



September 8, 2011

Filed via Electronic Submittal (E-File)

Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

SUBJECT: Yuba River Development Project
FERC Project No. 2246-058
Reply to Comments on Revised Study Plan

Dear Secretary Bose:

This letter provides Yuba County Water Agency's (YCWA) reply to comments on YCWA's Revised Study Plan filed by the United States Department of Agriculture, Forest Service (Forest Service), United States Department of Interior (USDOI), Fish and Wildlife Service (USFWS), State Water Resources Control Board (SWRCB), California Department of Fish and Game (CDFG), and Foothills Water Network (FWN).

Since the Federal Energy Regulatory Commission (FERC) must issue its Study Determination by September 16, 2011, YCWA has kept this reply brief. In some cases, YCWA's review of the comments has led YCWA to revise a study proposal in its Revised Study Plan. In those instances, a revised study proposal is attached to this letter (Attachment 1). The revised study proposal shows in redline any changes to the study proposal in YCWA's Revised Study Plan. YCWA requests FERC consider these redlined study proposals when preparing its Study Determination.

BACKGROUND

On August 17, YCWA filed with the FERC a Revised Study Plan in support of YCWA's relicensing of the Yuba River Development Project, FERC Project No. 2246 (Project). YCWA is the existing licensee, and current owner and operator of the Project.

The Revised Study Plan included plans for 42 studies that YCWA proposed to perform to supplement existing, relevant and reasonably available information regarding the Project and the resources potentially affected by the Project. YCWA estimated that the total cost to perform its proposed studies (i.e., the sum of the high and low cost estimate ranges included in each study) ranged between \$5,947,000 and \$7,916,800.

The Revised Study Plan also reported that, while consensus on many issues associated with YCWA's study plans had been reached, YCWA believed differences remained on 14 of the studies proposed by YCWA and YCWA had not adopted 11 "new studies"¹ requested by one or more Relicensing Participants² who filed comments on YCWA's Proposed Study Plan. YCWA reviewed its list of remaining differences with NMFS at an August 5, 2011 meeting, and with the Forest Service, USFWS, USDO National Park Service, SWRCB, CDFG and FWN at an August 10, 2011 meeting. The purposes of the meetings were to attempt to resolve differences prior to filing of the Revised Study Plan, and to be sure YCWA had not missed any differences. Table 1 lists the studies for which YCWA believed differences remained upon filing of its Revised Study Plan.

Table 1. Studies for which YCWA believed differences remained upon filing of its Revised Study Plan

Study Number	Study Name	Relicensing Participant With Whom YCWA Believed Differences Remained Upon Filing of Its Revised Study Plan
PROPOSED STUDIES FOR WHICH A MODIFICATION WAS REQUESTED AND NOT ADOPTED IN REVISED STUDY PLAN		
1.1	Channel Morphology Upstream of Englebright Reservoir	NMFS
1.2	Channel Morphology Downstream of Englebright Dam	USFWS
2.3	Water Quality	CDFG
2.5	Water Temperature Monitoring	FWN
3.1	Aquatic Macroinvertebrates Upstream of Englebright Reservoir	Forest Service and CDFG
3.2	Aquatic Macroinvertebrates Downstream of Englebright Dam	USFWS
3.6	Special-Status Turtles – Western Pond Turtle	Forest Service and CDFG
3.9	Non-ESA Listed Fish Populations Downstream of Englebright Dam	CDFG
3.10	Instream Flow Upstream of Englebright Reservoir	USFWS
3.11	Fish Entrainment	Forest Service and CDFG
6.1	Riparian Habitat Upstream of Englebright Reservoir	FWN and NMFS
6.2	Riparian Habitat Downstream of Englebright Dam	USFWS and NMFS
7.2	Narrows 2 Powerhouse Intake	USFWS and CDFG
7.8	ESA/CESA-Listed Salmonids Downstream of Englebright Dam	USFWS and NMFS
7.10	Instream Flow Downstream of Englebright Dam	USFWS and NMFS
Total		14
NEW STUDIES NOT ADOPTED IN REVISED STUDY PLAN		
New	Effects of the Project and Related Activities on Fish Passage for Anadromous Fish	NMFS
New	Effects of the Project and Related Activities on Hydrology for Anadromous Fish	NMFS
New	Effects of the Project and Related Activities on Water Temperature for Anadromous Fish	NMFS

¹ In its Revised Study Plan, YCWA defines a "new study" as a study that was not proposed by YCWA in its April 19, 2011 Proposed Study Plan.

² YCWA defines Relicensing Participants as federal, state and local agencies, Native American tribes, non-governmental organizations, businesses and unaffiliated members of the public that participate in the Yuba River Development Project relicensing.

Table 1. (continued)

Study Number	Study Name	Relicensing Participant With Whom YCWA Believed Differences Remained Upon Filing of Its Revised Study Plan
NEW STUDIES NOT ADOPTED IN REVISED STUDY PLAN (continued)		
New	Effects of the Project and Related Activities on Coarse Substrate for Anadromous Fish	NMFS
New	Effects of the Project and Related Activities on the Loss of Marine-Derived Nutrients in the Yuba River	NMFS
New	Anadromous Fish Ecosystem Effects	NMFS
New	Estimating Downstream Migration of <i>O. mykiss</i> in the Yuba River	USFWS
New	Salmonid Floodplain/Off-Channel Rearing Habitat	USFWS
New	Angling Study	FWN
New	Deer Herd Migration Routes and Mule Deer Winter Range Access Assessment	YCFG
Total		11

YCWA'S REPLY TO COMMENTS ON REVISED STUDY PLAN

YCWA carefully reviewed the six comment letters and found that comments were filed on 21 of the studies proposed by YCWA in its Revised Study Plan and nine new studies were requested. Table 2 provides a list of studies by commenter.

Table 2. Studies for which comments were filed on the Revised Study Plan.

Study Number	Study Name	Commenter on Revised Study Plan					
		Forest Service	USFWS	NMFS	CDFG	SWRCB	FWN
1.1	Channel Morphology Upstream of Englebright Reservoir	--	--	X	--	--	-- ³
1.2	Channel Morphology Downstream of Englebright Dam	--	X	X	X	-- ¹	-- ⁴
2.1	Hydrologic Alteration	--	--	X	--	--	--
2.2	Water Balance/Operations Model	--	--	X	--	--	--
2.4	Bioaccumulation	--	--	--	X	-- ¹	-- ⁴
2.5	Water Temperature Monitoring	--	--	--	--	--	X
2.6	Water Temperature Model	--	--	X	--	--	--
3.1	Aquatic Macroinvertebrates Upstream of Englebright Reservoir	X	-- ⁸	--	X	-- ¹	-- ⁵
3.2	Aquatic Macroinvertebrates Downstream of Englebright Dam	--	-- ⁸	--	--	--	-- ³
3.6	Special-Status Turtles – Western Pond Turtle	X	--	--	X	-- ¹	-- ⁵
3.8	Stream Fish Populations Upstream of Englebright Reservoir	--	X	--	--	--	--
3.9	Non-ESA Listed Fish Populations Downstream of Englebright Dam	--	X	--	X	-- ¹	-- ⁴
3.10	Instream Flow Upstream of Englebright Reservoir	--	X	--	X	-- ¹	-- ⁴
3.11	Fish Entrainment	X	X	X	X	X	-- ⁵
6.1	Riparian Habitat Upstream of Englebright Reservoir	--	--	X	--	--	X
6.2	Riparian Habitat Downstream of Englebright Dam	--	-- ²	X	--	--	--
7.2	Narrows 2 Powerhouse Intake	--	X	X	X	-- ¹	-- ⁴
7.8	ESA/CESA-Listed Salmonids Downstream of Englebright Dam	--	X	--	--	--	-- ³

Table 2. (continued)

Study Number	Study Name	Commenter on Revised Study Plan					
		Forest Service	USFWS	NMFS	CDFG	SWRCB	FWN
7.9	North American Green Sturgeon Downstream of Englebright Dam	--	X	X	X	-- ¹	-- ³
7.10	Instream Flow Downstream of Englebright Dam	--	X	X	--	--	--
7.11	Assessment of Narrows 2 Powerhouse as a Barrier to Anadromous Fish Upstream Migration	--	--	X	--	--	X
New	Effects of the Project and Related Activities on Fish Passage for Anadromous Fish	--	--	X	--	--	-- ⁶
New	Effects of the Project and Related Activities on Hydrology for Anadromous Fish	--	--	X	--	--	-- ⁶
New	Effects of the Project and Related Activities on Water Temperature for Anadromous Fish	--	--	X	--	--	-- ⁶
New	Effects of the Project and Related Activities on Coarse Substrate for Anadromous Fish	--	--	X	--	--	-- ⁶
New	Effects of the Project and Related Activities on Large Wood and Riparian Habitat for Anadromous Fish	--	--	X	--	--	-- ⁶
New	Effects of the Project and Related Activities on Loss of Marine-Derived Nutrients in the Yuba River	--	--	X	--	--	-- ⁶
New	Anadromous Fish Ecosystem Effects	--	--	X	--	--	-- ⁶
New	Estimating Downstream Migration of <i>O. mykiss</i> in the Yuba River	--	X	--	--	--	-- ⁷
New	Salmonid Floodplain/Off-Channel Rearing Habitat	--	X	--	X	-- ¹	-- ⁷
<i>Number of Studies by Commenter</i>		3	11	19	9	1	3
Total		30					

¹ SWRCB did not specifically propose modifications to the study or specifically request the study, but stated it supported CDFG's request.

² USFWS did not specifically propose modifications to the study, but referred FERC to NMFS's comments on this study proposal.

³ FWN did not specifically propose modifications to the study, but stated it supported USFWS's and NMFS' requests.

⁴ FWN did not specifically propose modifications to the study, but stated it supported CDFG's request.

⁵ FWN did not specifically propose modifications to the study, but stated it supported the Forest Service's and CDFG's requests.

⁶ FWN did not specifically propose the new study, but stated it supported NMFS's request.

⁷ FWN did not specifically propose the new study, but stated it supported USFWS's request.

⁸ USFWS did not specifically propose modifications to the study, but stated its support of CDFG's request.

