Study 3.11

ENTRAINMENT[1]

December 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 fish, western pond turtle (WPT) (*Actinemys* [formerly *Emys* or *Clemmys*] *marmorata*), and other aquatic species due to entrainment into Project intakes.

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

YCWA believes that four agencies have jurisdiction over fish and aquatic life in the geographic area covered in this study proposal: 1) 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) California Department of Fish and Game (CDFG); and 4) State Water Resources Control Board Division of Water Rights (SWRCB). Each of these agencies and their jurisdiction, 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 Pre-Application Document (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 PAD. USFWS's jurisdiction, goals and objectives 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

[1] YCWA's included a Fish Entrainment Study in its August 2011 Revised Study Plan. FERC's September 30, 2011 Study Determination stated: "we recommend that YCWA implement Cal Fish and Game's requested entrainment study for fish and turtles using PIT-tags as it pertains to monitoring entrainment at Lohman Ridge and Camptonville tunnels at the Our House and Log Cabin diversions, respectively (section 5.3.2 of Cal Fish and Game's requested study plan filed August 30, 2011). As such, YCWA shall file for Commission approval, a modified revised study plan within 90 days." Those modifications have been made in this study plan. Note that while FERC refers to the requested study as "Cal Fish and Game's requested study," the Forest Service and SWRCB pointed out to YCWA in subsequent meetings that they support CDFG's request, though no other agency filed a detailed study plan with FERC. For the purpose of this study plan and to be consistent with the FERC Determination, the request is referred to in this study plan as "CDFG's study," with the understanding that other agencies have stated they support and endorse CDFG's study request.

CDFG's letter is to preserve, protect, and as needed, to restore habitat necessary to support native fish, wildlife and plant species within the Federal Energy Regulatory Commission (FERC) Project Boundary of the Project and downstream of the Project as resources are affected by ongoing facilities operations.

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 Existing Information and Need for Additional Information

The Project includes 10 locations where a Project facility diverts water from a stream or reservoir to another location. Based on existing information, some of these intakes/outlets have a low potential to affect fish populations while other Project intakes have a much higher potential, which will require additional data gathering to characterize entrainment rates and assess potential effects on aquatic populations. The sections below describes for each intake, the type of intake, the potential for entrainment effects on fish and WPT populations, and proposed entrainment related data gathering.

3.1 Intakes for which No Additional Data Gathering Is Proposed

3.1.1 Project Dam Low-Level Intakes

The Project includes five dam low-level intakes, each of which is described in Table 3.1-1. These are: 1) Our House Diversion Dam low-level intake; 2) Our House Diversion Dam auxiliary low-level intake; 3) Log Cabin Diversion Dam low-level intake; 4) Log Cabin Diversion Dam auxiliary low-level intake; and 5) New Bullards Bar Dam low-level intake. In each case, the low-level intake is at or near the bottom of the impoundment.

Only two of the low-level intakes, the low-level outlets at Our House and Log Cabin diversion dams, are routinely used (almost always in the fully open position to meet instream flow requirements). The other three low-level intakes are used in emergencies or if otherwise needed (e.g., during repairs of the low-level intake, or infrequent major outages).[2]

[2] From 2005 through 2009, the Our House Diversion Dam Low-Level Auxiliary Intake has been exercised (i.e., tested during which the gates are quickly opened and closed) four times (i.e., March 23, April 10 and May 19, 2005; and January 3, 2006), and open for 200 days beginning on January 13, 2006, during which, with the approval of FERC, the Forest Service, CDFG and SWRCB YCWA removed sediment from Our House Diversion Dam Impoundment. Since 2005, the Log Cabin Diversion Dam Low-Level Auxiliary Intake has been exercised once (i.e., March 23, 2005), and was open for 19 days beginning on May 28, 2007.

Table 3.1-1. Description of Project's five low-level intakes.

Intake Structure (From/To)	Conduit Size (inches)	Control Valve/Gate (type)	Existing Minimum Release (cfs)	Estimated Maximum Capacity at Full Pool (cfs)
MIDDLE YUBA RIVER				
Our House Diversion Dam Low-Level Intake (Our House Diversion Dam Impoundment/Middle Yuba River Immediately Downstream of the Dam)	24 in diameter	Downstream Gate Valve Operated Manually	30 cfs from June 16 through April 14 and 50 cfs from April 15 through June 15, or natural inflow into Our House Diversion Dam Impoundment, whichever is less.	60 cfs. Minimum instream flow releases are normally made through this valve unless dam spill meets the minimum flow requirement.
Our House Diversion Dam Auxiliary Low-Level Intake (Our House Diversion Dam Impoundment/Middle Yuba River Immediately Downstream of the Dam)	72 in diameter	Upstream Slide Gate Operated Manually by a Motor On-Site		800 cfs. Used for emergencies only.
OREGON CREEK				
Log Cabin Diversion Dam Low-Level Intake (Log Cabin Diversion Dam Impoundment/Oregon Creek Immediately Downstream of the Dam)	18 in diameter	Downstream Gate Valve Operated by Hand	8 cfs from June 16 through April 14 and 12 cfs from April 15 through June 15, or natural inflow into Log Cabin Diversion Dam Impoundment, whichever is less.	13 cfs. Minimum instream flow releases are normally made through this valve unless dam spill meets the minimum flow requirement.
Log Cabin Diversion Dam Auxiliary Low-Level Intake (Log Cabin Diversion Dam Impoundment/Oregon Creek Immediately Downstream of the Dam)	72 in diameter	Upstream Slide Gate Operated by a Motor by a Motor On-Site		800 cfs. Used for emergencies only.
NORTH YUBA RIVER				
New Bullards Bar Dam Low-Level Intake (New Bullards Bar Reservoir/North Yuba River Immediately Downstream of the Dam)	72 in diameter	Downstream Hollow Jet Valve Operated Remotely	5 cfs at all times.	3,500 cfs, but actual maximum capacity is 1,250 cfs due to valve vibration. Minimum instream flow releases are normally made through the New Bullards Minimum Flow Powerhouse.

The spacing (i.e., opening between bars) in the trash racks in front of Our House and Log Cabin low-level intakes is 8.75 inches. The spacing in the trash racks in front of Our House and Log Cabin auxiliary low-level intakes is 12.375 inches. The spacing in the trash rack in front of the New Bullards Bar Dam Low-Level Intake is 5.0 inches.

A transition fishery[3] occurs in the vicinity Our House Diversion Dam. As described in Section 7.3.4.1 of the PAD, 2004 snorkeling surveys in the Middle Yuba River about 0.5 mile upstream of Our House Diversion Dam found rainbow trout (*Oncorhynchus mykiss*) and Sacramento pikeminnow/hardhead (*Ptychocheilus grandis/Mylopharodon conocephalus*) (the snorkelers were unable to distinguish between the two species); while about 0.5 mile downstream of the

[3] A transition fishery is one that includes both coldwater and warmwater fishes and is typically found in the Sierra in lower elevations where the fish community transitions from a coldwater fishery dominated by trout in the higher elevations to a warm water fishery in the lower elevations.

dam, the snorkelers found rainbow trout, Sacramento pikeminnow, hardhead, smallmouth bass (*Micropterus dolomieui*), and various sucker species (Family Catastomidae) (Gast et al. 2005). The general species composition upstream of the dam was confirmed by Nevada Irrigation District (NID) in 2008 and 2009 when its snorkeling surveys in the Middle Yuba River about 0.5 mile upstream of Our House Diversion Dam found Sacramento suckers, rainbow trout, and Sacramento pikeminnow (NID and PG&E 2010). NID did not find any hardhead, a CDFG Species of Special Concern and Forest Service Sensitive Species, in its sampling. CDFG does not stock fish in this area of the Middle Yuba River.

YCWA was unable to find any existing information regarding the fish community in Oregon Creek near Log Cabin Diversion dam, but the fish community and aquatic species are likely similar to that at Our House Diversion Dam. CDFG does not stock fish in Oregon Creek.

While YCWA was unable to find any recent fish studies of New Bullards Bar Reservoir, CDFG fish stocking records are informative. The reservoir has a long history of annual fish stocking activities dating back to 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). Between 1969 and 2007, about 5 million Kokanee (*O. nerka*), nearly 1.6 million rainbow trout, just over 310,000 Eagle Lake rainbow trout, 40,000 brook trout (*Salvelinus fontinalis*), 200 eastern brook trout, 200 cutthroat trout (*Oncorhynchus clarki*), Kamloop rainbow trout, and 185 spotted bass (*Micropterus punctulatus*) were planted in New Bullards Bar Reservoir by CDFG (CDFG 1989, 2007). Besides these fishes, sport fishermen report catching in the reservoir largemouth bass (*M. salmoides*), smallmouth bass, redear sunfish (*Lepomis microlophus*), crappie (*Pomoxis sp.*), bluegill (*L. macrochirus*) and channel catfish (*Ictalurus punctatus*).

There are reports of western pond turtle (WPT), a CDFG Species of Special Concern and a Forest Service Sensitive Species, in the Project vicinity including records at: locations near New Bullards Bar Reservoir; several locations near tributaries of Grizzly Gulch, a tributary of Oregon Creek; two locations about 2 miles southeast of New Bullards Bar Dam near Little Willow Creek, a tributary of the Middle Yuba River; and a location north of Jones Bar on the South Yuba River. Most of the locations are ponds. Amy Lind, Forest Service, (personal communication) has observed WPT in Oregon Creek above the Log Cabin Diversion Dam impoundment and Dan Teater, Forest Service, (personal communication) has observed WPT at the impoundment. A juvenile WPT was also found in a puddle near the impoundment during June 2011 field reconnaissance for YCWA's relicensing studies. There were no detections of WPT during basking site surveys at Our House Diversion Dam impoundment in 2010, but one adult WPT was observed at a survey site 3.5 miles upstream of the impoundment (PG&E and NID 2010). YCWA reviewed occurrences from CDFG's California Natural Diversity Data Base (CNDDB) (CDFG 2003), the Tahoe National Forest (TNF) (GIS data and Access database), on-line museum record data (CAS 2010, MVZ 2010), and Vindum and Koo (1998).

Based on the above information, the potential affects to fish populations and WPT due to possible entrainment into one or more of the above low-level intakes is low. No fishes listed as endangered or threatened under the federal Endangered Species Act (ESA) or California Endangered Species Act (CESA) are potentially affected. However, hardhead may or may not be affected: Gast et al. (2005) reported possible observing some in 2004 but NID did not find any in 2008 and 2009. Any fish entrained into either Our House or Log Cabin diversion dam low-

level intakes would not be damaged since they would simply pass unimpeded (i.e., not pass through any valves) to the river downstream of the dam. Potential entrainment effects related to Our House and Log Cabin diversion dam auxiliary intakes and the New Bullards Bar Dam low-level intake would be very short-term since these intakes are used on a very infrequent basis. Further, with regards to the New Bullards Bar Dam low-level intake, the potential for fish to be entrained during its infrequent use is low because the intake is located at elevation 1,447.7 ft in the reservoir, over 508 feet below the reservoir surface at full pool (El. 1,956 ft), where fish normally do not congregate. WPT does not occur at such depths.

Given the low potential to entrain native fish, the fish populations potentially affected contain no special-status, ESA-listed or CESA-listed fishes with the possible exception of hardhead, and the fish that may be entrained through intakes that are normally used would not be damaged, no additional data gathering regarding entrainment effects at the Project's five low-level intakes is proposed.

3.1.2 Project Power Diversions

The Project includes three water diversions, each of which terminates at a powerhouse or a powerhouse bypass. These are 1) New Bullards Minimum Flow Powerhouse Penstock, 2) New Colgate Power Tunnel and 3) Narrows 2 Powerhouse Penstock. Table 3.1-2 provides information regarding the conduits, and Figures 3.1-2 and 3.1-3 and 3.1-4 show the amount of water diverted by each structure in representative normal, wet and dry water years. Figure 3.1-1 shows the New Colgate Power Tunnel Intake portals.

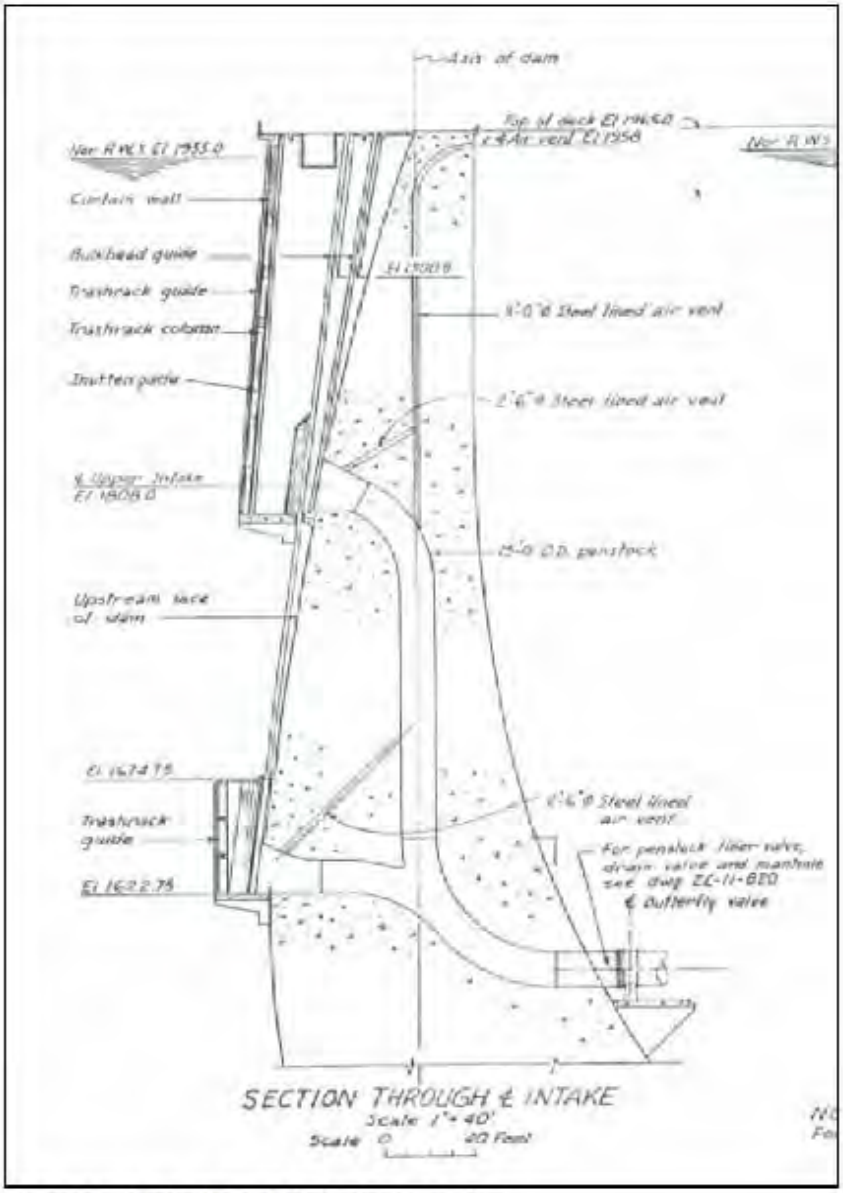

Figure B-2. Section Through New Bullards Bar Dam

Figure 3.1-1. New Colgate Power Tunnel Intake.

Table 3.1-2. Description of Project power diversions.

Intake Structure (From/To)	Conduit Description	Turbine Number and Type/Bypass Control Valve or Gate	Depth of of Intake Invert at Full Pool	Existing Minimum Release	Estimated Maximum Capacity
	(type & size)	(# and type)	(feet)	(cfs)	(cfs)
NORTH YUBA RIVER					
New Bullards Bar Minimum Flow Powerhouse Penstock (New Bullards Bar Reservoir/North Yuba Rive at base of New Bullards Bar Dam)	70-foot long, 12 in diameter steel pipe	1 Pelton Turbine/ No Powerhouse Bypass	508.5 ft deep (El, 1,447.5 ft as compared to full pool at El. 1,956 ft),	5 cfs at all times	6 cfs
New Colgate Power Tunnel and Penstock (New Bullards Bar Reservoir/ Yuba River)	5.2 miles long and composed of four different types of conveyance structures: an unlined horseshoe tunnel 26 feet square; an lined horseshoe tunnel 20 feet wide and 14.5 feet high; a lined circular tunnel 14 feet in diameter; and 2,809 feet of steel penstock with a diameter ranging from 9 feet to 14.5 feet.	2 Pelton Turbines/ No Powerhouse Bypass	Two openings in intake structure: deeper opening is 336 ft deep (El, 1,620 ft as compared to full pool at El. 1,956 ft) and upper opening is 148 ft deep (El, 1,808 ft as compared to full pool at El. 1,956 ft)	5 cfs at all times	3,500 cfs
YUBA RIVER					
Narrows 2 Powerhouse Penstock (USACE's Englebright Reservoir/Yuba River about 200 ft downstream of base on USEACE's Englebright Dam)	748 ft long composed of two sections: the first is a 376-ft long section 20 feet in diameter and concrete lined, and the second is a 372- ft long section 14 feet in diameter and steel lined.	1 Francis Turbine/ Two Powerhouse Bypasses: 1) a 78-inch diameter fixed cone valve; and 2) a 36-inch diameter bypass valve.	86 ft deep (El. 439.0 ft as compared to full pool at El. 525 ft)	Downstream of Narrows 1 and 2 Powerhouses:[1] Oct 16–10: 600–1,050 cfs Nov: 600-700 cfs Dec: 600-1,400 cfs Jan 1-15: 1,000-1,850 cfs	3,400 cfs through the Powerhouse, 3,000 cfs through the 78 inch Bypass Valve, and 650 cfs through the 36 inch Bypass Valve

[1] The Project FERC license includes a ramping rate below USACE's Englebright Dam (Article 33(f), and minimum flows requirements downstream of USACE's Daguerre Point Dam (Article 33(d).

