Application for a New License
Major Project – Existing Dam

Water Quality
Monitoring Plan

Security Level: Public

Yuba River Development Project
FERC Project No. 2246

December 2016

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GLOSSARY – DEFINITIONS OF TERMS, ACRONYMS AND ABBREVIATIONS

Term	Definition
BOG	Surface Water Ambient Monitoring Program Bioaccumulation Oversight Group
Cal Fish and Wildlife	California Department of Fish and Wildlife
EPA	United States Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
Forest Service	United States Department of Agriculture, Forest Service
GIS	Geographic Information System
GPS	Global Positioning System
License Year	First full calendar year after FERC license issuance
Plan	Water Quality Monitoring Plan
QAPP	Quality Assurance Project Plan
QA/QC	Quality assurance and quality control
Project	Yuba River Development Project, FERC Project No. 2246
Report	Water Quality Monitoring Report
RWQCB	Central Valley Regional Water Quality Control Board
Sample Event	Events when water quality samples will be collected
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
YCWA	Yuba County Water Agency

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SECTION 1.0

INTRODUCTION

In April 2014, the Yuba County Water Agency (YCWA), pursuant to Section (§) 5.18 of Title 18 of the Code of Federal Regulations (C.F.R.), filed with the Federal Energy Regulatory Commission (FERC) an Application for a New License for Major Project – Existing Dam - for YCWA's 361.9 megawatt Yuba River Development Project, FERC No. 2246 (Project). In December 2016, YCWA amended its April 2014 Application for a New License. The initial license for the Project was issued by the Federal Power Commission (FERC's predecessor) to YCWA on May 16, 1963, effective on May 1, 1963. The Federal Power Commission's May 6, 1966, Order Amending License changed the license's effective date to May 1, 1966, for a term ending on April 30, 2016.

YCWA included this Water Quality Monitoring Plan (Plan) in its December 2016 Amended Application for a New License.

The United States Department of Agriculture, Forest Service's (Forest Service) Federal Power Act Section 4(e) authority only applies in this Plan to Project facilities on National Forest System (NFS) land. The Forest Service administers the Plumas National Forest (PNF) in conformance with the PNF Land and Resource Management Plan (Forest Service 1988), as amended, and administers the Tahoe National Forest (TNF) in conformance with TNF Land and Resource Management Plan (TNF 1990), as amended. When the TNF or PNF Forest Plan revisions occur, those revised plans will supersede the 1990 TNF and 1988 PNF plans.

1.1 Background

1.1.1 Yuba River Development Project

The Project is located in Yuba, Sierra and Nevada counties, California, on the main stems of the Yuba River, the North Yuba River and the Middle Yuba River, and on Oregon Creek, a tributary to the Middle Yuba River. Major Project facilities, which range in elevation from 280 feet to 2,049 feet, include: 1) New Bullards Bar Dam and Reservoir; 2) Our House and Log Cabin diversion dams; 3) Lohman Ridge and Camptonville diversion tunnels; 4) New Colgate and Narrows 2 power tunnels and penstocks; 5) New Colgate, New Bullards Minimum Flow and Narrows 2 powerhouses; and 6) appurtenant facilities and features (e.g., administrative buildings, switchyards, roads, trails and gages). The existing Project does not include any above-ground open water conduits (e.g., canals or flumes) or any transmission lines.

In addition, the Project includes 16 developed recreation facilities. These include: 1) Hornswoggle Group Campground; 2) Schoolhouse Campground; 3) Dark Day Campground; 4)

Cottage Creek Campground;[1] 5) Garden Point Boat-in Campground; 6) Madrone Cove Boat-in Campground; 7) Frenchy Point Boat-in Campground; 8) Dark Day Picnic Area; 9) Sunset Vista Point; 10) Dam Overlook; 11) Moran Road Day Use Area; 12) Cottage Creek Boat Launch;[2] 13) Dark Day Boat Launch, including the Overflow Parking Area; 14) Schoolhouse Trail; 15) Bullards Bar Trail; and 16) floating comfort stations.[3] All of the recreation facilities are located on National Forest System (NFS) lands, with the exception of the Dam Overlook, Cottage Creek Boat Launch and small portions of the Bullards Bar Trail, which are located on land owned by YCWA. All of the developed recreation facilities are located within the existing FERC Project Boundary, except for a few short segments of the Bullards Bar Trail to the east of the Dark Day Boat Launch. In addition, the Project includes two undeveloped recreation sites at Our House and Log Cabin diversion dams, both located on NFS lands and within the existing FERC Project Boundary.

Figure 1.1-1 shows the Project Vicinity,[4] proposed Project, and proposed FERC Project Boundary.[5]

[1] Cottage Creek Campground was burned in 2010 and has not been rebuilt. YCWA is in discussions with the Forest Service regarding rebuilding the burned campground.

[2] Emerald Cove Marina provides visitor services at Cottage Creek Boat Launch, including houseboat and boat rentals, boat slips and moorings, fuel and a general store. The marina is operated under a lease from YCWA by a private company.

[3] The Project recreation facilities included one campground that is no longer part of the Project. Burnt Bridge Campground was closed initially by the Forest Service in 1979 due to low use levels. FERC, in an August 19, 1993 Order which approved YCWA's Revised Recreation Plan, directed YCWA to remove all improvements and restore the Burnt Bridge Campground to the condition it was in prior to development of the facility. YCWA consulted with the Forest Service and all that remains of Burnt Bridge Campground today is the circulation road and vehicle spurs; all other facilities were removed.

[4] For the purpose of this Plan, "Project Vicinity" refers to the area surrounding the proposed Project on the order of United States Geological Survey (USGS) 1:24,000 quadrangles.

[5] The FERC Project Boundary is the area that YCWA uses for normal Project operations and maintenance. The Boundary is shown in Exhibit G of YCWA's Application for New License, and may be changed by FERC with cause from time to time during the term of the new license.

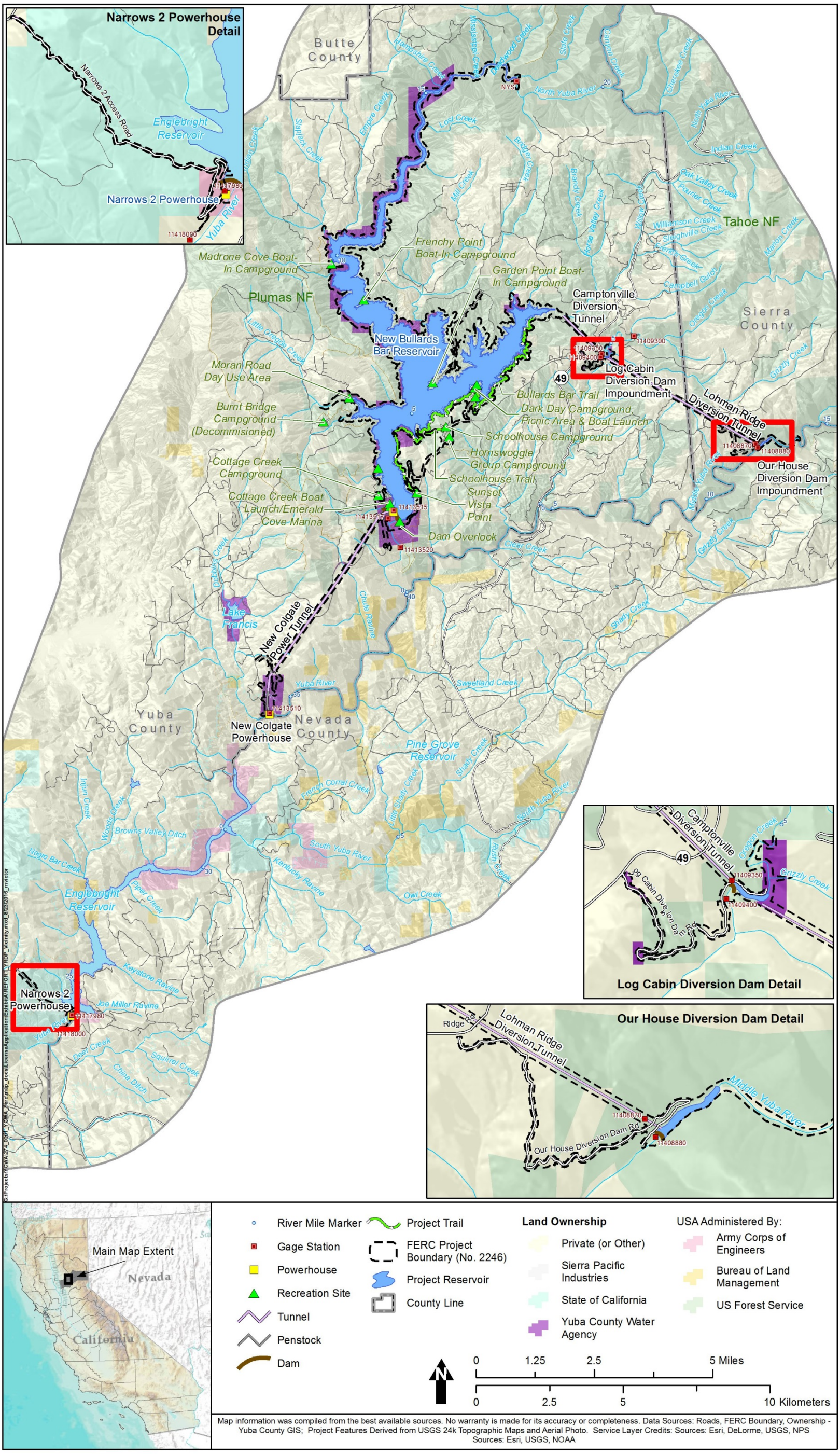

Figure 1.1-1. Yuba County Water Agency's Yuba River Development Project and Project Vicinity.

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1.2 Purpose of the Water Quality Monitoring Plan

This Plan describes the monitoring of four general water quality parameters: 1) *In Situ* water quality; 2) General water chemistry; 3) Recreation-related water quality monitoring; and 4) Bioaccumulation.

Existing water quality information, including water quality data collected during YCWA's relicensing studies, can be found in Section 3.3.2 of YCWA's Application for New License.

YCWA will coordinate, to the extent appropriate, the efforts required under this Plan with other Project resource efforts, including implementation of other resource management plans and measures included in the new license.

1.3 Objectives of the Water Quality Monitoring Plan

The objective of the Plan is to monitor water quality conditions in Project reservoirs and impoundments and Project-affected reaches of the North, Middle, and mainstream Yuba rivers, and in Oregon Creek, a tributary to the Middle Yuba River.

1.4 Contents of the Water Quality Monitoring Plan

This Plan includes the following:

- Section 1.0. Introduction. This section includes introductory information, including a description of the Project and the purpose and goals of the Plan.
- Section 2.0. Monitoring Methods and Analysis. This section describes the methods that will be used to monitor and analyze water quality.
- Section 3.0. Monitoring Locations and Frequencies. This section describes the locations at which water quality samples will be taken and the frequency with which they will be taken.
- Section 4.0. Reporting, Consultation and Plan Revisions. This section describes reporting, consultation and Plan revisions.
- Section 5.0. References Cited. This section lists references cited in this Plan.

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SECTION 2.0

MONITORING METHODS AND ANALYSIS

This section describes the methods that will be used to monitor and analyze water quality.

To allow for comparison of post-license issuance water quality information with pre-license issuance information, the post-license issuance monitoring will use the same methods and analysis as the pre-license issuance sampling to the extent practical.