YCWA found that the commenters, in many portions of their letters: 1) expressed support or endorsement for other commenters' filings (refer to most of Sections 2 and 3 of FWN's letter, and to page 2 of SWRCB's letter); 2) expressed their opinion regarding YCWA's implementation of the Integrated Licensing Process to date, especially with regards to study plan development (refer to NMFS's letter regarding NMFS's statements that it is the responsibility of the applicant, not agencies, to develop detailed study plans and YCWA's reference to "new" studies, and to NMFS's and USFWS's letter regarding how YCWA treated effects analysis in its study proposals); and 3) referred FERC to previous filings (refer to FWN's and NMFS's letters). In this letter, YCWA does not reply in detail to those types of comments.³ In general, YCWA believes each commenter is free to support another

³ By not replying in this letter to those comments, it should not be inferred that YCWA agrees or disagrees with the comments – only that YCWA refrained from replying at this time to reduce the amount of material that FERC must review to prepare its Study Determination. YCWA reserves its right to reply to these comments in the future.

commenter's filing; it has implemented the ILP to the best of its understanding and ability and in a manner consistent with other recent relicensings in California; and it has already provided FERC with replies to comments similar to these in previous filings.

YCWA also found that many of the comment letters repeated arguments or positions expressed in previous filings, most notably, the commenter's position that YCWA should perform additional studies, including fish passage and entrainment for anadromous fish at Englebright Dam and upstream of the Dam (refer to NMFS's, USFWS's and FWN's letters). In this letter, YCWA does not reply in detail to those comments.⁴ In general, YCWA believes the commenters did not advance any new evidence or arguments to support their positions, and YCWA already provided FERC with replies to comments such as these in previous filings.

YCWA identified eight study proposals for which, YCWA believes, a reply would benefit FERC in preparing its Study Determination. Those replies are provided below.

Study 2.3 – Water Quality

On August 24, 2011, YCWA, SWRCB and South Yuba River Citizens League (SYRCL) agreed to changes to the Water Quality Study (Study 2.3) that would satisfy both SWRCB's and FWN's concerns regarding the powerhouse mercury sampling and analysis portion of the study. A redline of the study proposal is attached showing the changes agreed to the SWRCB, SYRCL and YCWA. YCWA requests FERC consider this redlined study proposal when preparing its Study Determination.

Study 3.1 - Special-Status Turtles – Western Pond Turtle

The Forest Service requested that FERC defer its decisions regarding the Special-Status Turtles – Western Pond Turtle Study (Study 3.1) and the Fish Entrainment Study (Study 3.11). The Forest Service noted that YCWA and Relicensing Participants are working to reach consensus regarding a scientifically sound, reasonable and implementable design for these studies. To this end, YCWA and Relicensing Participants agreed to continue discussion regarding Study 3.1 and Study 3.11 on September 14 and 15, 2011.⁵ YCWA concurs with the Forest Service's suggestion to the extent that the delay does not affect the schedule for mandatory agencies to file disputes with FERC's Study Determination.

Study 3.10 – Instream Flow Upstream of Englebright Reservoir

CDFG requested that Step 9, Time Series Analysis, be deleted from the Instream Flow Upstream of Englebright Reservoir Study (Study 3.10). CDFG has not provided any reason for the requested deletion of this step, which YCWA believes should be retained in the

⁴ See footnote number 3.

⁵ The September 14 meeting was subsequently cancelled.

study. Time series analyses are standard for analyzing the relationship between fish habitat and flow. Also, as stated in its Proposed Study Plan, YCWA will consult with Relicensing Participants regarding all time series analysis parameters, including input, scenario assumptions, and desired output. YCWA requests FERC not adopt this change.

Study 3.11 – Fish Entrainment

The Forest Service and SWRCB requested that FERC defer its decisions regarding the Fish Entrainment Study (Study 3.11). The SWRCB noted that YCWA and Relicensing Participants agreed to continue discussion regarding study methods on September 14 and 15, 2011,⁶ and suggested FERC participate in the meetings and refrain from analyzing the merits of the study until after the meetings. YCWA concurs with the SWRCB's suggestion to the extent that it does not affect the schedule for mandatory agencies to file disputes with FERC's Study Determination.

Study 6.1 - Riparian Habitat Upstream of Englebright Reservoir

NMFS and FWN requested that the Riparian Habitat Upstream of Englebright Reservoir Study (Study 6.1) include a more detailed description of methods and analysis to more closely resemble the Riparian Habitat Downstream of Englebright Dam Study (Study 6.2). YCWA has made multiple redline modifications addressing these requests.

NMFS made a request to remove a sentence regarding the generalized geomorphology of bedrock controlled reaches. YCWA appreciates NMFS's concern and has added language to clarify the intent.

In addition, several methods outlined by NMFS in a new study request, Effects of the Project and Related Activities on Large Wood and Riparian Habitat for Anadromous Fish, have been incorporated into the Riparian Habitat Upstream of Englebright Reservoir Study (Study 6.1).

YCWA requests FERC consider this redlined study proposal when preparing its Study Determination.

Study 6.2 - Riparian Habitat Downstream of Englebright Dam

NMFS made a new request to at least double the number of study sites. USFWS made the same request by referring FERC to NMFS's comments on this study proposal. YCWA's study proposes that a total of four study sites be chosen to characterize changes in morphology and riparian vegetation, and additional sites be added within safely accessible reaches if more are necessary to develop a complete characterization of the riparian habitats occurring in the study area. YCWA is committed to adding additional study sites if it

⁶ See footnote number 5.

becomes apparent that more sites are needed to meet the study goals. NMFS and USFWS have not made it clear how additional sites would benefit the study and no additional sites have been added at this time. YCWA requests FERC not adopt this change.

Study 7.9 - North American Green Sturgeon Downstream of Englebright Dam

USFWS requested that, to adequately assess the effects of the Project on North American green sturgeon habitat, the suite of evaluation flows in the Instream Flow Study Downstream of Englebright Dam Study (Study 7.10) should include a full range of flows, including flows greater than those in the Yuba Accord. YCWA agrees. The existing North American Green Sturgeon Downstream of Englebright Dam Study (Study 7.9) states that habitat versus flow relationships will be calculated over the range of flows corresponding to the hydrologic period of evaluation. This would include flows in excess of those in the Yuba Accord. YCWA believes the requested change is not needed.

Study 7.11 - Assessment of Narrows 2 Powerhouse as a Barrier to Anadromous Fish Upstream Migration

NMFS requested that YCWA collect depth and directional velocity measurements using an Acoustic Doppler Current Profiler (ADCP), rather than a wading rod as stated in the Assessment of Narrows 2 Powerhouse as a Barrier to Anadromous Fish Upstream Migration Study (Study 7.11). YCWA considered using an ADCP but ADCP requires relatively calm (or laminar) flow. The river below the powerhouse is turbulent. YCWA requests FERC not adopt this change.

If you have any questions regarding this letter, please contact me.

Sincerely,

YUBA COUNTY WATER AGENCY



Curt Aikens
General Manager

Attachment: Redline of Water Quality Study (Study 2.3)
Redline of Riparian Habitat Upstream of Englebright Reservoir Study (Study 6.1)

cc: Alan Mitchnick – FERC
Ken Hogan – FERC
Yuba River Development Project Relicensing Contact List (via e-mail)

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Study 2.3

WATER QUALITY

September 2011

1.0 Project Nexus

Yuba County Water Agency's (YCWA or Licensee) continued operation and maintenance (O&M) of the existing Yuba River Development Project (Project) has a potential to affect water quality. Hydroelectric facilities control the timing and magnitude of flow delivered to stream channels and residence time of water within Project impoundments; these hydrologic factors define the physical, chemical and biological characteristics of water within the Yuba River watershed. Recreational uses at Project reservoirs and facilities have the potential to impact water quality through human contact.

Water temperature is not addressed in this study but in two separate studies: Water Temperature Monitoring and Water Temperature Modeling. Additionally, consistency of water quality with methylmercury fish tissue objectives is addressed in a separate study: Bioaccumulation.

2.0 Resource Management Goals of Agencies and Indian Tribes with Jurisdiction over the Resource Studied

YCWA believes that five agencies have jurisdiction over water quality and the resources that could be potentially affected in the geographic area included in this study proposal: 1) the United States Department of Agriculture, Forest Service (Forest Service) on National Forest System (NFS) land; 2) United States Department of Interior, Fish and Wildlife Service (USFWS); 3) United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS); 4) California Department of Fish and Game (CDFG); and 5) State Water Resources Control Board, Division of Water Rights (SWRCB). Each of these agencies and their jurisdiction and management direction, as understood by YCWA at this time, is discussed below.

Forest Service

The Forest Service's jurisdiction and applicable management goals are described by the Forest Service from page 59 to 76 in the Forest Service's March 2, 2011 letter to FERC providing the Forest Service's comments on YCWA's Pre-Application Document, or PAD (YCWA 2010). The Forest Service's jurisdiction and management goals are not repeated here.

USFWS

USFWS's jurisdiction and goals and objectives are described by USFWS on pages 1 through 3 of USFWS's March 7, 2011 letter to FERC that provided USFWS's comments on YCWA's Pre-Application Document (PAD). USFWS's jurisdiction, goals and objectives are not repeated here.

NMFS

NMFS's statutory authorities and responsibilities are described by NMFS in Section 2.0 of Enclosure A in NMFS's March 7, 2011 letter to FERC providing NMFS's comments on YCWA's PAD. NMFS's jurisdiction and responsibilities are not repeated here.

CDFG

CDFG's jurisdiction is described by CDFG on page 1 of CDFG's March 2, 2011 letter to FERC providing CDFG's comments on YCWA's PAD. CDFG's goal, as described on page 2 of CDFG's letter is to preserve, protect, and as needed, to restore habitat necessary to support native fish, wildlife and plant species.

SWRCB

SWRCB has authority under the federal Clean Water Act (33 U.S.C. §11251-1357) to restore and maintain the chemical, physical and biological integrity of the Nation's waters. Throughout the relicensing process the SWRCB maintains independent regulatory authority to condition the operation of the Project to protect water quality and the beneficial uses of stream reaches consistent with Section 401 of the federal Clean Water Act, the Regional Water Quality Control Board Basin Plans, State Water Board regulations, CEQA, and any other applicable state law.

3.0 Study Goals and Objectives

The goals of this study are: 1) to characterize existing water quality conditions in Project reservoirs and Project-affected reaches of the North, Middle and mainstem Yuba rivers and tributaries including Oregon Creek, 2) to determine consistency with state and federal water quality objectives, standards, and criteria, and 3) to identify potential Project O&M related causes for Basin Plan Objectives and Beneficial Use protections to not be met.

The objective of the study is to collect water quality data adequate to meet the study goals.

4.0 Existing Information and Need for Additional Information

Available information consists of existing regulatory plans and advisories for the watershed, as well as water quality data collected to date in the project area.