YCWA has not used the upper gate on the New Colgate Power Tunnel and Penstock Intake since 1993 when YCWA convened a Temperature Advisory Committee to obtain more-refined recommendations for the operation of New Bullards Bar Reservoir's multilevel outlet. The committee was composed of YCWA, USFWS and CDFG. After reviewing temperature model data and the operating options, USFWS and CDFG recommended that water releases from New Bullards Bar Reservoir be as cold as possible at all times. YCWA immediately implemented this recommendation and, since 1993, all controlled releases of water from New Bullards Bar Reservoir through New Bullards Bar Minimum Flow Powerhouse into the North Yuba River and through New Colgate Powerhouse into the Yuba River have been from the lower intake, which withdraws water from the coldest, deepest part of the New Bullards Bar Reservoir.

The spacing (i.e., opening between bars) in the trash racks in front of the New Bullards Bar Minimum Flow Powerhouse Penstock Intakes is 5.00 inches, and the spacing in the trash racks in front of the New Colgate Power Tunnel and Penstock Intake is 2.25 inches. The spacing in front of the Narrows 2 Powerhouse Penstock Intake is 4.1875 inches.

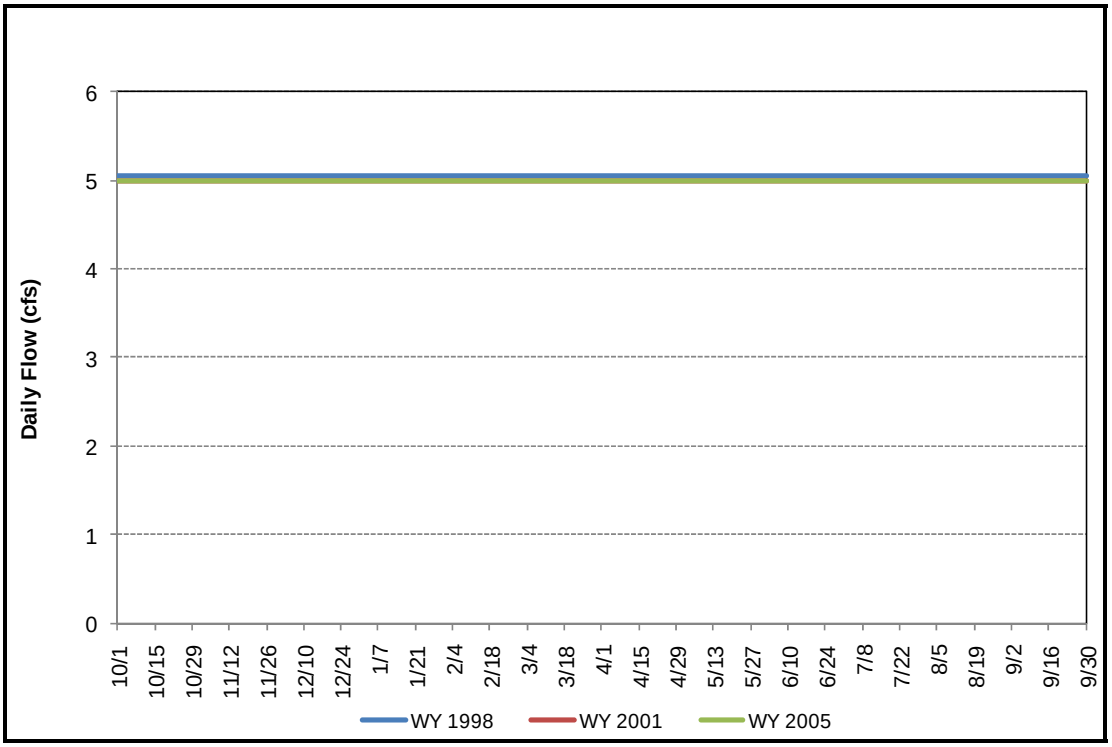

Figure 3.1-2. Mean Daily flow through New Bullards Minimum Flow Powerhouse Penstock in representative Normal (2005), Wet (1998) and Dry (2001) water years.

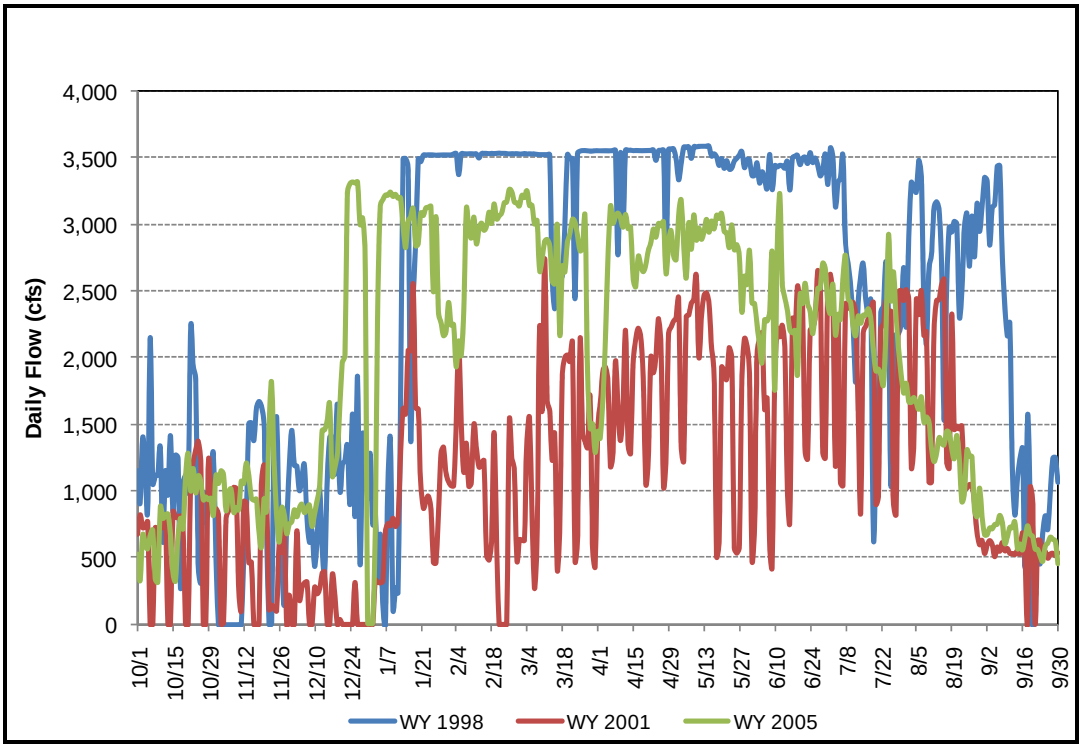

Figure 3.1-3. Mean daily flows through New Colgate Power Tunnel in representative Normal (2005), Wet (1998) and Dry (2001) water years.

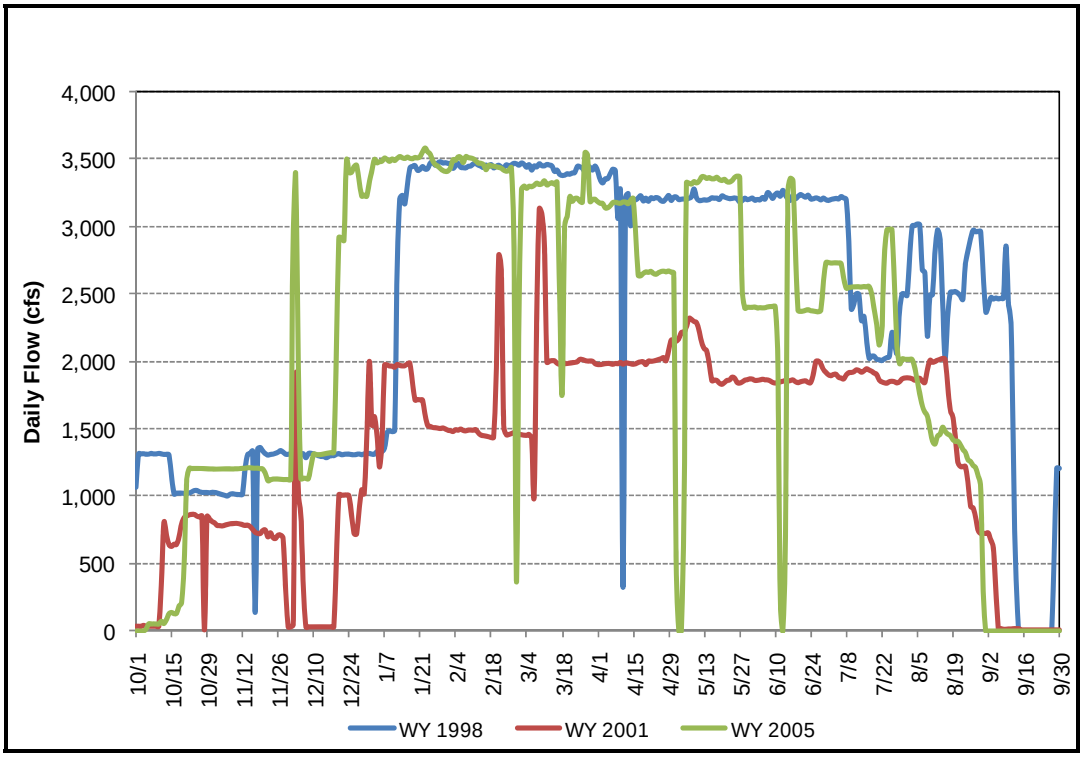

Figure 3.1-4. Mean daily flows through Narrows 2 Powerhouse Penstock in representative Normal (2005), Wet (1998) and Dry (2001) water years.

Included in Figure 3.1-4 is combined flow through the Narrows 2 Powerhouse bypasses and the powerhouse. The 36-inch diameter valve was included in the original powerhouse design and the 78-inch diameter valve was added in 2007 to provide the capability to bypass flows of up to 3,000 cfs around the Narrows 2 Powerhouse during times of full or partial powerhouse shutdown. Use of the bypass valves vary by year. Prior to installation of the 72-inch diameter valve in 2007, the 36-inch diameter valve was used for 34 days in 2005 (average flow of 103 cfs) and 15 days in 2006 (130 cfs). Since 2006, the two bypass valves were used, either separately or in combination, for 89 days in 2007 (combined average flow of 695 cfs), 166 days in 2008 (177 cfs) and 201 days in 2009 (193 cfs).

As described above, fish population data is limited but information available at this time identifies the fish community in New Bullards Bar Reservoir as a stocked fishery composed of Kokanee, rainbow trout, Eagle Lake rainbow trout, brook trout, eastern brook trout, cutthroat trout, Kamloop rainbow trout and spotted bass. Other fishes known to occur in the reservoir include largemouth bass, smallmouth bass, red ear sunfish, crappie, bluegill sunfish and channel catfish. CDFG has conducted surveys of fish in old and New Bullard's Bar reservoirs since the 1950s. A 1959 survey of fish species in the old Bullard's Bar Reservoir found 12 species of fish including bass, crappie, sunfish, bluegill, bullhead, shiners, Sacramento pikeminnow, sucker, and carp species. A subsequent summary report for CDFG fish survey activities in the reservoirs from 1959 through 1974 identified 16 species of fish as relatively common in the reservoirs, including smallmouth and largemouth bass, black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxis annularis*), warmouth (*Lepomis gulosus*), green sunfish (*Lepomis cyanellus*) red-ear sunfish, bluegill, brown bullhead (*Ameiurus natalis*), Sacramento pikeminow, Sacramento sucker (*Catostomus occidentalis*), common carp (*Cyprinus carpio*), rainbow trout, and Kokanee salmon (CDFG 1974). Brown trout and white catfish (*Ameiurus catus*) are noted as rare occurrences. Channel catfish, threadfin shad (*Dorosoma petenense*), and fathead minnow (*Pimephales promelas*) were reportedly planted in the reservoir prior to 1960, but were not captured during any surveys. Golden shiners (*Notemigonus crysoleucas*) were observed only in 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). The first documented CDFG capture of trout was reported in 1970 (CDFG 1963, 1970). Kokanee was first documented during CDFG survey efforts in 1972 (CDFG 1963, 1970, 1972).

Like for the fishery in New Bullards Bar Reservoir, YCWA was unable to find any recent fish population studies in the United States Army Corps of Engineer's (USACE) Englebright Reservoir, but CDFG fish stocking records are informative. As with New Bullards Bar Reservoir, Englebright Reservoir has a long history of annual fish stocking activities dating back to 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). CDFG stocking records indicate that fish plantings in Englebright Reservoir have taken place from 1965 through 2007. During this period, just over 756,000 rainbow trout, 228,320 Kokanee, 6,973 lake trout, nearly 28,000 brown trout (*Salmo trutta*), 4,000 Eagle Lake rainbow trout, 2,640 brook trout, 45 white crappie, and 80 black crappie were planted (CDFG 2007). Stocked species were primarily from the Shasta and San Joaquin hatcheries. Creel surveys conducted from July 2003 through May 2004 documented 12 sport fish species in Englebright Reservoir, including spotted bass, smallmouth bass, largemouth bass, bluegill, brown trout, rainbow trout, carp, channel catfish, crappie, Kokanee, sucker, yellow perch (*Perca flavescens*), and Sacramento pikeminnow (CDWR 2006).

Additionally, Englebright Reservoir has a known self-sustaining population of hardhead (J. Rowan, pers. comm., 2011).

Based on the above information, the potential effects to fish populations due to entrainment into one or more of the above power tunnels intakes is low. First, the native fish populations that would be affected are primarily stocked fish used to support a put-and-take fishery. There is a reported occurrence of hardhead in Englebright Reservoir, but hardhead are not a deepwater species and their life history describes them being in much shallower depths. There are no reported occurrences of, ESA-listed or CESA-listed fishes in the reservoirs. Second, the intakes occur deep in each reservoir where it is unlikely that fish congregate. However, fish population assessments have not been conducted to identify the species and age classes of this reservoir community.

Given the low potential to entrain fish and since the fish populations potentially affected are not known to include ESA-listed or CESA-listed fishes and the reservoirs support a put-and-take fishery, no additional data gathering under this study regarding entrainment effects at the Project's three power intakes is proposed.

3.2 Intakes for which Additional Data Gathering Is Proposed

3.2.1 New Bullards Bar and USACE's Englebright Reservoir

Entrainment monitoring as part of this study is not proposed at either New Bullards Bar or Englebright Reservoir. However, under YCWA's Reservoir Fish Populations Study (Study 3.7) gillnet sampling at depths up to 100 ft near the Project intakes in New Bullards Bar and Englebright reservoirs will occur in 2012. The results of this gillnet sampling will be presented in the Entrainment Study technical memorandum. YCWA will collaborate with the Forest Service, USFWS, CDFG, SWRCB and other interested Relicensing Participants regarding the results of the gillnet sampling and the need for additional entrainment-related information in New Bullards Bar and Englebright reservoirs. If it is collaboratively agreed that additional information is needed, YCWA, in collaboration with the agencies, will develop a study plan to gather the information and file the plan with FERC for approval.

3.2.2 Project Non-Power Diversion Intakes

The Project includes two non-power diversion intakes: 1) Lohman Ridge Tunnel; and 2) Camptonville Diversion Tunnel. Both diversions are from small impoundments (<200 acres), and the water conduits are composed entirely of underground tunnels except in the immediate vicinity of the intake and outlet where each tunnel daylights. Both the Lohman Ridge and Camptonville diversion tunnel intakes are passive diversion structures, each with a gate. The Lohman Ridge Diversion Tunnel has a maximum capacity of 860 cfs, and the Camptonville Diversion Tunnel has a maximum diversion capacity of 1,100 cfs. Table 3.2-1 provides information regarding the conduits, and Figures 3.2-1 and 3.2-2 show the amount of water diverted by each structure in representative normal, wet and dry Water Years. Since flow into the tunnels was not gaged prior to Water Year 1989, the 1988 data in Figures 3.2-1 and -2 are the

result of a synthesis. The spacing (i.e., opening between bars) in the trash racks in front of the Lohman Ridge and Camptonville diversion tunnel intakes are 10.625 inches and 11.0 inches, respectively.

Table 3.2-1. Description of Project's non-power diversion intakes.

