



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
SOUTHWEST REGION  
777 Sonoma Avenue, Room 325  
Santa Rosa, California 95404-4731

October 20, 2011

In response refer to:  
SWR/F/SWR3/LT/P-2246

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

Subject: Notice of Study Dispute for the Yuba River Hydroelectric Project (P-2246-058).

Dear Secretary Bose:

The National Marine Fisheries Service (NMFS) timely files herein its Notice of Study Dispute in the Integrated Licensing Process (ILP) (18 CFR § 5.14) for the Yuba River Hydroelectric Project. NMFS does so following its review of the Commission's Study Plan Determination for the Project (issued September 30, 2011) and other information including the Preliminary Application Document (PAD), Proposed Study Plan, and Revised Proposed Study Plan filed by the Yuba County Water Agency (Applicant for a new Project license).

NMFS finds several of its requests for information or study (Requests) filed March 7, 2011, are not adequately incorporated among those the Commission has ordered the Applicant to carry out in its Study Plan Determination. NMFS also finds that additional clarifications and discussions are necessary to fully understand what the Commission has ordered, and the rationale for the Commission's decisions.

The ILP regulations (18 CFR § 5.14 (a)) require a disputing Federal agency with authority to prescribe fishways pursuant to Federal Power Act Section 18, 16 U.S.C. § 811 to file, within 20 days of the Study Plan Determination, a notice of study dispute with respect to studies pertaining directly to the exercise of their authorities under section 18 of the Federal Power Act. NMFS is a bureau of the National Oceanic and Atmospheric Administration (NOAA) and exercises the authority of the Secretary of Commerce to prescribe fishways for inclusion in hydropower licensing orders, pursuant to Federal Power Act § 18. This Notice of Study Dispute is (timely)

filed with respect to requests for information or study filed by NMFS, and the Requests pertain directly to the exercise of NMFS' fishway prescriptive authorities.

With this notice, NMFS identifies the following Requests under dispute:

1. Effects of the Project and Related Activities on Fish Passage for Anadromous Fish;
2. Effects of the Project and Related Activities on Hydrology for Anadromous Fish;
3. Effects of the Project and Related Activities on Water Temperatures for Anadromous Fish Migration, Holding, Spawning, and Rearing Needs;
4. Effects of the Project and Related Activities on Coarse Substrate for Anadromous Fish: Sediment Supply, Transport and Storage;
5. Effects of the Project and Related Activities on Large Wood and Riparian Habitat for Anadromous Fish;
6. Effects of the Project and Related Activities on the Loss of Marine-Derived Nutrients in the Yuba River;
8. Anadromous Fish Ecosystem Effects Analysis: Synthesis of the Direct, Indirect, and Cumulative Effects of the Project and Related Facilities on Anadromous Fish.

The ILP regulations (18 CFR § 5.14 (b)) require that a notice of study dispute explain how the disputing agency's requests satisfy the criteria set forth in § 5.9 (b). The Requests filed in this ILP are included in their entirety in Enclosure B of this filing, and for each Request now under dispute, NMFS provides detailed explanations of how the criteria set forth in § 5.9 (b) are satisfied. Additional written explanations and clarifications of how the § 5.9 (b) criteria have been met are provided by NMFS in its Comments on the Applicant's Proposed Study Plan (July 18, 2011) and in its Comments on the Applicant's Revised Proposed Study Plan (September 1, 2011). Oral explanations of how the § 5.9 (b) criteria are met were provided by NMFS during ILP meetings, including a full-day session (June 17, 2011) with the Applicant and Commission staff; in that meeting, NMFS discussed all its Requests in an attempt to resolve outstanding study issues (§ 5.11 (e)). Additional clarifications are provided herein, and will be delivered during the Study Dispute Technical Conference.

The ILP regulations (18 CFR § 5.14 (b)) require that a notice of study dispute identify and provide contact information for the panel member designated by the disputing agency. NMFS

identifies Mr. David White: a fisheries engineer with NMFS Southwest Region (see: Enclosure A, p.5).

The ILP regulations (18 CFR § 5.14 (c)) state that studies and portions of study plans approved in the Study Plan Determination that are not the subject of a notice of dispute shall be deemed to be approved, and the potential Applicant shall proceed with those studies or portions thereof. NMFS noted in the Study Plan Determination instances where Commission staff orders the Applicant to plan and carry out studies in coordination with NMFS (and other agencies), with submission to the Commission for approval. NMFS objects to orders by the Commission that assign an active role to NMFS without prior consultation, while appearing to reserve a more a passive role for Commission staff until later in time (when they act in an approval role). It is the Commission (as the licensing agency) that is ordering study in its Study Plan Determination, not NMFS or other ILP interested parties. Therefore, Commission staff must assume the lead role to assure the order is carried out as they intended. This is especially important in this instance because the Commission's Study Plan Determination for this Project orders additional study components that lack sufficient detail or require additional planning to assure they are executed to meet the Commission's order requirements. Therefore, Commission staff should not reserve for itself an approval role only, but become active as soon as possible to assure any study plan elements under further development will satisfy its requirements. NMFS welcomes consultation with Commission staff to determine if technical support can be provided by NMFS on specific, individual tasks that seek to obtain scientifically defensible information for Project licensing uses.

If you have questions regarding this filing, please contact Mr. Larry Thompson at (916) 930-3613.

Sincerely,



Richard L. Wantuck  
Hydropower Program Supervisor  
Habitat Conservation Division

Enclosures

cc: Steve Edmondson, NMFS, Santa Rosa, CA  
Maria Rea, NMFS, Sacramento, CA  
Service List P-2246

**UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION**

**Yuba County Water Agency            )**  
**Yuba River Hydroelectric Project    )**  
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**P-2246-058**

**NOTICE OF STUDY DISPUTE**

**Introduction**

The Integrated Licensing Process (ILP) should, to the extent reasonably possible, serve to establish an evidentiary record upon which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. Notice of Proposed Rulemaking, Federal Energy Regulatory Commission, Hydroelectric Licensing Under the Federal Power Act, 68 FR 13988, 13995; March 21, 2003. Through its requests for information or study (Requests), the National Marine Fisheries Service (NMFS) seeks to determine whether and how the Project's facilities and operations will affect NMFS' trust resources. These are basic determinations that form the foundation for the Commission's licensing order. In all cases, NMFS' Requests seek to obtain information about the direct, indirect, or cumulative effects of the Project on:

- The anadromous species of direct concern to, and under the jurisdiction of, NMFS;

- The primary constituent elements of anadromous fish critical habitat in the lower Yuba River and areas downstream, including freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas (in the Bay/Delta); and
- The functions of essential fish habitat (EFH) for Chinook salmon spawning, incubation, juvenile rearing, juvenile migration, adult migration, and adult holding in the Yuba River (including in areas upstream of the Project's Narrows 2 Powerhouse facilities and Englebright Dam), and in areas downstream to the Bay/Delta.