4.1 Regulatory Status for Surface Water and Fish the Project Area

4.1.1 The Basin Plan

Water Quality Objectives and Beneficial Use Designations 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 2007 (CVRWQCB 1998). The Yuba River Development Project and the area downstream of the Project falls within two Basin Plan Hydro Units: Hydro Unit 517, which

includes New Bullards Bar Reservoir, and Hydro Unit 515.3, which includes the Yuba River from the United States Army Corp of Engineers' (USACE) Englebright Dam to the Feather River. Designated beneficial uses of surface water were excerpted from the Basin Plan and are shown by Hydro Unit in Table 4.1.1-1.

Table 4.1.1-1. Beneficial uses of surface water within the Yuba River Development Project and the area downstream as designated by Hydro Unit (HU) in the Basin Plan (CVRWQCB 1998).

Designated Beneficial Use Description from Basin Plan, Section II		Designated Beneficial Use by Hydro Unit from Basin Plan, Table II-1		
		Use	Sources to USACE's Englebright Reservoir	USACE's Englebright Dam to Feather River
			HU 517	HU 515.3
Municipal and Domestic Supply (MUN)	Uses of water for community, military or individual water supply systems including, but not limited to, drinking water supply.	MUNICIPAL AND DOMESTIC SUPPLY	Existing	--
Agricultural Supply (AGR)	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.	IRRIGATION	Existing	Existing
		STOCK WATERING	Existing	Existing
Industry	Uses of water for industrial activities that depend primarily on water quality.	INDUSTRIAL PROCESS SUPPLY (PROC)	--	--
	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.	INDUSTRIAL SURVICE SUPPLY (IND)	--	--
	Hydropower generation	POWER (POW)	Existing	Existing
Water Contact Recreation (REC-1)	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.	CONTACT	Existing	Existing
		CANOEING AND RAFTING*	Existing	Existing
Non-Contact Water Recreation (REC-2)	Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach-combing, camping, boating, tide-pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.	OTHER NON-CONTACT	Existing	Existing
Freshwater Habitat	Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	WARM ^{1,2}	--	Existing
	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	COLD ^{1,2}	Existing	Existing
Migration of Aquatic Organisms (MGR)	Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.	WARM ^{2,3}	--	Existing
		COLD ^{2,4}	--	Existing
Spawning (SPWN)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.	WARM ^{2,3}	--	Existing
		COLD ^{2,4}	Existing	Existing

Table 4.1.1-1. (continued)

Designated Beneficial Use Description from Basin Plan, Section II		Designated Beneficial Use by Hydro Unit from Basin Plan, Table II-1		
		Use	Sources to USACE's Englebright Reservoir	USACE's Englebright Dam to Feather River
			HU 517	HU 515.3
Wildlife Habitat (WILD)	Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation or enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.	WILDLIFE HABITAT	Existing	Existing

¹ Resident fish; does not include anadromous.

² Any hydrologic unit with both WARM and COLD beneficial use designations is considered COLD water bodies for the application of water quality objectives (CVRWQCB 1998).

³ Striped bass, sturgeon and shad.

⁴ Salmon and steelhead.

* Canoeing and rafting are flow-dependent beneficial uses.

4.1.2 California's List of Impaired Waters

Section 303(d) of the Clean Water Act (CWA) requires that every two years each State submit to the United States Environmental Protection Agency (EPA) a list of rivers, lakes and reservoirs in the State for which pollution control or requirements have failed to provide for water quality. The CVRWQCB and State Water Resources Control Board (SWRCB) work together to research and update the list for the Central Valley region of California. Based on a review of this list and its associated Total Maximum Daily Load (TMDL) Priority Schedule, in the Project Vicinity, USACE's Englebright Reservoir has been identified by the SWRCB as CWA §303(d) State Impaired for mercury; and Deer Creek, a tributary to the Yuba River, has been identified as impaired for pH (SWRCB 2006). However, there are currently no approved TMDL plans for the Yuba River.

In 2009, the CVRWQCB recommended including additional surface waters in the Project Area to the 303(d) list as impaired for mercury: New Bullards Bar Reservoir, the Middle Yuba River, the North Fork Yuba River from New Bullards Bar Dam to Englebright Reservoir, the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir, and the Lower Yuba River from USACE's Englebright Reservoir to the Feather (CVRWQCB 2009). The CVRWQCB is also recommending that the lower Yuba River be added to the 303(d) list as impaired for iron (CVRWQCB 2009). These recommendations were considered and adopted by the SWRCB at the August 3, 2010 Board meeting, at which time they were advanced forward for approval by the United States EPA (Azimi-Gaylon, pers. comm., 2010). At the time this study proposal is prepared, they have not been approved by the EPA.

4.1.3 Fish Ingestion Advisories

Using available fish tissue data and risk-based methodologies, the Office of Environmental Health Hazard Assessment (OEHHA) has issued species-specific fish ingestion advisories for trout, sunfish and bass caught in USACE's Englebright Reservoir (OEHHA 2003, OEHHA

2009). Fish ingestion advisories previously issued for Deer Creek, a tributary to the Yuba River, were recently retracted due to an insufficient quantity of data (OHHEA 2009).

4.2 Existing Water Quality Information

Existing, relevant and reasonably available information found at the Project Area¹ was documented in Section 7.2.9 of the YCWA's Pre-Application Package (YCWA 2010) and is summarized below.

4.2.1 Licensees' Summer 2009 Data

Information regarding water quality in the Project Area was gathered during the low flow summer season in 2009, a period when Project O&M effects were expected to be most pronounced, if they occur. The study consisted of two elements: a general water quality element and a recreation element. The general water quality element consisted of collecting samples from the reservoirs and stream reaches of the Project Area and analyzing each sample for 35 analytes. Secchi disc measurements were also made within reservoirs. The recreation study element consisted of collecting samples adjacent to New Bullards Bar Reservoir's Emerald Cove and Dark Day Campground boat ramps on five separate days over a 30 day period that included the Labor Day weekend. Bacteria counts were made for these samples.

Surface water samples were collected from the 17 locations between September 14 and 17, 2009. Temperatures ranged between 8.8 to 16.1 degrees Centigrade (°C) at all locations except upstream of the Project near the South Yuba River State Park, which had a temperature of 20.9°C. Dissolved oxygen (DO) was generally between 7.3 and 9.5 milligrams per liter (mg/L), while pH ranged between 7.3 and 8.3 standard units (su) in all 17 samples. Turbidity ranged from non-detected to 15.4 Nephelometric Turbidity Units (NTU) and hardness ranged from 21 to 90 mg/L. The Secchi disc measurement for New Bullards Bar was 9 feet and for USACE's Englebright Reservoir, the Secchi disc depth was 12 feet. Below and within Project facilities, metals and dissolved metals concentrations were either non-detected using laboratory methods or present in trace amounts. Metals concentration in Project surface water met both drinking water standards and aquatic life protective criteria.

Fecal coliform and *Escherichia coli* (*E. coli*) were not found, while total coliform was found. Fecal coliform is the only one of these parameters for which there is a Basin Plan Objective. Since total coliform counts were not accompanied by commensurate *E. coli* counts, it is likely that humans are not responsible for the observed total coliform.

¹ For the purposes of this document, the Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) existing Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.

4.2.2 Sacramento River Watershed Program 1996-1998

The Sacramento River Watershed Program collected 27 samples over a 3-year period between 1996 and 1998 from a site near Marysville, directly upstream of the Yuba River's confluence with the Feather River (LWA 2000 *IN* YCWA, CWDR, and BOR 2007). In this program, pH ranged from 7.0-7.8 su, turbidity ranged from 1-153 NTU, DO ranged from 8.0-12 mg/L, Total Organic Carbon (TOC) ranged from 0.7-2.4 mg/L, nitrate-nitrite concentrations ranged from 0.05-0.14 mg/L, and electrical conductivity (EC) ranged from 44-105 microSeimens per centimeter (μ S/cm). Samples were also analyzed for mercury (total; 1.19-46.7 nanograms per Liter, or ng/L). Samples collected in the earliest rounds were also analyzed for seven trace metals which were taken off the analyte list after metal concentrations were found to be consistently below drinking water criteria (LWA 2000).

4.2.3 Oroville Relicensing Water Quality Study 2002-2004

In support of the Oroville Dam relicensing effort, the California Department of Water Resources (CDWR) collected 30 samples from a Feather River site near Marysville, directly upstream of the Yuba River's confluence with the Feather River (DWR 2004 *IN* HDR|SWRI 2007). DWR analyzed each sample for more than 50 analytes, including total and dissolved metals. In the DWR samples, pH ranged from 7.1-7.4 su; turbidity ranged from 0.5-17.2 mg/L; DO ranged from 8.4-14.2 mg/L; TOC ranged from 0.8-3.6 mg/L; nitrate-nitrite concentrations ranged from less than 0.01-0.08 mg/L; and EC ranged from 76-28 μ S/cm.

4.2.4 South Yuba River Citizens League (SYRCL) 2000-2009

Since 2000, as weather and access have allowed, the South Yuba River Citizens League (SYRCL), a non-governmental organization, has implemented a citizen's monitoring program, funded by a grant sponsored by the Regional Water Quality Control Board (RWQCB). The program consists of sampling up to 33 sites in the Yuba River watershed for dissolved oxygen, pH, conductivity, temperature, turbidity, total suspended solids, and some metals (arsenic, mercury), sometimes as often as monthly. Based on these data, SYRCL has identified arsenic, bacteria, and mercury as constituents of concern in the watershed (SYRCL 2006; SYRCL Website 2005 *IN* HDR|SWRI 2007).

Upstream of the Project, surface water samples were collected from the North Yuba River just upstream of New Bullards Bar Reservoir during an 8 to 12-month period in 2001 (SYRCL 2007 *IN* HDR|SWRI 2007). A total of seven samples were collected for six general water quality parameters: pH ranged from 7-8.1 su, turbidity ranged from 0-45 mg/L, DO ranged from 8.3-12.3 mg/L, TOC ranged from 0.59-2.6 mg/L, nitrate-nitrite ranged from 0.025-0.05 mg/L, and EC ranged from 20-30 μ S/cm. In the Project Area, SYRCL has been sampling downstream of Colgate Powerhouse, measured constituents consisted of pH (6.8-8.6 su), DO (9.5-14.5 mg/L), temperature (7.1-18.4 C), turbidity (0-16.6 NTU), and electrical conductivity (60-143 μ S/cm).

Between 2001 and 2009, SYRCL collected samples from three locations downstream of USACE's Englebright Reservoir to the Feather River confluence, Parks Bar at Highway 20, Hallwood Avenue, and Marysville above the confluence with the Feather River (SYRCL 2009).

Samples were analyzed at different frequencies and results were as follows: coliform ranged from 42 to greater than 2,410 MPN/100 ml; arsenic ranged from non-detected in laboratory analysis to 3.9 mg/L; iron ranged from non-detected to 2360 mg/L; copper ranged from 1.06-19 mg/L; zinc ranged from 0.4-13.6 mg/L; chromium ranged from non-detected to 0.94 mg/L; and turbidity ranged from non-detected to 27 mg/L.