Intake Structure (From/To)	Dimensions and Type (feet and type)	Intake Structure (type)	Outlet Structure (type)	Estimated Maximum Capacity (cfs)
MIDDLE YUBA RIVER				
Lohman Ridge Diversion Tunnel Intake (Our House Diversion Dam Impoundment on Middle Yuba River/Log Cabin Diversion Dam Impoundment on Oregon Creek)	12.5 ft high by 12.5 ft wide, 19,410 feet (90% unlined and 10% lined) Tunnel	15 ft high by 12 ft wide concrete structure with a trash rack and slide gate operated manually by a motor on-site	15 ft high by 12 ft wide concrete structure: no control or enclosure (e.g., rack or fence)	860 cfs
OREGON CREEK				
Camptonville Diversion Tunnel Intake (Log Cabin Diversion Dam Impoundment on Oregon Creek/New Bullards Bar Reservoir on North Yuba River)	6,107 ft Tunnel. First 4,275-ft section is an unlined, horseshoe tunnel 14.5 ft wide by 14.5 ft high, and the second 1,832-ft section is a lined 11.7 ft wide by 13 ft high horseshoe tunnel.	14.5 ft high by 14.5 ft wide concrete structure with a trash rack and slide gate operated manually by a motor on-site	13 ft high by 11.7 ft wide concrete structure: no control or enclosure (e.g., rack or fence)	1,100 cfs (Includes direct diversion of natural flow in Oregon Creek and re-diversion of water from Middle Yuba River through Lohman Ridge Diversion Tunnel into the Log Cabin Impoundment.)

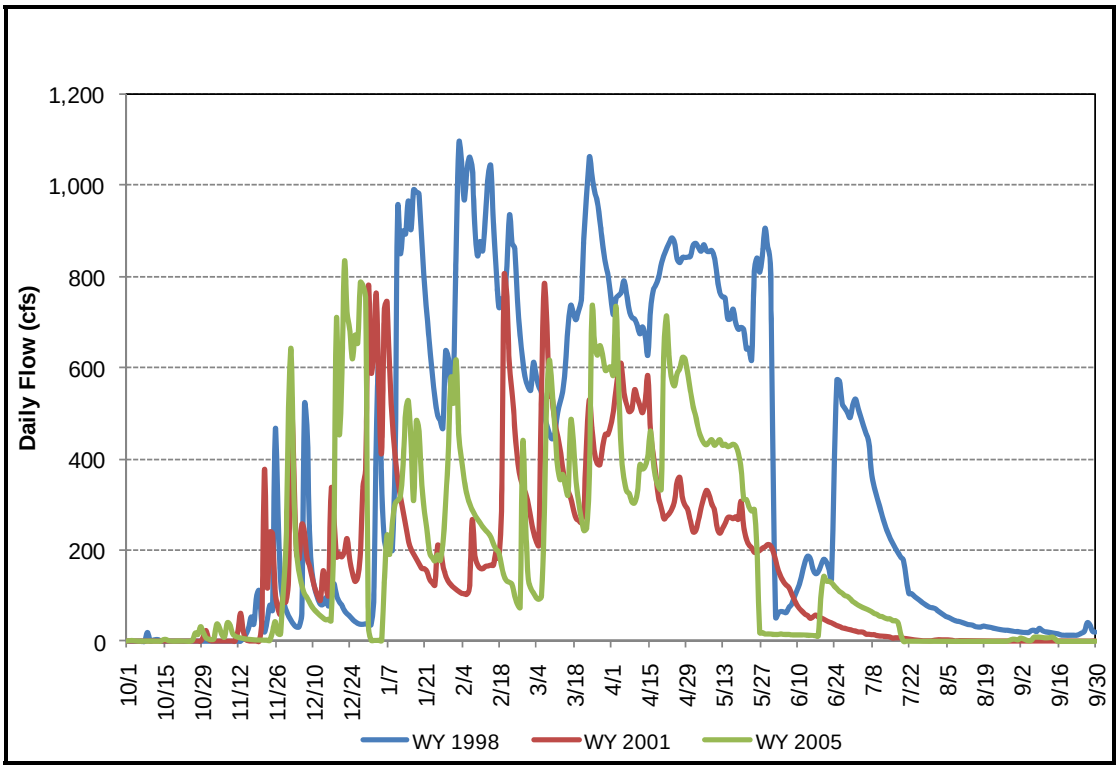

Figure 3.2-1. Mean daily flows in Lohman Ridge Diversion Tunnel in representative Normal (2005), Wet (1998) and Dry (2001) water years.

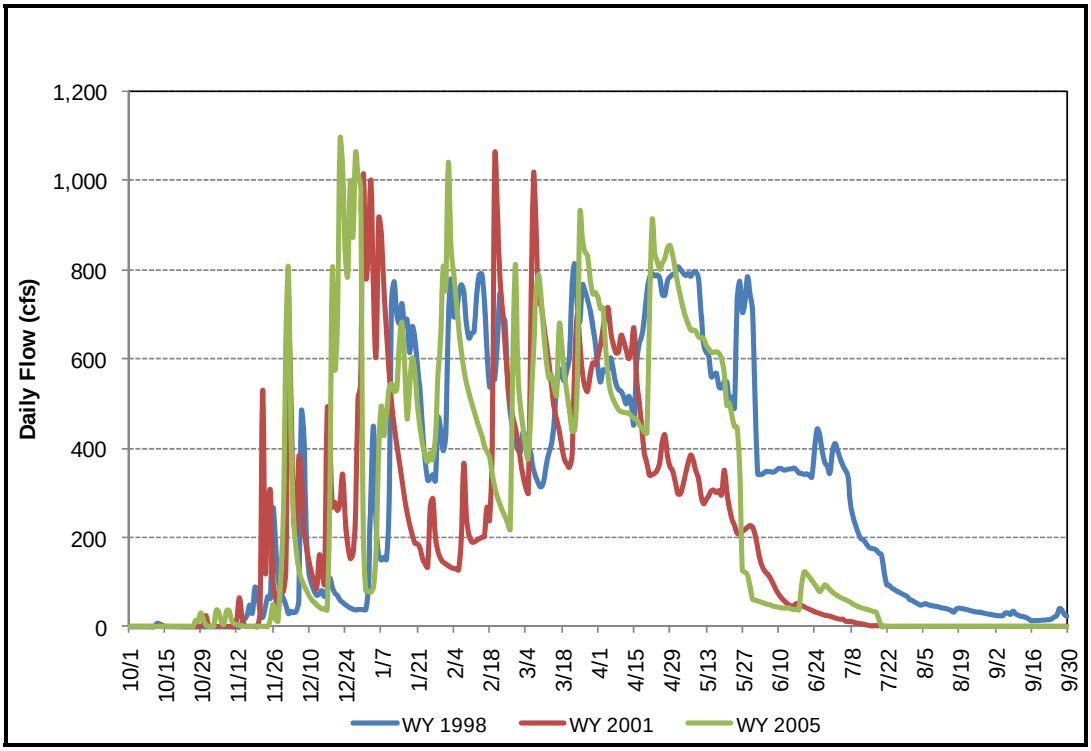

Figure 3.2-2. Mean daily flows in Camptonville Diversion Tunnel in representative Normal (2005), Wet (1998) and Dry (2001) water years.

As described above, the fish community potentially affected by entrainment into the Lohman Ridge Diversion Tunnel Intake is a transition fishery with no special-status, ESA-listed or CESA-listed fishes with the possible exception of hardhead. Little information is known concerning the potentially-affected fish community in Oregon Creek, but the fish and aquatic community is likely composed of the same fish as near the Lohman Ridge Diversion Tunnel intake.

Also as described above, WPT have been observed in Oregon Creek and at the Log Cabin Diversion Dam impoundment; and could occur, although not documented, at the Our House Diversion Dam impoundment. The existing gate structures would not prevent WPT from being entrained into either tunnel. WPT are likely active from April through October. The timing of diversions, which includes the April through June period and sometimes into July (i.e., in wet Water Years), overlaps the active season of WPT. The spring season (April through June) is when juvenile and adult WPT are moving from upland overwintering areas to streams and reservoirs, and hatchlings are leaving nesting areas and moving to streams.

While the two tunnels generally do not divert water from around mid July through October, significant amounts of water are diverted at other times of the year. Given the volume of water diverted by the two intakes, the potential for fish and other aquatic species to be entrained is high when the diversions occur, which could affect local fish and WPT populations.

4.0 Study Goals and Objectives

The goal of this study is to determine if the withdrawal of water at the Project's Lohman Ridge and Camptonville Diversion tunnel intakes are likely to have adverse effects on native fish populations and WPT.

The objective of the study is characterizing entrainment rates into the two diversion tunnels.

In addition, although not part of this study (i.e., no fieldwork or specific analysis) this study's final report will incorporate information from the relicensing Reservoir Fish Populations Study (Study 3.7) to characterize the occurrence of fish in the deeper portions of New Bullards Bar Reservoir near, to the extent possible, the New Colgate Power Tunnel intake and in Englebright Reservoir near the Narrows 2 Power Tunnel intake.

5.0 Study Methods and Analysis

5.1 Study Area

The study area includes the Middle Yuba River in the immediate vicinity of Our House Diversion Dam and Oregon Creek in the immediate vicinity of the Log Cabin Diversion Dam.

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

YCWA will obtain all necessary permits prior to performing fieldwork.

5.2 General Concepts

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.[4]
- 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 (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) 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 Study Methods

The study methods consist of a Passive Integrated Transponder (PIT) tagging methodology for monitoring entrainment rates into the Lohman Ridge and Camptonville diversion tunnels. Each step in the study is described below.

The methods for tagging fish and WPT are presented separately (Step 1 and 2, respectively). However, for each trout and WPT tagged, YCWA will record the individual's length in millimeters (i.e., fork length for trout and carapace length for WPT), weight in grams, and the location at which the individual was captured (i.e., GPS coordinates). Each tagged WPT will also be photographed. This information, as well as the distance in tenths of a mile upstream of the Project diversion intake where the tagged trout or WPT was released, will be included in the

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

final study report. Each tagged juvenile/adult trout and WPT will be released in the same general location at which it was captured.

5.3.1 Step 1 – Tag Fish

During fall 2012,[5] YCWA will collect fish on both Oregon Creek and the Middle Yuba River and implant each one with a PIT tag. YCWA's effort will last for five work days or until a total of 1,000 juvenile/adult trout, comprised collectively of rainbow and brown trout, are tagged, whichever occurs first. This effort will be applied on both Oregon Creek and the Middle Yuba River, which would result in up to a maximum of 10 days of tagging or 2,000 fish tagged (whichever comes first) for both streams combined. Rainbow and brown trout will be the focal species of the study and no other fish species will be tagged. All future reference within this study to trout will be in reference to only these two species. The minimum field crew size will be five people with two backpack electroshockers. Also as part of the prescribed effort, a cataraft boat electrofishing unit will be used to sample each diversion impoundment. YCWA will collect and tag the juvenile/adult trout upstream of each diversion over approximately a 2-mile length of stream. PIT tags will be implanted in each fish of appropriate size (≥60 millimeters Fork Length, or FL). After all PIT tags have been implanted, YCWA will promptly report the total number of juvenile/adult trout tagged to Relicensing Participants.[6]

Mortality resulting from PIT tagging is expected to be very low. PIT tags are relatively small in volume, lack a battery, and are light in weight. The surgical procedure is also generally less than 2 minutes. The minimal handling time and reduced influence of the tag has shown to result in low mortality rates (Jonasson et al. 2004 and Jones and Burum 1998). Tagged fish will be held for observation and recovery following surgery. Generally, if mortality does occur, it will be readily determined following the first 2 hours of the procedure. A conservative estimate of expected tag mortality rate would be 1 percent, based on past studies (Jonasson et al. 2004 and Jones and Burum 1998).

5.3.2 Step 2 – Tag WPT

Visual surveys in 2012 under the Special-Status Turtles – Western Pond Turtle Study (Study 3.6) will serve to identify WPT habitat use in Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment. If there are sightings of WPT near the tunnel intakes or in the diversion impoundments, YCWA will proceed to study entrainment in this species.

Baited hoop traps or basking traps will be used to capture WPT. Trapping will be performed in Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment each for up to 5 work days or until a maximum of 20 juvenile/adult turtles are tagged, whichever occurs first. Because trapping is generally less effective for juvenile WPT than adults, additional methods will be employed. The methodology of Study 3.6 includes searches for and capture by

[5] CDFG's study stated that YCWA would tag juvenile/adult rainbow trout in fall 2011. YCWA has changed the tagging period from fall 2011 to fall 2012 because YCWA will not file the study plan with FERC for approval until winter 2011 (i.e., on December 29, 2011). Therefore, the tagging cannot begin in fall 2011.

[6] CDFG's study said to report to the "Aquatic TWG." The Yuba River Development Project relicensing does not have an "Aquatic TWG." Therefore, YCWA has changed this to reporting to the Relicensing Participants.

hand or dip-net of juvenile WPT in suitable habitats (e.g., vegetated shallow edgewater), if such habitats occur at the Our House Diversion Dam and Log Cabin Diversion Dam impoundments. These searches for juvenile WPT in suitable habitat will be performed in concert with the trapping at Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment each for 5 work days or until a maximum of 20 juvenile/adult turtles (combined results from trapping and searches) are tagged, whichever occurs first. YCWA will affix PIT tags with underwater epoxy to the carapace (top shell) on up to 20 juvenile or adult WPT found in the immediate vicinity of the Lohman Ridge Diversion Tunnel intake entrance and the Camptonville Diversion Tunnel intake entrance. Each tagged WPT will be held until the epoxy is set, ensuring that there is no epoxy between scutes (i.e., shell plate), and released in the same general area that it was captured. If the WPT cannot be captured within the immediate vicinity of each entrance, then WPT will be captured from elsewhere within the Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment, and released where captured after tagging. However, if sufficient numbers of WPT cannot be captured and tagged to obtain meaningful entrainment results in either impoundment, YCWA will collaborate with the Forest Service, USFWS, CDFG and SWRCB to determine if this study aspect (i.e., WPT entrainment monitoring) should still be conducted.

5.3.3 Step 3 – Install Automatic PIT Tag Readers and Calibrate the Reader System

YCWA will install automatic PIT tag readers in the Lohman Ridge Diversion Tunnel and the Camptonville Diversion Tunnel near the tunnel entrances. YCWA will conduct an initial calibration at each diversion tunnel PIT tag reader by passing a minimum of 10 PIT tags along numerous gridded points in the detection area to identify if there are any areas that will not detect the tag. Technicians will work to tune the antenna to its maximum detection range. Final detection range testing will be used to determine the maximum percent efficiency expected from the PIT tag detection station during monitoring.

There will be 3 levels of detection range efficiency based on tag size. The largest tag will be 32 mm, followed by 23 mm, and 12 mm. Fish and WPT will be tagged with the largest tag possible, but to detect trout as small as 60 mm FL or to tag juvenile WPT, a 12 mm tag will be used. Efficiencies for each tag group will be reported, but it is expected for range of detection to reduce by up to 50 percent for each tag group (e.g., 3 ft detection range for 32 mm tag, 2 ft for 23 mm tag, 1.5 ft for 12 mm tag). It is currently estimated that at 80 percent of monitoring area will be covered for all tags. If the calibration is less than 80 percent for any tag group, YCWA will collaborate with the interested Relicensing Participants to determine how best to correct measurements of entrainment based on initial efficiency testing results. Note that this collaboration will occur soon after the calibration so that the study can proceed in fall 2012. Once the detection efficiency is initially set, field staff will work to maintain that efficiency within a range of 5 percent throughout the monitoring period.

5.3.4 Step 4 – Monitor Entrainment

YCWA will record the number of PIT tagged juvenile/adult trout and WPT passing through each diversion intake from November 1, 2012 through July 15, 2013. It is assumed this period will

cover the entire 2012-2013 diversion season. If the diversion season extends past July 15, 2013, YCWA will extend the monitoring until diversions end.

5.3.5 Step 5 – Data Analysis

YCWA will correlate the number of PIT tagged fish entrained into each diversion tunnel to the percent of the total fish population upstream of the diversion that would potentially be entrained. The calculation will be performed as follows:

- Assume survival of the PIT tagged fish in the stream through the diversion season is equal to that of untagged fish in the stream, and assume approximately greater than 99 percent PIT tag retention and tagging survivorship of implanted.
- Calculate the percent of the trout population in the sampling reach PIT tagged by using the sampling from the relicensing Stream Fish Populations Upstream of Englebright Reservoir Study (Study 3.8)[7] fish population estimate (number/mile) and the number of fish PIT tagged (PIT tagged fish/estimated number of fish in the section of stream where fish were tagged).
- Calculate the percent of the PIT tagged fish entrained at the end of the diversion season (PIT tagged fish entrained/PIT tagged fish).
- Calculate the number of the fish in the sampling reach where fish were tagged present during the fall 2012 that were entrained during the diversion season (percent of fall 2012 PIT tagged fish entrained times estimated number of fish in the reach where fish were tagged in fall 2012).

Analysis of WPT entrainment data will consist of comparing the number of PIT-tagged WPT that are detected passing through the tunnel entrances to the total numbers that are tagged. YCWA will not extrapolate WPT entrainment data to the population level since quantitative population estimates will not be developed.