2.1 Concepts That Apply to All Water Quality Monitoring

The following concepts and practices apply to all aquatic monitoring:

- Personal safety is the most important consideration of each fieldwork team.
- Prior to performing fieldwork, YCWA will obtain all necessary permits and approvals required to perform the fieldwork (e.g., scientific collection permits). All fieldwork will be performed by individuals who hold the necessary current permits to perform the fieldwork.
- All fieldwork will occur under normal operating flow conditions (i.e., requests for variance to minimum streamflow requirements not needed).
- YCWA will make a good faith effort to obtain permission to access private property, where needed, well in advance of entering the property.
- Where required, Global Positioning System (GPS) data will be collected using either a Map Grade Trimble GPS (sub-meter data collection accuracy under ideal conditions), a Recreation Grade Garmin GPS unit (3-meter data collection accuracy under ideal conditions), or similar units. GPS data will be post-processed and exported from the GPS unit into Geographic Information System (GIS)-compatible file format in an appropriate coordinate system using desktop software. The resulting GIS file will then be reviewed by both field staff and YCWA's GIS analyst. Metadata will be developed for GIS data sets.
- Incidental observations of Western pond turtle (*Actinemys marmorata*) and American bullfrog (*Lithobates catesbeianus*) will be recorded, and field crews will be trained on the identification of these two species. Any fish species easily distinguishable, but previously not observed in the study reaches will also be noted. The incidental observation records will include the species, location, and an estimated number of individuals per observation. Records of special-status species observations will be submitted to the California Natural Diversity Database (CNDDB), and included in the appropriate monitoring reports.
- Field crews will be trained on and provided with materials (e.g., Quat, a disinfectant) for decontaminating their boots, waders, and other equipment between monitoring sites. Major concerns are amphibian chytrid fungus, and invasive invertebrates (e.g., zebra

mussel, *Dreissena polymorpha*). Field crews will adhere to accepted decontamination guidelines to minimize the likelihood of transmitting diseases (USFWS 2005), as appropriate.

2.2 Water Quality Analytes

For the purpose of this Plan, water quality analytes to be monitored are divided into four categories: 1) *In Situ* (i.e., direct monitoring in water); 2) General (i.e., samples collected for analysis in a laboratory); 3) Recreation (i.e., samples collected to focus on recreation in New Bullards Bar Reservoir and Log Cabin and Our House Impoundments); and 4) Bioaccumulation (i.e., samples focusing on metals accumulation in fish in New Bullards Bar Reservoir and Log Cabin and Our House Impoundments). Table 2.2-1[6] lists the analytes in each of these categories:

Table 2.2-1. Analytes to be monitored under this Plan.

	Analyte		Method	Target Reporting Limit µg/L (or other)	Hold Time
IN SITU	**BASIC WATER QUALITY – *IN SITU***				
	Water Temperature	°C	--	+/-0.2°	Field (in situ)
	Dissolved Oxygen	DO	SM 4500-O	0.1 mg/L	Field (*in situ*)
	Specific conductance	--	SM 2510A	0.001 µohms	Field (*in situ*)
	pH	--	SM 4500-H	0.1 su	Field (*in situ*)
	Turbidity	--	SM 2130 B	0.1 NTU	Field (*in situ*)
	Secchi Disc	--	--	--	Field (*in situ*)
GENERAL	**BASIC WATER QUALITY – LABORATORY**				
	Total Organic Carbon	TOC	SM 5310	0.2 mg/L	28 d
	Dissolved Organic Carbon	DOC	EPA 415.1 D	0.5/0.1	28 d
	Total Dissolved Solids	TDS	EPA 2540 C SM 2340 C	1 mg/L	7d
	Total Suspended Solids	TSS	EPA 2520 D SM 2340 D	1 mg/L	7d
	INORGANIC IONS				
	Total Alkalinity	--	SM 2340 B	2000	14 d
	Calcium	Ca	EPA 6010 B	30	180 d
	Chloride	Cl	EPA 300.0	20	28 d
	Hardness (measured value)	--	EPA 2340 B SM 2340 C	1 mg/L as $CaCO_3$	14 d
	Magnesium	Mg	EPA 6010 B	1	180 d
	Potassium	K	EPA 6010 B	500	180 d
	Sodium	Na	EPA 6010 B	29	180 d
	Sulfate	SO_4	EPA 300.0	1.0 mg/L	28 d
	Sulfide	S^{2-}	SM 4500 S2 - D	0.05 mg/L	28 d
	NUTRIENTS				
	Nitrate-Nitrite	--	EPA 300.0	2	28 d <pH 2
	Total Ammonia as N	--	EPA 4500-NH3 SM 4500-NH3	0.02	28 d <pH 2
	Total Kjeldahl Nitrogen as N	TKN	SM 4500 N	100	28 d <pH 2
	Total phosphorus	TP	SM4500 P	20	28 d <pH 2
	Dissolved Orthophosphate	PO_4	EPA 365.1 EPA 300.0	0.01	48 h at 4 °C

[6] Methods and target reporting limits are subject to change based on new requirements or regulations, as described in Section 4.

Table 2.2-1. (continued)

	Analyte		Method	Target Reporting Limit µg/L (or other)	Hold Time
GENERAL (cont'd)	**METALS (total and dissolved)**				
	Aluminum (total and dissolved)	Al	EPA 200.8/EPA 1638	4.0/ 0.4	180 d
	Arsenic (total and dissolved)	As	EPA 200.8/1638	0.15/0.04	180 d
	Cadmium (total and dissolved)	Cd	EPA 200.8/1638	0.020/0.004	180 d
	Chromium, Total (total and dissolved)	Cr	EPA 200.8/1638	0.010/0.03	180 d
	Copper (total and dissolved)	Cu	EPA 200.8/1638	0.10/0.01	180 d
	Iron (total and dissolved)	Fe	EPA 200.8/1638	10.0/3.2	180 d
	Lead (total and dissolved)	Pb	EPA 200.8/EPA 1638	0.040/0.003	180 d
	Mercury (total)	Hg	EPA 1631	0.0005/0.00008	28 d
	Methylmercury (total and dissolved)	CH_3Hg	EPA 1630	0.00005/0.000019	90 d
	Nickel (total and dissolved)	Ni	EPA 200.8/1638	0.10/0.01	180 d
	Selenium (total)	Se	EPA 200.8/1638	0.60/0.19	180 d
	Silver (total and dissolved)	Ag	EPA 200.8/1638	0.20/0.006	180 d
	Zinc (total and dissolved)	Zn	EPA 200.8/1638	0.2/0.1	180 d
RECREATION	**BACTERIA**				
	Total coliform	--	SM 9221	1.1 MPN	24 h
	Fecal coliform	--	SM 9221	1.1 MPN	24 h
	Escherichia coli	*E. coli*	SM 9223	1.1 MPN	24 h
	PETROLEUM HYDROCARBONS				
	Total Petroleum Hydrocarbons (gasoline range)	TPH-g	SW 8015B	50	14 d
	Oil & Grease	O&G	Visual Observation	--	--
BIOACCUMU-LATION	**METALS (wet-weight fish tissue / wet-weight crayfish tissue)**				
	Mercury	Hg	EPA 7473[1]	0.03 µg/g	28 d
	Arsenic	As	EPA 200.8	0.30 µg/g	180 d
	Copper	Cu	EPA 200.8	0.20 µg/g	180 d
	Selenium	Se	EPA 200.8	0.40 µg/g	180 d
	Silver	Ag	EPA 200.8	0.01 µg/g	180 d

[1] EPA 7473 analyzes for mercury in solids and solutions by thermal decomposition, amalgamation and atomic absorption spectrometry (EPA 1998)

Key:
EPA = United States Environmental Protection Agency
$CaCO_3$ = Calcium carbonate
°C = degrees Celsius
d = days
h = hours
µohms = microohms
µg/L = micrograms per liter (equals parts per billion)
µg/g = micrograms per gram (equals parts per billion)
mg/L = milligrams per liter (equals parts per million)
MPN = Most Probable Number
NTU = Nephelometric Turbidity Units
pH = Units
SM = Standard Method
su = Standard Unit

2.3 Water Quality Monitoring

2.3.1 *In Situ* Water Quality Sampling

2.3.1.1 Field Methods

In Situ water quality measurements will occur in September or August from the surface of flowing water in streams, and at two depths - one just below the surface in the epilimnion and one below the thermocline in the hypolimnion - in New Bullards Bar Reservoir and in the United States Army Corps of Engineers' (USACE) Englebright Reservoir, as described in Section 3.2.

All *In Situ* monitoring will include water temperature (±0.1degree Celsius, or °C), dissolved oxygen (or DO, ±0.2 mg/L), pH (±0.2 standard unit, or su) and specific conductance (±0.001 microohms per centimeter, or µohms/cm), which will be measured *in situ* using a Hydrolab DataSonde 5 or other similar instrument that has equivalent precision and accuracy. YCWA will note relevant conditions during each *In Situ* monitoring event on the field data sheet (e.g., weather, air temperature, flow, description of location, floating material, evidence of oil and grease on the water, and activities in the vicinity of sampling site that could cause short- or long-term alterations to water quality, such as dredging).

In Situ monitoring in streams will include turbidity (± 1 Nephelometric Turbidity Unit), which will be measured *in situ* using a Hydrolab DataSonde 5 or other similar instrument that has equivalent precision and accuracy.

In Situ monitoring in reservoirs and impoundments will include Secchi depth measurements. Secchi depth readings will be taken by lowering a Secchi disc over the shaded side of the boat until the disc is no longer visible from the boat. The disk will then be raised until visible, at which location the depth of the disc will be recorded in tenths of a foot, and the average of the two readings will be used as the water clarity reading for that location.

In Situ monitoring triggered by the operation of the new New Bullards Bar Dam Low Level Outlet and the new New Colgate Powerhouse Tailwater Depression System will occur within a week before operation, immediately following operation, and 10-14 days after operation.

2.3.1.2 Quality Assurance/Quality Control Review Methods

Prior to and after each use, the instrument(s) will be calibrated using manufacturer's recommended calibration methods. Any variances will be noted on the field data sheet and final report and recalibration or repair done as necessary. In addition, YCWA will subject all data to quality assurance and quality control (QA/QC) procedures including, but not limited to, spot-checks of transcription and identification of any data that seem inconsistent. If any inconsistencies are found, YCWA will consult with the field crew that collected the data to identify any potential sources of error before concluding that data are correct.

2.3.2 General Water Quality Sampling

2.3.2.1 Field Methods

General water quality measurements will be taken in September or August from the surface of flowing water in streams, and at two depths - one just below the surface in the epilimnion and one below the thermocline in the hypolimnion - in New Bullards Bar Reservoir and in Englebright Reservoir, as described in Section 3.2.

Each laboratory sample will be collected into laboratory-supplied clean containers. Water samples to be analyzed for metals will be taken using "clean hands" methods consistent with the United States Environmental Protection Agency's (EPA) Method 1669 sampling protocol *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria* (EPA 1995). Samples requiring filtration before metals analysis will be filtered in accordance with standard protocols in the field. Certification of filter cleanliness will be obtained from the vendor and kept in the Project files.

All sample containers will be labeled with the date and time that the sample is collected, sampling site or identification label and handled in a manner consistent with appropriate chain-of-custody protocols. The sample container will be preserved, as appropriate, stored and delivered to a State of California-certified water quality laboratory for analyses of the parameters listed in Table 2.2-1 in accordance with maximum holding periods for each parameter. A chain-of-custody record will be maintained with the samples at all times. The sampling site location will be recorded using a GPS unit.