4.2.5 Need for Additional Data

Historic data suggest that surface water of the Project Area generally meets Basin Plan Objectives. However, the vast majority of historic data is 10 years old or more, much of it has been collected near the mouth of the Yuba River, and YCWA's 2009 data was collected only in one season – summer low flow period. Data collection efforts throughout project affected streams and impoundments during the spring runoff would be useful, as would water quality information from additional sites during the summer low flow period and downstream of New Bullards Bar reservoir in the fall.

5.0 Study Methods and Analysis

5.1 Study Area

For the purpose of this study, 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. Background conditions will be collected from sampling sites upstream of all Project facilities.

If YCWA proposes an addition to the Project, the study area will be expanded if necessary to include areas potentially affected by the addition.

5.2 General Concepts and Procedures

The following general concepts and practices apply to the study:

- Personal safety is the most important consideration of each fieldwork team.
- Licensee will make a good faith effort to obtain permission to access private property where needed well in advance of entering the property.
- Field crews may make minor variances to the FERC-approved study in the field to accommodate actual field conditions and unforeseen problems. When minor variances are made, Licensee's field crew will follow the protocols in the FERC-approved study.
- When Licensee becomes aware of major variances to the FERC-approved study, Licensee will issue an e-mail to the Relicensing Contact List describing the variance and reason for the

variance. Licensee will contact by phone the Forest Service (if the variance is on National Forest System land), USFWS, SWRCB and CDFG to provide an opportunity for input regarding how to address the variance. Licensee will issue an e-mail to the Relicensing Contact List advising them of the resolution of the variance. Licensee will summarize in the final study report all variances and resolutions.

- Licensee's performance of the study does not presume that Licensee is responsible in whole or in part for measures that may arise from the study.
- 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 Licensee's relicensing GIS analyst. Metadata will be developed for deliverable GIS data sets. Upon request, GIS maps will be provided to agencies in a form, such as ESRI Shapefiles, GeoDatabases, or Coverage with appropriate metadata, that is useful for interactive data analysis and interpretation. Metadata will be Federal Geographic Data Committee (FGDC) compliant.²
- Licensee's field crews will record incidental observations of aquatic and wildlife species observed during the performance of this study. All incidental observations will be reported in the appropriate Licensee report (e.g., incidental observations of special-status fish recorded during fieldwork for the Special-Status Turtles – Western Pond Turtle Study will be reported in Licensee's Stream Fish Populations Study report). The purpose of this effort is not to conduct a focus study (i.e., no effort in addition the specific field tasks identified for the specific study) or to make all field crews experts in identifying all species, but only to opportunistically gather data during the performance of the study.
- Field crews will be trained on and provided with materials (e.g., Quat) for decontaminating their boots, waders, and other equipment between study sites. Major concerns are amphibian chytrid fungus, and invasive invertebrates (e.g., zebra mussel, *Dreissena polymorpha*). This is of primary importance when moving: 1) between tributaries and mainstem reaches; 2) between basins (e.g., Middle Yuba River, Yuba River, and North Yuba River); and 3) between isolated wetlands or ponds and river or stream environments.

5.3 Methods

The study will be performed in eight steps: 1) select water quality parameters; 2) select sampling locations; 3) collect water samples; 4) perform laboratory analyses using standard methods adequately sensitive to determine consistency with state and federal water quality standards; 5) prepare quality assurance/quality control (QA/QC) review; 6) determine consistency with Basin Plan Objectives and beneficial use protection needs; 7) consult Operations Staff; and 8) prepare

² The Forest Service and CDFG each have requested that a copy of the GIS maps be provided to them when the maps are available.

report. The report will be made available to Relicensing Participants. Each of these steps is described below.

5.3.1 Step 1 – Select Water Quality Parameters

For the purpose of this study proposal, water quality parameters and constituents to be measured are divided into two categories: 1) general water quality study and 2) recreation study. The parameters included in each category and associated information are listed in Table 5.3.1-1.

Table 5.3.1-1. Water quality parameters and constituents to be measured and methods, reporting limits and laboratory holding times for each.

Analyte		Method	Target Reporting Limit µg/L (or other)	Hold Time	
GENERAL STUDY	BASIC WATER QUALITY- IN SITU				
	Dissolved Oxygen	DO	SM 4500-O	0.1 mg/L	Field (<i>in situ</i>)
	Specific conductance	--	SM 2510A	0.001 µmhos	Field (<i>in situ</i>)
	pH	--	SM 4500-H	0.1 su	Field (<i>in situ</i>)
	Turbidity	--	SM 2130 B	0.1 NTU	Field (<i>in situ</i>)
	Secchi Disc	--	--	--	Field (<i>in situ</i>)
	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 ²⁻	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
	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 ₃ Hg	EPA 1630	0.00005/0.000019	90 d
	Nickel (total and dissolved)	Ni	EPA 200.8/1638	0.10/0.01	180 d

Table 5.3.1-1. (continued)

Analyte			Method	Target Reporting Limit µg/L (or other)	Hold Time
RECREATION STUDY	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
	BACTERIA				
	Total coliform	--	SM 9221	1.1 MPN	24 h
	Fecal coliform	--	SM 9221	1.1 MPN	24 h
	<i>Escherichia coli</i>	<i>E. coli</i>	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	--	--

Key:

EPA = United States Environmental Protection Agency
CaCO₃ = Calcium carbonate
d = days
h = hours
µmhos = micro-ohms
µg/L = micrograms per liter (equals parts per billion)
mg/L = milligrams per liter (equals parts per million)
MPN = Most Probable Number
NTU = Nephelometric Turbidity Units
SM = Standard Method
su = Standard Unit

5.3.2 Step 2 – Select Sampling Locations

5.3.2.1 Select General Water Quality Sample Locations

General water quality samples will be collected upstream and downstream of the Project reservoir, diversions and powerhouses. Samples will also be collected downstream of Project facilities at multiple sites between USACE's Englebright Reservoir and the Feather River. In New Bullards Bar Reservoir and in the USACE's Englebright Reservoir samples will be collected at a minimum of three sites each, including the deepest part of the reservoir near the dams. At each reservoir location, general water chemistry samples will be collected for laboratory analysis at two depths: within the hypolimnion and just below the surface in the epilimnion (Table 5.3.2-1).

Table 5.3.2-1. General water quality sample locations - reservoirs.

Reservoir	Sample Depth	Location
NORTH YUBA RIVER		
New Bullards Bar Reservoir	Surface	Three Sites: 1) Near Madrone Cove, 2) Mid-Reservoir at influence of Slate Creek, and 3) Near Dam
	Bottom	
YUBA RIVER		
USACE's Englebright Reservoir	Surface	Three Sites: 1) Upper reservoir, 2) Mid-Reservoir, and 3) Near Dam
	Bottom	

Stream samples for general water quality will be collected upstream and downstream of New Bullards Bar Reservoir, Our House Diversion Dam Impoundment, Log Cabin Diversion Dam

Impoundment, and USACE's Englebright Reservoir, as well as at four locations between USACE's Englebright Dam and the Feather River (Table 5.3.2-2). Water chemistry samples will be grab samples collected for laboratory analysis from the moving water.

Table 5.3.2-2. General water quality sample locations - stream reaches.

Stream Reach	Sample Depth	Location	Notes
MIDDLE YUBA RIVER			
--	Surface	Above Our House Dam Diversion	Above New Bullards Bar Inflow SYRCL Sampling Site
Our House Diversion Dam Reach	Surface	Below Our House Dam Diversion	Immediately downstream of dam
--	Surface	MYR upstream of confluence with NYR	MYR and Oregon Creek conditions
OREGON CREEK			
--	Surface	Above Log Cabin Diversion Dam	Immediately upstream of the impoundment and above inflow from tunnel
Log Cabin Diversion Dam Reach	Surface	Below Log Cabin Diversion Dam	Immediately downstream of dam
NORTH YUBA RIVER			
--	Surface	Below Fiddle Creek at Hwy 49 ¹	SYRCL Sampling Site
New Bullards Bar Dam Reach	Surface	Below New Bullards Bar Dam	--
YUBA RIVER			
--	Surface	Above Colgate Powerhouse	SYRCL Sampling Site
Colgate Powerhouse Reach	Surface	Below Colgate Powerhouse	--
	Surface	Downstream of Dobbins Ck/ upstream of SYR confluence & high-water line of Englebright Reservoir	Mixing of Dobbins with New Bullards/Colgate flow in Yuba
SOUTH YUBA RIVER			
--	Surface	South Yuba River State Park – SYR upstream of Englebright high-water line	SYR delivery conditions from Yuba-Bear and Drum-Spaulding Projects; and routing; SYRCL's Bridgeport sampling site
YUBA RIVER			
--	Surface	Narrows #2 Tailrace/ Below USACE's Englebright Dam	--
Narrows 2 Powerhouse Reach	Surface	Below Deer Creek at Hwy 20	SYRCL Sampling Site
Daguerre Point Dam Reach	Surface	Below USACE's Daguerre Point Diversion Dam	SYRCL Sampling Site
	Surface	At Walnut Avenue	--
	Surface	Marysville	SYRCL Sampling Site

¹ Or, if water levels are low, a location in flowing water upstream of the reservoir

² A location near the head of the reservoir.

Key:

Hwy = Highway

MYR = Middle Yuba River

SYR = South Yuba River

SYRCL = South Yuba River Citizens League

USACE = United States Army Corps of Engineers

5.3.2.2 Select Reservoir Recreation Water Quality Sample Locations

Two recreation water quality samples will be collected, one each from the surface of New Bullards Bar Reservoir near the boat ramps in Emerald Cove and Dark Day Campground (Table 5.3.2-3).

Table 5.3.2-3. Recreation water quality sample locations--reservoir.

Reservoir	Sample Depth	Location
New Bullards Bar Reservoir	Surface	Emerald Cove Near the Boat Ramp
	Surface	Dark Day Cove equidistant between the Boat Ramp and the informal day use area. ¹
	Surface	Moran Cove Day Use Area Shoreline

¹ New Bullards Bar does not have any beaches, due to the reservoir's steep shoreline. However, at low water levels, the exposed shoreline near Dark Day Cove boat ramp is more gently sloped and recreationists have been observed swimming at this location.