NMFS' Requests are intended to provide information that directly applies to:

- Exercise of its Federal Power Act Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;

Since collecting information for multiple, complementary uses is more efficient than repeating study several times for discrete, individual purposes, NMFS' Requests are also intended to support the following uses:

- Development of NMFS' future Federal Power Act Section 10(j) and 10(a) recommendations for protection, mitigation, and enhancement measures;
- Development of NMFS' recommended measures during Magnuson-Stevens Fishery Conservation and Management Act (MSA) consultation with the Commission regarding the effects of Project on identified essential fish habitat (EFH) for Chinook salmon; and

- Endangered Species Act (ESA) Section 7 consultation (informal and, potentially, formal) between the Commission and NMFS regarding Project effects on threatened species and designated critical habitats in the Yuba River, and in areas downstream.

Furthermore, NMFS has designed its Requests for multiple, complementary uses because improving efficiency in the study phases of licensing was a primary motivation for the multi-agency efforts that resulted in the Interagency Task Force Reports; one report (ITF 2000) was specifically produced for the purpose of streamlining the hydropower licensing process by coordinating and integrating Endangered Species Act (ESA) consultation with the Federal Power Act licensing process. It is obvious to NMFS that study results pertaining to the exercise of its fishway prescriptive authority cannot be easily separated from study results that inform ESA consultation (nor should they be separated, as fishway prescriptive authority would be exercised by NMFS in a licensing order, which could issue only if the Commission could insure that the Project would not be likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Upon review of the Commission's Study Plan Determination for the Project, NMFS finds several of its Requests are not adequately incorporated among those ordered by the Commission to be completed. Therefore, NMFS disagrees with the Commission's Study Plan Determination, and thereby files this Notice of Study Dispute for the following NMFS Requests:

1. Effects of the Project and Related Activities on Fish Passage for Anadromous Fish.
2. Effects of the Project and Related Activities on Hydrology for Anadromous Fish.

3. Effects of the Project and Related Activities on Water Temperatures for Anadromous Fish Migration, Holding, Spawning, and Rearing Needs.
4. Effects of the Project and Related Activities on Coarse Substrate for Anadromous Fish: Sediment Supply, Transport and Storage.
5. Effects of the Project and Related Activities on Large Wood and Riparian Habitat for Anadromous Fish.
6. Effects of the Project and Related Activities on the Loss of Marine-derived Nutrients in the Yuba River.
8. Anadromous Fish Ecosystem Effects Analysis: Synthesis of the Direct, Indirect, and Cumulative Effects of the Project and Related Facilities on Anadromous Fish.

NMFS filed its Requests to obtain Project-specific effects information NMFS did not find in the Applicant's Preliminary Application Document (PAD). While the Commission's Notice of Intent to File License Application for a New License and Commencing Pre-filing Process (January 4, 2011) announced the filing of the PAD, it did not review the PAD content against its requirements (§ 5.6 (d)). Thus, NMFS' Requests were filed (March 7, 2011) to fill gaps it identified with regard to the PAD's treatment of information relevant to Yuba River anadromous fishes and habitats. The Requests were also filed to fill gaps NMFS identified after Commission scoping of the Project. NMFS observes the Commission staff did not develop and submit any information or study requests in response to the Applicant's PAD, or following the Project site visit or public scoping meetings.

**NMFS is a Bureau of the National Oceanic and Atmospheric Administration and Exercises the Authority of the Secretary of Commerce to Prescribe Fishways for Inclusion in Hydropower Licensing Orders**

The ILP regulations (§ 5.14 (a)) require a disputing Federal agency with authority to prescribe fishways pursuant to Federal Power Act Section 18, 16 U.S.C. § 811 to file, within 20 days of the Study Plan Determination, a notice of study dispute with respect to studies pertaining directly to the exercise of their authorities under section 18 of the Federal Power Act. NMFS is a bureau of the National Oceanic and Atmospheric Administration (NOAA) and exercises the authority of the Secretary of Commerce to prescribe fishways for inclusion in hydropower licensing orders, pursuant to Federal Power Act § 18. This Notice of Study Dispute is timely filed with respect to Requests previously filed by NMFS and pertaining directly to the exercise of NMFS' fishway prescriptive authorities.

**NMFS' Requests Satisfy the Criteria Set Forth in the ILP Regulations**

The ILP regulations (§ 5.14 (b)) require that a notice of study dispute explain how the disputing agency's requests satisfy the criteria set forth in §5.9 (b). NMFS has shown how each of its Requests (March 7, 2011) satisfy the criteria set forth in §5.9 (b). NMFS' Requests, filed in this ILP, are included in their entirety in Enclosure B of this Notice of Study Dispute filing. For each Request now under dispute, NMFS provides detailed explanations of how the criteria set forth in §5.9 (b) are satisfied. Additional written explanations and clarifications of how the criteria set forth in §5.9 (b) are met were provided by NMFS in its Comments on the Applicant's Proposed Study Plan (July 18, 2011) and its Comments on the Applicant's Revised Proposed Study Plan



(September 1, 2011). Oral explanations to Commission staff about how §5.9 (b) criteria are met in NMFS' Requests were provided during ILP meetings, including a full-day session (June 17, 2011) with the Applicant where NMFS discussed all its Requests in detail, in an attempt to resolve outstanding study issues (§ 5.11 (e)). If necessary, additional clarifications can be delivered by NMFS staff during the Study Dispute Technical Conference. However, since this Conference will focus on issues that are not reconciled by the Commission staff's Study Plan Determination, NMFS expects equal time will be devoted to Commission staff explanations of how all elements of the Proposed Study Plan, as recently approved by the Commission, met the study plan content criteria § 5.11 (d). NMFS notes the burden prior to a study plan determination is on the applicant to demonstrate its compliance with the study plan content criteria set out in § 5.11(d). Thus, Commission staff is expected to explain in detail how the standards they have applied to the Applicant's Proposed Study Plan are equally applied to the NMFS study requests. We further expect that the format and agenda of the Conference will include a specific time period or method to look at issues related to the consistency of Commission's determinations with the § 5.9 (b) and § 5.11 (d) regulations.