As part of the field quality assurance program, two field blanks and equipment rinsates will be collected and submitted to the laboratory (i.e., approximately one for every 10 analyses). A field blank is a sample of analyte-free water poured into the container in the field, preserved and shipped to the laboratory with samples. A field blank for filtered samples will be similarly created, but filtered using field techniques before pouring into the container. A field blank assesses the contamination from field conditions during sampling. A rinsate is a sample of analyte-free water poured over or through decontaminated field sampling equipment prior to the collection of samples to assess the adequacy of the decontamination processes. Two duplicate samples will also be collected.

At each General Water Quality site and when the sample is collected, YCWA will collect *In Situ* measurements, as described in Section 2.3.1.

2.3.2.2 Laboratory Methods

All laboratory analyses will be conducted using EPA Standard Methods or the equivalent sufficiently-sensitive protocol as listed in Table 2.2-1 to detect and report at levels necessary for evaluation against state and federal water quality standards. A State of California-certified laboratory will prepare and analyze water samples for the following General surface water analytical parameters:

- Basic Water Chemistry – Laboratory
- Inorganic Ions
- Metals
- Nutrients

The analytes and target reporting limits associated with each parameter are listed in Table 2.2-1.

2.3.2.3 Quality Assurance/Quality Control Review Methods

The Quality Assurance Program Plan (QAPP) prepared by YCWA for relicensing will be used during data acquisition and synthesis (Attachment A).

All samples will be collected, handled, and delivered to the lab consistent with current EPA methods or other approved sampling/handling protocols including, but not limited to *Standard Methods for Examination of Water and Wastewater*. Appropriate QA/QC methods and documentation will be followed. Field QA/QC methods may vary dependent on chemical constituents, but certain methods will be uniformly applied to all field sampling. Clean sampling techniques will be applied throughout the sampling effort. This includes the use of disposable gloves for all field crew members. All sample bottles will be prepared by a California-certified laboratory, and the bottles will be wrapped with clean parafilm around the top when samples have been collected. The laboratory will prepare all sample bottles and, where necessary, place the appropriate amount and type of preservative in sample bottles. All sample collection devices will be rinsed between sampling events with de-ionized water and then rinsed with water from the water body to be collected from. The labeled samples will be placed in closed, lightproof containers filled with ice. Samples will be delivered to the laboratory in accordance with maximum holding times. QA/QC in the field will be assured by accurately and thoroughly completed sample labels, field sheets, chain-of-custody and sample log forms. Sample labels will include sample identification code, date, time, stream/lake name, sampling location, collector's name, sample type and preservative if applicable.

YCWA will subject all data to QA/QC procedures including, but not limited to: spot-checks of transcription; review of electronic data submissions for completeness; comparison of results to field blank and rinsate results; and, identification of any data that seem inconsistent. If any inconsistencies are found, YCWA will consult with the laboratory to identify any potential sources of error before concluding that the data are correct.

All verified chemical detections, including data whose results are "J" qualified,[7] will be used for this assessment. Should the laboratory need to re-extract samples and re-run the sample under different calibration conditions, the data identified by the laboratory as the most certain will be used. If field-sampling conditions, as measured by the field blank and the rinsate sample results, indicate that samples have been corrupted, YCWA will identify the data accordingly.

[7] Results with a "J" qualifier are results where the chemical was detected, but there is uncertainty in the quantity. The quantity is above the method detection limit, but below the reporting limit.

2.3.3 Recreation Water Quality Sampling

2.3.3.1 Field Sampling

Recreation water quality samples will be taken from the near-shore surface of New Bullards Bar Reservoir and Our House and Log Cabin diversion dam impoundments at the sites described in Section 3.2. Each monitoring event will include five different days within a 30-day period which spans the Independence Day holiday weekend (CVRWQCB 1998). YCWA will select the five days to be sampled, which will include a minimum of two sample days before and after Independence Day. Sampling will follow the same procedures described in Section 2.3.2.1 for General water quality sampling. Visual observations of oil and grease will be recorded.

2.3.3.2 Laboratory Analysis

YCWA will analyze the water quality samples for recreation following the procedures described in Section 2.3.2.2 for General water quality sampling. The samples will be analyzed for total coliform, fecal coliform, *Escherichia coli,* Total Petroleum Hydrocarbons (TPH) and oil and grease following the methods described in Table 2.2-1.

2.3.3.3 Quality Assurance/Quality Review Methods

For all Recreation water quality sampling, YCWA will follow the QA/QC methods described for General water quality sampling in Section 2.3.2.1.

2.3.4 Bioaccumulation Sampling

2.3.4.1 Field Sampling

Bioaccumulation sampling will occur in September or August, concurrent with stream fish monitoring as described in the Upper Yuba River Aquatic Monitoring Plan, which is part of the new license. Monitoring locations are described in Section 3.2.

Table 2.3-1 lists for each target species, the number of specimens and minimum size of specimens at each monitoring location during up to two sampling events (i.e., a sampling event is one visit to the site to collect the target number for collection). If YCWA has not collected the target number for collection after the second sampling event, no additional sampling is required to collect the target number for collection at that location that year, and YCWA will process the samples from the two sampling events.

YCWA is only required to collect crayfish samples every other year that bioaccumulation samples are collected, beginning with the first year that bioaccumulation samples are collected.

Table 2.3-1. Bioaccumulation sampling target species, size and number by location.

Species	Target Number for Collection[1]	Size[2] (Total Length in millimeters, or mm)
NEW BULLARDS BAR RESERVOIR		
Freshwater Crayfish Species	9	≥35 Carapace Width[3]
Rainbow trout *Oncorhynchus mykiss*	9	≥200 Total Length
Kokanee salmon *O. nerka*	9	≥200 Total Length
Black bass *Micropterus* species	9	≥305 Total Length
OUR HOUSE DIVERSION DAM IMPOUNDMENT		
Rainbow trout *O. mykiss*	9	≥200 Total Length
LOG CABIN DIVERSION DAM IMPOUNDMENT		
Rainbow trout *O. mykiss*	9	≥200 Total Length

[1] OEHHA 2009
[2] Appendix I of Cal EPA 2005
[3] ≥ indicates more than or equal to

Fish and crayfish will be collected in accordance with the protocols of the State Water Resources Control Board (SWRCB) Surface Water Ambient Monitoring Program (SWAMP). Fish collection will be conducted using gill netting, electrofishing, hook-and-line, or other fish collection techniques approved by the California Department of Fish and Wildlife (Cal Fish and Wildlife). Crayfish will be captured using 10 baited traps soaked overnight along boat ramps and campgrounds. Sample site locations in New Bullards Bar Reservoir will be recorded using a GPS unit.

Field samples will be handled in a manner consistent with the SWAMP Bioaccumulation Oversight Group (BOG) QAPP (Bonnema 2014). The SWAMP BOG QAPP incorporates the collection methods outlined in the California Environmental Protection Agency's *General Protocol for Sport Fish Sampling and Analysis* (Cal EPA 2005) and Cal Fish and Wildlife's Method #MPSL-102a (CDFG 2005) for handling of fish. Crayfish size will be measured by carapace length and weighed unless otherwise specified in SWAMP protocols.

2.3.4.2 Laboratory Analysis

Fish tissue samples and crayfish will be delivered to a California-certified analytical laboratory. Analytical methods will be consistent with the SWRCB SWAMP BOG QAPP, which includes the criteria for data quality acceptability, testing including deviations, calibration, and preventative and corrective measures (Bonnema 2014). Individual samples will be analyzed for total mercury. Five samples of tissues of rainbow trout from each sampling location will also be analyzed for arsenic, copper, selenium and silver. The methods and reporting limits for mercury and the four additional metals in fish tissue are provided in Table 2.1-1.

2.3.4.3 Quality Assurance/Quality Review Methods

For all Bioaccumulation sampling, YCWA will follow the QA/QC methods described for General water quality sampling in Section 2.3.2.3 and to Bonnema 2014, as applicable.

SECTION 3.0

MONITORING LOCATIONS AND FREQUENCIES

3.1 Monitoring Area

The Study area includes: 1) the Middle Yuba River from and including Our House Diversion Dam Impoundment to the confluence with the North Yuba River; 2) Oregon Creek from and including the Log Cabin Diversion Dam Impoundment to the confluence with the Middle Yuba River; 3) the North Yuba River from and including New Bullards Bar Reservoir to the confluence with the Middle Yuba River; and 4) the portion of the Yuba River from the confluence of the North and Middle Yuba rivers to the Feather River, including Englebright Reservoir (Figure 1.1-1).

To assess water quality entering Project reservoirs and impoundments and Project-affected reaches, water quality samples will be collected upstream of all Project facilities.

3.2 Monitoring Locations

To allow for comparison of post-license issuance water quality information with pre-license issuance information, the post-license issuance monitoring locations, to the extent possible, use the same monitoring locations as the pre-license issuance water quality sampling locations at selected monitoring sites. Table 3.3-1 lists water quality monitoring locations, including Universal Transverse Mercator (UTM) coordinates for each *In Situ*, General, Recreation and Bioaccumulation monitoring site. Figure 3.3-1 shows the location of each monitoring site in relation to Project facilities and features.

3.3 Monitoring Frequency

The monitoring frequencies in this Plan use "License Years," with "License Year 1" designating the first full calendar year in which the new license is effective. While YCWA has requested FERC issue a new license with a term of 50 years, for planning purposes this Plan assumes FERC will issue a new license with a term of 30 years. Regardless, monitoring under this Plan is intended to cover the period from License Year 1 until the time FERC issues a new license (i.e., through the term of the new license and any annual licenses issued by FERC until a new license is issued).

Table 3.3-1 describes the frequency of water quality monitoring for In Situ, General, Recreation and Bioaccumulation monitoring through the term of the new license.

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Table 3.3-1. Locations and frequency of *In Situ*, General, Recreation and Bioaccumulation water quality monitoring. The number in the cell is the number of sampling events in that License Year.