If YCWA and Relicensing Participants collaboratively identify additional locations of concern regarding Project-related bacteria during the Recreation Use and Visitor Surveys Study (Study 8.1), additional recreation-related bacteria sampling will be performed at those locations. In particular, YCWA and the Forest Service have agreed that YCWA will perform recreation surveys at Oregon Creek Day Use Area during the relicensing Recreation Use and Visitor Surveys Study (Study 8.1). If the surveys indicate a Project nexus, YCWA will perform additional data collection, which could include general water quality and bacteria sampling at the day use area.

5.3.2.3 Select Turbidity-associated Mercury Sample Locations

One surface water quality sample will be collected each from the New Colgate Powerhouse tailrace and the Narrows No. 2 Powerhouse tailrace, when the powerhouses are in operation, during a single period expected to be of high turbidity in 2012. A flow of 5,000 cfs, as measured at the Smartsville gage,³ when flows as measured at Smartsville have increased by at least 100 percent in the previous 7 days, will trigger the sampling event. Water samples will be analyzed for turbidity, total suspended sediment, total dissolved sediment, total mercury and methylmercury using the methods described in Table 5.3.1-1. Water chemistry samples will be grab samples collected as near as safely possible to the powerhouse outlet for laboratory analysis from the moving water, consistent with Section 5.3.3.1.2.

5.3.3 Step 3 – Collect Samples

All data will be acquired in accordance with standard quality assurance practices.

5.3.3.1 General Water Quality Reservoir and Stream Sampling

Water chemistry samples will be collected from all locations in the spring run-off period (June/July) and late summer low flow season (late August/early September). A single sample will be collected downstream of New Bullards Bar for a third time, in the fall (October/November). A single sample will be collected downstream of each powerhouse during for a fourth period, during a time of high turbidity (Section 5.3.2.3). YCWA will make a good faith effort to keep Relicensing Participants informed of the study's progress and preliminary findings following data QA/QC. And, if data from spring or summer sampling events show elevated constituent or parameter levels at locations other than downstream of New Bullards Bar,

³ <http://cdec.water.ca.gov/cgi-progs/queryF?s=YRS>

YCWA will consult with Licensing Participants and determine need for additional fall sampling at select sites, as appropriate.

5.3.3.1.1 In Situ Sampling

In situ water quality measurements will be made at these same depths with a Hydrolab DataSonde 5 (Hydrolab), or other instrument with similar precision and accuracy. Water temperature ($\pm 0.1^{\circ}\text{C}$), DO (± 0.2 mg/L), pH (± 0.2 standard unit, or su), specific conductance (± 0.001 micromhos per centimeter ($\mu\text{omhos/cm}$)), and turbidity (± 1 NTU) will be measured *in situ* using a Hydrolab DataSonde 5 or other similar instrument that has the same precision and accuracy. Prior to and after each use, the instrument 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. YCWA will note relevant conditions during each sampling event on the field data sheet (i.e., air temperature, flow, description of location, floating material, evidence of oil and grease, and activities in the vicinity of sampling site that could cause short or long term alterations to water quality, such as dredging).

5.3.3.1.2 Laboratory Samples

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 EPA's 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 5.3.1-1 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 (approximately one for every ten 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. It assesses the adequacy of the decontamination processes. Two duplicate samples will also be collected.

5.3.3.1.3 Secchi Depth Readings in Reservoirs

Prior to collecting reservoir samples, a Secchi disk will be slowly lowered into the water on the shady side of the boat until it is no longer visible, and the depth recorded. Then, the Secchi disc will be slowly raised until it just becomes visible once again and this depth will be recorded a second time. The average of the two depths will be considered the Secchi depth.

5.3.3.2 **Recreation Water Quality Sampling**

In accordance with bacteria sampling protocols, bacteria samples will be collected on five different days within a 30-day period which spans the Independence Day holiday weekend and five different days within a 30-day period which spans the Labor Day holiday weekend (CVRWQCB 1998). A single petroleum hydrocarbon sample will be collected at each location during each of the holiday weekends included in the bacteria sampling. At each near-shore sample location, surface water will be collected from the near surface (bacteria) and/or the surface (petroleum hydrocarbons). Visual observations of oil and grease will be recorded in the field notebook.

5.3.4 **Step 4 – Perform Laboratory Analyses**

5.3.4.1 **Chemical Analyses**

All laboratory analyses will be conducted using EPA Standard Methods or the equivalent sufficiently sensitive 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 surface water analytical parameters:

- Basic Water Chemistry - Laboratory
- Inorganic Ions
- Metals
- Nutrients
- Petroleum Hydrocarbons

The analytes and target reporting limits associated with each parameter are listed in Table 5.3.1-1.

5.3.4.2 **Bacteria Analyses**

Surface water samples collected adjacent to recreation sites will be analyzed for:

- Total coliform
- Fecal coliform
- *Escherichia coli*

Bacteria samples will be delivered to a local laboratory within the holding times required in Table 5.3.1-1.

5.3.5 Step 5 – Prepare Quality Assurance/Quality Control Review

All data will be verified and/or validated as appropriate. In brief, following the field sampling and laboratory analyses, which includes the laboratories’ own QA/QC analysis, 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 is correct.

All verified chemical detections, including data whose results are “J” qualified,⁴ 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.

5.3.6 Step 6 – Determine Consistency with Basin Plan Objectives

5.3.6.1 All Samples Excluding Samples Collected From Powerhouse Release (Section 5.3.2.3)

Table 5.3.6-1 shows the standards, criteria and benchmark values that will be used to assist with in the assessment of sample results and their consistency with the Basin Plan Objectives. The selected values primarily consist of the Title 22 drinking water standards, which are incorporated by reference into the Basin Plan itself, and the California Toxics Rule (CTR) (EPA 2000). However, when a study analyte does not have a compliance threshold (benchmark) in one these preferred sources, benchmarks will be applied from *A Compilation of Water Quality Goals* (Marshack 2008, as amended for July 2008 – April 2010); *Water Quality Standards for Recreational Waters* (EPA 2003; another compilation with multiple regional sources); and others as cited.

Table 5.3.6-1. Standards, Criteria and Benchmarks used for determining consistency with Basin Plan Objectives and designated beneficial uses of water in project reservoirs and project-affected stream reaches.¹

Analyte	Symbol or Abbreviation	Standard, Criteria or Benchmark Value	Reference	Notes
BACTERIA (MUN, REC-1)				
Total coliform	--	< 10,000 MPN per 100 mL < 240 MPN per 100 mL (geometric mean);	EPA 2003	Water contact recreation, single-day sample; Water contact recreation, 30-day geometric mean

⁴ 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.

Table 5.3.6-1. (continued)

Analyte	Symbol or Abbreviation	Standard, Criteria or Benchmark Value	Reference	Notes
BACTERIA (MUN, REC-1) (continued)				
Fecal coliform	--	< 200 MPN per 100 mL (geometric mean); < 10% of samples > 400 MPN per 100 mL	CVRWQCB 1998	Water contact recreation, 30-day geometric mean; with individual samples not > 400 MPN/100 mL
<i>Escherichia coli</i>	<i>E. coli</i>	< 126 MPN per 100 mL (geometric mean) < 235 MPN per 100 mL in any single sample	CVRWQCB 2002; EPA 2003	Water contact recreation, 30-day geometric mean
BIOSTIMULATORY SUBSTANCES (COLD, SPAWN)				
Total Kjeldahl Nitrogen	TKN	None	--	--
Total Phosphorous	TP	None	--	--
CHEMICAL CONSTITUENTS (MUN)				
Alkalinity	--	20 mg/L	Marshack 2008	EPA AWQC; less than 20 mg/L can affect water treatment
Aluminum	Al	1 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Arsenic	As	0.01 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Cadmium	Cd	5 µg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Calcium	Ca	None	--	--
Analyte	Symbol or Abbreviation	Standard, Criteria or Benchmark Value	Reference	Notes
Chromium (total)	Cr (total)	50 µg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Copper	Cu	1.3 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Lead	Pb	15 µg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Mercury (inorganic)	Hg	2 µg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Nickel	Ni	100 µg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Nitrate	NO ₃ -N	45 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Nitrite	NO ₂ -N	1 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Nitrate + Nitrite	NO ₃ -N+NO ₂ -N	10 mg/L (combined total)	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Potassium	K	None	--	--
Selenium	Se	50 µg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64431 Primary MCL
Sodium	Na	20 mg/L	Marshack 2008	Sodium Restricted Diet ²
DISSOLVED OXYGEN (COLD, SPAWN)				
Dissolved Oxygen	DO	> 7 mg/L (minimum)	CVRWQCB 1998	Aquatic life protection
FLOATING MATERIAL (REC-1, REC-2)				
Floating Material	--	Narrative Criteria	CVRWQCB 1998	Aesthetics – Absent by visual observation
OIL & GREASE (REC-1, REC-2)				
Oil & Grease	--	Narrative	CVRWQCB 1998	Aesthetics – Absent by visual observation
Total Petroleum Hydrocarbons	TPH	None	--	--

Table 5.3.6-1. (continued)

Analyte	Symbol or Abbreviation	Standard, Criteria or Benchmark Value	Reference	Notes
pH (MUN, COLD, SPAWN, WILD)				
pH	--	6.5-8.5	CVRWQCB 1998	Aquatic life protection
SEDIMENT AND SETTLEABLE SOLIDS (REC-2, SPAWN, WILD)				
Sediment	--	Narrative	CVRWQCB 1998	See Geology and Soil Resources
TASTES & ODOR (MUN)				
Aluminum	Al	0.2 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Chloride	Cl	250 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Copper	Cu	1.0 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Iron	Fe	0.3 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Silver	Ag	0.1 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Specific conductance	--	900 µS/cm	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Sulfate	SO ₄ ²⁻	250 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Total Dissolved Solids	TDS	500 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
Zinc	Zn	5 mg/L	CDPH 2010 cited in CVRWQCB 1998	22 CCR §64449 Secondary MCL
TEMPERATURE (COLD, SPAWN)				
Temperature	--	Narrative	CVRWQCB 1998	See Water Temperature Study
TOXICITY (COLD, SPAWN, MUN)				
Alkalinity	--	20 mg/L	Marshack 2008	EPA AWQC; buffering capacity
Aluminum	Al	0.087 µg/L	Marshack 2008	EPA AWQC; aquatic life protective ³
Ammonia as N (pH and Temp dependent)	NH ₃ -N	24.1 mg/L (CMC); 4.1-5.9 mg/L (CCC)	EPA 2000	CTR criteria over 0-20°C assuming pH 7.0
		5.6 mg/L (CMC); 1.7-2.4 mg/L (CCC)	EPA 2000	CTR criteria over 0-20°C assuming pH 8.0
		0.9 mg/L (CMC); 0.3-0.5 mg/L (CCC)	EPA 2000	CTR criteria over 0-20°C assuming pH 9.0
Arsenic	As	0.34 mg/L (CMC); 0.15 mg/L (CCC)	EPA 2000	CTR criteria
Cadmium (hardness dependent)	Cd	0.16 µg/L (CMC); 0.25 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as CaCO ₃
		0.35 µg/L (CMC); 0.41 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as CaCO ₃
Cadmium (hardness dependent) (continued)	Cd (continued)	0.54 µg/L (CMC); 0.56 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as CaCO ₃
		0.95 µg/L (CMC); 0.81 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as CaCO ₃
Chloride	Cl-	860 mg/L (CMC); 230 mg/L (CCC)	Marshack 2008	EPA AWQC; aquatic life protective