5.3.6 Step 6 – QA/QC Data

YCWA will perform a quality assurance/quality control review of the data.

5.3.7 Step 7 – Prepare Report

YCWA will prepare a report that includes the following sections: 1) Study Goals and Objectives; 2) Methods and Analysis; 3) Results; 4) Discussion; and 5) Description of Variances from the FERC-approved study proposal, if any.

For all special-status fish observations, YCWA will complete and file the appropriate CNDDB form.

[7] As part of YCWA's Stream Fish Populations Upstream of Englebright Reservoir Study (Study 3.8), YCWA will do a three-pass electrofishing quantitative sampling in fall 2012 at one site on the Middle Yuba River approximately 0.5 mile upstream of Our House Diversion Dam impoundment and at one site on Oregon Creek approximately 0.5 mile upstream of Log Cabin Diversion Dam impoundment. YCWA will calculate fish per mile for each site.

6.0 Study-Specific Consultation

This study includes four study-specific consultations:

- The results of YCWA's Reservoir Fish Populations Study (Study 3.7) gillnet sampling near the Project intakes in New Bullards Bar and Englebright reservoirs will be presented in the Entrainment Study technical memorandum. YCWA will collaborate with the Forest Service, USFWS, CDFG, SWRCB and other interested Relicensing Participants regarding the results of the gillnet sampling and the need for additional entrainment-related information in New Bullards Bar and Englebright reservoirs. If it is collaboratively agreed that additional information is needed, YCWA, in collaboration with the agencies, will develop a study plan to gather the information and file the plan with FERC for approval.
- After all PIT tags have been implanted, YCWA will promptly report the total number of fish and turtles tagged to the Relicensing Participants (Step 1).
- If sufficient numbers of WPT cannot be captured and tagged to obtain meaningful entrainment results in either impoundment, YCWA will collaborate with the Forest Service, USFWS, CDFG and SWRCB to determine if this study aspect (i.e., WPT entrainment monitoring) should still be conducted. (Step 2.)
- If PIT tag calibration is less than 80 percent for any tag group, YCWA will collaborate with the interested Relicensing Participants to determine how best to correct measurements of entrainment based on initial efficiency testing results. Note that this collaboration will occur soon after the calibration so that the study can proceed in fall 2012. (Step 3.)

7.0 Schedule

YCWA anticipates the schedule to complete the study as follows assuming that FERC approves the study by the end of January 2012 (i.e., approximately 30 days after December 29, 2011 when YCWA files the revised study plan with FERC):

Tag Fish (Step 1)..... September 2012
Tag WPT (Step 2) .....July or August – September 2012
Install Readers and Calibrate System (Step 3)..... September – October 2012
Monitor Entrainment (Step 4).....November 2012 – August 2013
Data Analysis (Step 5) ..... September 2013
QA/QC Data (Step 6)..... September 2013
Prepare Report (Step 7) ..... October 2013

8.0 Consistency of Methodology with Generally Accepted Scientific Practices

This study is consistent with the goals, objectives, and methods outlined for recent FERC hydroelectric relicensing efforts in California.

9.0 Level of Effort and Cost

YCWA believes the cost range estimate for this study in 2011 dollars to be from $400,000 to $500,000.[8]

10.0 List of Attachments

FERC's September 30, 2011 Determination required YCWA file the modified study plan with FERC within 90 days of the date of the Determination, allowing at least 30 days for agency comment on the proposed modifications. The attachments to this study plan provide documentation that YCWA provided the modified study plan to agencies for review, written comments on the modifications received from the agencies, and if YCWA did not adopt a agency request, the reason why the request was not adopted. The study plan attachments include:

Attachment 3-11A	YCWA's Transmittal of the Draft Study Plan to the Forest Service, USFWS, NMFS, SWRCB and CDFG
Attachment 3-11B	Written Comments on the Draft Study Plan from the Forest Service, USFWS and CDFG. No written comments were received from NMFS or SWRCB.
Attachment 3-11C	YCWA's Reply to Written Comments on the Draft Study Plan

11.0 References Cited

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[8] YCWA's Fish Entrainment Study in its August 2011 Revised Study Plan had an estimate cost range of between $175,500 and $235,000. With the modifications required by FERC in its September 30, 2011 Study Determination, the estimated cost range is between $400,000 and $500,000.

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Yuba County Water Agency (YCWA). 2010. Yuba River Development Project relicensing Pre-Application Document. Yuba County Water Agency, Marysville, CA. http://www.ycwa-relicensing.com.

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ATTACHMENT 3-11A

YCWA's Transmittal of the Draft Study Plan to Forest Service, USFWS, NMFS, SWRCB and CDFG[9]

[9] YCWA has included below the October 28, 2011 e-mail that transmitted the draft Entrainment Study Plan to the Forest Service, USFWS, NMFS, CDFG and SWRCB. CDFG included in its November 28, 2011 comments a redline of the draft Study Plan, which can be found at pages 34 through 64 of this document. Therefore, to conserve paper, YCWA has not included in Attachment 3-11A the draft Study Plan that was attached to the October 28, 2011 e-mail.

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Lynch, Jim

To:	Smith, Dennis; dleater@fs.fed.us; alison_willy@fws.gov; Larry Thompson; Jeff Parks; MaryLisa Lynch (mlynch@dfg.ca.gov); Sharon Stohrer
Cc:	'Geoff Rabone'; caikens@ycwa.com
Subject:	Yuba Relicensing: Transmittal of Draft Entrainment Study Plan to Agencies for 30 Day Review
AMServiceURLStr:	https://slingshot.hdrinc.com/CFSS/control?view=services/FTService

- YUBA RIVER DEVELOPMENT PROJECT RELICENSING –

Transmittal of Entrainment Study (Study 3.11) Plan for 30-Day Review Period
- Written Comments due to YCWA by Close of Business on November 28, 2011 -

On September 30, 2011, FERC's Director of the Office of Energy Projects issued a Study Determination related to Yuba County Water Agency's (YCWA) relicensing of its Yuba River Development Project, FERC Project 2246. That Determination required YCWA to develop and file with FERC by December 29, 2011 (90 days from the date of the Determination) a modified plan for Study 3.11, Entrainment. The Determination also required YCWA to consult with agencies regarding the plan prior to filing it with FERC.

Attached to this e-mail in Microsoft™ Word format is a draft Entrainment Study plan for your review. We would appreciate your **written comments by close of business on November 28, 2011**, 30 days from the date of this e-mail.

We will address each agency's written comments in the study plan that we file with FERC, and attach the agency's written comments to the study plan we file. We may call you if we have questions regarding your comments to be sure we understand them, or to reconcile differences.

Note that other studies for which FERC Determination directed YCWA to consult with agencies are on hold pending the outcome of NMFS dispute of the Determination.

Let us know if there is anything we can do to facilitate your review.

If you have any questions regarding this e-mail or study plan, please contact Jim Lynch.

Curt Aikens
General Manager
Yuba County Water Agency
530-741-6278 x115

This email was sent to Relicensing Participants on behalf of the above party by:

JAMES LYNCH | **HDR Engineering, Inc.**
Senior Vice President, Hydropower Services

2379 Gateway Oaks, Suite 200 | Sacramento, CA 95833
916.564.4214 | d: 916.679.8740 | c: 916.802.6247
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ATTACHMENT 3-11B

Written Comments on the Draft Study Plan from Forest Service, USFWS and CDFG[10]

[10] The Forest Service, USFWS and CDFG each provided a transmittal letter with an attachment that was YCWA's draft study plan with redlines showing the agency's comments. On inspection, the attachment to each transmittal letter is identical. Therefore, to conserve paper, YCWA has included here each transmittal letter, but has only included the attachment to CDFG's letter.

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File Code: 1920
Date: November 28, 2011

Curt Aikens
General Manager
Yuba County Water Agency
1220 F Street
Marysville, CA 95901-4740

Dear Mr. Aikens,

The United States Forest Service is an active participant in the Integrated Licensing Process (ILP), currently underway for relicensing of the Yuba River Development Project. In this relicensing effort, Yuba County Water Agency (Licensee) received a Study Plan Determination from the Federal Energy Regulatory Commission (Commission) with directives for significant modification to several resource study plans, including the revised plan for study of entrainment (Study 3.11).

The Commission instructed that the Licensee implement the agencies requested entrainment study for fish and turtles (filed August 30, 2011), as it pertains to entrainment risks at Lohman Ridge and Camptonville tunnels. In developing modified study plans to meet the Commission's request, the Licensee has prepared a draft Entrainment Study (October 28, 2011) and issued this draft for review and comment by the Forest Service and other State and federal resource agencies.

Forest Service staff value the opportunity to assist Yuba County Water Agency in clarification of study needs and refinements to the draft Entrainment Study to finalize a study design appropriate for implementation in the ILP study phase. Forest Service comments are provided in the form of redlined revisions to the Licensee's October 28th draft Entrainment Study and are presented here in the attachment. The redline edits provided have been prepared in the spirit of collaboration and in accordance with direction given by the Commission.

If you have questions regarding this submittal or need further discussion regarding Forest Service contributions to this licensing effort, please contact: Dennis Smith, at (707) 562-2384 or e-mail at dennismith@fs.fed.us or Dan Teater, at (530) 367-2224 or email at dteater@fs.fed.us.

Sincerely,

/s/ Tom Quinn
TOM QUINN
Forest Supervisor

cc: MLYNCH
RWHUGHES

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Sacramento, California 95825-1846

In Reply Refer To:

NOV 28 2011

James Lynch
HDR Engineering, Inc.
Senior Vice President, Hydropower Services
2379 Gateway Oaks, Suite 200
Sacramento, California 95833

Subject: U.S. Fish and Wildlife Service Comments on Yuba County Water Agency October 2011 Draft Entrainment Study 3.11 for Yuba River Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project #P-2246; Yuba, Sierra, and Nevada Counties, California

Dear Mr. Lynch:

The U.S. Fish and Wildlife Service (Service) has reviewed the Federal Energy Regulatory Commission's (FERC or Commission) September 30, 2011, Study Plan Determination for the Yuba River Hydroelectric Project (Project) (FERC No. P-2246) and Yuba County Water Agency's (YCWA) October 2011 Draft Entrainment Study 3.11 for the Project. The Service has worked closely with the California Department of Fish and Game (CDFG) and U. S. Forest Service (USFS) in editing the October 2011 Draft Entrainment Study to increase the clarity and precision of the text.

Attached is a November 15, 2011, version of Study 3.11 that was edited by the CDFG, USFS, and Service (Agency edits). The Service supports the revised Agency edits and believes they are consistent with the Commission's Study Plan Determination. In addition, the Agency edits provide much needed clarity to the document.

Based on the Commission's Study Plan Determination, future data collection on fish entrainment at New Bullards Bar and Englebright reservoirs is contingent upon findings from implementation of YCWA's August 2011 Reservoir Fish Populations Study 3.7. The Service is concerned that Study 3.7 may miss fish detections near the power intakes in these reservoirs, due to obstruction by houseboat anchors and cables and by timing and depth of sampling. The stipulation of a technical review of Study 3.7 findings was added in the Agency edits in an attempt to address this concern.

The Service believes that the appropriate timing, depth, and location of sampling under Study 3.7 is essential to estimate the risk of entrainment sampling at the power intakes. Commercial information indicates that, in the warm summer months, rainbow trout (*Oncorhynchus mykiss*) and Kokanee salmon (*O. nerka*) are typically found at 50 to 65 feet in Englebright Reservoir (http://www.wonews.com/t-NCFreshReports_080510.aspx) and Kokanee salmon are at 80 to 90 feet in New Bullards Bar Reservoir (http://www.gofishn.com/content/new-bullards-bar-reservoir-yuba-county-california and http://www.bullardsbar.com/fishing.cfm).

Since the November 15, 2011, edits of Study 3.7, you have made the Service aware of Project changes at Our House Diversion Dam that could affect the outcome of Study 3.7. The newly proposed Our House Diversion Dam Sediment Pass-Through Program includes opening the low-level gate at Our House Diversion Dam during high flow periods between November 1 and March 31, up to 48 hours at a time, to clear sediment from the vicinity of Our House Diversion Dam structures and disperse finer sediments from the active channel. The low-level gate could be opened multiple times in one year, depending on flows in the river. If the low-level gate openings are likely to occur during the period of the study, then pass-through operation should be noted in Table 3.1-1 "Description of Project's five low-level intakes" and additional receivers should be deployed to detect this additional entrainment.

If you have any questions regarding this response, please contact Alison Willy of my staff at (916) 414-6534.

Sincerely,

Daniel Welsh
Assistant Field Supervisor

Enclosure

cc:
Alan Mitchnick, Federal Energy Regulatory Commission, Washington, D.C.

ec:
DFG, North Central Region, Rancho Cordova, CA
MaryLisa Lynch, CDFG, North Central Region, Rancho Cordova, CA
Sharon Stohrer, CDFG, North Central Region, Rancho Cordova, CA
Beth Lawson, CDFG, North Central Region, Rancho Cordova, CA
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Amy Lind, USFS, Southwest Research Station, Davis, CA
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EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

November 17, 2011

Curt Aikens, General Manager
Yuba County Water Agency
1220 F Street
Marysville, CA 95901-4740

Subject: Comments on Draft Modified Revised Entrainment Study Plan for Yuba River Development Project (FERC Project No. 2246)

Dear Mr. Aikens:

The California Department of Fish and Game (Department) is an active participant in the Integrated Licensing Process (ILP), currently underway for relicensing of the Yuba River Development Project. In this relicensing effort, Yuba County Water Agency (Licensee) received a Study Plan Determination from the Federal Energy Regulatory Commission (Commission) with directives for significant modification to several resource study plans, including the revised plan for study of entrainment (Study 3.11).

The Commission instructed that the Licensee implement the Department's requested entrainment study for fish and turtles (filed August 30, 2011), as it pertains to entrainment risks at Lohman Ridge and Camptonville tunnels. In developing modified study plans to meet the Commission's request, the Licensee has prepared a draft Entrainment Study (October 28, 2011) and issued this draft for review and comment by the Department and other State and federal resource agencies.

Department staff appreciate the opportunity to assist Yuba County Water Agency in clarification of study needs and refinements to the draft Entrainment Study to finalize a study design appropriate for implementation in the ILP study phase. Department comments are provided in the form of redlined revisions to the Licensee's October 28th draft Entrainment Study and are presented here as Enclosure A. The redline edits provided have been prepared in the spirit of collaboration and in accordance with direction given by the Commission.

If you have questions regarding this submittal or need further discussion regarding Department contributions to this licensing effort, please contact: Sharon Stohrer, at (916) 358-2384 or e-mail at sstohrer@dfg.ca.gov, or MaryLisa Lynch, at (916) 358-2921 or email at mlynch@dfg.ca.gov.

Sincerely,

Kent A. Smith
Regional Manager

Enclosure

cc's on page 2

Conserving California's Wildlife Since 1870

Yuba County Water Agency
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Study 3.11

DRAFT ENTRAINMENT[1]

October 2011 + Agency edits (11-15-11)

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 fish, western pond turtle (WPT) (*Actinemys* [formerly *Emys* or *Clemmys*] *marmorata*), and other aquatic species due to entrainment into Project intakes.

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

YCWA believes that four agencies have jurisdiction over fish and aquatic life in the geographic area covered in this study proposal: 1) 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) California Department of Fish and Game (CDFG); and 4) State Water Resources Control Board Division of Water Rights (SWRCB). Each of these agencies and their jurisdiction, 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 Pre-Application Document (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 PAD. USFWS's jurisdiction, goals and objectives 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

[1] YCWA's included a Fish Entrainment Study in its August 2011 Revised Study Plan. FERC's September 30, 2011 Study Determination stated: "we recommend that YCWA implement Cal Fish and Game's requested entrainment study for fish and turtles using PIT-tags as it pertains to monitoring entrainment at Lohman Ridge and Camptonville tunnels at the Our House and Log Cabin diversions, respectively (section 5.3.2 of Cal Fish and Game's requested study plan filed August 30, 2011). As such, YCWA shall file for Commission approval, a modified revised study plan within 90 days." Those modifications have been made in this study plan. Note that while FERC refers to the requested study as "Cal Fish and Game's requested study," the Forest Service and SWRCB pointed out to YCWA in subsequent meetings that they support CDFG's request, though no other agency filed a detailed study plan with FERC. For the purpose of this study plan and to be consistent with the FERC Determination, the request is referred to in this study plan as "CDFG's study," with the understanding that other agencies have stated they support and endorse CDFG's study request.

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CDFG's letter is to preserve, protect, and as needed, to restore habitat necessary to support native fish, wildlife and plant species within the Federal Energy Regulatory Commission (FERC) Project Boundary of the Project and downstream of the Project as resources are affected by ongoing facilities operations.

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 Existing Information and Need for Additional Information

The Project includes 10 locations where a Project facility diverts water from a stream or reservoir to another location. Based on existing information, some of these intakes/outlets have a low potential to affect fish populations while other Project intakes have a much higher potential for lethal effects, which will require additional data gathering to characterize entrainment rates and assess potential effects on aquatic populations. The sections below describes for each intake, the type of intake, the potential for entrainment effects on fish and WPT populations, and proposed entrainment related data gathering.