Monitoring Site				Monitoring Methods	Relicensing Results		License Year (Year 1 is First Full Calendar Year After License Issuance and Year 30 Is Assumed Term of New License for This Exercise. Assumes YCWA Files with FERC NOI/PAD at Earliest Possible Time [in Year 25, 5.5 years prior to license expiration] to Enter Relicensing Process for New License.) [1]																														Possible Number of Sampling Events for License with a 30-Year Term
Stream	River Mile	Location	UTM Coordinates		Method	Year(s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
North Yuba	New Bullards Bar Reservoir	Madrone Cove	E 658132, N 4370616	In Situ - Profile	Profile (166995-1-3)	2012	1	1	1																											3
North Yuba	New Bullards Bar Reservoir	Mid-Reservoir	E 660800, N 4365496	In Situ - Profile	Profile (166995-1-4)	2012	1	1	1																											3
North Yuba	New Bullards Bar Reservoir	Near Dam	E 660121, N 4362916	In Situ - Profile	Profile (166995-1-1)	2012	1	1	1																											3
Middle Yuba	12.9	Above OHDD	E 672657, N 4364537	In Situ	In Situ (166995-2-1)	2012	1	1	1																											3
Middle Yuba	12.6	Below OHDD	E 672321 N4364280	In Situ	In Situ (166995-2-2)	2012	1	1	1																											3
Middle Yuba	1.5	Below Moonshine Creek	E 663859, N 4361336	In Situ	Not sampled in Relicensing		1	1	1																											3
Oregon Creek	4.5	Above LCDD	E 667279, N 4367450	In Situ	In Situ (166995-2-3)	2012	1	1	1																											3
Oregon Creek	4.2	Below LCDD	E 667027, N 4367295	In Situ	In Situ (166995-2-4)	2012	1	1	1																											3
North Yuba	23.7	Above NBB at HWY 49	E 670904, N4375975	In Situ	In Situ (166995-2-5)	2012	1	1	1		3 [2]	3 [2]																								9
North Yuba	2.2	Below NBB at weir	E 659832, N 4361793	In Situ	In Situ (166995-2-6)	2012	1	1	1																											3
Yuba	34.3	Above Colgate	E 656003, N 4355032	In Situ	In Situ (166995-2-14)	2012	1	1	1																											3
Yuba	34.1	Below Colgate	E 655742, N 4354997	In Situ	In Situ (166995-2-15)	2012	1	1	1																											3
Yuba	32.5	At Rice Crossing	E 654768, N 4352982	In Situ	In Situ (166995-2-16)	2012	1	1	1		3 [3]	3 [3]																								9
Yuba	Englebright Reservoir	Upstream End of Reservoir	E 651295, N 4349546	In Situ - Profile	In Situ (166995-1-5)	2012	1	1	1																											3
Yuba	Englebright Reservoir	Mid-Reservoir	E 649898, N 4347543	In Situ - Profile	In Situ (166995-1-6)	2012	1	1	1																											3
Yuba	Englebright Reservoir	Near Dam	E 649413 N 4344948	In Situ - Profile	In Situ (166995-1-2)	2012	1	1	1																											3
Yuba	24.0	Below Narrows	E 649037, N 4344375	In Situ	In Situ (166995-2-8)	2012	1	1	1																											3
Yuba	18.4	Below Deer Creek, HWY 20	E 643829, N 4342515	In Situ	In Situ (166995-2-9)	2012	1	1	1																											3
Yuba	11.6	Below DPDD	E 634261, N 4341058	In Situ	In Situ (16995-2-10)	2012	1	1	1																											3
Yuba	7.2	At Walnut Ave	E 628593, N 4337949	In Situ	In Situ (166995-2-11)	2012	1	1	1																											3
Yuba	0.7	At Marysville	E 621732, N 4332654	In Situ	In Situ (166995-2-12)	2012	1	1	1																											3
North Yuba	New Bullards Bar Reservoir	Madrone Cove	E 658132, N 4370616	General Water Chemistry	General (166995-1-3)	2012			1 [4]												1 [5]							1								3
North Yuba	New Bullards Bar Reservoir	Mid-Reservoir	E 660800, N 4365496	General Water Chemistry	General (166995-1-4)	2012			1 [4]												1 [5]							1								3
North Yuba	New Bullards Bar Reservoir	Near Dam	E 660121, N 4362916	General Water Chemistry	General (166995-1-1)	2012			1 [4]												1 [5]							1								3
Middle Yuba	12.9	Above OHDD	E 672657, N 4364537	General Water Chemistry	General (166995-2-1)	2012			1 [4]												1 [5]							1								3
Middle Yuba	12.6	Below OHDD	E 672321 N4364280	General Water Chemistry	General (166995-2-2)	2012			1 [4]												1 [5]							1								3
Middle Yuba	1.5	Below Moonshine Creek	E 663859, N 4361336	General Water Chemistry	Not sampled in Relicensing				1 [4]												1 [5]							1								3
Oregon Creek	4.5	Above LCDD	E 667279, N 4367450	General Water Chemistry	General (166995-2-3)	2012			1 [4]												1 [5]							1								3
Oregon Creek	4.2	Below LCDD	E 667027, N 4367295	General Water Chemistry	General (166995-2-4)	2012			1 [4]												1 [5]							1								3

Table 3.3-1. (continued)

Monitoring Site				Monitoring Methods	Relicensing Results		License Year (Year 1 is First Full Calendar Year After License Issuance and Year 30 Is Assumed Term of New License for This Exercise. Assumes YCWA Files with FERC NOI/PAD at Earliest Possible Time [in Year 25, 5.5 years prior to license expiration] to Enter Relicensing Process for New License.) [1]																														Possible Number of Sampling Events for License with a 30-Year Term
Stream	River Mile	Location	UTM Coordinates		Method	Year(s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
North Yuba	23.7	Above NBB at HWY 49	E 670904, N4375975	General Water Chemistry	General (166995-2-5)	2012			1 [4]												1 [5]								1							3
North Yuba	2.2	Below NBB at weir	E 659832, N 4361793	General Water Chemistry	General (166995-2-6)	2012			1 [4]												1 [5]								1							3
Yuba	34.3	Above Colgate	E 656003, N 4355032	General Water Chemistry	General (166995-2-14)	2012			1 [4]												1 [5]								1							3
Yuba	34.1	Below Colgate	E 655742, N 4354997	General Water Chemistry	General (166995-2-15)	2012			1 [4]												1 [5]								1							3
Yuba	32.5	At Rice Crossing	E 654768, N 4352982	General Water Chemistry	General (166995-2-16)	2012			1 [4]												1 [5]								1							3
Yuba	Englebright Reservoir	Upstream End of Reservoir	E 651295, N 4349546	General Water Chemistry	General 166995-1-5	2012			1 [4]												1 [5]								1							3
Yuba	Englebright Reservoir	Mid-Reservoir	E 649898, N 4347543	General Water Chemistry	General 166995-1-6	2012			1 [4]												1 [5]								1							3
Yuba	Englebright Reservoir	Near Dam	E 649413 N 4344948	General Water Chemistry	General 166995-1-2	2012			1 [4]												1 [5]								1							3
Yuba	24.0	Below Narrows	E 649037, N 4344375	General Water Chemistry	General (166995-2-8)	2012			1 [4]												1 [5]								1							3
Yuba	18.4	Below Deer Creek, HWY 20	E 643829, N 4342515	General Water Chemistry	General (166995-2-9)	2012			1 [4]												1 [5]								1							3
Yuba	11.6	Below DPDD	E 634261, N 4341058	General Water Chemistry	General (16995-2-10)	2012			1 [4]												1 [5]								1							3
Yuba	7.2	At Walnut Ave	E 628593, N 4337949	General Water Chemistry	General (166995-2-11)	2012			1 [4]												1 [5]								1							3
Yuba	0.7	At Marysville	E 621732, N 4332654	General Water Chemistry	General (166995-2-12)	2012			1 [4]												1 [5]								1							3
Yuba	New Bullards Bar Reservoir	Emerald Cove Near Boat Ramp	E 659767, N 4362148	Recreation	Grab Sample (103410-3-1)	2012	5	5	5			5 [6]	5 [7]					5 [6]	5 [7]					5 [6]						5 [6]						5 [6]	50
Yuba	New Bullards Bar Reservoir	Dark Day Cove equidistant between the Boat Ramp and the informal day use area	E 662830, N 4366440	Recreation	Grab Sample (103410-3-2/ 103410-3-3)	2012	5	5	5			5 [6]	5 [7]					5 [6]	5 [7]					5 [6]						5 [6]						5 [6]	50
Yuba	New Bullards Bar Reservoir	Moran Cove Day Use Area Shoreline	E 658627, N 4365881	Recreation	Grab Sample (103410-3-4)	2012	5	5	5			5 [6]	5 [7]					5 [6]	5 [7]					5 [6]						5 [6]						5 [6]	50
Middle Yuba	Our House Diversion Dam Impoundment	Near Shore near Dam	E 672481, N 4364455	Recreation	Grab Sample (103410-3-5)	2012	5							5 [8]	5 [8]									5 [9]	5 [9]									5 [10]	5 [10]		35
Oregon Creek	Log Cabin Diversion Dam	Near Shore near Dam	E 667129, N 4367391	Recreation	Grab Sample (103410-3-6)	2012	5							5 [8]	5 [8]									5 [9]	5 [9]									5 [10]	5 [10]		35
Yuba	New Bullards Bar Reservoir - Anywhere in Reservoir	NBB	Multiple Locations - Shallow Coves	Bioaccumulation	Boat E-Fish	2011	1	1	1			1 [11]						1 [11]						1 [11]						1 [11]						1 [11]	8

Table 3.3-1. (continued)

Monitoring Site				Monitoring Methods	Relicensing Results		License Year (Year 1 is First Full Calendar Year After License Issuance and Year 30 Is Assumed Term of New License for This Exercise. Assumes YCWA Files with FERC NOI/PAD at Earliest Possible Time [in Year 25, 5.5 years prior to license expiration] to Enter Relicensing Process for New License.) [1]																														Possible Number of Sampling Events for License with a 30-Year Term
Stream	River Mile	Location	UTM Coordinates		Method	Year(s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Middle Yuba	Our House Diversion Dam Impoundment - Anywhere in Impoundment	OHD	E 672430, N 4364384	Bioaccumulation	Gill Net	2011	1					1 [12]												1 [12]												1 [12]	4
Oregon Creek	Log Cabin Diversion Dam - Anywhere in Impoundment	LCD	E 667049, N 4367447	Bioaccumulation	Gill Net	2011	1					1 [12]												1 [12]												1 [12]	4
Total	**28 Sites**			--	--		49	37	58	0	6	24	15	10	10	0	0	16	15	0	21	0	0	28	10	0	0	0	0	37	0	0	0	10	10	18	374

[1] If FERC issues to YCWA a new license with a term of more than 30 years: for *In Situ* monitoring, the pattern shown above beginning with License Year 1 will be repeated beginning in License Year 31; and for General Water Chemistry, Recreation and Bioaccumulation monitoring, the pattern shown above beginning with License Year 3 will be repeated beginning in License Year 31.

[2] The specific License Years shown in this table are placeholders to represent new New Bullards Bar Dam Low Level Outlet monitoring. Specifically, monitoring will occur in each of the first two years the new outlet is used The specific License Years to be monitored depends on when the new outlet is used.

[3] The specific License Years shown in this table are placeholders to represent new New Colgate Powerhouse Tailwater Depression System (TDS) monitoring. Specifically, monitoring will occur in each of the first two years the new TDS is used The specific License Years to be monitored depends on when the new TDS is used.

[4] The specific License Years shown in this table are placeholders to represent conditional General Water Quality monitoring in License Years 3 or 4. Specifically, if a Below Normal or drier Water Year occurs in Years 3 or 4 as defined by the May Water Year type using the above Englebright Water Year types, monitoring will occur in the first year it occurs. If a Below Normal or drier Water Year type does not occur in License Years 3 or 4, monitoring will occur in Year 5 regardless of Water Year type. The specific License Years to be monitored depends on Year 3 and Year 4 Water Year types.

[5] The specific License Years shown in this table are placeholders to represent back-to-back dry year conditional General Water Quality monitoring in License Years 6 through 14. Specifically, monitoring will occur in the second year of the first occurrence of two consecutive Dry/Critically Dry WYs (i.e., two back-to-back Dry WYs, two back-to-back Critically Dry WYs, or one Dry WY and one Critically Dry WY combination), as defined by the May Water Year type using the above Englebright Water Year types from years 6 through 14. If a back-to-back Dry/Critically Dry Water Year does not occur from License Year 6 though 14, monitoring will occur once in Year 15 regardless of Water Year typeThe specific License Years to be monitored depends on the occurrence of back-to-back dry Water Year types in Years 6 through 14.

[6] The specific License Years shown in this table are placeholders to represent Recreation monitoring in Years that FERC Form 80 is due to be filed with FERC. Specifically, monitoring will occur in the year that YCWA files its FERC Form 80. The specific License Years to be monitored depends on when the Form 80 is due to be filed.