Table 5.3.6-1. (continued)

Analyte	Symbol or Abbreviation	Standard, Criteria or Benchmark Value	Reference	Notes
TOXICITY (COLD, SPAWN, MUN) (continued)				
Chromium (hardness dependent)	Cr	47.19 µg/L (CMC); 15.31 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as CaCO ₃
		83.25 µg/L (CMC); 27.0 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as CaCO ₃
		116.03 µg/L (CMC); 37.64 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as CaCO ₃
		176.31 µg/L (CMC); 57.19 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as CaCO ₃
Copper (hardness dependent)	Cu	0.8 µg/L (CMC); 0.69 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as CaCO ₃
		1.54 µg/L (CMC); 1.25 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as CaCO ₃
		2.25 µg/L (CMC); 1.77 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as CaCO ₃
		3.64 µg/L (CMC); 2.74 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as CaCO ₃
Iron	Fe	1 mg/L (CCC)	Marshack 2008	EPA AWQC; aquatic life protective
Mercury (total)	Hg	0.050 µg/L	EPA 2000 40 CFR 131.38	CTR/Federal Register. 5/18/00
Nickel (hardness dependent)	Ni	37.2 µg/L (CMC); 4.1 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as CaCO ₃
		66.9 µg/L (CMC); 7.4 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as CaCO ₃
		94.3 µg/L (CMC); 10.5 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as CaCO ₃
		145.2 µg/L (CMC); 16.1 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as CaCO ₃
Selenium (total)	Se	20 µg/L (CMC) 5 µg/L (CCC)	Marshack 2008	EPA AWQC; aquatic life protective
Silver (hardness dependent)	Ag	0.02 µg/L (CMC) Instantaneous	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as CaCO ₃
		0.07 µg/L (CMC) instantaneous	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as CaCO ₃
Silver (hardness dependent)	Ag	0.13 µg/L (CMC) instantaneous	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as CaCO ₃
		0.32 µg/L (CMC) instantaneous	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as CaCO ₃

Table 5.3.6-1. (continued)

Analyte	Symbol or Abbreviation	Standard, Criteria or Benchmark Value	Reference	Notes
TOXICITY (COLD, SPAWN, MUN) (continued)				
Lead (hardness dependent)	Pb	2 µg/L (CMC) 0.086 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as CaCO ₃
		5 µg/L (CMC) 0.191 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as CaCO ₃
		8 µg/L (CMC) 0.303 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as CaCO ₃
		14 µg/L (CMC) 0.54 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as CaCO ₃
Specific conductance	--	150 µmhos	CVRWQCB 1998	Aquatic Life Protection
Zinc (hardness dependent)	Zn	9.26 µg/L (CMC) 9.33 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as CaCO ₃
		16.66 µg/L (CMC) 16.79 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as CaCO ₃
		23.48 µg/L (CMC) 23.68 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as CaCO ₃
		36.20 µg/L (CMC) 36.50 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as CaCO ₃
TURBIDITY (COLD, SPAWN, WILD, MUN)				
Turbidity	NTU	increase < 1 NTU for 1-5 NTU background; increase < 20% for 5-50 NTU background; increase < 10 NTU for 50-100 NTU background	CVRWQCB 1998	Aesthetics, disinfection

1 Note: a constituent may be listed under more than one beneficial use. When a standard or criterion was not available, benchmarks were excerpted from EPA (2003) and Marshack (2008).

2 Guidance level to protect those individuals restricted to a total sodium intake of 500 mg/day (Marshack 2008).

3 Benchmark is likely overly protective, as EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 0.087 µg aluminum/L, when either total recoverable or dissolved is measured (Marshack 2008)

Key:

AWQC = Ambient Water Quality Criteria
EPA = Environmental Protection Agency
CaCO₃ = Calcium carbonate
CMC = Criterion Maximum Concentration (1-hour acute exposure) for aquatic toxicity as defined by EPA (2000)
CCC = Criterion Continuous Concentration (4-day chronic exposure) for aquatic toxicity as defined by EPA (2000)
CTR = California Toxics Rule

MCL = Maximum Contaminant Level
µmhos = micromhos
µg/L = micrograms per liter
mg/L = milligrams per liter
MPN = Most Probable Number
NTU = Nephelometric turbidity units
SM = Standard Method
su = standard unit

The CVRWQCB has adopted, by reference, California Title 22 maximum contaminant levels (MCL) for drinking water as Basin Plan objectives (CVRWQCB 1998), with the exception that more stringent criteria may apply as necessary for protection of specific beneficial uses. Hence, these values are adopted as the drinking water standard herein. It should be noted, however, that chemical concentrations that were originally intended to apply to finished tap water, rather than to untreated sources of drinking water, will be applied to the untreated reservoir or river water.

For water quality objectives related to aquatic toxicity for ammonia and trace metals, the CTR (EPA 2000) is the preferred benchmark source. Part 40 CFR § 131.38 established Criterion Maximum Concentrations (CMC) as the highest concentrations to which aquatic life can be exposed for a short period⁵ [one hour] without deleterious effects and Criterion Continuous Concentrations (CCC) as the highest concentration to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. When single grab samples are collected, as will be the case for this study, it is assumed that constituent concentrations are representative of the continuous ambient condition, and CCC values are therefore used as the appropriate criteria to compare against environmental sample results.

Because of differences in acute and chronic toxicity to aquatic organisms of many elements and compounds, as well as variations with ambient water quality such as pH or hardness, several entries in Table 5.3.6-1 have multiple benchmarks to illustrate this range. The benchmarks for seven of the metals addressed in this study plan (cadmium, chromium, copper, lead, nickel, silver, and zinc) are reported for dissolved metals from the CTR (EPA 2000). In Table 5.3.6-1, benchmarks for these metals are calculated in 5 mg/L increments of hardness since the aquatic toxicity of these metals reportedly increases as hardness decreases. Similarly, the CMC and CCC levels for ammonia are a function of both pH and temperature and are presented for the temperature range of 0°-20°C in pH increments of 1.0 su in Table 5.3.6-1.

5.3.6.2 Samples Collected From Powerhouse Release (Section 5.3.2.3)

YCWA will compare the samples collected from the powerhouse tailraces to ambient levels of total mercury and methylmercury, as determined by YCWA's sampling in this study at other locations and seasons, as well as regional studies performed by others.

5.3.7 Step 7 – Consult with Operations Staff

If a water quality result suggests Basin Plan objectives are not being met, YCWA will consult with Project Operations staff to identify Project O&M activities that typically occur in the area with the potential to adversely-affect the parameter.

5.3.8 Step 8 – Collaboratively Agree on New Focused Second Year Study

YCWA will meet with interested and available Relicensing Participants no later than 6 weeks prior to the date that YCWA's Initial Study Report is scheduled to be filed with FERC to review data available from the study at that time and discuss the need for, and scope of, a focused water quality study in 2013. The criteria to be used by YCWA and Relicensing Participants to consider the need for a focused second year study will be when a constituent is found at an elevated level, where elevated is defined as a level outside the standards, criteria and benchmarks provided in Table 5.3.6-1, and the elevated level can reasonably be attributed to Project effects. If YCWA and Relicensing Participants collaboratively agree focused studies are needed in a second year, YCWA will develop a new study proposal or modification to this study proposal (depending on the scope of work for the focused study), provide it to the SWRCB, CDFG, and

⁵ Based on extended sample collection and one-hour averaging.

Forest Service for review, file it with FERC prior to or at the same time as YCWA files its Initial Study Report, and implement the study as directed by FERC.

5.3.9 Step 9 – Prepare Report

At the conclusion of the study, YCWA will prepare a report that includes the following sections: 1) Study Goals and Objectives; 2) Methods; 3) Results; 4) Discussion; and 5) Description of Variances from the FERC-approved study proposal, if any. The report will include in Microsoft Excel format on compact disc (CD) a complete water quality dataset. Also, the report will include a table that will show for each parameter measured the results of the sampling sorted by sampling location. Data that are greater than the benchmarks provided in Table 5.3.6-1 will be highlighted. The table will be appended to report and available in its Microsoft Excel format.

6.0 Study-Specific Consultation

This study requires three study-specific consultations:

- If YCWA and Relicensing Participants collaboratively identify additional locations of concern regarding Project-related bacteria during the Recreation Use and Visitor Surveys Study (Study 8.1), additional recreation-related bacteria sampling will be performed at the locations (Step 2). In particular, YCWA and the Forest Service have agreed that YCWA will perform recreation surveys at Oregon Creek Day Use Area during the relicensing Recreation Use and Visitor Surveys Study (Study 8.1). If the surveys indicate a Project nexus, YCWA will perform additional data collection, which could include general water quality and bacteria sampling at the day use area.
- YCWA will make a good faith effort to keep Relicensing Participants informed of the study's progress and preliminary findings from verified and/or validated data following data QA/QC (Step 3).
- YCWA will collaborate with Relicensing Participants regarding need for a focused second year study (Step 8).

7.0 Schedule

YCWA anticipates the schedule to complete the study as follows assuming FERC issues its Study Determination by September 16, 2011 and the study is not disputed by a mandatory conditioning agency:

Select Parameters and Sampling Locations (Steps 1 & 2).....	December 2011
Collect Data (Step 3).....	January – November 2012
Lab Analysis and QA/QC Review (Steps 4 & 5)	June – December 2012
Basin Plan Consistency and Operations Staff Consultation (Steps 6 & 7).....	December 2012
Collaborative Review of Data and Need for Focused Study (Step 8).....	[See Section 5.3.8]
Prepare Report (Step 9).....	November 2012 – September 2013

8.0 Consistency of Methodology with Generally Accepted Scientific Practices

The study methods discussed above are consistent with the study methods followed in several other relicensings. The methods presented in this study plan also are consistent with those used in recent relicensings in California.

9.0 Level of Effort and Cost

YCWA estimates that the cost to complete this study in 2011 dollars is between \$160,000 and \$220,000.