3.1 Intakes for which No Additional Data Gathering Is Proposed at This Time

3.1.1 Project Dam Low-Level Intakes

The Project includes five dam low-level intakes, each of which is described in Table 3.1-1. These are: 1) Our House Diversion Dam low-level intake; 2) Our House Diversion Dam auxiliary low-level intake; 3) Log Cabin Diversion Dam low-level intake; 4) Log Cabin Diversion Dam auxiliary low-level intake; and 5) New Bullards Bar Dam low-level intake. In each case, the low-level intake is at or near the bottom of the impoundment.

Only two of the low-level intakes, the low-level outlets at Our House and Log Cabin diversion dams, are routinely used (almost always in the fully open position to meet instream flow requirements). The other three low-level intakes are used in emergencies or if otherwise needed (e.g., during repairs of the low-level intake, or infrequent major outages).[2]

[2] From 2005 through 2009, the Our House Diversion Dam Low-Level Auxiliary Intake has been exercised (i.e., tested during which the gates are quickly opened and closed) four times (i.e., March 23, April 10 and May 19, 2005; and January 3, 2006), and open for 200 days beginning on January 13, 2006, during which, with the approval of FERC, the Forest Service, CDFG and SWRCB YCWA removed sediment from Our House Diversion Dam Impoundment. Since 2005, the Log Cabin Diversion Dam Low-Level Auxiliary Intake has been exercised once (i.e., March 23, 2005), and was open for 19 days beginning on May 28, 2007.

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Table 3.1-1. Description of Project's five low-level intakes.

Intake Structure (From/To)	Conduit Size (inches)	Control Valve/Gate (type)	Existing Minimum Release (cfs)	Estimated Maximum Capacity at Full Pool (cfs)
MIDDLE YUBA RIVER				
Our House Diversion Dam Low-Level Intake (Our House Diversion Dam Impoundment/Middle Yuba River Immediately Downstream of the Dam)	24 in diameter	Downstream Gate Valve Operated Manually	30 cfs from June 16 through April 14 and 50 cfs from April 15 through June 15, or natural inflow into Our House Diversion Dam Impoundment, whichever is less.	60 cfs. Minimum instream flow releases are normally made through this valve unless dam spill meets the minimum flow requirement.
Our House Diversion Dam Auxiliary Low-Level Intake (Our House Diversion Dam Impoundment/Middle Yuba River Immediately Downstream of the Dam)	72 in diameter	Upstream Slide Gate Operated Manually by a Motor On-Site		800 cfs. Used for emergencies only.
OREGON CREEK				
Log Cabin Diversion Dam Low-Level Intake (Log Cabin Diversion Dam Impoundment/Oregon Creek Immediately Downstream of the Dam)	18 in diameter	Downstream Gate Valve Operated by Hand	8 cfs from June 16 through April 14 and 12 cfs from April 15 through June 15, or natural inflow into Log Cabin Diversion Dam Impoundment, whichever is less.	13 cfs. Minimum instream flow releases are normally made through this valve unless dam spill meets the minimum flow requirement.
Log Cabin Diversion Dam Auxiliary Low-Level Intake (Log Cabin Diversion Dam Impoundment/Oregon Creek Immediately Downstream of the Dam)	72 in diameter	Upstream Slide Gate Operated by a Motor by a Motor On-Site		800 cfs. Used for emergencies only.
NORTH YUBA RIVER				
New Bullards Bar Dam Low-Level Intake (New Bullards Bar Reservoir/North Yuba River Immediately Downstream of the Dam)	72 in diameter	Downstream Hollow Jet Valve Operated Remotely	5 cfs at all times.	3,500 cfs, but actual maximum capacity is 1,250 cfs due to valve vibration. Minimum instream flow releases are normally made through the New Bullards Minimum Flow Powerhouse.

The spacing (i.e., opening between bars) in the trash racks in front of Our House and Log Cabin low-level intakes is 8.75 inches. The spacing in the trash racks in front of Our House and Log Cabin auxiliary low-level intakes is 12.375 inches. The spacing in the trash rack in front of the New Bullards Bar Dam Low-Level Intake is 5.0 inches.

A transition fishery[3] occurs in the vicinity Our House Diversion Dam. As described in Section 7.3.4.1 of the PAD, 2004 snorkeling surveys in the Middle Yuba River about 0.5 mile upstream

[3] A transition fishery is one that includes both coldwater and warmwater fishes and is typically found in the Sierra in lower elevations where the fish community transitions from a coldwater fishery dominated by trout in the higher elevations to a warm water fishery in the lower elevations.

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of Our House Diversion Dam found rainbow trout (*Oncorhynchus mykiss*) and Sacramento pikeminnow/hardhead (*Ptychocheilus grandis/Mylopharodon conocephalus*) (the snorkelers were unable to distinguish between the two species); while about 0.5 mile downstream of the dam, the snorkelers found rainbow trout, Sacramento pikeminnow, hardhead, smallmouth bass (*Micropterus dolomieui*), and various sucker species (Family Catastomidae) (Gast et al. 2005). The general species composition upstream of the dam was confirmed by Nevada Irrigation District (NID) in 2008 and 2009 when its snorkeling surveys in the Middle Yuba River about 0.5 mile upstream of Our House Diversion Dam found Sacramento suckers, rainbow trout, and Sacramento pikeminnow (NID and PG&E 2010). NID did not find any hardhead, a CDFG Species of Concern and Forest Service Sensitive Species, in its sampling. CDFG does not stock fish in this area of the Middle Yuba River.

YCWA was unable to find any existing information regarding the fish community in Oregon Creek near Log Cabin Diversion dam, but the fish community and aquatic species supported in this drainage are likely similar to that at Our House Diversion Dam. CDFG does not stock fish in Oregon Creek.

While YCWA was unable to find any recent fish studies of New Bullards Bar Reservoir, CDFG fish stocking records are very informative. The reservoir has a long history of annual fish stocking activities dating back to 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). Between 1969 and 2007, about 5 million Kokanee (*O. nerka*), nearly 1.6 million rainbow trout, just over 310,000 Eagle Lake rainbow trout, 40,000 brook trout (*Salvelinus fontinalis*), 200 eastern brook trout, 200 cutthroat trout (*Oncorhynchus clarki*), Kamloop rainbow trout, and 185 spotted bass (*Micropterus punctulatus*) were planted in New Bullards Bar Reservoir by CDFG (CDFG 1989, 2007). Besides these fishes, sport fishermen report catching in the reservoir largemouth bass (*M. salmoides*), smallmouth bass, redear sunfish (*Lepomis microlophus*), crappie (*Pomoxis sp.*), bluegill (*L. macrochirus*) and channel catfish (*Ictalurus punctatus*).

Western Pond Turtle (*Actinemys marmorata*), a California ~~CDFG State~~ Species of Special Concern and Forest Service Sensitive Species, has been observed ~~in~~ and near the Project area including the following locations:near New Bullards Bar Reservoir; several locations near tributaries of Grizzly Gulch, a tributary of Oregon Creek; two locations about 2 miles southeast of New Bullards Bar Dam near Little Willow Creek, a tributary of the Middle Yuba River; and a location north of Jones Bar on the South Yuba River. These locations are ponds or slow moving water in rivers. A. Lind, Forest Service, (personal communication) has observed WPT in Oregon Creek above the Log Cabin Diversion Dam impoundment and D. Teater, Forest Service, (personal communication) has observed WPT at the impoundment. A juvenile WPT was also found in a puddle near the impoundment during field reconnaissance (June 2011) for YCWA's relicensing studies. There were no detections of WPT during basking site surveys at Our House Diversion Dam impoundment in 2010, but one adult WPT was observed at a survey site 3.5 miles upstream of the impoundment (PG&E and NID 2010). YCWA reviewed occurrences from CDFG's California Natural Diversity Data Base (CNDDB) (CDFG 2003), the Tahoe National Forest (TNF) (GIS data and Access database), on-line museum record data (CAS 2010, MVZ 2010), and Vindum and Koo (1998).

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Based on the above information, the potential affects to fish populations and WPT due to possible entrainment into one or more of the above low-level intakes is low. No fishes listed as endangered or threatened under the federal Endangered Species Act (ESA) or California Endangered Species Act (CESA) are ~~potentially~~ likely to be affected. However, WPT and hardhead may or may not be affected: Gast et al. (2005) reported possible observing hardhead in 2004 but NID did not find any in 2008 and 2009. ~~Any~~ It is unknown whether fish or WPT entrained into either Our House or Log Cabin diversion dam low-level intakes would ~~not~~ be damaged as ~~since~~ they may~~would simply~~ pass unimpeded (i.e., not pass through any valves) to the river downstream of the dam. Potential entrainment effects related to Our House and Log Cabin diversion dam auxiliary intakes and the New Bullards Bar Dam low-level intake would be very short-term since these intakes are used on a very infrequent basis. Further, with regards to the New Bullards Bar Dam low-level intake, the potential for fish to be entrained during its infrequent use is low because the intake is located at elevation 1,447.7 ft in the reservoir, over 508 feet below the reservoir surface at full pool (El. 1,956 ft), where fish normally do not congregate. WPT does not occur at such depths.

Given the low potential to entrain native fish, the fish populations potentially affected contain no special-status, ESA-listed or CESA-listed fishes with the possible exception of hardhead, and the fish that may be entrained through intakes that are normally used would not be damaged, no additional data gathering regarding entrainment effects at the Project's five low-level intakes is proposed.

3.1.2 Project Power Diversions

The Project includes three water diversions, each of which terminates at a powerhouse or a powerhouse bypass. These are 1) New Bullards Minimum Flow Powerhouse Penstock, 2) New Colgate Power Tunnel and 3) Narrows 2 Powerhouse Penstock. Table 3.1-2 provides information regarding the conduits, and Figures 3.1-1 and 3.1-2 and 3.1-3 show the amount of water diverted by each structure in representative normal, wet and dry water years. Figure 3.1-1 shows the New Colgate Power Tunnel Intake portals.

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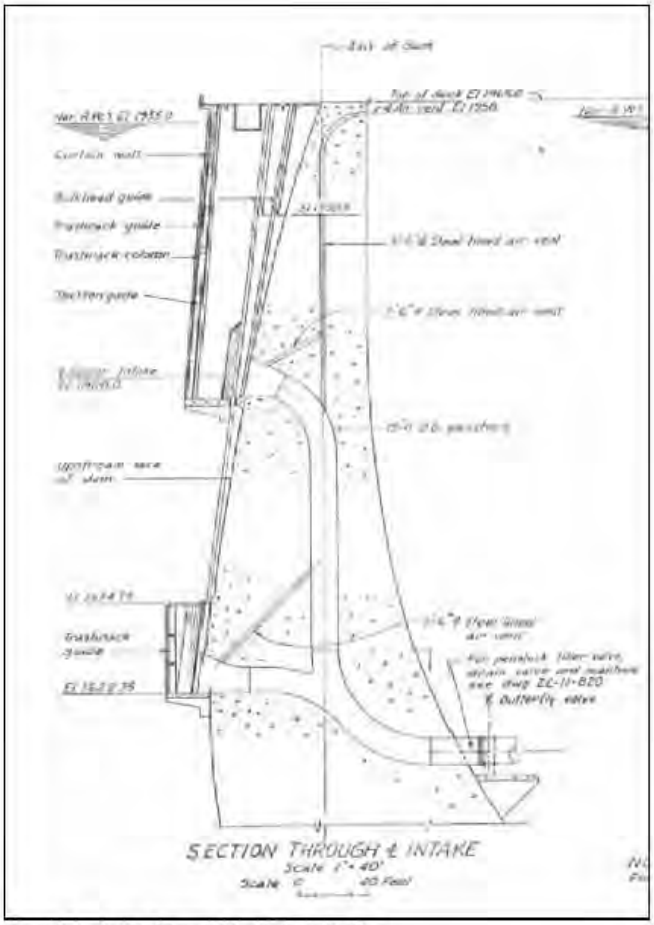

Figure B-2. Section Through New Bullards Bar Dam

Figure 3.1-1. New Colgate Power Tunnel Intake.

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Table 3.1-2. Description of Project power diversions.

Intake Structure (From/To)	Conduit Description (type & size)	Turbine Number and Type/Bypass Control Valve or Gate (# and type)	Depth of of Intake Invert at Full Pool (feet)	Existing Minimum Release (cfs)	Estimated Maximum Capacity (cfs)
NORTH YUBA RIVER					
New Bullards Bar Minimum Flow Powerhouse Penstock (New Bullards Bar Reservoir/North Yuba Rive at base of New Bullards Bar Dam)	70-foot long, 12 in diameter steel pipe	1 Pelton Turbine/ No Powerhouse Bypass	508.5 ft deep (El. 1,447.5 ft as compared to full pool at El. 1,956 ft),	5 cfs at all times	6 cfs
New Colgate Power Tunnel and Penstock (New Bullards Bar Reservoir/New Colgate PH, then Yuba River)	5.2 miles long and composed of four different types of conveyance structures: an unlined horseshoe tunnel 26 feet square; an lined horseshoe tunnel 20 feet wide and 14.5 feet high; a lined circular tunnel 14 feet in diameter; and 2,809 feet of steel penstock with a diameter ranging from 9 feet to 14.5 feet.	2 Pelton Turbines/ No Powerhouse Bypass	Two openings in intake structure: deeper opening is 336 ft deep (El. 1,620 ft as compared to full pool at El. 1,956 ft) and upper opening is 148 ft deep (El. 1,808 ft as compared to full pool at El. 1,956 ft)	5 cfs at all times	3,500 cfs
YUBA RIVER					
Narrows 2 Powerhouse Penstock (USACE's Englebright Reservoir/Narrows 2 PH, then Yuba River about 200 ft downstream of base on USEACE's Englebright Dam)	748 ft long composed of two sections: the first is a 376-ft long section 20 feet in diameter and concrete lined, and the second is a 372- ft long section 14 feet in diameter and steel lined.	1 Francis Turbine/ Two Powerhouse Bypasses: 1) a 78-inch diameter fixed cone valve; and 2) a 36-inch diameter bypass valve.	86 ft deep (El. 439.0 ft as compared to full pool at El. 525 ft)	Downstream of Narrows 1 and 2 Powerhouses:[1] Oct 16–10: 600–1,050 cfs Nov: 600-700 cfs Dec: 600-1,400 cfs Jan 1-15: 1,000-1,850 cfs	3,400 cfs through the Powerhouse, 3,000 cfs through the 78 inch Bypass Valve, and 650 cfs through the 36 inch Bypass Valve

[1] The Project FERC license includes a ramping rate below USACE's Englebright Dam (Article 33(f). and minimum flows requirements downstream of USACE's Daguerre Point Dam (Article 33(d).

YCWA has not used the upper gate on the New Colgate Power Tunnel and Penstock Intake since 1993 when YCWA convened a Temperature Advisory Committee to obtain more-refined recommendations for the operation of New Bullards Bar Reservoir's multilevel outlet. The committee was composed of YCWA, USFWS and CDFG. After reviewing temperature model data and the operating options, USFWS and CDFG recommended that water releases from New Bullards Bar Reservoir be as cold as possible at all times. YCWA immediately implemented this recommendation and, since 1993, all controlled releases of water from New Bullards Bar Reservoir through New Bullards Bar Minimum Flow Powerhouse into the North Yuba River and through New Colgate Powerhouse into the Yuba River have been from the lower intake, which withdraws water from the coldest, deepest part of the New Bullards Bar Reservoir.

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The spacing (i.e., opening between bars) in the trash racks in front of the New Bullards Bar Minimum Flow Powerhouse Penstock Intakes is 5.00 inches, and the spacing in the trash racks in front of the New Colgate Power Tunnel and Penstock Intake is 2.25 inches. The spacing in front of the Narrows 2 Powerhouse Penstock Intake is 4.1875 inches.

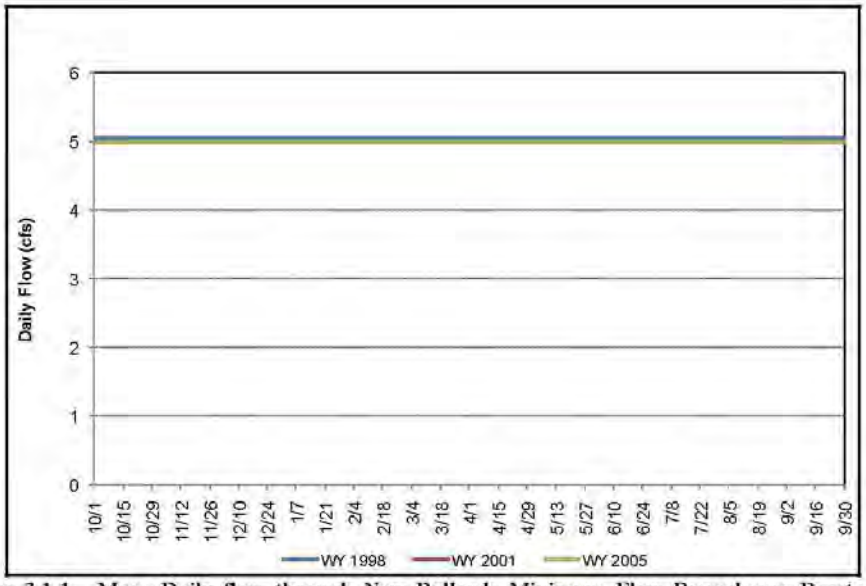

Figure 3.1-1. Mean Daily flow through New Bullards Minimum Flow Powerhouse Penstock in representative Normal (2005), Wet (1998) and Dry (2001) water years.