### **NMFS Identifies and Provides Contact Information for the Agency Panelist**

The ILP regulations (§ 5.14 (b)) require that a notice of study dispute identify and provide contact information for the panel member designated by the disputing agency; NMFS identifies David White, NMFS Fisheries Engineer, to act as the agency panelist. Mr. White has no direct involvement with this Project ILP, and therefore is not otherwise involved in the proceeding. § 5.14 (b). Mr. White's contact information is: David K. White, National Marine Fisheries Service, Habitat Conservation Division, 777 Sonoma Avenue, Santa Rosa, CA 95404. His

phone number is (707) 575-6810, his FAX number is (707) 578-3435, and his email address is [David.K.White@noaa.gov](mailto:David.K.White@noaa.gov).

## **NMFS' Requests Pertain Directly to the Exercise of its Authorities under Section 18 of the Federal Power Act**

### 1. Effects of the Project and Related Activities on Fish Passage for Anadromous Fish;

Staff of the Commission's Office of Energy Projects (OEP), in its Study Plan Determination, has disagreed with NMFS' reasoning regarding the nexus between the Narrows 2 Development and the effects of these Project facilities and operations on upstream fish passage of anadromous fishes:

*We do not agree with NMFS' reasoning with respect to the role of YCWA's Narrows 2 powerhouse and upstream fish migration. (p. 38)*

and

*Consequently, NMFS has failed to demonstrate a nexus between studying anadromous fish passage upstream of Englebright dam and the Narrows 2 powerhouse (study criterion 5). (p. 39).*

NMFS' view is that by restricting or rejecting Request #1, OEP staff is predetermining the effects of the Project (Narrows 2 Development) on fish passage, without study. In turn, this predetermination could hinder NMFS' ability to fully inform itself through the means provided by the ILP in exercising its §18 authority. NMFS urges the Commission to mandate studies sufficient for the Commission to ensure that its licensing order is supported by a fully-developed record.

NMFS finds sufficient, existing indications of nexus between the Narrows 2 Development and upstream passage for anadromous fishes. In its prior filings NMFS discussed existing information regarding conceptual fish passage options developed for the vicinity of the Narrows 2 Development and Englebright Dam (MWH 2010). NMFS filed the information in this ILP (March 7, 2011, Enclosure H). MWH (2010) contains abundant considerations of the fish passage effects of the Narrows 2 Development as they contemplated various fish passage options in the vicinity of the hydropower complex that includes: Narrows 1 & 2 hydropower facilities Development, Englebright Dam, and Englebright Reservoir. For example, with regard to a fish ladder MWH (2010) identified a potential site for an upstream passageway entrance directly adjacent to and below the Narrows 2 Powerhouse (MWH 2010, p. 6-2, 6-3, Plates 3 and 4); the engineers did not identify the toe of Englebright Dam as a likely location in the vicinity for a successful upstream fishway entrance. In the discussion of the option of a fish ladder extending from near the base of the Narrows 2 Development to Englebright Reservoir, MWH (2010) states:

*An entrance structure would be located adjacent to the Narrows II powerhouse (Plates 3 and 4). (p. 6-2).*

*The auxiliary water system (AWS) would deliver approximately 340 cfs to the ladder entrance pool, which represents 10 percent of the peak discharge flow from the Narrows II powerhouse. To provide the attraction flows, the Narrows II powerhouse would be modified to direct flows from the draft tube into the AWS. (p. 6-3)*

*Modification of the powerhouse might be required and may require a temporary shutdown of the Narrows II powerhouse and hard rock boring to establish a pipeline connection from the draft tube to the fish ladder entrance chamber. The modification to the powerhouse would create about 2 feet of head to deliver the auxiliary water. (p. 6-3).*

*Pilot facilities could be built as a first phase of this alternative. Initial development would consist of construction of the entrance pool and AWS. (p. 6-3).*

NMFS finds this information establishes a connection (nexus) between anadromous fish passage and the Project's Narrows 2 Development – the Narrows 2 Powerhouse facilities provide the dominant attraction flows for upstream anadromous fish migrants, and fish passage experts have recognized the importance of this connection in their conceptual designs for a fish ladder in the vicinity.

In the discussion of a tramway option that would extend from near the base of the Narrows 2 Development to Englebright Reservoir, MWH (2010) states:

*Upstream passage over Englebright Dam via a fish tramway (Plate 5) would provide semi-volitional fish passage. (p. 6-4).*

*An AWS for the downstream fish entrance is assumed to be supplied by tapping the Narrows II penstock. An entrance and collection structure consisting of holding ponds would be constructed adjacent to the Narrows II powerhouse. The entrance structure would have multiple entrance gates, an entrance pool, and an*

*auxiliary water supply to attract fish to the ladder entrance. The AWS would deliver approximately 340 cfs to the ladder entrance pool, which represents 10 percent of the peak discharge flow from the Narrows II powerhouse. To provide the attraction flows, the Narrows II powerhouse would be modified to direct flows from the draft tube into the AWS. (p. 6-5).*

*Since downstream pool water comes from the deep reservoir water via the Narrows II penstock and the upstream pool water would come from near surface water pumps on the reservoir, it is likely that the water supplied to the downstream holding pools would be colder than the water in the upstream holding pool. Depending on the temperature differential, it may be necessary to pump water from different levels into the upstream release pool to transition fish to the same water temperature as flows entering the holding at the base of the dam. This water temperature issue should be analyzed in the next phase of analysis. (p. 6-5).*

With respect to a collection and transport fishway option extending from near the base of the Narrows 2 Development to the upper Yuba River, MWH (2010) identifies potential collection facilities adjacent to the Narrows 2 Powerhouse, due to “Fish attraction and entrance same as ladder or tramway” (Table 4-1, p. 4-3). Again, NMFS finds this information establishes a connection (nexus) between anadromous fish passage and the Project’s Narrows 2 Development – the Narrows 2 Powerhouse facilities provide the dominant attraction flows for upstream anadromous migrants, and experts have recognized the importance of this connection in their conceptual fishway designs.

Note also the nexus identified (p. 6-5) between the Project’s Narrows 2 intake and penstock and their effects on water temperature differential that could affect the

effectiveness of a fishway. An important point here is that fish passage engineers and biologists recognize the utility of further phases of study, as they contemplate the potential effects of the Narrows 2 Development and related facilities (e.g. Englebright Dam) on fish passage.

NMFS notes MWH (2010) also includes a conceptual fish passage option for collecting adult anadromous fishes near the base of Daguerre Point Dam, with transport options to targeted habitats of the upper Yuba River (in the South, Middle, and North Yuba rivers) (pp. 5-1 to 5-3; 6-6 to 6-9). It may be that the effects of the Narrows 2 Development and other Project facilities on anadromous fish passage (if more completely understood) warrant locating a point of collection for upstream anadromous migrants well downstream of the Narrow 2 Powerhouse. Thus, NMFS' Request #1 has been submitted, in part, for additional study to inform its fishway prescriptive authorities with regard to decisions about the point of downstream collection for a potential fishway. NMFS notes that MWH (2010) also presented information about collection and transport facilities in terms of potential "interim or pilot" programs (Section 5). NMFS prescription of a fishway could be implemented as a phased approach, and such implementations would be informed by the study of Project effects contained in Request #1.