10.0 References Cited

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Study 6.1

RIPARIAN HABITAT UPSTREAM OF ENGLEBRIGHT RESERVOIR

September 2011

1.0 Project Nexus and Issue

Yuba County Water Agency's (YCWA or Licensee) continued operation and maintenance (O&M) of the Yuba River Development Project (Project) may have the potential to affect riparian habitat.

2.0 Resource Management Goals of Agencies with Jurisdiction Over the Resource to be Studied

YCWA believes that two agencies have jurisdiction over riparian habitat: 1) the United States Department of Agriculture Forest Service (Forest Service); and 2) California Department of Fish and Game (CDFG). Each of these agencies and their jurisdiction and management direction, as understood by YCWA at this time, is discussed below.

Forest Service

The Forest Service's management goals for special-status plants on National Forest System (NFS) land are identified in the National Forest Management Act (NFMA, public Law 94-588 1976) and the Tahoe National Forest (TNF) Land and Resource Management Plan (TNF LRMP) (USDA Forest Service 1990), as amended by the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2001) and the Supplemental Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004):

- Plant Community Diversity/Special Habitats/Connectivity: Manage riparian plant communities to maintain and improve the species composition and structural diversity. Manage riparian plant communities to maintain and/or improve spatial and temporal connectivity for native riparian plant species within and between watersheds to provide physically, chemically and biologically unobstructed movement for their survival, migration and reproduction.
- Streamflow Patterns/Sediment Regimes/Stream and Shoreline Riparian Vegetation: Manage stream flows to maintain and /or improve in-stream flows so they are sufficient to sustain desired conditions of riparian plant communities. Manage streambanks and shorelines to minimize erosion and sustain desired riparian habitats.

CDFG

The CDFG is the relevant state fish and wildlife agency for consultation and Federal Power Act (FPA) Section 10(j) (16 U.S.C. § 803(j)) purposes. In the state of California, fish and wildlife resources are held in trust for the people of the state by and through the CDFG (Cal. Fish and Game Code § 711.7).

3.0 Study Goals and Objectives

The goal of this study is to assess the condition of riparian habitats within river reaches upstream of the United States Army Corps of Engineer's (USACE) Englebright Reservoir potentially affected by continued Project O&M.

The objective of this study is to gather the data and information necessary to meet the study goals.

4.0 Existing Information and Need for Additional Information

YCWA's Pre-Application Document contained information about the riparian vegetation mapped in the area of the Project, including CalVeg maps and National Wetland Inventory (NWI) maps on a 1:24,000 scale, shown with United States Geological Survey (USGS) topographic features and Project facilities. Section 7.6 of the Pre-Application Document includes a table of NWI palustrine and riverine wetland types and acres within the Project Area¹ and the Federal Energy Regulatory Commission (FERC) Project Boundary.²

Based on NWI maps (1987), there are approximately 40,417 feet and 125 acres of riverine wetlands within the Project Area, with approximately 8,044 feet and 54 acres within the FERC Project Boundary. Remaining NWI classified wetland habitats in the Project Area include approximately 63,926 feet and 13 acres of palustrine wetlands and approximately 4,635 acres of reservoir open water.

NWI riparian wetlands have been classified using aerial imagery but no ground-mapping data is known to exist to support this inventory. In addition, no known site-specific assessments of riparian habitats or habitat condition within the FERC Project Boundary are known to exist. To achieve the study goals, additional information is needed.

5.0 Study Methods and Analysis

5.1 Study Area

The study area includes: 1) the Middle Yuba River from Our House Diversion Dam Impoundment to the confluence with the North Yuba River, 2) Oregon Creek from the Log Cabin Diversion Dam Impoundment to the confluence with the Middle Yuba River, 3) the North Yuba River from New Bullards Bar Dam Reservoir to the confluence with the Middle Yuba

¹ For the purposes of this document, the Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) existing Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between Project facilities and downstream to the next major water controlling feature or structure.

² The FERC Project Boundary is the area that YCWA uses for normal Project operations and maintenance, and is shown on Exhibits J, K, and G of the current license.

River, and 4) and the portion of the Yuba River from the confluence of the North and Middle Yuba rivers to just upstream of the USACE Englebright Reservoir.

If YCWA proposes an addition to the Project, the study area will be expanded if necessary to include areas potentially affected by the addition.

5.2 General Concepts and Procedures

The following general concepts and practices apply to the study:

- Personal safety is the most important consideration of each fieldwork team.
- Licensee will make a good faith effort to obtain permission to access private property where needed well in advance of entering the property.
- Field crews may make minor variances to the FERC-approved study in the field to accommodate actual field conditions and unforeseen problems. When minor variances are made, Licensee's field crew will follow the protocols in the FERC-approved study.
- When Licensee becomes aware of major variances to the FERC-approved study, Licensee will issue an e-mail to the Relicensing Contact List describing the variance and reason for the variance. Licensee will contact by phone the Forest Service (if the variance is on National Forest System land), [United States Fish and Wildlife Service \(USFWS\)](#), [State Water Resources Control Board \(SWRCB\)](#) and CDFG to provide an opportunity for input regarding how to address the variance. Licensee will issue an e-mail to the Relicensing Contact List advising them of the resolution of the variance. Licensee will summarize in the final study report all variances and resolutions.
- Licensee's performance of the study does not presume that Licensee is responsible in whole or in part for measures that may arise from the study.
- 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 Licensee's relicensing GIS analyst. Metadata will be developed for deliverable GIS data sets. Upon request, GIS maps will be provided to agencies in a form, such as ESRI Shapefiles, GeoDatabases, or Coverage with appropriate metadata, that is useful for interactive data analysis and interpretation. Metadata will be Federal Geographic Data Committee (FGDC) compliant.³
- Licensee's field crews will record incidental observations of aquatic and wildlife species observed during the performance of this study. All incidental observations will be reported in the appropriate Licensee report (e.g., incidental observations of special-status fish recorded

³ The Forest Service and CDFG each have requested that a copy of the GIS maps be provided to them when the maps are available.

during fieldwork for the Special-Status Turtles – Western Pond Turtle Study will be reported in Licensee’s Stream Fish Populations Study report). The purpose of this effort is not to conduct a focus study (no effort in addition the specific field tasks identified for the specific study) or to make all field crews experts in identifying all species, but only to opportunistically gather data during the performance of the study.

- Field crews will be trained on and provided with materials (e.g., Quat-128 [didecyl dimethyl ammonium chloride], scrub brush, etc.) for decontaminating their boots, waders, and other equipment between study sites. Major concerns are amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), and invasive invertebrates (e.g., zebra mussels, *Dreissena polymorpha*). This is of primary importance when moving: 1) between tributaries and mainstem reaches; 2) moving between basins (e.g., Middle Yuba River, Yuba River and North Yuba River); and 3) moving between isolated wetlands or ponds and river or stream environments.

5.3 Methods

The study includes five steps: 1) site selection; 2) gather data and prepare for field effort; 3) conduct field surveys; 4) prepare data and quality assure/quality control (QA/QC) data; and 5) prepare report. Each step is described below.

5.3.1 Step 1 – Site Selection

YCWA will co-locate study sites to the extent possible with YCWA’s Study 1.1 Channel Morphology Upstream of Englebright Reservoir Study sites. Six study sites have currently been proposed. At five of the six sites, three riparian vegetation transects will be performed along transects co-located with the Channel Morphology Study; at the site above Our House Dam on the Middle Yuba River, one riparian vegetation transect will be performed, co-located with the Channel Morphology Study. A total of sixteen vegetation transects will be performed.

Channel Morphology study sites are selected within a reach to represent the range of channel and habitat types in the reach (Bovee 1982). The characteristic feature of a study reach is homogeneity of the channel structure and flow regime. The sites chosen will represent those sites most likely to exhibit effects of project features and operations on channel morphology and habitat features.

Based on historical and habitat mapping information, in the Middle and North Yuba rivers and in the Yuba River upstream of USACE’s Englebright Reservoir, channel characteristics are primarily controlled by bedrock and boulders, rather than fluvial processes. In other words, these channels are not usually “self-formed” and boulders and bedrock control lateral and vertical stability. Bedrock channels are generally insensitive to short-term changes in sediment supply or discharge. Only a persistent decrease in discharge and/or an increase in sediment supply sufficient to convert the channel to an alluvial morphology would significantly alter bedrock channels (Montgomery and Buffington 1993). Highly confined channels dominated by bedrock and boulder substrates generally have limited capacity to support extensive vegetation, because the substrate frequently prevents root establishment, and the limited size and number

floodplains associated with confined channels prevent riparian stands from developing. However, there may be localized changes to morphology and substrate distribution that may affect riparian ecology, such as the development of point bars or other sediment depositional features.

Characteristics of the areas where Channel Morphology sites will be placed are gradients less than 2 percent, accumulations of gravel and finer material in channel and on margins, and floodplain and/or terrace development. Based on habitat mapping information, the study will include six study sites located within four reaches (Table 5.3-1). The study site above Our House Dam was added at the request of Relicensing Participants; the level of analysis at this site is limited to a “snapshot” of the riparian vegetation.

Table 5.3-1. Potential location and character of riparian habitat study sites to be co-located with YCWA’s Channel Morphology Upstream of Englebright Reservoir Study (Study 1.1).

Stream	Potential Location	Character
Middle Yuba River	Below Oregon Creek in the vicinity of Freemans Crossing (RM 3.5 -4.5)	Moderately and unconfined channel, ~1% gradient, alluvial and depositional.
	Above Oregon Creek (RM 4.5 – 5.5)	Steeper (>1% gradient), confined, more transport-dominated than near Freemans’s Crossing, though some lateral cobble/gravel bar development.
	Above Our-House Dam	Low gradient (1.7% map gradient), depositional.
Oregon Creek	Celestial Valley (RM 1.5 – 2.5)	Confined 1.6% gradient, planar bedform, gravel-sized material in channel and on margins.
North Yuba River	Below New Bullards Bar Dam	Reach has very little accessibility due to vertical cliffs, and dominance of bedrock and boulders within channel. Large, immobile substrate, lateral and vertical controls by bedrock limits responsiveness to changes in inputs of sediment and to changes in hydrology.
Yuba River	Below New Colgate Powerhouse	Confined, less than 1%, cobble and boulder-dominated bed with very deep pools immediately below the Powerhouse, but increasing alluvial deposition as move downstream.