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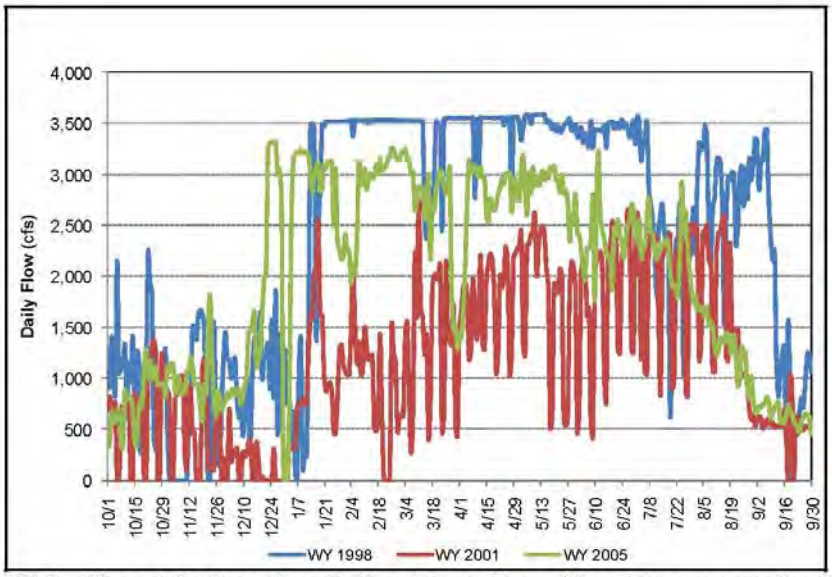

Figure 3.1-2. Mean daily flows through New Colgate Power Tunnel in representative Normal (2005), Wet (1998) and Dry (2001) water years.

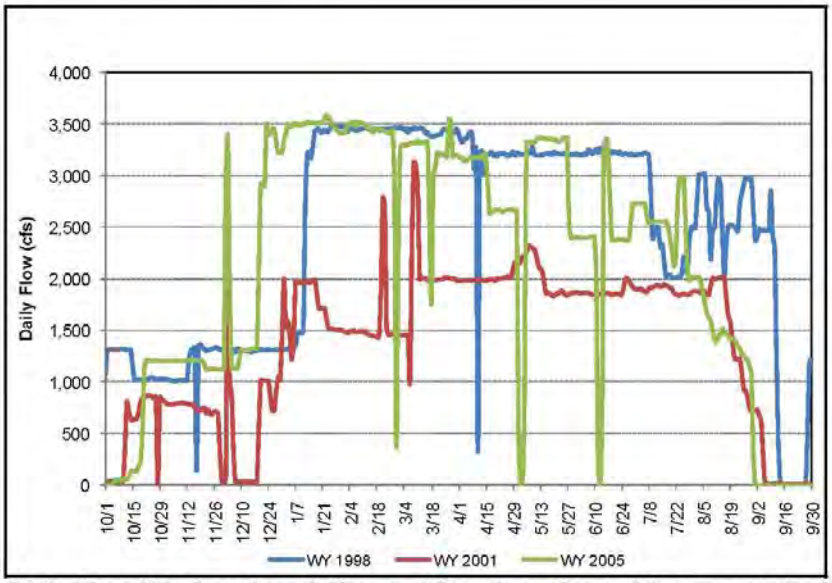

Figure 3.1-3. Mean dialy flows through Narrows 2 Powerhouse Penstock in representative Normal (2005), Wet (1998) and Dry (2001) water years.

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Included in Figure 3.1-3 is combined flow through the Narrows 2 Powerhouse bypasses and the powerhouse. The 36-inch diameter valve was included in the original powerhouse design and the 78-inch diameter valve was added in 2007 to provide the capability to bypass flows of up to 3,000 cfs around the Narrows 2 Powerhouse during times of full or partial powerhouse shutdown. Use of the bypass valves vary by year. Prior to installation of the 72-inch diameter valve in 2007, the 36-inch diameter valve was used for 34 days in 2005 (average flow of 103 cfs) and 15 days in 2006 (130 cfs). Since 2006, the two bypass valves were used, either separately or in combination, for 89 days in 2007 (combined average flow of 695 cfs), 166 days in 2008 (177 cfs) and 201 days in 2009 (193 cfs).

As described above, fish population data is limited but information available at this time identifies the fish community in New Bullards Bar Reservoir as a stocked fishery composed of Kokanee, rainbow trout, Eagle Lake rainbow trout, brook trout, eastern brook trout, cutthroat trout, Kamloop rainbow trout and spotted bass. Other fishes known to occur in the reservoir include largemouth bass, smallmouth bass, red ear sunfish, crappie, bluegill sunfish and channel catfish. CDFG has conducted surveys of fish in old and New Bullard's Bar reservoirs since the 1950s. A 1959 survey of fish species in the old Bullard's Bar Reservoir found 12 species of fish including bass, crappie, sunfish, bluegill, bullhead, shiners, Sacramento pikeminnow, sucker, and carp species. A subsequent summary report for CDFG fish survey activities in the reservoirs from 1959 through 1974 identified 16 species of fish as relatively common in the reservoirs, including smallmouth and largemouth bass, black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxis annularis*), warmouth (*Lepomis gulosus*), green sunfish (*Lepomis cyanellus*) red-ear sunfish, bluegill, brown bullhead (*Ameiurus natalis*), Sacramento pikeminow, Sacramento sucker (*Catostomus occidentalis*), common carp (*Cyprinus carpio*), rainbow trout, and Kokanee salmon (CDFG 1974). Brown trout and white catfish (*Ameiurus catus*) are noted as rare occurrences. Channel catfish, threadfin shad (*Dorosoma petenense*), and fathead minnow (*Pimephales promelas*) were reportedly planted in the reservoir prior to 1960, but were not captured during any surveys. Golden shiners (*Notemigonus crysoleucas*) were observed only in 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). The first documented CDFG capture of trout was reported in 1970 (CDFG 1963, 1970). Kokanee was first documented during CDFG survey efforts in 1972 (CDFG 1963, 1970, 1972).

Like for the fishery in New Bullards Bar Reservoir, YCWA was unable to find any recent fish population studies in the United States Army Corps of Engineer's (USACE) Englebright Reservoir, but CDFG fish stocking records are very informative. As with New Bullards Bar Reservoir, the USACE's Englebright Reservoir has a long history of annual fish stocking activities dating back to 1959 (Central Valley Fish Hatchery 1959; CDFG 1974). CDFG stocking records indicate that fish plantings in Englebright Reservoir have taken place from 1965 through 2007. During this period, just over 756,000 rainbow trout, 228,320 Kokanee, 6,973 lake trout, nearly 28,000 brown trout (*Salmo trutta*), 4,000 Eagle Lake rainbow trout, 2,640 brook trout, 45 white crappie, and 80 black crappie were planted (CDFG 2007). Stocked species were primarily from the Shasta and San Joaquin hatcheries. Creel surveys conducted from July 2003 through May 2004 documented 12 sport fish species in Englebright Reservoir, including spotted bass, smallmouth bass, largemouth bass, bluegill, brown trout, rainbow trout, carp, channel catfish, crappie, Kokanee, sucker, yellow perch (*Perca flavescens*), and Sacramento pikeminnow

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(CDWR 2006). Additionally, Englebright Reservoir has a known self-sustaining population of hardhead (J. Rowan, pers. comm., 2011).

The potential effects to fish and WPT populations due to entrainment into one or more of the above power tunnels intakes are unknown. Detailed fish and WPT population assessments have not been conduted to identify the species and age class(es) within New Bullards Reservoir and Englebright Reservoir that have potential to be affected by project operations. However, fish populations that could be affected include, but are not limited to, a known self-sustaining population of hardhead in Englebright Reservoir. The depth of the intake for Narrows 2 powerhouse is at 86 feet at low pool, and could present risk. If the reservoir fish and WPT population sampling results are inconclusive, (i.e. sampling limitations causing sampling error due to depths and proximity to intakes) Aadditional data gathering would be needed to fully evaluate entrainment effects to reproducing fish populations within these reservoirs. Using results from the first year of data collected in Reservoir Fish Population study (SP 3.7) and other sources, an informed decision on need for entrainment monitoring at the New Colgate and Narrows 2 powerhouse intakes will be made in a timely manner to allow for planning and initiation of second year studies.

No additional data gathering under this study regarding entrainment effects at the Project's three power intakes is proposed at this time but may be required in second year studies.

3.2 Intakes for which Additional Data Gathering Is Proposed

3.2.1 New Bullards Bar and USACE's Englebright Reservoir

Entrainment monitoring as part of this study is not proposed at either New Bullards Bar or USACE's Englebright Reservoir in the first year of study. Under YCWA's Reservoir Fish Populations Study (Study 3.7) fish population sampling will be conducted near each dam's intakes up to a depth of 100 feet. This sampling will help characterize deepwater fish populations in both reservoirs and be used for any future discussions of entrainment at either dam facility. Depending on the first year reservoir fish sampling effort, a decision will be made on whether or not to conduct entrainment studies on these facilities.

3.2.2 Project Non-Power Diversion Intakes

The Project includes two non-power diversions intakes: 1) Lohman Ridge Tunnel; and 2) Camptonville Diversion Tunnel. Both diversions are from small impoundments (<200 acres), and the water conduits are composed entirely of underground tunnel except in the immediate vicinity of the intake and outlet where each tunnel daylights. Both the Lohman Ridge and Camptonville diversion tunnel intakes are passive diversion structures with a gate. The Lohman Ridge Diversion Tunnel has a maximum capacity of 860 cfs, and the Camptonville Diversion Tunnel has a maximum diversion capacity of 1,100 cfs, either of which may present velocities great enough to entrain fish, WPT or other aquatic life. Table 3.2-1 provides information regarding the conduits, and Figures 3.2-1 and 3.2-2 show the amount of water diverted by each structure in representative normal, wet and dry Water Years. Since flow into the tunnels was not

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gaged prior to Water Year 1989, the 1988 data in Figures 3.2-1 and -2 are the result of a synthesis. The spacing (i.e., opening between bars) in the trash racks in front of the Lohman Ridge and Camptonville diversion tunnel intakes are 10.625 inches and 11.0 inches, respectively.

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Table 3.2-1. Description of Project's non-power diversion intakes.

Intake Structure (From/To)	Dimensions and Type (feet and type)	Intake Structure (type)	Outlet Structure (type)	Estimated Maximum Capacity (cfs)
MIDDLE YUBA RIVER				
Lohman Ridge Diversion Tunnel Intake (Our House Diversion Dam Impoundment on Middle Yuba River/Log Cabin Diversion Dam Impoundment on Oregon Creek)	12.5 ft high by 12.5 ft wide, 19,410 feet (90% unlined and 10% lined) Tunnel	15 ft high by 12 ft wide concrete structure with a trash rack and slide gate operated manually by a motor on-site	15 ft high by 12 ft wide concrete structure: no control or enclosure (e.g., rack or fence)	860 cfs
OREGON CREEK				
Camptonville Diversion Tunnel Intake (Log Cabin Diversion Dam Impoundment on Oregon Creek/New Bullards Bar Reservoir on North Yuba River)	6,107 ft Tunnel. First 4,275-ft section is an unlined, horseshoe tunnel 14.5 ft wide by 14.5 ft high, and the second 1,832-ft section is a lined 11.7 ft wide by 13 ft high horseshoe tunnel.	14.5 ft high by 14.5 ft wide concrete structure with a trash rack and slide gate operated manually by a motor on-site	13 ft high by 11.7 ft wide concrete structure: no control or enclosure (e.g., rack or fence)	1,100 cfs (Includes direct diversion of natural flow in Oregon Creek and re-diversion of water from Middle Yuba River through Lohman Ridge Diversion Tunnel into the Log Cabin Impoundment.)

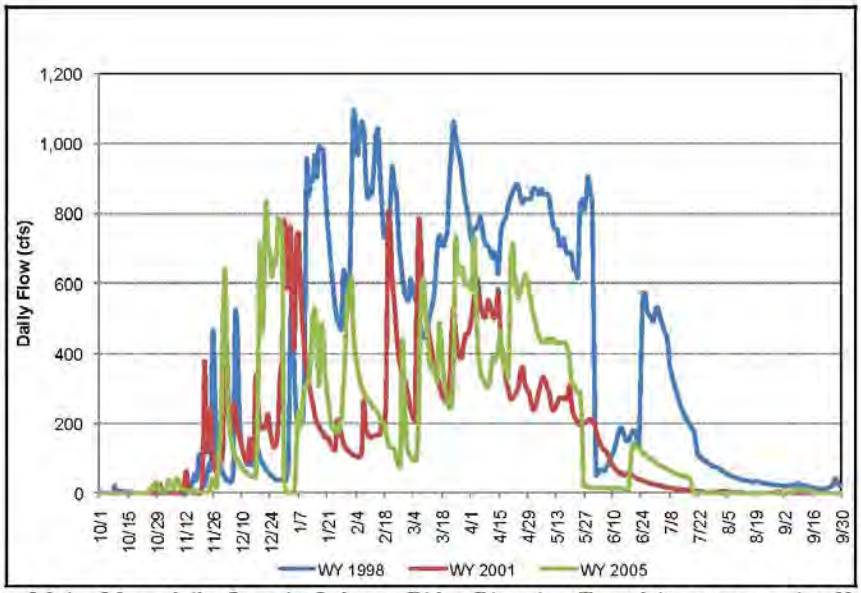

Figure 3.2-1. Mean daily flows in Lohman Ridge Diversion Tunnel in representative Normal (2005), Wet (1998) and Dry (2001) water years.

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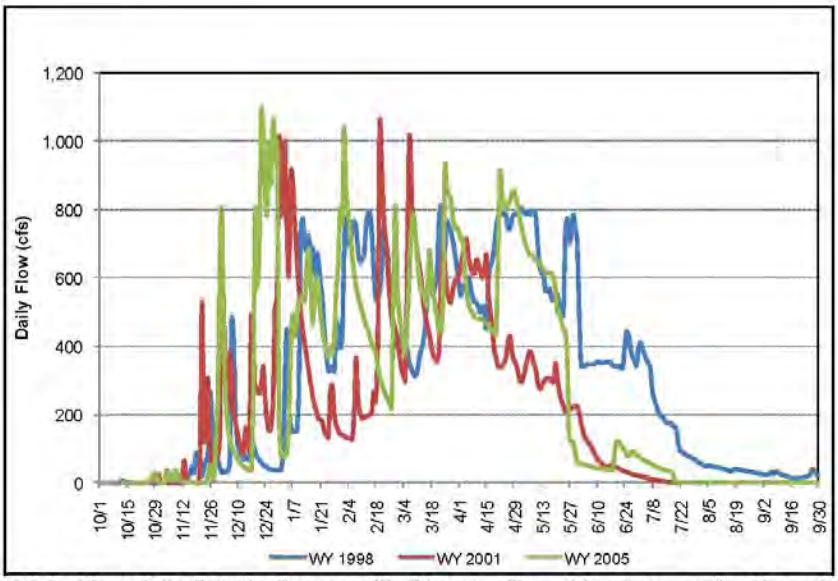

Figure 3.2-2. Mean daily flows in Camptonville Diversion Tunnel in representative Normal (2005), Wet (1998) and Dry (2001) water years.

As described above, the fish community potentially affected by entrainment into the Lowman Ridge Diversion Tunnel Intake is a transition fishery with no special-status, ESA-listed or CESA-listed fishes with the possible exception of hardhead. Little information is known concerning the potentially-affected fish community in Oregon Creek, but the fish and aquatic community is likely composed of the same fish as near the Lohman Ridge Diversion Tunnel intake.

Also as described above, WPT have been observed in Oregon Creek and at the Log Cabin Diversion Dam impoundment. They also occur in the Middle Yuba River above Our House Diversion Dam pool -and may occupy habitat provided at that impoundment. The existing gate structures at these intake tunnels would not prevent WPT from being entrained and washed ~~into~~down the tunnels. WPT are likely active from April through October. The timing of diversions, which includes the April through June period and sometimes into July (i.e., in wet Water Years), overlaps the active season of WPT. The spring season (April through June) is when juvenile and adult WPT are moving from upland overwintering areas to streams and reservoirs, and hatchlings are leaving nesting areas and moving to streams where risk of entrainment may be high.

While the two tunnels generally do not divert water from around mid July through October, significant amounts of water are diverted at other times of the year. Given the volume of water diverted by the two intakes, the potential for fish and other aquatic species to be entrained is high when the diversions occur, which could affect local fish and WPT populations.