NMFS notes the general recognition (throughout the MWH report) of Englebright Reservoir and Englebright Dam as features that require consideration in the design of fish passageway options in the vicinity. This contrasts with OEP staff's views expressed in the Study Plan Determination (p. 38, footnote 13) where they correctly recognize that

Englebright Dam blocks access by listed salmonids to the habitat above the Dam, but rule out consideration of the role of the Project's Narrows 2 Development by expecting that any studies of fish passage would be related to NMFS' ongoing ESA consultation with the U.S. Army Corps of Engineers (Corps). The MWH report (2010) demonstrates that adequate evaluation of fish passage effects in the vicinity of the Narrows 2 Development and Englebright Dam will require additional study that considers both facilities in the design of fish passageway options.

The nexus between Narrows 2 Development and fish passage demonstrates to NMFS the unrealistic nature of OEP staff's view that any studies of fish passage in the vicinity should be excluded from this Federal Power Act ILP, and rather conducted only during NMFS' ongoing ESA consultation with the Corps. NMFS' decisions to either: (1) prescribe, (2) not prescribe, or (3) reserve authority over the license term should be informed by results of study such as would be yielded from satisfying NMFS' Request #1.

OEP staff also appears to prematurely (and impermissibly) decide upon a future execution of NMFS' statutory authority to prescribe fishways when it predetermines (incorrectly, and without further study) that any Project effects on upstream fish passage are limited to the 400 feet between the Narrows 2 Powerhouse outlet and Englebright Dam:

*The Narrows 2 powerhouse is located nearly 400 feet downstream from the Englebright dam. Therefore, any project effects on upstream fish passage are*

*limited to the 400 feet between the Narrows 2 powerhouse outlet and Englebright dam, which is the next barrier for upstream fish passage. (p. 38).*

In addition to noting that OEP staff appears to acknowledge that the outlet of the Narrows 2 Development is a barrier (and Englebright Dam is the next upstream barrier), without gathering substantial evidence, OEP staff also appears to presume that NMFS' would exercise its fishway prescriptive authority to pass fish only around or past the Narrows 2 Powerhouse to the 400 feet of the Yuba River upstream to Englebright Dam. This appears to ignore, or even rule out, that NMFS may determine that upstream passage to targeted, suitable habitats of the upper Yuba River would be an option chosen. NMFS' point is that its decisions to either: (1) prescribe, (2) not prescribe, or (3) reserve authority over the license term should be informed by results of study such as proposed in NMFS' Request #1.

NMFS also wishes to point out that upstream passage around or past the Narrows 2 Powerhouse may not provide access by anadromous fishes to the 400 feet up to the base of Englebright Dam. First, this may not occur during times when Englebright Dam is not spilling because it is likely that insufficient attraction flows would occur during these times (which are most months of the year). Second, NMFS has observed (and photographed) during multiple site visits that only a confined, narrow waterway remains under some release flows for potential upstream fish passage beyond the vicinity of the Narrows 2 Powerhouse. There is a significant bedrock outcrop in the stream channel which becomes exposed and dewatered when discharges from Narrows 2 are reduced or bypassed, thus creating an additional impediment to further fish passage to the base of



Englebright Dam (Enclosure C, Photo #4). Third, this narrow waterway is located on river left while the attraction flows provided by the Narrows 2 Powerhouse occur on river right, and so upstream migrants would be expected to leave the dominant attraction flow on one side of the river and cross over to seek a narrow, slow-flowing waterway as an upstream route; this is unlikely behavior to be expected from upstream migrating anadromous fishes. Fourth, the narrow upstream waterway to the remaining 400 feet up to the base of Englebright Dam may not exist at all during times when the Narrows 2 Powerhouse is shut down for maintenance and the Narrows 2 Flow Bypass is in operation; this is a valve and penstock branch off the main Narrows 2 Penstock that was added to the Project in 2008 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 shutdowns (PAD, p. 6-7). The Flow Bypass facilities are also depicted in MWH (2010) (Plate 6).

During a recent (September 13, 2011) site visit to the vicinity of the Narrows 2 Powerhouse and Flow Bypass (as well as to Englebright Dam), attendees observed the Narrows 2 Powerhouse shut down for maintenance and the Flow Bypass in operation (Enclosure C, Photo #1). Attendees included personnel from NMFS, the Army Corps, the Yuba County Water Agency, a consulting hydrologist, and two fish passage engineering consultants. It was observed that Chinook salmon:

- a) Held in a school (congregated) in a deep pool downstream of the Narrows 2 Powerhouse (Enclosure C, Photos 2 and 3);

- b) Individuals swam in the (lower velocity) margins of the (very high velocity) attraction flow provided by the release from the Flow Bypass;
- c) Could not pass beyond the release from the Flow Bypass because no upstream waterway existed, and dry rock was exposed (Enclosure C, Photo #4);
- d) Were absent from the pool at the base of Englebright Dam (Enclosure C, Photo #5).

Thus, the information above provides additional support for the existing nexus between the Narrows 2 Powerhouse Flow Bypass facilities and the effects on upstream fish passage. Further study is warranted, and directly pertains to NMFS' fishway prescription decisions and authorities.

The OEP staff also appears to disagree with NMFS' reasoning regarding the nexus of the Narrows 2 Development based on the prior existence of Englebright Dam:

*We do not agree with NMFS' reasoning with respect to the role of YCWA's Narrows 2 powerhouse and upstream fish migration. The Corps' Englebright dam, constructed on the Yuba River, is a federal facility and blocked upstream fish passage for almost 25 years before the development of the Narrows 2 powerhouse. (p. 38).*

NMFS does not understand why OEP staff dismisses NMFS' Request #1 to investigate the fish passage effects of the Narrows 2 Development on the basis that sometime in the past the facilities did not exist. The fact is the Narrows 2 Development presently exists, the nexus between the Development and its effects on fish passage has been adequately

explained, and NMFS is requesting evaluation of the fish passage effects in its Request #1. Instead of studying the full range of potential effects, the OEP staff has directed the Applicant to conduct a simplistic, token study of effects only near the tailrace of the Narrows 2 Powerhouse (Study 7.11). Moreover, OEP staff incorrectly states NMFS' criticisms of Study 7.11 through omission of key information:

*NMFS criticism of study 7.11 is specific to the fact that the proposed information to be gathered would not inform a decision as to whether or not “the physical characteristics around and within the Narrows 2 powerhouse and related infrastructure (including, flow, velocity turbulence, temperature, etc.) would determine effects of Project facilities and operations on attraction and passage of anadromous fish. (p. 39).*

OEP staff omits here discussion of NMFS' criticisms of Study 7.11 made in its Comments on Revised Proposed Study Plan (Enclosure A, pp. 19-22). The NMFS criticisms extend to finding the Applicant's proposed methods vague regarding: how study data will be generated, (modeled or measurement?); where data collection or calculation will occur (where is the downstream comparison point?); how one transect of velocity and depth data could be deemed adequate to characterize the complex hydraulics associated with the tailrace and the upstream and downstream conditions; how data can be collected with a wading rod in the pool near the tailrace that is significantly deeper than depths feasible to wade for the majority of its width; what kind of data is being compared (is the Applicant using depth-averaged velocities?); or how the data will be combined/synthesized to assess potential injury and/or attraction into the Narrows 2 Powerhouse. In addition, NMFS commented that depth and velocity measurements

should be collected with an Acoustic Doppler Current Profiler (ADCP) (or similar instrument) that collects the entire vertical velocity field, not with a flow meter and wading rod, and collections should be made throughout the area of interest, not only along one transect within the entire upstream, downstream, and Powerhouse outfall vicinities. NMFS notes that ADCP are used to collect velocity data in turbulent flow (which is nearly ubiquitous in natural channels with coarse substrate) all the time, and, in fact, ADCP are even used to measure the degree of turbulence and energy diffusion in some studies.

Accordingly, NMFS seeks to understand the Project's fish passage effects external to the facilities (e.g. the attraction flows and tailrace conditions they create). OEP staff's errors regarding Study 7.11 should not overshadow the other components of NMFS' Request #1 that remain unsatisfied by the Study Plan Determination. NMFS seeks information about the mechanical and hydraulic conditions internal or within Project facilities that affect fish passage. NMFS' Request #1 also seeks information about the Project's effects on fish passage as they inter-relate with non-Project facilities (e.g., Englebright Dam, Englebright Reservoir, the Narrows 1 hydroelectric project, Daguerre Point Dam, the Hallwood-Cordua diversion and fish screen, etc.). OEP staff's errors regarding Study 7.11 should not overshadow NMFS' main point with regard to the fish passage effects of the Narrows 2 Development – that the Yuba River's natural flow has been re-channelized and dominantly re-routed through the manmade Narrows 2 Development and Narrows 1 facilities, which is operated in close coordination with the Project. Anadromous fishes appear to be seeking to migrate through these facilities in lieu of natural migration

through the unaltered channel of the Yuba River. Thus far, there is no contradictory evidence indicating that these fish are not seeking a migratory pathway. Therefore, basing a denial of a study request on the grounds that fish would not attempt to migrate through the Project lacks a rational basis. A licensing order based on an intentional disregard of this evidence would, in turn, be arbitrary and capricious. To properly inform the Commission, the Applicant should be directed to fully implement Request #1.

The OEP staff has also unreasonably ignored substantial evidence that upstream fish passage will be achieved through means other than the licensing proceeding. The OEP staff argues that it is not “reasonably certain” (p. 38) that fish passage will occur to areas of the upper Yuba River in the near future, and determined that the Applicant need not study Project effects on anadromous fish because the Commission would not base a licensing order on such future passage. In accepting this determination, not only would the Commission substantially hinder NMFS' efforts to inform itself fully in the exercise of its prescriptive authority, but it would also limit the effectiveness of its own ability to analyze its licensing order as required by the National Environmental Policy Act. Under NEPA, the Commission is required to study the environmental consequences of its action, including direct and indirect and cumulative effects of its licensing decision. By dismissing the possibility that fish passage will be achieved through the means described by NMFS, and by determining that no studies should consider the effects of the project on fish benefiting from this passage, the OEP would hinder the Commission's ability to prepare a properly informed environmental analysis as required by NEPA.

In making this determination, the OEP staff misapplies the substantial evidence standard, which NMFS notes is “reasonably foreseeable” and not “reasonably certain.” Because FERC’s license condition decisions will pivot on the forthcoming National Environmental Policy Act (NEPA) analysis, the Commission must take care to be precise in this definition, as well as its application to study plan determinations. Under NEPA, the Commission has to study the environmental consequences of its action, including direct and indirect and cumulative effects of its licensing decision. By dismissing the possibility that fish passage will be achieved through the means described by NMFS, and by determining that no studies should take this passage into consideration, the OEP would hinder the Commission's ability to prepare a properly informed environmental analysis as required by NEPA.

The D.C. Circuit described the standard it applied to review of fishway prescriptions in Wisconsin Power & Light Co. v. Federal Energy Regulatory Comm’n, 363 F.3d 453 (D.C. Cir. 2004). In reviewing Fish and Wildlife Service’s fishway prescriptions for the Commission-licensed project under review, the court provided that the Service “must provide substantial evidence to show that fishery resources will be adversely affected by a particular project as well as to support the particular solutions for protecting those resources.” *Id.* at 462. Here, NMFS has provided substantial evidence for the prospect of upstream fish passage occurring within the next several years through means other than the licensing process. NMFS directs OEP staff to its filing of its Scoping Comments (March 7, 2011):

*NMFS recommends that the Commission’s scoping also consider other potential alternatives that could place anadromous fishes in the upper Yuba in the foreseeable future. These include:*

- 1) actions taken under the “Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead (HEA) to mitigate for any presently unmitigated impacts due to the blockage of fish passage caused by FERC-licensed hydroelectric projects in the Feather River;*
- 2) collaborative efforts, such as those underway in the “Yuba Salmon Forum” that have discussed the potential reintroduction of anadromous fishes to the upper Yuba;<sup>1</sup>*
- 3) potential future actions taken in the licensings of the Yuba-Bear Hydroelectric Project (FERC No. 2266) and the Drum-Spaulding Hydroelectric Project (FERC No. 2310), which both affect the conditions in existing and potential Yuba River anadromous habitats. (Enclosure E, pp. 14-15).*

*In addition, NMFS’ Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead (Draft Recovery Plan) identifies upper Yuba River locations as important for the recovery of CV spring-run Chinook salmon and CV steelhead. The Draft Recovery Plan’s conceptual recovery scenarios include potential reintroductions of*

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<sup>1</sup> Since the filing of NMFS Comments attached as Enclosure C, the applicant has hired several consultants to conduct habitat assessments and fish passage evaluations for potential reintroduction programs. The Applicant conducts these studies apart from relicensing, within the context of the Yuba Salmon Forum and the North Yuba River Initiative.

these species to the upper Yuba, into Primary candidate watersheds of the North Yuba, Middle Yuba, and South Yuba rivers. In the Yuba River, the development and implementation of the following recovery actions are identified to re-colonize historic habitats above the Project's facilities and Englebright Dam:

- 1) Enhance habitat conditions, including providing flows and suitable water temperatures for successful upstream and downstream passage, holding, spawning and rearing; and
- 2) Improve access within the area above Englebright Dam, including increasing minimum flows, providing passage at Our House, New Bullards Bar, and Log Cabin dams, and assessing feasibility of passage improvement at natural barriers.