[7] The specific License Years shown in this table are placeholders to represent Recreation monitoring in the year following the first and second time that the FERC Form 80 is due to be filed with FERC. The specific License Years to be monitored depends on when the Form 80 is due to be filed.

[8] The specific License Years shown in this table are placeholders to represent conditional Recreational monitoring in License Years 4 through 10. Specifically, if a Below Normal or drier Water Year occurs in Years 4 through 9 as defined by the May Water Year type using the above Englebright Water Year types, monitoring will occur in the first year it occurs and in the next year. If a Below Normal or drier Water Year type does not occur in License Years 4 through 9, monitoring will occur in Year 10 regardless of Water Year type. The specific License Years to be monitored depends on Year 4 through Year 9 Water Year types.

[9] The specific License Years shown in this table are placeholders to represent conditional Recreation monitoring in License Years 11 through 20. Specifically, monitoring will occur in the second year of the first occurrence of two consecutive Dry/Critically Dry WYs (i.e., two back-to-back Dry WYs, two back-to-back Critically Dry WYs, or one Dry WY and one Critically Dry WY combination), as defined by the May Water Year type using the above Englebright Water Year types and in the next year. If a back-to-back Dry/Critically Dry Water Year does not occur from License Year 11 though 19, monitoring will occur in Year 20 regardless of Water Year type.The specific License Years to be monitored depends on the occurrence of back-to-back dry Water Year types.

[10] The specific License Years shown in this table are placeholders to represent conditional Recreation monitoring in License Years 21 through 30. Specifically, monitoring will occur in the second year of the first occurrence of two consecutive Dry/Critically Dry WYs (i.e., two back-to-back Dry WYs, two back-to-back Critically Dry WYs, or one Dry WY and one Critically Dry WY combination), as defined by the May Water Year type using the above Englebright Water Year types and in the next year. If a back-to-back Dry/Critically Dry Water Year does not occur from License Year 21 though 29, monitoring will occur in Year 30 regardless of Water Year type.The specific License Years to be monitored depends on the occurrence of back-to-back dry Water Year types.

[11] The specific License Years shown in this table are placeholders to represent Bioaccumulation monitoring in Years that FERC Form 80 is due to be filed with FERC. Specifically, monitoring will occur in the year that YCWA files its FERC Form 80. The specific License Years to be monitored depends on when the Form 80 is due to be filed.

[12] The specific License Years shown in this table are placeholders to represent Bioaccumulation monitoring in Years that FERC Form 80 is due to be filed with FERC. Specifically, monitoring will occur in the year that YCWA files its FERC Form 80 and then every second time a Form 80 is filed. The specific License Years to be monitored depends on when the Form 80 is due to be filed.

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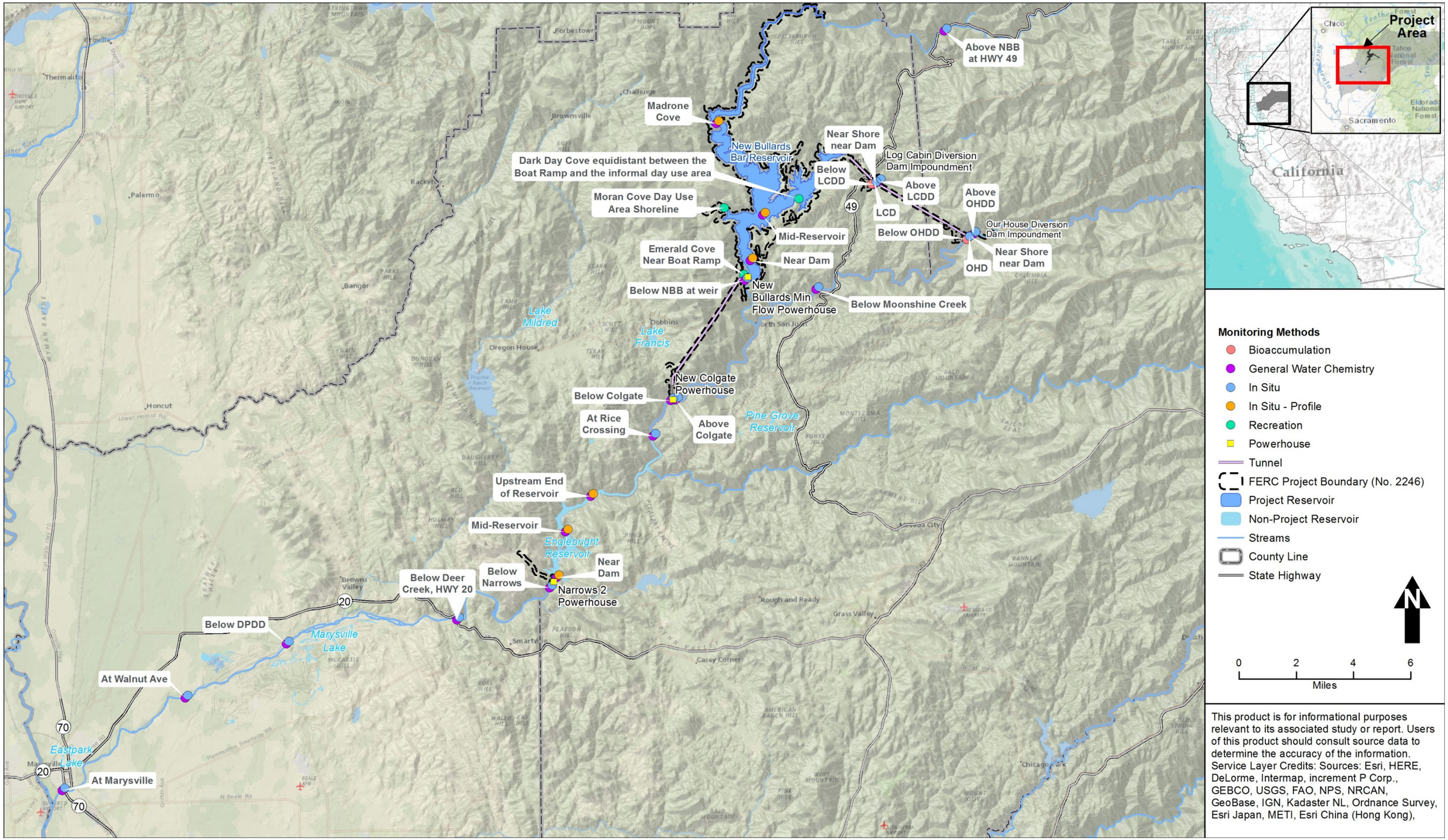

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Figure 3.3-1. Water quality sample locations.

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SECTION 4.0

REPORTING, CONSULTATION AND PLAN REVISIONS

4.1 Reporting

4.1.1 *In Situ* Monitoring

For *In Situ* monitoring, YCWA will submit water quality information and describe when data are modified from the field data, with rationale to the SWRCB, Central Valley Regional Water Quality Board (RWQCB), Cal Fish and Wildlife, and Forest Service within 30 days of collecting and QA/QC'ing the information.

4.1.2 General, Recreation and Bioaccumulation Monitoring

For General, Recreation and Bioaccumulation monitoring, within 60 days after receiving the laboratory results for each monitoring event, YCWA will file a water quality report (Report) with FERC and make the Report available to the SWRCB, RWQCB, Cal Fish and Wildlife and Forest Service.

The Report will include:

- A list and description of sample locations.
- Summary of sample methods employed.
- Laboratory report with QA/QC documentation.
- All raw data collected during the monitoring in Microsoft Excel™ format.
- Any analyses performed by YCWA on the raw data.
- A summary of results, in tabular format, that will include specific method detection limits for each constituent and analytical data reported.
- Graphs, as appropriate, to clearly demonstrate any changes in specific water quality parameters over time, depth, or downstream movement of flow through the system.
- Describe when data is modified from the field data, with rationale.
- A summary of monitoring data to characterize existing water quality conditions, including the collected data (e.g. years within the license) imposed into Table 2.2-1.
- A listing of the following: 1) fecal coliform monitoring results greater than a geometric average of 200/100 ml on no less than five samples collected in any 30-day period and/or greater than 400/100 ml on 10 percent or more of all samples taken in a 30-day period; 2) dissolved oxygen monitoring results less than 7 mg/L, except in the hypolimnion of reservoirs; 3) pH monitoring results less than 6.5 units or greater than 8.5 units; and 4) if

> YCWA observed oils, greases, waxes, or other materials that result in a visible film or coating on the surface of the water or on objects in the water.

If Recreation fecal coliform monitoring results are greater than a geometric average of 200/100 ml on no less than five samples collected in any 30-day period and/or greater than 400/100 ml on 10 percent or more of all samples taken in a 30-day period (CVRWQCB 1998), YCWA will notify the SWRCB, RWQCB and Forest Service within 24 hours of receiving the lab report from the laboratory.

4.2 Consultation

If requested in writing (i.e., email is acceptable) by the SWRCB, RWQCB, Cal Fish and Wildlife, or Forest Service regarding data or reports, YCWA will attempt to schedule a meeting with that agency within 60 days of the request and other interested parties may attend the meeting.

4.3 Plan Revisions

Following any data reporting and if requested by the SWRCB, RWQCB, Cal Fish and Wildlife, or Forest Service, YCWA will schedule a meeting with that agency to discuss possible modifications to the Plan, and other interested parties may attend the meeting. Such modifications may be due to, but not limited to, changes in FERC Form 80 filing years, updates in the Basin Plan (e.g., threshold limits, sampling methodology and type of bacteria sampled), sample location suitability (e.g., access or public use), or development of statewide programs (e.g., Statewide Mercury Program). Sixty days following the meeting, YCWA, RWQCB, Cal Fish and Wildlife and Forest Service may submit in writing to the SWRCB any recommendations for modification to the Plan. Within 60 days of receiving the comments, the SWRCB will advise YCWA, in writing, regarding any suggested modifications to the Plan. YCWA will diligently provide to the SWRCB a draft revised Plan for the SWRCB's approval. Upon written approval by the SWRCB of the revised Plan, YCWA will file the revised Plan with FERC. When FERC approves the revised Plan, YCWA will implement the revised Plan as approved by FERC.[8]

[8] The Plan will not be considered revised until FERC issues its approval.

SECTION 5.0

REFERENCES CITED

Bonnema, A. 2014. Quality Assurance Project Plan: A Study of Lakes and Reservoirs with Low Concentrations of Contaminants in Sport Fish. Moss Landing Marine Labs. Prepared for SWAMP BOG, 64 pages plus appendices and attachments.

California Department of Fish and Game (CDFG). 2005. Marine Pollution Studies Laboratory at Moss Landing Method #MPSL-102a.

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Central Valley Regional Water Quality Control Board (CVRWQCB). 1998. Water Quality Control Plan. (Basin Plan). The Sacramento River Basin and the San Joaquin River Basin. State of California Regional Water Quality Control Board, Central Valley Region. Revised in October 2007 with the approved amendments. Sacramento, California.

Office of Environmental Health Hazard Assessment (OEHHA). 2009. 2009 Update of California Sport Fish Advisories. California Environmental Protection Agency. Last updated March 18, 2009. URL: <www.oehha.ca.gov/fish/so_cal/index.html>.

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_____. 1995. Method 1669: Sampling ambient water for trace metals at United States Environmental Protection Agency water quality criteria levels. EPA 821-R-95-034, United States Environmental Protection Agency, Washington, DC.