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The outlet of the Camptonville tunnel where it daylights to New Bullards Bar Reservoir has potentially lethal effects on fish, WPT, and~~or~~ other aquatic life entrained into the tunnel at high or low reservoir surface elevations. At low reservoir elevations, the tunnel delivers flow to the reservoir,, onto substrate at an elevation higher than the reservoir water surface. Additionally, at this location, Forest Service, CDFG, and the Licensee's consultant observed thousands of Kokanee at the mouth of Willow Creek on November 10, 2011. These fish and resident rainbow trout could potentially be entrained as they attempt to enter the outlet to Camptonville tunnel. Fish passage into Willow Creek will be studied as part of Study 3.7 (Reservoir Fish Population). First year fish passage data will be considered when determining the need for second year entrainment studies.

4.0 Study Goals and Objectives

The goal of this study is to determine if the withdrawal of water at the Project's Lohman Ridge and Camptonville Diversion tunnel intakes are likely to have adverse effects on native fish populations, ~~and~~ WPT, and other aquatic life.

The objective of the study is characterizing entrainment rates into the two diversion tunnels.

In addition, although not part of this study (i.e., no fieldwork or specific analysis) this study's final report will incorporate information from the relicensing Reservoir Fish Populations Study (Study 3.7) to characterize the occurrence of fish in the deeper portions of New Bullards Bar Reservoir near, to the extent possible, the New Colgate Power Tunnel intake and in Englebright Reservoir near the Narrows 2 Power Tunnel intake.

5.0 Study Methods and Analysis

5.1 Study Area

The study area includes the Middle Yuba River in the immediate vicinity of Our House Diversion Dam and Oregon Creek in the immediate vicinity of the Log Cabin Diversion Dam.

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

YCWA will obtain all necessary permits prior to performing fieldwork.

5.2 General Concepts

The following general concepts and practices apply to the study:

- Personal safety is the most important consideration of each fieldwork team.

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- 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. A "minor variance" will be clearly defined in the Communications Guidelines; any exception from the study design that does not meet the definition for minor will be considered a "major" variance. 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.[4]
- 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 (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*

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

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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 Study Methods

The study methods consist of a Passive Integrated Transponder (PIT) tagging methodology for monitoring entrainment rates into the Lohman Ridge and Camptonville diversion tunnels. Each step in the study is described below.

5.3.1 Step 1 – Tag Fish

During fall 2012,[5] YCWA will collect fish on both Oregon Creek and the Middle Yuba River and implant each one with a PIT tag. YCWA's fish collection effort on both Oregon Creek and the Middle Yuba River will last for five work days or until 1,000 juvenile/adult trout are tagged, whichever occurs first. YCWA will collect and tag the juvenile/adult trout starting at the impoundment and moving upstream of each diversion over approximately a 2-mile length of impoundment and stream. The Licensees will schedule a consultation phone call with the Relicensing Participants to occur after the second day of tagging to discuss whether sufficient sample size will likely be achieved. If sufficient sample size does not seem likely at that time, the Relicesing Participants and the Licensee will discuss options for collection of additional fish including sampling from further upstream, or collecting additional fish from below Diversion Dam.

The minimum field crew size will be five people with two backpack electroshockers. Boat electroshockers will also be used on the impoundments. PIT tags will be implanted in each fish of appropriate size (≥60 millimeters Fork Length, or FL), and YCWA will record the location the fish was collected and the size of the fish (length as FL). Each tagged juvenile/adult ~~rainbow~~ trout will be released in the same general area that it was captured. After all PIT tags have been implanted, YCWA will promptly report the total number of juvenile/adult rainbow trout tagged to Relicensing Participants.[6]

5.3.2 Step 2 – Tag WPT

Visual surveys in 2012 under the Special-Status Turtles – Western Pond Turtle Study (Study 3.6) will serve to identify WPT habitat use in Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment. If WPT are sighted in the impoundment area or within ½ mile upstream of the impoundment, YCWA will proceed to study entrainment in this species. Baited hoop traps or basking traps will be used to capture WPT. Trapping will be performed ~~on~~ up to a total of five~~5~~ day or until 20 juvenile/adult turtles are collected ~~days~~ in each impoundment area. Searches for and capture by hand or dip-net of juvenile WPT in suitable

[5] CDFG's study stated that YCWA would tag juvenile/adult ~~rainbow~~ trout in fall 2011. YCWA has changed the tagging period from fall 2011 to fall 2012 because YCWA will not file the study plan with FERC for approval until winter 2011 (i.e., on December 29, 2011). Therefore, the tagging cannot begin in fall 2011.

[6] CDFG's study said to report to the "Aquatic TWG." The Yuba River Development Project relicensing does not have an "Aquatic TWG." Therefore, YCWA has changed this to reporting to the Relicensing Participants.

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habitats (e.g., vegetated shallow edgewater) will similarly occur for five days in each impoundment area. Trapping and hand-capture efforts will initially focus on the impoundments, within ~100ft of the diversion tunnel openings and then gradually move upstream only if enough WPT cannot be found in the impoundment. YCWA will consult with the Agencies in order to determine the best method for PIT tagging WPT (i.e. affix PIT tags to the top of the shell or injecting tags) to ensure best reception on a minimum of 10, and up to 20 juvenile or adult WPT found in the vicinity of the Lohman Ridge Diversion Tunnel intake entrance and the Camptonville Diversion Tunnel intake entrance. Each tagged WPT will be released in same general area that it was captured. If a minimum of 10 WPT cannot be captured within the immediate vicinity of each entrance, then WPT will be captured from elsewhere within the Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment or up to ½ mile upstream of the impoundment, and released where captured after tagging. However, if a minimum of 10 WPT cannot be captured and tagged in either impoundment, YCWA will consult with CDFG and USFS to determine how this ~~if this~~ study aspect should still be conducted.

5.3.3 Step 3 – Install Automatic Pit Tagging Readers and Calibrate the Reader System

YCWA will install automatic PIT tag readers in the Lohman Ridge Diversion Tunnel and the Camptonville Diversion Tunnel near the tunnel entrances. YCWA will conduct an initial calibration at each diversion tunnel PIT tag reader by passing a minimum of 10 PIT tags along numerous gridded points in the detection area to identify if there are any areas that will not detect the tag. Technicians will work to tune the antenna to its maximum detection range. Final detection range testing will be used to determine the maximum percent efficiency expected from the PIT tag detection station during monitoring.

There will be 3 levels of detection range efficiency based on tag size. The largest tag will be 32 mm, followed by 23 mm, and 12 mm. Fish and WPT will be tagged with the largest tag possible, but to detect rainbow trout as small as 60 mm or to tag juvenile WPT, a 12 mm tag will be used. Efficiencies for each tag group will be reported, but it is expected for range of detection to reduce by up to 50 percent for each tag group (e.g., 3 ft detection range for 32 mm tag, 2 ft for 23 mm tag, 1.5 ft for 12 mm tag). It is currently estimated that at 80 percent of monitoring area will be covered for all tags. If the calibration is less than 100~~80~~ percent for any tag group, YCWA will consult with the interested Relicensing Participants to determine collaboratively how best to correct measurements of entrainment based on initial efficiency testing results. Note that this consultation will occur soon after the calibration so that the study can proceed in fall 2012. Once the detection efficiency is initially set, field staff will work to maintain that efficiency within a range of 5 percent throughout the monitoring period.

5.3.4 Step 4 – Monitor Entrainment

YCWA will record the number of PIT tagged juvenile/adult rainbow trout and WPT passing

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through each diversion intake during the entire diversion season.[7]

5.3.5 Step 5 – Data Analysis

YCWA will correlate the number of PIT tagged fish entrained into each diversion tunnel to the percent of the total fish population upstream of the diversion that would potentially be entrained. The calculation will be performed as follows:

- Assume survival of the PIT tagged fish in the stream through the diversion season is equal to that of untagged fish in the stream, and assume approximately greater than 99 percent PIT tag retention and tagging survivorship of implanted.
- Calculate the percent of the trout population in the sampling reach PIT tagged by using the sampling from the relicensing Steam Fish Populations Upstream of Englebright Reservoir Study (Study 3.8)[8] fish population estimate (number/mile) and the number of fish PIT tagged (PIT tagged fish/estimated number of fish in the section of stream where fish were tagged).
- Calculate the percent of the PIT tagged fish entrained at the end of the diversion season (PIT tagged fish entrained/PIT tagged fish).
- Calculate the number of the fish in the sampling reach where fish were tagged present during the fall 2012 that were entrained during the diversion season (percent of fall 2012 PIT tagged fish entrained times estimated number of fish in the reach where fish were tagged in fall 2012).

Analysis of WPT entrainment data will consist of comparing the number of pit-tagged WPT that are detected passing through the tunnel entrances to the total numbers that are tagged. YCWA will not extrapolate WPT entrainment data to the population level since quantitative population estimates will not be developed.

For fish and WPT a table of all individuals PIT tagged, their size and age class, their location relative to the diversion intake (e.g., upstream, across reservoir, middle of reservoir, etc.), and their distance from the diversion intake will be provided.

5.3.6 Step 6 – QA/QC Data

YCWA will perform a quality assurance/quality control review of the data.

5.3.7 Step 7 – Prepare Report

[7] CDFG's study states that monitoring will occur from approximately December 2011 through June 2013. YCWA has changed the monitoring period to approximately December 2012 through June 2013 because YCWA will not file the study plan with FERC for approval until winter 2011 (i.e., on December 29, 2011). Therefore, the monitoring cannot begin in December 2011.

[8] As part of YCWA's Steam Fish Populations Upstream of Englebright Reservoir Study (Study 3.8), YCWA will do a three-pass electrofishing quantitative sampling in fall 2012 at one site on the Middle Yuba River approximately 0.5 mile upstream of Our House Diversion Dam impoundment and at one site on Oregon Creek approximately 0.5 mile upstream of Log Cabin Diversion Dam impoundment. YCWA will calculate fish per mile for each site.

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YCWA will prepare a report that includes the following sections: 1) Study Goals and Objectives; 2) Methods and Analysis; 3) Results; 4) Discussion; and 5) Description of Variances from the FERC-approved study proposal, if any.

For all special-status fish observations, YCWA will complete and file the appropriate CNDDB form.

6.0 Study-Specific Consultation

This study includes four study-specific consultations:

- Licensees will schedule a consultation phone call with the Relicensing Participants to occur after the second day of fish tagging to discuss whether sufficient sample size will likely be achieved. If sufficient sample size does not seem likely at that time, the Relicesing Participants and the Licensee will discuss options for collection of additional fish including sampling from further upstream, or collecting additional fish from below Diversion Dam.
- After all PIT tags have been implanted, YCWA will promptly report the total number of fish and turtles tagged to the Relicensing Participants (Step 1).
- If the PIT tag calibration is less than 100 percent, then YCWA will consult with the interested Relicensing Participants to determine collaboratively how best to correct measurements of entrainment based on PIT tag recordings (Step 3).
- If sufficient numbers of WPT cannot be captured and tagged to obtain meaningful entrainment results in either impoundment, YCWA will consult with CDFG and USFS to determine how this study aspect should be conducted (Step 2).
- Following data collection and 1st year reporting for Reservoir Fish Populations (Study 3.7), YCWA shall convene a technical meeting to discuss findings with Agency representatives from USFS, FWS, CDFG, SWRCB, NMFS and other interested Relicensing Participants. The YCWA and Agency representatives shall then make an informed decision regarding the need for additional study on entrainment risks associated with project operation at intake structures in Englebright Reservoir and New Bullards Bar Reservoir. A letter of record on this finding shall be transmitted to FERC for determination on additional study requirements.

7.0 Schedule

YCWA anticipates the schedule to complete the study as follows assuming that FERC approves the study by the end of January 2012 (i.e., approximately 30 days after December 29, 2011 when YCWA files the revised study plan with FERC):

Tag Fish (Step 1)..... September ~~October – November~~ 2012
Tag WPT (Step 2).....July or August – September~~October~~ 2012
Install Readers and Calibrate System (Step 3)..... August - September~~November~~ 2012
Monitor Entrainment (Step 4~~).....~~September ~~December~~ 2012 – August~~June or July~~ 2013
Data Analysis (Step 5)..... September ~~June – July~~ 2013

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QA/QC Data (Step 6)..... September ~~June – July~~ 2013
Prepare Report (Step 7) ..... September ~~July – August~~ 2013

8.0 Consistency of Methodology with Generally Accepted Scientific Practices

This study is consistent with the goals, objectives, and methods outlined for recent FERC hydroelectric relicensing efforts in California.

9.0 Level of Effort and Cost

YCWA believes the cost range estimate for this study in 2011 dollars to be from $400,000 to $500,000.[9]

10.0 List of Attachments

FERC's September 30, 2011 Determination required YCWA file the modified study plan with FERC within 90 days of the date of the Determination, allowing at least 30 days for agency comment on the proposed modifications. The attachments to this study plan provide documentation that YCWA provided the modified study plan to agencies for review, written comments on the modifications received from the agencies, and if YCWA did not adopt a agency request, the reason why the request was not adopted. The study plan attachments include:

Attachment 3-11A	YCWA's Transmittal of the Draft Study Plan to the Forest Service, USFWS, NMFS, SWRCB and CDFG
Attachment 3-11B	Written Comments on the Draft Study Plan from the Forest Service, USFWS, NMFS, SWRCB and CDFG
Attachment 3-11C	YCWA's Reply to Written Comments on the Draft Study Plan

10.0 References Cited

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[9] YCWA's Fish Entrainment Study in its August 2011 Revised Study Plan had an estimate cost range of between $175,500 and $235,000. With the modifications required by FERC in its September 30, 2011 Study Determination, the estimated cost range is between $400,000 and $500,000.

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ATTACHMENT 3-11C

YCWA's Reply
to
Written Comments on the Draft Study Plan

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Flood Control • Water Supply Fishery Enhancement • Recreation • Hydro Electric Generation

December 29, 2011

Electronically Transmitted

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Subject: Yuba River Development Project
FERC Project No. 2246-058
Reply to Comments on YCWA's
Revised Study 3.11, Entrainment

Dear Messrs. Quinn, Welsh and Smith:

On September 30, 2011, the Federal Energy Regulatory Commission's (FERC) Director of the Office of Energy Projects (Director) issued a Study Plan Determination (Determination) related to Yuba County Water Agency's (YCWA) relicensing of its Yuba River Development Project, FERC Project 2246.

The Determination required, in part, that YCWA modify YCWA's proposed Study 3.11, Fish Entrainment (Study) from YCWA's August 17, 2011 Revised Study Plan to include implementation of "*...Cal Fish and Game's requested entrainment study for fish and turtles using PIT-tags as it pertains to monitoring entrainment at Lohman Ridge and Camptonville tunnels at the Our House and Log Cabin diversions, respectively (section 5.3.2 of Cal Fish and Game's requested study plan filed August 30, 2011).*" (Page 19 of Appendix A of FERC's

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September 30, 2011 letter). Further, the Determination required YCWA file the modified Study with FERC within 90 days of the date of FERC's letter (i.e., by December 29, 2011), allowing at least 30 days for comment by agencies. The Determination required YCWA include in its filing copies of agency's comments, a discussion of how comments were addressed, and reason for not adopting any agency recommendations.

YCWA modified the Study as directed by the Determination and, on October 28, 2011, provided the draft modified Study for 30-day review and comment to the United States Department of Agriculture, Forest Service (Forest Service); United States Department of Interior, Fish and Wildlife Service (USFWS); United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS); California Department of Fish and Game (CDFG); and State Water Resources Control Board (SWRCB).

The Forest Service, USFWS and CDFG each provided comments in letters dated November 11, 2011. NMFS and SWRCB did not provide comments. The Forest Service's, USFWS's and CDFG's each included an identical redline of YCWA's October 28, 2011 draft modified Study showing the agency's comments. Since the comments on the draft modified Study from the three agencies are identical, YCWA provides its reply to the comments in this single letter, which is addressed to all three agencies. A copy of this letter is filed with FERC as part of the revised Study.

YCWA's reply focuses primarily on comments regarding methods, Study-specific consultation and schedule (Sections 5.3, 6.0 and 7.0, respectively, of the Study) to the extent the comments in those sections address fish and turtles entrainment monitoring into Lohman Ridge and Camptonville diversion tunnels. YCWA has not replied to agency comments on other portions of the draft modified Study since they do not affect the specifics of the Study, and YCWA may or may not have adopted comments in the other sections. In addition, YCWA appreciates the agencies' notation of typographic edits and has corrected those.

Provided below are YCWA's reply to the Forest Service's, USFWS's and CDFG's comments regarding the draft modified Study. For ease of reference, YCWA has duplicated (the redline and strikeout are those proposed by the agencies) and assigned an alpha-numeric designation to each of the comments. Immediately following each comment is YCWA's reply indicating whether YCWA has adopted the comment, adopted the comment with modification, or did not adopt the comment.

As a summary, of the 18 comments identified by YCWA in the agencies' letters, three comments were adopted, six comments were adopted with modification, and nine comments were not adopted. Note that of the nine not adopted comments, five comments (Agencies-6, -8, -10, -11 and -16) dealt with a single subject and two comments (Agencies-2 and -15) dealt with a single subject.