Recovery action #2 above should remind OEP staff that NMFS' Request #1 requested information or study of Project facilities other than only the Narrows 2 Development, and that fish passage effects of the Project should also be evaluated at the Project's other dams. Moreover, when upstream passage is achieved, it follows that the Project's intakes (e.g. at the Narrows 2 Development) cannot be assumed to operate as a safe or effective downstream fishway, and thus requires study. Prior proceedings have recognized NMFS' ability to prescribe downstream passage when there were plans for upstream fish passage around a Government dam by an entity other than the licensee, as described below.



In licensing proceedings for the Applegate Dam Hydroelectric Project (FERC No. 11910), Symbiotics, LLC filed an application for an original license to construct, operate, and maintain project works at the Corps' Applegate dam on the Applegate River near Medford, Oregon. 129 FERC ¶ 62207 (2009), at 1. The Corps dam blocked all access of anadromous fish to habitat upstream of the dam, and the Corps constructed and operated a fish collection facility at the base of the dam, which collects salmon and steelhead for use as broodstock at a hatchery. The Commission provided, "The proposed project will use the head created by the Applegate dam, which is a federal facility and thus not part of the licensed project." *Id.* at 2. NMFS and FWS originally reserved authority to prescribe fishways, and NMFS "further stated it will require downstream fish passage in the event anadromous salmonids are passed upstream of Applegate dam as a result of state or federal actions." *Id.* at 7; NMFS 2008,<sup>2</sup> at 13. After the Oregon Department of Fish and Wildlife submitted a plan to reintroduce anadromous salmonids to habitat above Applegate dam, which NMFS characterized as "significant new information," NMFS filed revised preliminary fishway prescriptions for downstream fishways. NMFS 2008, at 13-28; 129 FERC ¶ 62207, at 7. NMFS analyzed the specific project impacts to fish passing downstream, NMFS 2008, at 8-11, and included rationale for determining that the prescribed downstream passage facilities and requirements would provide safe, timely and effective passage, NMFS 2008, at 13-28. The Commission included these fishway prescriptions in the license. 129 FERC ¶ 62207, at 8, 26 (Ordering paragraph (F)), and 70-74 (Appendix C).

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<sup>2</sup> NMFS' Revised Comments and Recommended Terms and Conditions and Preliminary Fishway Prescriptions for an Application for a Major License for the Applegate Dam Hydroelectric Project (FERC No. 11910-002), March 31, 2008.

NMFS' decisions that pertain directly to the exercise of its fishway prescriptive authorities are influenced by information about the Project's fish passage effects on the target anadromous species and habitats, and on any future fishways that may be contemplated. Thus, NMFS' decisions to either: (1) prescribe, (2) not prescribe, or (3) reserve authority over the license term, would be informed by the results of NMFS Request #1. NMFS is attempting through its Request #1 (and others) to act responsibly and not pre-determine an outcome before studies are performed to inform the decision. By rejecting or restricting study unnecessarily, OEP staff may cause important and costly decisions to be made without the benefit of targeted scientific study results and information. The ILP should, to the extent reasonably possible, serve to establish an evidentiary record upon which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. 68 FR 13988, 13995; March 21, 2003.

## 2. Effects of the Project and Related Activities on Hydrology for Anadromous Fish;

The hydrologic alterations due to large dams (like New Bullards Dam) and diversions (like those occurring at the New Colgate Development) are widely accepted as primary predictors of altered fish communities (Carlisle et al. 2010). The consequences of hydrologic alteration are also well linked to geomorphic alterations to river channels and downstream floodplains, which in turn often degrade aquatic habitats. Hydrologic regimes, comprised of flow magnitude, duration, frequency, timing, and rate-of-change, substantially influence aquatic habitat and ecology (Poff and Zimmerman 2010). Stream characteristics and ecological

processes affected by hydrologic regimes include stream channel width and depth, floodplain inundation, transport, storage, deposition, and recruitment of substrates and organic matter, and development, recruitment, and persistence of riparian vegetation. Project-related changes in the timing of high flows affect anadromous species and habitats by altering timing of immigration and emigration, ability to ascend natural and artificial barriers, and ability to utilize overbank habitats that provide cover and nutrients in juvenile life-stages. Thus, there is a clear nexus between Project facilities and operations and the condition of upstream and downstream migration, spawning, rearing, and holding habitats for anadromous fishes. NMFS' decisions that pertain directly to the exercise of its fishway prescriptive authorities are influenced by information about the Project's hydrologic effects on the target species and habitats of the lower Yuba River (downstream of Englebright Dam and the Narrows 2 powerhouse and bypass facilities). Clearly, if Project-related hydrologic alterations of anadromous habitat conditions occur in the lower Yuba to a degree that the viability of anadromous fish populations is affected throughout the license term, this study result would inform any future, potential exercise of NMFS fishway prescriptive authority. Similarly, results of NMFS' requested study of the Project's effects on hydrologic alteration in the upper Yuba River could inform any future fishway prescription; if hydrologic alterations occur to the extent that potential anadromous habitat (e.g. Chinook salmon essential fish habitat (EFH)) could not support a viable population, and enhancement measures cannot be identified in this ILP to render it suitable, this result would directly pertain to the exercise of NMFS' prescriptive fishway authorities. Hydrologic alterations could potentially impair the functions of EFH for Chinook salmon spawning, incubation, juvenile rearing, juvenile migration, adult migration, or adult holding. The effectiveness of fish ladders or other

volitional, semi-volitional (e.g. tramway), or non-volitional (e.g. collection and transport) fishways are also affected by hydrologic conditions -- the magnitude, duration, frequency and timing of the waters flowing through these fishways. The ILP should, to the extent reasonably possible, serve to establish an evidentiary record upon which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. 68 FR 13988, 13995; March 21, 2003.

