Switching Center will be notified that workers will begin work for the day.

Actual Start: The Switching Center will use this column to fill in actual time notification was made.

Other Agency Notified: The Switching Center will check this column after other agency has been notified, if required.

Expected Return: List date and time that the Switching Center can expect to be notified that all work is complete for the day and all crew members are accounted for.

Initiate Search Procedure If Not Contacted By: List the date and time that the work group would expect the Switching Center to initiate Search and Rescue**.** ***This is very critical information for the Switching Center.***

Actual Return: The Switching Center will use this column to fill in actual time notification was made.

Other Agency Notified: The Switching Center will check this column after other agency has been notified, if required.

NOTES:

Work plan is sent via fax or e-mail to the Generation Supervisor 3 Hydro Working Days prior to start of work. Hydro workdays are Monday through Thursday 7:00 AM – 5:30 PM.

Notify Switching Center Immediately if work plan changes.

Wear appropriate clothing/footwear for the work being performed. Bright colored clothing is preferred.

Pets are not allowed on jobsite.

All crewmembers must read and understand radio operation instructions provided when radios are issued.