United States Fish and Wildlife Service (USFWS). 2005. Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog. Online: http://www.fws.gov/sacramento/es/Survey-Protocols Guidelines/Documents/crf_survey_guidance_aug2005.pdf (Accessed May 30, 2016).

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Water Quality Monitoring Plan

Attachment A

August 2012 Quality Assurance Project Plan

Yuba River Development Project

FERC Project No. 2246

December 2016

Quality Assurance Project Plan
Yuba County Water Agency
Yuba River Development Project

Draft
Version 1.0

FERC Project No. 2246

Prepared for
Yuba County Water Agency
1220 F Street
Marysville, CA 95901

Prepared by
HDR Engineering, Hydropower Services
2379 Gateway Oaks, Suite 200
Sacramento, CA 95833

August 2012

REVISION LOG

Number	Description of Change	Section Number	QAPP Version

Table of Contents

Table of Contents (continued)

List of Figures

List of Tables

LIST OF APPENDICES

LIST OF ACRONYMS

DO	dissolved oxygen
DQO	data quality objective
EPA	United States Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
ID	identification number
mg/L	milligrams per liter
NTU	nephelometric turbidity unit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
TRL	Target Reporting Limit
YCWA	Yuba County Water Agency

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SECTION 1.0

GROUP A ELEMENTS: PROJECT MANAGEMENT

1.1 Title and Approval Sheet

This Quality Assurance Program Plan (QAPP) is to be used by HDR, Inc. when implementing Study 2.3 Water Quality, the Federal Energy Regulatory Commission (FERC) approved water quality study developed to support the relicensing of Yuba County Water Agency's (YCWA's) Yuba River Development Project (Project), FERC Project No. 2246.

Prepared by: _____ _____

(Name) (Date)

Approved by: _____ _____

(Name) (Date)

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1.2 Distribution List

This document will be distributed to the key personnel listed in Table 1.2-1 and will be provided as an attachment to relevant reports and upon request.

Table 1.2-1. Personnel Responsibilities.

Name	Affiliation	Title	Contact Information
James Lynch	HDR	Project Manager	2379 Gateway Oaks, Suite 200 Sacramento, CA 95833 916-564-4214
Carin Loy	HDR	Study Lead	2379 Gateway Oaks, Suite 200 Sacramento, CA 95833 916-564-4214
Fred Holzmer	HDR	QA Officer	379 Gateway Oaks, Suite 200 Sacramento, CA 95833 916-564-4214
Chuck Vertucci	HDR	Field Coordinator	379 Gateway Oaks, Suite 200 Sacramento, CA 95833 916-564-4214
Don Burley	CalScience	Laboratory Project Manager	7440 Lincoln Way Garden Grove, CA 92841-1427 (714) 895-5494
Kate Haney	Frontier Global Sciences Inc	Laboratory Project Manager	11720 North Creek Parkway N. Suite 400 Bothell, WA 98011 425-686-1996, ext. 1526
Antonia Powers	Cranmer Engineering, Inc.	Laboratory Director	1188 East Main Street Grass Valley, CA 95945 530-273-7284

1.3 Project/Task Organization

1.3.1 Involved Parties and Roles

This QAPP has been prepared for the water quality investigation component(s) of the Project's relicensing. Within this QAPP are descriptions of methods, procedures, and practices that will be used to assure and control the quality of chemical data.

Key personnel who will be involved in the project are listed above in Table 1.2-1. Under contract to YCWA, HDR will be responsible for all aspects of the water quality study(ies) including the organization of field staff, scheduling of sampling days, field quality assurance/quality control (QA/QC), coordination with the off-site laboratory, and reporting. Laboratory analytical services will be provided by a California certified laboratory.

The Study Lead is responsible for monitoring and verifying implementation of the QA/QC procedures found in this QAPP. Key personnel assigned to the project will have reviewed the QAPP and will be instructed by Study Lead regarding the requirements of the QA/QC program.

The Study Lead will work directly with the Field Coordinator or other designee and Laboratory Project Managers to ensure that QAPP objectives are being met. All members of the team will continually assess the effectiveness of the QA/QC program and recommend modifications, as needed.

1.3.2 Quality Assurance Officer Role

The QA Officer is familiar with the study, but not involved in day-to-day implementation. The QA officer is versed in HDR policies, water quality field sampling, and laboratory procedures. The QA officer will review the study's intermediate and final products, and work with the Study Lead to ensure they are of high quality when complete.

1.3.3 Persons Responsible for QAPP Update and Maintenance

The Study Lead is responsible for keeping the QAPP up-to-date. Modifications may be instigated by any member of the study team—the Study Lead, the Field Coordinator, the QA Officer, the laboratory project manager, or others. Exceptions to the content of this document will be formalized in the table following the title page. New versions of the QAPP will be available to project personnel and attached to subsequent reports. Variances and non-conformances with the QAPP will be documented in applicable project reports.

1.3.4 Organizational Chart and Responsibilities

The organizational chart for implementation of the water quality investigation component of the Project relicensing is presented in Figure 1.3-1.

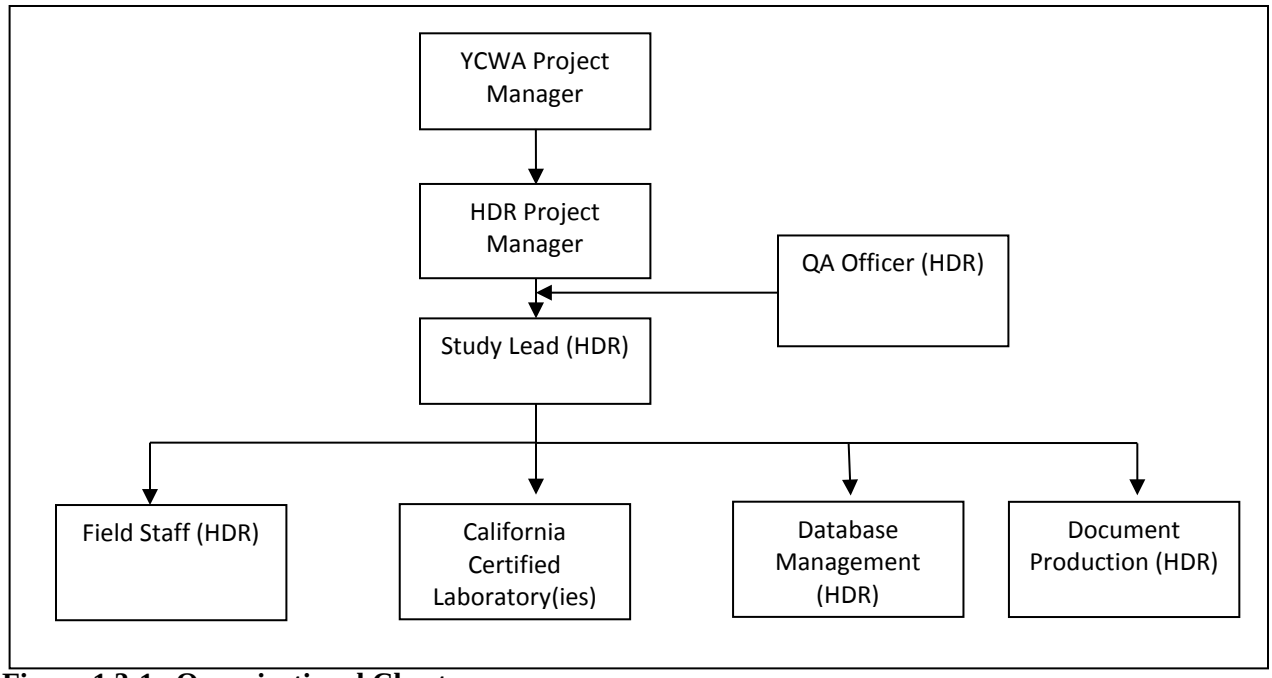

Figure 1.3-1. Organizational Chart

1.4 Problem Definition/Background

1.4.1 Problem Statement

This QAPP has been developed to provide guidance and quality assurance for water quality sampling and analyses conducted to implement the FERC-approved water quality study plan(s) developed to support the Project's FERC relicensing.

1.4.2 Decisions or Outcomes

The collected data will provide one or more "snap-shots" of the physical and/or chemical state of surface water in the study area, defined in the study plan. The data will be filed with FERC in the Initial Study Report and in other relicensing documents, as needed, and will be suitable to compare to applicable regulatory standards and criteria. The data may be integrated with other information or data and used for trend analyses or for modeling. Additional information and detail can be found in the FERC-approved study plan(s).

1.4.3 Water Quality Regulatory Criteria

Water quality objectives for Project reservoirs and Project affected stream reaches are established in Central Valley Regional Water Quality Control Board's (CVRWQCB) Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin Rivers, the fourth edition of which was initially adopted in 1998 and most recently revised in 2011 (CVRWQCB 1998).

The standards are composed of designated existing and potential beneficial uses and water quality objectives to protect the beneficial uses. Additional information and detail can be found in the FERC-approved study plan(s).

1.5 Project/Task Description

1.5.1 General Work Statement

Each FERC-approved study plan details the scope of the water quality investigation. Chemical constituents and characteristics of surface water will be measured both in the field and through collection of water quality samples for off-site analyses by a California certified laboratory. Examples of in situ water field measurements that may be performed include pH, specific conductivity, instantaneous water temperature, dissolved oxygen (DO), DO percent saturation, turbidity, and Secchi disk. Examples of analyses that may be performed on samples sent to an off-site California certified laboratory are trace metals, hardness, bacteria, sediment, nutrients, minerals, chlorophyll, pesticides, total petroleum hydrocarbons or other organics.

Refer to the "Group B Element: Data Generation and Acquisition" section of this QAPP for quality assurance practices associated with sample collection, instrument calibration, and so forth.

1.5.2 Project Schedule

The study schedule is specified in the FERC-approved study plan.

1.5.3 Geographical Setting

Located in California's Sierra Nevada, the study area includes 1) the Middle Yuba River from and including Our House Diversion Dam Impoundment to the confluence with the North Yuba River, 2) Oregon Creek from and including the Log Cabin Diversion Dam Impoundment to the confluence with the Middle Yuba River, 3) the North Yuba River from and including New Bullards Bar Dam Reservoir to the confluence with the Middle Yuba River, and 4) and the portion of the Yuba River from the confluence of the North and Middle Yuba rivers to the Feather River, including USACE's Englebright Reservoir.

1.5.4 Constraints

Water quality sample collection will occur at elevations ranging from 44.4 to 2238.5 feet above sea level and may occur over a wide range of weather conditions (rain, snow, sun, wind, high heat, and cold weather). Stream flows may be high or low. Lake and reservoir sampling may require the use of a boat and occur at different stages of lake or reservoir surface elevation. Remote sites may require 4-wheel driving or long hikes carrying heavy bottles and equipment.

Permission may need to be received from landowners prior to any work on private lands. Due to the distances covered, only five to nine locations may be visited in a single day and still meet the laboratory's hours of operation or shipping deadlines.

Many of the watersheds where HDR works have extremely low naturally occurring levels of trace metals and waters are free or nearly free of contaminants. Hence, samples are highly susceptible to contamination during sampling and handling activities by both the field personnel and the analytical laboratory and the lowest possible method detection limits and reporting limits are required.

1.6 Quality Objectives and Criteria for Measurement Data

Data quality objectives (DQOs) are a set of performance or acceptance criteria that the collected data should achieve in order to minimize the possibility of either making a decision error or failing to keep uncertainty in estimates to within acceptable levels. DQOs are defined in terms of five parameters: precision, accuracy, representativeness, completeness, and comparability (PARCC) and differ with different measurement techniques.