5.3.2 Step 2 – Collect and Review Existing Data and Information

Existing data, including GIS data, historical information, reports, maps, and aerial photography relevant to riparian vegetation will be collected and reviewed where available for river reaches. These sources are expected to provide documentation on geology, topography, soils, riparian vegetation coverage and type, invasive species, and land-use (i.e., mining, timber management, recreation, road development, fires, grazing, and water diversions). Historical aerial photographs of the sites will be used to examine changes over time, such as variation in lateral movement or changes in vegetation coverage (i.e., forest development following disturbance), and for comparison with current field conditions. Information regarding riparian vegetation and physical processes on western slope Sierra Nevada streams or other pertinent riparian literature from other geographic regions will also be reviewed. Pertinent information will be used for comparison and interpretive purposes when evaluating the streams and rivers in the study area. The current condition of the riparian habitat occurring within the study sites will be assessed by combining existing information with field surveys.

5.3.3 Step 3 – Condition Assessment

Riparian areas are generally very dynamic, as seasons of drought or floods may desiccate or scour away otherwise healthy vegetation. Therefore, resilience to such events is important and can be assessed by riparian species abundance, richness, distribution and age structure. The health of a riparian community considers these factors in the context of providing resiliency to natural events, as well as structure or complexity for wildlife habitat.

All pertinent references, aerial photographs, hydrology, and field data will be used to describe existing conditions of riparian vegetation and any clear changes to the vegetation or channel that may have occurred over time. Although each methodology will be described in detail in the subsections that follow, an overview of the methods is included here with generalized rationale:

- Vegetation transects with nested plots
 - Species abundance, richness, and distribution
 - Age-class structure of riparian vegetation
 - Germination and recruitment
- Historical aerial photograph analysis
 - Examine what changes have taken place over time
 - When changes took place
 - Examine possible causes for changes
- Large woody material mapping
 - Locations and physical characteristics of large woody material
 - Function in the channel
- General riparian condition
 - Changes in channel and bank substrate (including any excessive erosion or deposition)
 - Land use activities
 - Unusual stress or mortality on riparian plant community
 - Riparian vegetative and hydrologic connectivity (or lack of)

5.3.3.1 Vegetation Transects with Nested Plots

Surveyors will collect quantitative data along vegetation transects. Vegetation transects will extend from the water's edge at low flow, to hill slope (including bars if present); at the Oregon Creek study site, where the channel is unconfined, the vegetation transect will end at calculated floodprone width. For the purpose of the study, riparian vegetation is defined as wetland indicator species as identified by the *National List of Plant Species that Occur in Wetlands: California (Region 0)*, (Reed 1988).

Information collected along each transect will include two types of plots: 1) herbaceous vegetation (1 meter square plots), and 2) woody vegetation (trees and shrubs) (5 by 2 meter plots). Plots will be nested, with herbaceous and other cover plots occurring within the woody vegetation plots. More than one herbaceous and other cover plot may be located within a woody

plot. Both the woody and herbaceous cover plots will be located perpendicular to transects located on the downstream side.

At a minimum, each transect will have at least two nested plots: one woody plot on each side of the stream at the start of vegetation, and within each woody plot, two herbaceous plots located side by side. Additional fluvial features (i.e. floodplains and terraces) that are at least 2 meters wide and are intersected by a vegetative transect will have a minimum of one nested plot. The following information will be collected in the plots:

Herbaceous vegetation:

- Dominant species cover in percent
- Total canopy cover
- Layer canopy cover (generally stratified by herbaceous and other, shrub, and tree layers)
- List all species present in each plot and provide an indication of whether they are native and/or special-status
- Other cover data (i.e., large woody material or boulders)

Woody vegetation:

- Canopy coverage class in percent
- Stem count per individual or species class
- Tree diameter in DBH
- Dominant species relative decadence in percent
- Dominant species coverage in percent
- List all tree and shrub species present and provide an indication of whether they are native and/or special-status⁴
- Approximate age class by size (i.e. seedling, recruit or adult)
- Other cover data (i.e. large woody material or boulders)

5.3.3.2 Historical Aerial Photograph Analysis

Field data and observations will be used in tandem with historical aerial photography analysis to determine if any major shifts in riparian stand structure, composition, or surface area have occurred. The photographs will also be used to identify observable changes in land use, channel morphology (i.e., excessive erosion or deposition), upland influences (i.e., landslide), or other features pertinent to the analysis.

5.3.3.3 Large Woody Material

Large woody material (LWM) plays an important role in streams by shaping channel morphology, storing sediment and organic matter, and providing habitat for wildlife. Two types

⁴ For all special-status species observations, YCWA will complete the appropriate CNDDDB form and transmit the form to the CNDDDB. YCWA will provide a copy of the CNDDDB form to the Forest Service if the observation occurs on NFS land.

of efforts will be made to assess LWM that has the potential to be affected by Project operations. First, LWM will be quantified at specified locations, and second, a generalized LWM budget will estimate the amount of LWM moving through the Project-affected reaches.

5.3.3.3.1 Quantifying Large Woody Material

At each of the five study sites occurring below Project Dams (excluding the study site upstream of Our House Dam) LWM will be counted as follows: all LWM greater than 3 ft in length within the active channel within four diameter classes (4-12 inches, 12-24 inches, 24-36 inches, and greater than 36 inches) and four length classes (3-25 ft, 25-50 ft, 50-75 ft, and greater than 75 ft). More detailed measurements will be taken for key pieces located within riparian habitat study sites.

Key pieces of LWM are defined as pieces either longer than 1/2 times the bankfull width, or of sufficient size and/or are deposited in a manner that alters channel morphology and aquatic habitat (e.g., trapping sediment or altering flow patterns). Key piece characteristics to be recorded will include:

- piece location, either mapped onto aerial photos or documented with GPS
- piece length
- piece diameter
- piece orientation
- position relative to the channel
- whether the piece has a rootwad
- tree species or type (e.g., conifer or hardwood)
- whether the piece is associated with a jam or not
- the number of large pieces in the jam
- recruitment mechanism
- function in the channel

Based on habitat mapping information, response reaches (reaches with the most potential to be affected by LWM) are most likely to occur in Oregon Creek and the Middle Yuba River. To assess LWM quantities in a Project-affected response reach, YCWA will quantify LWM in Oregon Creek at two locations: the Oregon Creek Study Site below Log Cabin Dam (impaired condition) and one location upstream of Log Cabin Dam (unimpaired condition). The length of each site assessment will be at least 20 times the bankfull width. Additional LWM survey sites are not included due to limited and unsafe access.

In addition, available quantitative information regarding the amount of LWM captured and removed from project reservoirs will be included, where possible.

5.3.3.3.2 Large Woody Material Budget

LWM data collected will be used to develop a LWM budget estimate that describes, to the extent possible, the mean annual volumetric flux of LWM. In addition to field collected quantities of

LWM (Section 5.3.3.3.1), estimates of the mean annual volume of LWM trapped in reservoirs, where available, will be included with estimates of LWM passing over Our House, Log Cabin, and Englebright dams (based on recorded flows and flows estimated for the movement of LWM over each dam). YCWA will describe the LWM budget as the quantity of LWM observed in study sites, estimated mean annual volume of wood trapped in Project facilities (no longer available to downstream reaches), and estimated mean annual volume of wood passing over Project facilities. Existing conditions and Project-related influences on LWM budget will be discussed.

5.3.3.4 General Riparian Site Information

The purpose of collecting generalized information within each study site is to provide a venue for describing all relevant influences to the riparian system that may not otherwise be included in data collection efforts. Any pertinent information regarding study site condition will be collected and used in conjunction with other collected data for site assessment.

General riparian site information to be collected includes:

- Channel and bank substrate along transects
- Evidence of channel encroachment or bank instability (including any excessive erosion or deposition)
- Evidence of recreational and other land use activities
- Evidence of unusual stress or mortality on riparian plant community
- Evidence of riparian vegetative connectivity (or lack of)
- Hydrologic connectivity (or lack of)
- Biotic structure, including vertical and horizontal complexity

In addition, YCWA will collect:

- Herbarium specimen for all bryophyte species encountered in the plots (or otherwise observed at the site) and submit the specimen to the Forest Service
- Establish photo points at each site
- Add the presence of riparian vegetation to cross-sectional profiles to indicate where the vegetation occurs relative to bankfull and flood prone widths
- Provide rooting depth (as indicated by available literature search - no site-specific measurements) of the dominant riparian species present in a tech memo
- Historical photograph analysis of riparian study sites
- Inundation duration and frequency at significant changes in bank profile or vegetation composition shifts along the channel cross section

Channel cross sections and vegetation transect information will provide a basis for examining the relationship between flow, inundation duration and frequency, and riparian vegetation. Seedling and recruitment information will be captured by vegetation plot and general site description and

will reflect if germination or regeneration are occurring under current operating conditions. To the extent possible, calculated unimpaired and regulated flow information will be examined against existing riparian vegetation, or shifts in riparian vegetation or health, as observed in historical aerial photograph analysis or field observations. Field data and observations will also be used in tandem with historical aerial photograph analysis to determine if any major shifts in riparian stand structure, composition, or surface area have occurred.

5.3.4 Step 4 – Prepare Data and Quality Assure/Quality Control Data

Following field surveys, YCWA will develop GIS maps depicting existing riparian habitat and other related information collected during the study. Field data will then be subject to QA/QC procedures, including spot-checks of transcription and comparison of GIS maps with field notes. YCWA will also produce a map for each study site that shows the extent of riparian vegetation as depicted on historical al aerial photos compared to riparian vegetation extent depicted on recent aerial photos.

5.3.5 Step 5 – Prepare Report

YCWA will prepare a report that includes the following sections: 1) Study Goals and Objectives; 2) Methods; 3) Results; 4) Discussion; and 5) Description of Variances from the FERC-approved study proposal, if any. The report will include field data to support riparian condition assessment and riparian habitat maps.

6.0 Study-Specific Consultation

The study includes one study-specific consultation:

- YCWA will consult with interested and available Relicensing Participants regarding the number and location of the riparian habitat assessment sites (Step 1).

7.0 Schedule

YCWA anticipates the schedule to complete the study as follows assuming FERC issues its Study Determination by September 16, 2011 and the study is not disputed by a mandatory conditioning agency:

Site Selection (Step 1).....	September 2011 - March 2012
Collect and Review Existing Data and Information (Step 2)	April - May 2012
Condition Assessment (Step 3).....	June - July 2012
Prepare and QA/QC Data (Step 4)	July 2012
Study Report Preparation (Step 5)	August - September <u>2012</u>

8.0 Consistency of Methodology with Generally Accepted Scientific Practices

This study provides an assessment of existing riparian vegetation and is consistent with the goals, objectives, and methods outlined for most recent FERC hydroelectric relicensing efforts in California. The proposed methodologies use standard assessment methods developed and used by federal land management agency personnel.

9.0 Level of Effort and Cost

YCWA estimates the cost to complete this study in 2011 dollars is between \$211,000 and \$285,000.

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