3. Effects of the Project and Related Activities on Water Temperatures for Anadromous Fish Migration, Holding, Spawning, and Rearing Needs;

NMFS' decisions that pertain directly to the exercise of its fishway prescriptive authorities are influenced by information about the Project's thermal effects on the target anadromous species and habitats, and on any future fishways that may be contemplated. Thus, NMFS' decisions to either: (1) prescribe, (2) not prescribe, or (3) reserve authority over the license term, would be informed by the results of NMFS Request #3. Stream temperature alterations due to large dams (like New Bullards Dam) that form large, stratifying reservoirs like New Bullards Reservoir, and/or large scale diversions of instream flows (as occur, for example, at the Project's New Colgate Development) are common and expected consequences. Thus, there is a clear nexus between Project facilities and operations and the thermal alterations that could affect lower Yuba River migration, spawning, rearing, and holding habitats for anadromous fishes. A reasonable "mapping" of the connection or nexus is:

Project facilities/operations → reservoir stratification/flow alterations/instream flow diversions → lower Yuba River water temperature effects → thermal requirements of lower Yuba River aquatic species → lower Yuba River anadromous fishes → target species of a potential fishway prescription  
(Note: the target species for a potential fishway from the lower to the upper Yuba River were identified in Enclosure F, Request #1, March 7, 2011).

A similar mapping would apply to the upper Yuba River Chinook salmon habitat:

Project facilities/operations → reservoir stratification/flow alterations/stream flow diversions → Yuba River water temperature effects within EFH → thermal requirements of Yuba River anadromous fishes → target species of a potential fishway prescription.

That is, whether or not upper Yuba River habitats are altered by the Project to the extent that they are rendered thermally unsuitable is information about Project effects that is directly applicable to NMFS' responsible exercise of its fishway prescriptive authorities. Temperature also plays an important role in the design and construction of effective fishways. Successful future operations of Yuba River fishways may require adults and/or juveniles to successfully navigate Project reservoirs. Thus, the thermal profiles of Project reservoirs and of non-Project reservoirs (e.g. Englebright Reservoir), combined with inflow temperatures and currents may provide cues to migration, and inform the design of more effective fish passage alternatives. The effectiveness of fish ladders or other volitional, semi-volitional (e.g. tramway), or non-volitional (e.g. collection and transport)

fishways may be affected by the temperature of water that flows through them. Existing information regarding conceptual fish passage alternatives for the Yuba River (MWH 2010) identifies several fish passage alternatives in the Yuba basin which could require automated temperature control devices – or other engineering solutions - to provide sufficiently suitable water temperatures throughout a fishway. More specific information regarding water temperatures at all Project reservoirs, powerhouses (e.g. Colgate Powerhouse) and diversions (e.g. the 8-mile reach of the upper Yuba River bypassed by the Colgate Development) would be used by NMFS to exercise its authorities with respect to fishway prescriptions. The ILP should, to the extent reasonably possible, serve to establish an evidentiary record upon which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. 68 FR 13988, 13995; March 21, 2003.

4. Effects of the Project and Related Activities on Coarse Substrate for Anadromous Fish: Sediment Supply, Transport and Storage;

The interruptions in coarse sediment supply, and alterations to coarse sediment transport and storage due to large dams (like New Bullards Dam) are widely accepted as primary causes of geomorphic alterations to river channels and downstream floodplains. Thus, there is a clear nexus between Project facilities and operations and downstream migration, spawning, rearing, and holding habitats for anadromous fishes:

Project facilities/operations → coarse substrate supply interruptions and transport/storage alterations → channel alterations → potential anadromous

habitat degradations → coarse substrate quantity, distribution, and quality → anadromous spawning habitat quality and availability → anadromous incubation, alevin, fry, and juvenile habitat → the target species for passage in a potential fishway prescription.

If Project-related geomorphic alterations of anadromous habitats occur in the lower Yuba to a degree that those habitats cannot support viable anadromous fish populations, this study result would inform any potential exercise of NMFS' fishway prescriptive authority to pass anadromous species from the lower to the upper Yuba River, and back downstream. If geomorphic alterations of potential anadromous habitat in occur in the upper Yuba River (upstream of Englebright Dam and the Narrows 2 powerhouse and bypass facilities), this study result would inform NMFS' fishway prescriptive decisions; if the habitat is altered by the Project so that it cannot support the functions of EFH for Chinook salmon spawning, incubation, juvenile rearing, juvenile migration, adult migration, or adult holding, and enhancement measures cannot be identified in this ILP to render it suitable, this result would directly pertain to the exercise of NMFS' prescriptive fishway authorities.

NMFS' Request #4 is closely related to the Applicant's Proposed Studies 1.1 Channel Morphology Upstream of Englebright Dam and 1.2 Channel Morphology Downstream of Englebright Dam. NMFS notes that significant progress was made in bridging the differences between NMFS's proposed and Applicant's proposed studies through collaboration between NMFS, the Applicant, and other licensing participants. The differences between the study plans were further closed following FERC's September 30,

2011 Study Plan Determination, specifically with recommendations made on pages 4–6. However, NMFS does not agree with FERC’s determination that an analysis comparing the mass balance between coarse sediment supply and transport capacity is not necessary for assessing project effects to the resource. NMFS calls to FERC’s attention that the *difference* (or mass balance) between sediment supply and transport is the primary factor in determining channel morphology shape, form, and process rather than the absolute values of supply and transport. Furthermore, NMFS believes that FERC’s characterization of NMFS’ request to compare unimpaired sediment supply and transport capacity as an assessment of pre-Project historical conditions that would add little value to the licensing proceedings. NMFS calls to FERC’s attention that the unimpaired supply and transport metrics being requested represent a quantification and comparison on the ongoing, annual hydrological alteration and annual sediment entrapment that is occurring in Project Reservoirs (e.g., New Bullards Bar and Our House dams). NMFS emphasizes that annual sediment entrapment at Project reservoirs is an existing condition that will continue throughout any future license issuance. This annual sediment entrapment could also be potentially reconnected with downstream reaches by designing sediment pass through facilities and operational procedures at Project dams such as Our House and/or Log Cabin.

Thus, NMFS’ decisions to either: (1) prescribe, (2) not prescribe, or (3) reserve authority over the license term, would be informed by the results of NMFS’ Request #4. The ILP should, to the extent reasonably possible, serve to establish an evidentiary record upon



which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. 68 FR 13988, 13995; March 21, 2003.