DQOs for relicensing water quality studies are presented in Table 1.6-1.

Table 1.6-1. Data Quality Objectives, by Measurement Type and Sampling Event

Precision	Accuracy	Representativeness	Completeness	Comparability
FIELD MEASUREMENTS (e.g. pH, specific conductivity, temperature, dissolved oxygen)				
--	Instrument calibration meets manufacturers' requirements	Sample locations, sampling frequency and analytical methods follow study plan.	90%	Meets Target Reporting Limits provided in the study plan.
ANALYTICAL LABORATORY ANALYSES (e.g. metals, nutrients)				
Field duplicates within10%; Laboratory QA/QC meet method requirements.	Laboratory QA/QC meets method requirements.	Sample locations, sampling frequency and analytical methods follow study plan.	90%	Meets Target Reporting Limits provided in the study plan.
BACTERIA ANALYSES (e.g. fecal coliform, total coliform, e. coli)				
Field duplicates within 10%; Laboratory QA/QC meet method requirements.	Laboratory QA/QC meets method requirements.	Sample locations, sampling frequency and analytical methods follow study plan.	100%	Meets Target Reporting Limits provided in the study plan.

-- not applicable

Precision is a measure of the reproducibility of analyses under a given set of conditions. In other words, precision describes how well repeated measurements agree. Precision is typically evaluated by comparing analytical results from duplicate samples and calculating the relative percent difference (RPD), where RPD is defined as:

$RPD = \left(\frac{|C_1 - C_2|}{\left(\frac{C_1 + C_2}{2} \right)} \right) \times 100$, where C_1 and C_2 are the analyte's concentrations in each duplicate

Precision will be determined through the use of field duplicates, laboratory matrix spike/matrix spike duplicates and laboratory duplicate quality control samples.

Accuracy is a measure of the bias that exists in a measurement system. In other words, accuracy describes how close an analytical measurement is to its "true" value. For analytical samples, accuracy is typically measured by analyzing a sample of known concentration (prepared using analytical-grade standards) and comparing the analytical result with the known concentration. For bacteria samples, accuracy is evaluated by comparing results to a laboratory reference sample.

Representativeness is the degree sampling data accurately and precisely depict selected characteristics. The representativeness of the data is mainly dependent on the sample design, such as locations (spatial), sampling frequency (temporal), and sample collection procedures, as well as analytical constituents and methods. The FERC-approved study plan presents the study design.

Completeness, which is expressed as a percentage, is calculated by subtracting the number of rejected and unreported results from the total planned results and dividing by the total number of planned results. Estimated results do not count against completeness because they are considered usable as long as any limitations are identified. Results rejected because of out-of-control analytical conditions, severe matrix effects, broken or spilled samples, or samples that could not be analyzed for any other reason are subtracted from the total planned number of results to calculate completeness. Though regulations currently do not require a specific percentage of data completeness, it is expected that the measurement techniques selected for use in this project are capable of generating data that is of 90% of more completeness for field and laboratory analyses.

Comparability is the degree of confidence with which one data set can be compared to another. A broad spectrum of analytical constituents has been selected to characterize water quality and the use of approved/documented analytical methods will ensure that analytical results adequately represent the true concentrations of constituents within these samples. In addition, Target Reporting Limits (TRLs) have been selected for each analyte, where appropriate, to ensure that the analytical methods used are of adequate sensitivity to generate useful data for the purposes of this project. Presented in the FERC-approved study plan, selection of appropriate TRLs was based on a review the CVWRCB's numeric and narrative water quality objectives and other

regulatory standards, criteria and benchmarks, as well as the capabilities of commercial laboratories.

1.7 Special Training Needs/Certification

Proper training of field and laboratory personnel represents a critical aspect of quality control.

All field personnel that participate in water quality monitoring will have reviewed this QAPP. Field personnel will have also been trained in water quality sample collection (including QA/QC, grab sampling techniques, flow measurement techniques, completing laboratory chain-of-custody forms, ordering correct laboratory analyses, and proper handling of water samples), field analysis (including instrument calibration, data recording procedures, and interpretation of collected data), and GPS use. All samplers will be provided hands-on training in the "clean hands-dirty hands" technique by the QA Officer or his designee when trace metals are constituents of interest (See Section 11). The QA Officer or his designee will provide training to field personnel. Documentation of training will be will be maintained in the project file.

All laboratories utilized to perform analytical services will be certified by the State of California, The certification includes requirements that laboratory personnel will be certified and trained. Certification and training is documented in the laboratory's quality assurance manual and verified during the State audit[1].

1.8 Documents and Records

1.8.1 Project Documents, Records, and Electronic Files

The documents and records that will be used or generated during this project include the following:

Study Plan. The FERC-approved study plan contains information regarding sampling locations, frequencies, sample collection methods, analytical methods, target reporting limits, and water quality objectives.

Quality Assurance Project Plan. The QAPP (this document) contains details on the quality assurance and quality control procedures that will be implemented throughout the water quality study(ies).

Field records. The Study Lead or designee will maintain all field records, including field data sheets documenting results of field analyses and QC samples, equipment maintenance and calibration documentation, and sample collection and handling documentation (copies of chain-of-custody forms, shipping receipts, etc.).

[1] http://www.cdph.ca.gov/certlic/labs/Pages/default.aspx

Laboratory records. The analytical laboratory will generate records for sample receipt and storage, instrument calibration, analytical QC, and reporting. Lab reports summarizing analytical results and QC results will be provided to HDR both in hard-copy and electronic formats. The information contained within and the format of the data report package will include at a minimum the sample identification number (ID), sampling date/time, test method, extraction date/time, analysis date/time, analytical result, QA sample results, instrument and equipment calibration information, and a description of any corrective action taken to resolve data quality issues.

Data verification records. Field data sheets, field QC results, chain-of-custody forms, and lab reports from each sampling event will be reviewed by the Study Lead and documented for the project file.

Project database. Microsoft Excel spreadsheets will be used to store all water quality data gathered during this project.

1.8.2 Retention of Project Documentation

Throughout the relicensing, the original field notebooks and forms, equipment maintenance and calibration documentation, chain-of-custody forms, laboratory reports, and data verification records will be stored at the HDR office at 2379 Gateway Oaks Drive, Suite 200, Sacramento, CA 95833. Records will be transferred to YCWA upon license receipt or earlier, at YCWA's discretion.

1.8.3 Electronic File Back-up

All electronic files will be stored on HDR network servers and will be backed-up on a regular basis by the HDR information technology staff

1.8.4 Distribution of QAPP Revisions

Revisions that occur after the original QAPP is approved will be indicated on the QAPP title page and will be distributed in subsequent deliverables and upon request.

SECTION 2.0

GROUP B ELEMENTS: DATA GENERATION AND ACQUISITION

2.1 Sampling Process Design

The FERC-approved study plan presents the study design, including sample locations, frequency of sample collection, analytical parameters, and laboratory methods.

2.2 Sampling Methods

Data will be obtained in the field and in the laboratory.

The field sampler will maintain a field notebook and will note relevant conditions during each sampling event on the field data sheet. At a minimum, the following information pertaining to each sample will be recorded: date, time, weather conditions, name(s) of people collecting samples, units of measurements, depth, GPS coordinates for sample site, and river flow or reservoir water level.

Gloves and other appropriate personal protective equipment will be worn during sample and data collection activities. Observations of any field conditions that could affect sample results will be recorded in the field notebook, such as the concentrated presence of domestic animals or wildlife. Digital photo documentation of sampling conditions may also be performed. All field notes will be clearly written in a format that can be reproduced (i.e. scanned (pdf)) and entered into electronic format (Word or Excel).

2.2.1 Field Data Collection

The field measurement equipment that may be used during this project includes the following:

- Handheld multi-parameter meter (Hydrolab™ DataSonde 5) or equivalent. A sonde will be used to measure water temperature (±0.1°C), dissolved oxygen (±0.2 mg/L), pH (±0.2 standard unit, or su), specific conductance (±0.001 µmhos/cm), and turbidity (±1 NTU) and depth.

- Field turbidimeter (Hach Model 2100P Portable Turbidimeter). This meter will be used to measure turbidity in the field. The meter employs a tungsten-filament light source and two light detectors to measure scattered (at 90°) and transmitted light. The unit has a reported range of 0.01 to 1000 NTU.

Prior to each use, the instrument will be calibrated using manufacturer's recommended calibration methods (See Section 16). Any variances will be noted on the field data sheet and

final report. If necessary to obtain a complete dataset, re-sampling within the FERC-approved study window will be performed. Non-disposable sampling equipment will be thoroughly cleaned between sampling sites.

Any field collected data that are not already in electronic format (Excel) will be hand entered into an electronic format and checked by a second-party.

2.2.2 Analytical Sample Collection

Surface samples will be collected using a grab sampling technique. Hypolimnetic samples will be collected using a Kemmerer bottle or equivalent. Each laboratory sample will be collected using laboratory-supplied clean containers, certified to meet the reporting limits specified in the study plan. Water samples to be analyzed for metals will be collected using "clean hands-dirty hands" method[2] consistent with the EPA Method 1669 sampling protocol as described in *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels* (EPA 1996; Attachment A).

Samples requiring filtration before metals analysis will be filtered in accordance with standard protocols. Whether filtering is done in the field or the laboratory, samples will be filtered with a 0.45 micro millimeter (µm) diameter pore-membrane filter, prior to preservation. Filters used in the field will be disposable and certified clean at the desired reporting limits, specified in the study plan.

As part of the field quality assurance program, field blanks and equipment rinsates will also be collected and submitted to the laboratory for analysis (See Section 14). While still in the field, full sample containers will be labeled, placed in re-sealable plastic bags (e.g. Ziploc®), and stored in a cooler on ice to maintain a temperature of approximately 4º C.

2.3 Sample Handling and Custody

A chain-of-custody record will be maintained with the laboratory samples at all times.

A chain-of-custody form that identifies the sample bottles, date and time of sample collection, and analyses requested will be initiated at the time of sample collection and prior to sample shipment or release. Identification information for each sample will be consistent with the information entered in the field notebook. The samples will be transported or shipped to the analytical lab in insulated containers within the appropriate holding time and will be accompanied by the chain-of-custody form. If shipment is needed, the samples will be packaged

[2] One member of a two-person sampling team is designated as "dirty hands"; the second member is designated as "clean hands." All operations involving contact with the sample bottle and transfer of the sample from the sample collection device to the sample bottle are handled by the individual designated as "clean hands." "Dirty hands" is all other activities that do not involve direct contact with the sample.

and shipped in accordance with U.S. Department of Transportation standards. The original chain-of-custody will be given to the lab with the samples and HDR will retain a copy for their records.

Once received by the laboratory, a sample receipt and storage record will be generated. The laboratory will perform all analyses within the constituent- or method- specific holding times.

After analyses, all samples will be disposed of in accordance with federal, state, and local requirements.

2.4 Analytical Methods

The FERC-approved study plan presents the laboratory methods that will be employed. Containers, preservatives, holding times, and QA/QC requirements are specified in the analytical methods and/or in the laboratory's own standard operating procedures. Analytical methods are preferentially U.S. Environmental Protection Agency (EPA) or American Society for Testing and Materials (ASTM) methods and are detailed in the laboratory's own quality assurance manual.

For each analyte, the laboratory must be able to achieve target reporting limits and method detection limits that will allow consistency with the Basin Plan's Water Quality Objectives to be assessed. Because many of the watersheds where HDR works are free or nearly free of contaminants, low method detection limits and reporting limits are often required. Though not preferred, it may be necessary for the commercial laboratory to report estimated or "J-flagged" data to meet target reporting limits for some analytes.