COMMENTS AND REPLIES

Agencies-1: *"YCWA's fish collection effort on both Oregon Creek and the Middle Yuba River will last for five work days or until 1,000 juvenile/adult trout are tagged, whichever occurs*

first." (Page 17 of 30, First Paragraph in Section 5.3.1, Step 1 - Tag Fish, Modification to Second Sentence)

YCWA's Reply: Adopted. YCWA consulted with the Forest Service and CDFG to confirm it was the intent of the agencies that: 1) tagging focus on both rainbow and brown trout collectively, and not all fish species; and 2) 1,000 fish or up to 5 days of effort, whichever is less, be expended upstream of Our House Diversion Dam and Log Cabin Diversion Dam each, and not collectively. Therefore, YCWA has modified the above sentence to read: "*During fall 2012,*[1] *YCWA will collect fish on both Oregon Creek and the Middle Yuba River and implant each one with a PIT tag. YCWA's effort will last for five work days or until a total of 1,000 juvenile/adult trout, comprised collectively of rainbow and brown trout, are tagged, whichever occurs first. This effort will be applied on both Oregon Creek and the Middle Yuba River, which would result in up to a maximum of 10 days of tagging or 2,000 fish tagged (whichever comes first) for both streams combined.*"

Agencies-2: "*YCWA will collect and tag the juvenile/adult trout starting at the impoundment and moving upstream of each diversion over approximately a 2-mile length of impoundment and stream. The Licensees will schedule a consultation phone call with the Relicensing Participants to occur after the second day of tagging to discuss whether sufficient sample size will likely be achieved. If sufficient sample size does not seem likely at that time, the Relicensing Participants and the Licensee will discuss options for collection of additional fish including sampling from further upstream, or collecting additional fish from below Diversion Dam*. (Page 17 of 30, First Paragraph in Section 5.3.1, Step 1 - Tag Fish, New Sentence at End of Paragraph)

YCWA's Reply: Not Adopted. YCWA has not adopted the agency's recommendation for three reasons. First, as stated in YCWA's reply to Agencies-1, the Study clearly establishes the geographic extent and limit of YCWA's tagging efforts – upstream of each diversion dam and for 5 consecutive work days or until 1,000 trout are tagged on the stream, whichever occurs first. YCWA believes this is a reasonable geographic area and effort. Second, the level of effort described in the draft modified Study is the level of effort proposed by CDFG, and which the Determination deemed to be appropriate. YCWA believes that tagging 1,000 trout or tagging all trout that can be tagged in 5 work days, which will likely extend at least 2 miles upstream of the diversion, is a "sufficient sample size" for the Study. YCWA's proposal is fully consistent with CDFG's initial request and the Determination. Third, YCWA believes that an open ended consultation is not needed given the level of effort (i.e., 5 work days or 1,000 trout). In particular, tagging trout from further upstream than 2 miles or downstream of the diversion, and presumably transporting them upstream, is contrary to the Study analysis – comparing the number of trout entrained to the trout population estimate from Study 3.8, Stream Fish Populations Upstream of Englebright Reservoir. This estimate of trout abundance would be developed just upstream of the diversion impoundment, not over 2 miles upstream of the

[1] CDFG's study stated that YCWA would tag juvenile/adult rainbow trout in fall 2011. YCWA has changed the tagging period from fall 2011 to fall 2012 because YCWA will not file the study plan with FERC for approval until winter 2011 (i.e., on December 29, 2011). Therefore, the tagging cannot begin in fall 2011.

diversion, and certainly would not include trout introduced to the stream from below the diversion. Also refer to YCWA's reply to Agencies-15.

Agencies-3: "*Boat electroshockers will also be used on the impoundments.*" (Page 17 of 30, Second Paragraph in Section 5.3.1, Step 1 - Tag Fish, New Sentence after First Sentence)

YCWA's Reply: Adopted. YCWA has added the following sentence to the Study: "*Also as part of the prescribed effort, a cataraft boat electrofishing unit will be used to sample each diversion impoundment.*"

Agencies-4: "*Each tagged juvenile/adult ~~rainbow~~ trout will be released in the same general area that it was captured.*" (Page 17 of 30, Second Paragraph in Section 5.3.1, Tag Fish, Modification to Third Sentence)

YCWA's Reply: Adopted. YCWA has deleted the word "*rainbow*" from this sentence and added a reference to WPT. Tagging will focus on both rainbow trout and brown trout collectively; other fish species will not be tagged or otherwise counted during the tagging effort.

Agencies-5: "*If WPT are sighted in the impoundment area or within ½ mile upstream of the impoundment, YCWA will proceed to study entrainment in this species.*" (Page 17 of 30, First Paragraph in Section 5.3.2, Step 2 - Tag WPT, Modification to Second Sentence)

YCWA's Reply: Not Adopted. YCWA has not adopted the recommendation. The Determination clearly stated that "*Pit tagging would only occur if turtles are found near the tunnel intakes.*" and (Page 19 of Determination). Defining "near" as within 0.5 mile upstream of the impoundment is also inconsistent with the Study approach advocated by CDFG in its August 30, 2011 comments on Study 3.6, Special-Status Turtles – Western Pond Turtle in YCWA's Revised Study Plan, in which intensive visual surveys for WPT are to "*focus on areas within 30 m (~100 ft) of the tunnel entrances.*"

Agencies-6: "*Trapping will be performed ~~on~~ up to a total of ~~5~~five day or until 20 juvenile/adult turtles are collected ~~days~~ in each impoundment area.*" (Page 17 of 30, First Paragraph in Section 5.3.2, Step 2 - Tag WPT, Modification to Fourth Sentence)

YCWA's Reply: Not Adopted. YCWA has not adopted the recommendation. This wording implies that trapping will continue until 20 turtles are collected, regardless of the required effort, and does not allow for the possibility that fewer turtles will be captured. The Determination clearly stated that "*Therefore, if an insufficient number of turtles are found inhabiting both reservoirs, YCWA should consult with Cal Fish and Game and the Forest Service to determine if the Pit-tagging should be conducted.*" (Page 19 of Determination). YCWA has included this consultation effort in the draft modified Study, as directed by FERC. Also refer to Agencies-8, -10, -11 and -16.

However, to increase the chances of obtaining the desired number of turtles for the study, trapping will be initiated during seasons when turtles are most actively foraging and basking, and beginning early in the morning. Based on the results of WPT visual surveys being conducted for

Study 3.6, Special-Status Turtles – Western Pond Turtle, trapping could begin as early as July. YCWA has adopted the following alternate wording: "*Trapping will be performed in Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment each for 5 work days or until a maximum of 20 juvenile/adult turtles are tagged, whichever occurs first.*" As stated at the end of Step 2, "*if sufficient numbers of WPT cannot be captured and tagged to obtain meaningful entrainment results in either impoundment, YCWA will consult with CDFG and USFS to determine if this study aspect should still be conducted.*"

Agencies-7: "*Searches for and capture by hand or dip-net of juvenile WPT in suitable habitats (e.g., vegetated shallow edgewater) will similarly occur for five days in each impoundment area.*" (Pages 17 and 18 of 30, First Paragraph in Section 5.3.2, Step 2 - Tag WPT, Modification to Fifth Sentence)

YCWA's Reply: Adopted with Modification. YCWA has modified the sentence to read "*These searches for juvenile WPT in suitable habitat will be performed in concert with the trapping at Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment each for 5 work days or until a maximum of 20 juvenile/adult turtles (combined results from trapping and searches) are tagged, whichever occurs first.*"

Agencies-8: "*Trapping and hand-capture efforts will initially focus on the impoundments, within ~100ft of the diversion tunnel openings and then gradually move upstream only if enough WPT cannot be found in the impoundment.*" (Page 18 of 30, First Paragraph in Section 5.3.2, Step 2 - Tag WPT, New Sentence)

YCWA's Reply: Not Adopted. Refer to YCWA's reply to Agencies-6, -10, -11 and -16.

Agencies-9: "*YCWA will consult with the Agencies in order to determine the best method for PIT tagging WPT (i.e. affix PIT tags to the top of the shell or injecting tags) to ensure best reception ~~affix PIT tags to the top shell~~ on a minimum of 10, and up to 20 juvenile or adult WPT found in the vicinity of the Lohman Ridge Diversion Tunnel intake entrance and the Camptonville Diversion Tunnel intake entrance.*" (Page 18 of 30, First Paragraph in Section 5.3.2, Step 2 - Tag WPT, Modification to Sixth Sentence)

YCWA's Reply: Adopted with Modification. YCWA has reviewed tagging methods and has concluded that externally attached tags will obtain the best results and will also be least invasive. YCWA has modified the sentence to indicate that PIT tags will be affixed to the top of the turtle's carapace (i.e., the shell).

Agencies-10: "*If a minimum of 10 WPT cannot be captured within the immediate vicinity of each entrance, then WPT will be captured from elsewhere within the Our House Diversion Dam impoundment and Log Cabin Diversion Dam impoundment or up to ½ mile upstream of the impoundment, and released where captured after tagging.*" (Page 18 of 30, First Paragraph in Section 5.3.2, Step 2 - Tag WPT, Modification to Seventh Sentence)

YCWA's Reply: Not Adopted. Refer to YCWA's reply to Agencies-6, -8, -11 and -16.

Agencies-11: "*However, if a minimum of 10 WPT cannot be captured and tagged in either impoundment, YCWA will consult with CDFG and USFS to determine how this ~~if this~~ study aspect should still be conducted.*" (Page 18 of 30, First Paragraph in Section 5.3.2, Step 2 - Tag WPT, Modification to Last Sentence)

YCWA's Reply: Not Adopted. Refer to YCWA's reply to Agencies-6, -8, -10 and -16.

Agencies-12: "*If the calibration is less than 100 ~~80~~ percent for any tag group, YCWA will consult with the interested Relicensing Participants to determine collaboratively how best to correct measurements of entrainment based on initial efficiency testing results.*" (Page 18 of 30, Second Paragraph in Section 5.3.3, Step 3 – Install Automatic Pit Tagging Readers and Calibrate the Reader System, Modification to Fifth Sentence)

YCWA's Reply: Not adopted. YCWA has investigated and presented historical findings on the abilities of the PIT monitoring technology to Relicensing Participants. YCWA clearly identified that the PIT monitoring station would likely not achieve 100 percent efficiency and that 80 percent would be an ambitious, but reasonable starting point for the monitoring stations. It is unreasonable to assume that any monitoring station, regardless of location or technology is 100 percent efficient. YCWA has included the following in the Study regarding collaboration on efficiency: *"If the calibration is less than 80 percent for any tag group, YCWA will collaborate with the interested Relicensing Participants to determine how best to correct measurements of entrainment based on initial efficiency testing results. Note that this collaboration will occur soon after the calibration so that the study can proceed in fall 2012."*

Agencies-13: "*YCWA will record the number of PIT tagged juvenile/adult rainbow trout and WPT passing through each diversion intake during the entire diversion season.*" (Page 18 of 30, First Paragraph in Section 5.3.4, Step 4 – Monitor Entrainment, Modification to First Sentence)

YCWA's Reply: Adopted with Modification. YCWA notes that CDFG's November 11, 2011 letter recommended that monitoring occur from approximately December 2011 through June 2012 (Page 17 of CDFG's recommended study) and FERC's Determination notes that diversions normally occur from November through mid-July (Page 17 of Appendix A). Since YCWA must plan to have fish tagged and the automatic PIT tagging readers installed before the diversion season, YCWA has modified the sentence to read "*YCWA will record the number of PIT tagged juvenile/adult trout and WPT passing through each diversion intake from November 1, 2012 through July 15, 2013. It is assumed this period will cover the entire 2012-2013 diversion season. If the diversion season extends past July 15, 2013, YCWA will extend the monitoring until diversions end.*"

Agencies-14: "*For fish and WPT a table of all individuals PIT tagged, their size and age class, their location relative to the diversion intake (e.g., upstream, across reservoir, middle of reservoir, etc.), and their distance from the diversion intake will be provided.*" (Page 19 of 30, New Paragraph Added to End of Section 5.3.5, Step 5 – Data Analysis)

YCWA's Reply: Adopted with Modification. YCWA will add a sentence to the Study that

states "*The methods for tagging fish and WPT are presented separately (Step 1 and 2, respectively). However, for each trout and WPT tagged, YCWA will record the individual's length in millimeters (i.e., fork length for trout and carapace length for WPT), weight in grams, and the location at which the individual was captured (i.e., GPS coordinates). Each tagged WPT will also be photographed. This information, as well as the distance in tenths of a mile upstream of the Project diversion intake where the tagged trout or WPT was released, will be included in the final study report. Each tagged juvenile/adult trout and WPT will be released in the same general location at which it was captured.*" YCWA does not propose to develop an age class estimate for each of the up to 1,000 tagged trout and for the WPT.

Agencies-15: "*Licensees will schedule a consultation phone call with the Relicensing Participants to occur after the second day of fish tagging to discuss whether sufficient sample size will likely be achieved. If sufficient sample size does not seem likely at that time, the Relicensing Participants and the Licensee will discuss options for collection of additional fish including sampling from further upstream, or collecting additional fish from below Diversion Dam.*" (Page 20 of 30, New Bullet Added to Beginning of Section 6.0, Study-Specific Consultation)

YCWA's Reply: Not Adopted. Refer to YCWA's reply to Agencies-2.

Agencies-16: "*If sufficient numbers of WPT cannot be captured and tagged to obtain meaningful entrainment results in either impoundment, YCWA will consult with CDFG and USFS to determine how this ~~if this~~ study aspect should be conducted (Step 2).*" (Page 20 of 30, Modification to Third Bullet in Section 6.0, Study-Specific Consultation)

YCWA's Reply: Not Adopted. Refer to YCWA's reply to Agencies-6, -8, -10 and -11.

Agencies-17: "*Following data collection and 1st year reporting for Reservoir Fish Populations (Study 3.7), YCWA shall convene a technical meeting to discuss findings with Agency representatives from USFS, FWS, CDFG, SWRCB, NMFS and other interested Relicensing Participants. The YCWA and Agency representatives shall then make an informed decision regarding the need for additional study on entrainment risks associated with project operation at intake structures in Englebright Reservoir and New Bullards Bar Reservoir. A letter of record on this finding shall be transmitted to FERC for determination on additional study requirements.*" (Page 20 of 30, New Bullet Added to End of Section 6.0, Study-Specific Consultation)

YCWA's Reply: Adopted with Modification. YCWA has modified the Study to include the following statement: "*Entrainment monitoring as part of this [Entrainment] study is not proposed at either New Bullards Bar or Englebright Reservoir. However, under YCWA's Reservoir Fish Populations Study (Study 3.7) gillnet sampling at depths up to 100 ft near the Project intakes in New Bullards Bar and Englebright reservoirs will occur in 2012. The results of this gillnet sampling will be presented in the Entrainment Study technical memorandum. YCWA will collaborate with the Forest Service, USFWS, CDFG, SWRCB and other interested Relicensing Participants regarding the results of the gillnet sampling and the need for additional entrainment-related information in New Bullards Bar and Englebright reservoirs. If it is*

collaboratively agreed that additional information is needed, YCWA, in collaboration with the agencies, will develop a study plan to gather the information and file the plan with FERC for approval."[2]

Agencies-18:

Tag Fish (Step 1)..... September ~~October – November~~ 2012
Tag WPT (Step 2).....July or August – September ~~October~~ 2012
Install Readers and Calibrate System (Step 3)..... August - September ~~November~~ 2012
Monitor Entrainment (Step 4 ..... September ~~December~~ 2012 – August ~~June – July~~ 2013
Data Analysis (Step 5) ..... September ~~June – July~~ 2013
QA/QC Data (Step 6)..... September ~~June – July~~ 013
Prepare Report (Step 7) .....September ~~July – August~~ 2013

(Page 20 of 30, Modification to Section 7.0, Schedule)

YCWA's Reply: Adopted with Modification. YCWA has made minor alterations to the proposed schedule. Diversion monitoring will not need to begin until diversions occur, which would require a start date on November 1. The monitoring stations will be set-up in advance and fish and WPTs will be collected and tagged in advance. WPTs may require earlier tagging periods, as they overwinter in the fall, which reduces the potential for being collected. Additional time is also allotted for reporting, considering that both fish and WPTs will be investigated. The schedule has been changed as provided below.

Tag Fish (Step 1)..... September 2012
Tag WPT (Step 2).....July or August – September 2012
Install Readers and Calibrate System (Step 3) ..... September – October 2012
Monitor Entrainment (Step 4 .....November 2012 – August 2013
Data Analysis (Step 5) ..... September 2013
QA/QC Data (Step 6)..... September 2013
Prepare Report (Step 7) ..... October 2013

[2] Note that the FERC-approved Reservoir Fish Populations Study (Study 3.7) is a 1-year study. The agency's comments suggest that it is a multiple year study, which is incorrect.

If you have any questions regarding this matter, please contact me

Sincerely,
YUBA COUNTY WATER AGENCY

Curt Aikens
General Manager

cc: Alan Mitchnick – FERC DC
Ken Hogan – FERC DC

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