2.5 Quality Control

2.5.1 In Situ Data Collection

Projects that require pH and DO sampling also require a method of back-up or corrective action for inconsistent or questionable measurements collected in the field. For example, if pH is measured at less than 6 or greater than 8.5 in the field, a second measurement must be taken to verify the value. The second measurement could consist of ensuring that pH is included in the analyses of grab samples submitted to the California-certified laboratory, recalibrating the probe and re-measuring in the field, or returning to the site with a calibrated probe within the study window specified within the FERC-approved study plan. 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 or corrective action 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.

2.5.2 Sample Collection

QA/QC activities for sampling processes include the collection of field duplicates for bacterial and chemical testing, and the preparation of field blanks and/or equipment blanks as necessary. The number of duplicates should be one per every ten stations sampled or one per field visit.

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 certified metals-free water will be used for hardness and metals.

2.5.3 Analytical Laboratory

All laboratories providing analytical support for this project will have the appropriate facilities to store, prepare, and process samples and appropriate instrumentation and staff to provide data of the required quality within the time period dictated by the project. The California certified laboratory will have a quality assurance plan in place and will adhere to standard protocols for accuracy, precision, instrument bias, and analytical bias.

The laboratory's deliverable (i.e. data package) will include information documenting their ability to conduct the analyses with the required level of data quality. Such information may include results from inter-laboratory calibration studies, control charts, and summary data from internal QA/QC checks, and results from analyses of certified reference materials. Additionally, the laboratory will report any inconsistencies or problems associated with any sample run(s) to HDR, who will document the situation as a variance or non-conformance, as appropriate (e.g., contaminated reagents, equipment malfunction, lost or broken sample bottles upon receipt, etc.).

2.6 Instrument/Equipment Testing, Inspection, and Maintenance

2.6.1 Field Equipment

The field measurement equipment that may be used during this project includes the following:

- Handheld multi-parameter meter (Hydrolab DataSonde 5). This sonde will be used to measure dissolved oxygen, temperature, pH, and conductivity in the field.
- Field turbidimeter (Hach Model 2100P Portable Turbidimeter). This meter will be used to measure turbidity in the field. The meter employs a tungsten-filament light source and

two light detectors to measure scattered (at 90°) and transmitted light. The unit has a reported range of 0.01 to 1000 NTU.

Prior to each field visit, the sonde will be rented from and calibrated by the manufacturer. Upon receipt of the Hydrolab and prior to leaving for the field, the Field Lead or his designee will confirm the probe is working. Written documentation of calibration will be maintained in the project file, attached to relevant reports, and provided upon request.

In the event that the sonde shows signs of malfunction or drift in readings during fieldwork, basic diagnostics will be performed. At a minimum, the following will be checked: batteries, computer connection, and software. The probes will be examined for obstructions, such as algae, or physical damage. The Hydrolab user manual will be taken into the field that includes some basic trouble shooting. If basic trouble shooting is not successful, the sampling team will order a replacement rental unit and return to sample the site in a few days and within the sample period specified in the FERC-approved Study Plan.

2.6.2 Laboratory Equipment

All laboratories utilized to perform analytical services will be certified by the State of California. The certification includes requirements that the laboratory maintain their analytical equipment in accordance with manufactures instructions and analytical method requirements. Instrument testing, inspection and maintenance procedures are documented in the laboratory's quality assurance manual and verified during the State's audit.[3] Records will be kept at the laboratory and available upon request.

2.7 Instrument/Equipment Calibration and Frequency

Field instruments will be calibrated according to manufacturer's instructions immediately before use in the field. Sondes will be rented from and calibrated by the manufacturer immediately before use in the field. Documentation of calibration prior to each field visit will be maintained in the project file.

2.8 Inspection/Acceptance of Supplies and Consumables

Project supplies and consumables that may directly or indirectly affect the quality of results include filters, samplers, gloves, bottles and more. To avoid contaminating samples through supplies, supply selection will be made the meet the needs of the study plan. Supplies will be examined for damage as they are received and consumables will be replaced no later than the date recommended in the manufacturer's instructions.

[3] http://www.cdph.ca.gov/certlic/labs/Pages/default.aspx

The California-certified laboratory will provide all bottles used for sample collection and cleanliness certification will be provided. Specifically, all equipment used for trace metals sample collection will be certified clean and double-bagged, allowing for the measurement at the concentrations required for the study plan using the clean-hands-dirty-hands technique described in EPA Method 1669 (Attachment A).

A small inventory of critical spare parts for field equipment (DO membranes, o-rings, and temperature and conductivity probes) will be kept by HDR and brought in the field if needed; however, perishable supplies or expensive parts may not be kept on hand, and will need to be ordered when needed. All spare parts and supplies will be obtained through the equipment manufacturer or other reputable sources.

2.9 Non-Direct Measurements (Existing Data)

Water quality data has been previously collected in the study area. Though it is unknown at this time what existing data may be incorporated into relicensing documents, if any, the level of review of all incorporated existing data will be disclosed.

2.10 Data Management

Field and laboratory data will be entered and maintained in Excel spreadsheets. The contract laboratory will provide an electronic data deliverable and an electronic narrative that includes, at a minimum, Level II documentation.

Throughout the relicensing, the original field notebooks and forms, equipment maintenance and calibration documentation, chain-of-custody forms, laboratory reports, and data verification records will be stored at the HDR office at 2379 Gateway Oaks Drive, Suite 200, Sacramento, CA 95833. Records will be transferred to YCWA upon license receipt or earlier, at YCWA's discretion.

SECTION 3.0

GROUP C ELEMENTS: ASSESSMENT AND OVERSIGHT

3.1 Assessments and Response Actions

Periodic assessments will be conducted to ensure that data collection is conducted according to requirements presented in this QAPP. The Study Lead will have the primary responsibility for assessing compliance with the QAPP requirements pertaining to sample collection and handling procedures, field analytical procedures, laboratory analytical procedures, and communicating project status to the QA Officer and Project Manager. The QA Officer or his designee will conduct reviews of field sampling and analysis procedures at the beginning of each field season. The reviews may be performed at a demonstration site or involve accompanying sampling personnel to determine whether sampling activities are being conducted in accordance with the QAPP and Study Plan. Laboratory analyses will be assessed through evaluating results of QC samples and compliance with DQOs.

If a non-conformance is identified, the QA Officer and/or Study Lead, will notify the Project Manager immediately. The Project Manager, QA Office, and Study Lead will discuss the observed discrepancy with the appropriate person responsible for the activity to determine whether the information collected can still be considered accurate, what the cause(s) were leading to the deviation, how the deviation might impact data quality, and what corrective actions might be considered. The QA Officer and Study Lead will then follow up to ensure that corrective actions have been implemented.

3.2 Reports to Management

The study schedule is specified in the FERC-approved study plan. As described in the study plan, the primary deliverable will be a technical memorandum, transmitting the data collected.

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SECTION 4.0

GROUP D ELEMENTS: DATA VALIDATION AND USABILITY

4.1 Data Review, Verification, and Validation Requirements

Data review, verification and validation are steps in the transition between data collection via sampling and analysis and data use and interpretation. Although data review, verification and data validation are commonly used terms, they are defined and applied differently in various organizations and quality systems. For the purposes of relicensing, the terms will be generally defined as follows:

- Data review ensures the data have been recorded, transmitted, and processed correctly. That includes, ensuring the data are sensible and checking for data entry, transcription, calculation, reduction, and transformation 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 (USEPA 2002).

- 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 (USEPA 2002). Data validation begins with the output from data verification.

4.2 Verification and Validation Methods

Documentation of review, verification, and/or validation will be maintained in the project file.

For the relicensing, all data will be reviewed and verified. In brief, following the field sampling and laboratory analyses, which includes the laboratories' own QA/QC analyses, HDR will subject all data to QA/QC procedures including, but not limited to: spot-checks of transcription; review of electronic data submissions for completeness; comparison of results to field blank and rinsate results; and, identification of any data that seem inconsistent. If any inconsistencies are found, HDR will consult with the laboratory to identify any potential sources of error before concluding that the data is correct.

All verified chemical detections, including data whose results are "J" qualified, will be used for this assessment. Should the laboratory need to re-extract samples and re-run the sample under different calibration conditions, the data identified by the laboratory, as the most certain, will be

used. If field-sampling conditions, as measured by the field blank and the rinsate sample results, indicate that samples have been corrupted, HDR will identify the data accordingly.

4.3 Reconciliation with User Requirements

To fulfill YCWA's data needs, it is important that the data collected during this project are accurate, precise, representative, and complete, and can therefore be used to characterize water quality within the YCWA Project area. These data requirements will be assessed by ensuring that DQOs are met throughout the project.

After each discrete sampling event, the Study Lead will evaluate if the data quality objectives (DQOs) of Table 7.0-1 have been met. Results of the evaluation will be documented on the Data Review and Verification Form provided in Attachment B. If the impact of the QC failure on data quality is minimal, the data will be flagged and included with in the database. If a greater impact is found, the Study Lead will work with the QA Officer to determine the next steps. Data that does not meet the DQOs listed in Section 7 will be evaluated to 1) determine the cause of the problem; 2) determine whether corrective actions can be implemented so that DQOs are met in the future; and/or 3) determine if re-sampling is necessary to meet completeness or other PARCC objectives.

At the end of the monitoring program, the data generated under this project will be given to the YCWA.

4.4 References

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APPENDIX A.

SAMPLING AMBIENT WATERS FOR TRACE METALS AT EPA WATER QUALITY LEVELS

APPENDIX B.

DATA REVIEW AND VERIFICATION CHECKLIST

APPENDIX B.

DATA REVIEW AND VERIFICATION CHECKLIST

This checklist should be used to document data review verification of data generated through implementation of the FERC-approved study plan.

GENERAL

- ☐ For each sample event, samples have been collected and analyzed at all locations and for all analyses specified in the study plan.
- ☐ For each sample and analyses, the project file contains records field notes, chain-of-custody, and analytical results, including quality assurance documenation (hardcopy and electronic)

FIELD DATA

- ☐ Field notes and/or data sheets include date, time of sample collection, field sampling staff, time arrived at site, time left site, site identification, description of site conditions (weather), field parameters, reservoir level or flow information (measured or estimated), sample collection procedures, and call-out quality assurance samples collected. If mistakes are found on the field data sheet, changes can be made by crossing out the mistake and marking the change with a date of change, initials, and reason for change.
- ☐ Documentation of field equipment calibration is in the fieldnotes and/or project records.
- ☐ Field data entered into Excel, have been checked by a second-party.

LABORATORY REPORT

- ☐ Field duplicates, blanks, and rinsates were submitted to the laboratory at the frequency specified in the study plan.
- ☐ Any constituents found in blanks or rinsates are discussed in the final report.
- ☐ Any duplicate concentrations that differ by more than 10% are discussed in the final report.
- ☐ Samples were received by the laboratory intact and analyzed within method and/or study specified holding times.
- ☐ On laboratory reports, sample IDs, analyses, reporting/detection limits, units, column labels, footnotes, and titles are accurate. Have lab re-issue report with corrections if there are inconsistencies.
- ☐ Check that non-detects are always reported in the same manner using consistent notation. For example, either “ND” or “<.” Have lab re-issue report with corrections if there are inconsistencies.
- ☐ If observed, “J” qualified data and/or elevated detection limits are discussed in the final report.

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