5. Effects of the Project and Related Activities on Large Wood and Riparian Habitat for Anadromous Fish;

The recruitment, transportation and deposition of large woody debris or material (LWD) plays an important role in fish habitat quality and quantity because it provides escape cover from predators, overhead cover, additional structure, and food (Lisle 1986, Everett and Ruiz 1993). Lack of sufficient LWD in reaches of the lower Yuba River may be due to Project effects, and may result in degradation of ESA-designated critical habitat for anadromous fishes. Similar degradations in the upper Yuba River could affect the functioning condition of EFH for Chinook salmon spawning, incubation, juvenile rearing, juvenile migration, adult migration, or adult holding. This information would influence NMFS' decisions regarding its fishway prescriptive authority (i.e. whether or not anadromous fishes should be passed from the lower to targeted reaches of the upper Yuba River). The safety and effectiveness of fish ladders, screens, or other fishways may be affected by the amount of LWD contributed to Project reservoirs and stream reaches. LWD fate and transport through Project reservoirs can affect the proper functioning of fish collection facilities. Thus, beginning with designs for fishways, LWD must be taken into account to achieve safe and effective fish passage.

NMFS Study Request #5 is closely related to the Applicant's Proposed Studies 6.1 Riparian Habitat Upstream of Englebright Reservoir and 6.2 Riparian Habitat

Downstream of Englebright Dam. NMFS notes that significant progress was made in fulfilling the information that Request #5 was seeking with FERC's September 30, 2011 Study Plan Determination, specifically with recommendations made on pages 21–28. However, NMFS notes that three primary determinations made by FERC for modification of the Applicant's Proposed Study 6.1 are fairly open ended and were left to be negotiated between the Applicant and resource agencies. NMFS is specifically referring to the following in the Study Plan Determination:

*“In addition to these seven study sites, we recommend that after consultation with NMFS, CDFG and the Forest Service, YCWA should identify additional study sites to adequately survey LWD in the potential response reaches of Oregon Creek and the Middle Yuba River (pg. 23).*

*“Although YCWA's revised study provided more details on how the study would relate flows to riparian vegetation, it did not provide specific details on the study methods to be used. Therefore, YCWA should modify section 5.3.3.4, after consultation with NMFS, Cal Fish and Game, Forest Service, FWS, and Foothills, to provide a detailed description of study methods. (pg. 24)”*

*“We note that the germination models recommended by Foothills might be useful if the study shows that project operation has resulted in inadequate conditions for germination of riparian species. We recommend modifying study 6.1 to require a determination of need for modeling the relationship between flows and riparian species germination after the first year of study to be included in the initial study report (pg 24-25).*

NMFS notes that these determinations leave ambiguity as to how many additional LWD study sites are being required in Oregon Creek and the Middle Yuba, what methods are

needed and subsequently require more detail to assess the Project's effects to riparian resources due to altered hydrology, and which methods are to be used and what benchmarks will be set to determine whether project operation has resulted in inadequate conditions for germination of riparian species and thus trigger additional modeling between flows and riparian species germination. NMFS seeks additional clarification from FERC as the lead federal agency on these determinations, in part because it appears FERC is delegating the responsibility for negotiating the details of the determinations to NMFS and other relicensing agencies and stakeholders, without exercising its own responsibility for oversight. Thus, it affects NMFS' decisions to either: (1) prescribe, (2) not prescribe, or (3) reserve authority over the license term, decisions that would be informed by the results of NMFS' Request #5. NMFS seeks additional clarification from FERC as the lead federal agency on these determinations, in part because it appears FERC is delegating the negotiating of these determinations to NMFS and other relicensing agencies and stakeholders.

Thus, NMFS' decisions with respect to its fishway prescriptive authorities over the license term would be informed by the results of NMFS' Request #5. The ILP should, to the extent reasonably possible, serve to establish an evidentiary record upon which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. 68 FR 13988, 13995; March 21, 2003.

6. Effects of the Project and Related Activities on the Loss of Marine-Derived Nutrients in the Yuba River;

Due primarily to the construction of dams, other barriers, and the dewatering of stream reaches, an estimated 1,057 miles (or 48%) of the stream lengths historically available to Chinook salmon have been lost from the original total of 2,183 miles in the Central Valley; if only spawning and holding habitat (excluding migration corridors in the lower elevations) are considered, the reduction in historical range probably exceeds 72% because most of the former spawning and holding habitat is in upstream reaches now inaccessible to Chinook salmon (Yoshiyama et al. 2001).

The Project dams, diversions, and other facilities have the potential to exert direct and indirect effects on anadromous fishes in the lower Yuba River, and therefore cumulatively affect the numbers of adult fall-run and spring-run Chinook salmon returning to the lower Yuba each year. NMFS' Request #6 has explained that upstream migration of anadromous salmonids, followed by their death, is important to replenish or "fertilize" streams and rivers, and the uptake of nutrients has been found to enhance the abundances of benthic macro invertebrates, the condition of juvenile salmon, riparian shrub and tree growth, birds, mammals, and other "receptors." NMFS explained this salmon-borne "fertilizer" improves the quality of anadromous spawning and rearing habitat, and thus the reproductive success of subsequent generations of salmon (Quinn 2005). Thus, NMFS requested evaluation (by "desktop" estimation) of the current annual mass of marine-derived nitrogen transported by fall-run and spring-run Chinook salmon to the lower Yuba River, and comparison to historic amounts to determine the trend or

severity of recent losses. This would provide information about the existing cumulative effects of the Project, (i.e. whether or not anadromous fish populations are likely affected by nutrient losses in the lower Yuba River). Based on this information, and if Yuba River Chinook salmon escapements continue their long-term decline, resource agencies may determine the lower Yuba requires “fertilization” due to nutrient deficits. NMFS explained that use of a manufactured salmon carcass analogue (Kohler et al. 2008) is one treatment option (that could be a protection, mitigation or enhancement measure), and the results of Request #6 could inform and assist in monitoring the success of nutrient treatments.

NMFS also requested estimations of the loss (compared with historical amounts) of marine-derived nitrogen to the upper Yuba River, due to the lack of a fishway for passage of Chinook salmon to these areas. NMFS explained that investigations in the Pacific Northwest are finding that the inland transport of nutrients by salmon, and the deposit in rivers when they die, is an “ecosystem service” that functions at the very base of the aquatic and terrestrial food webs. Given NMFS’ resource goals and objectives to reintroduce anadromous fishes to the upper Yuba watershed, resource agencies may determine the upper Yuba requires “fertilization” due to years of nutrient deficits caused by blocked anadromous access, which occurs due to Project and non-Project facilities. As stated above, the use of a manufactured salmon carcass analogue is one treatment option. Thus, the marine-derived nutrient status of the upper Yuba River is information that could influence NMFS’ decisions regarding the responsible exercise of its fishway prescriptive authority; this is especially the case with respect to a potential fishway prescription at the Narrows 2 Development facilities. NMFS stated its reasoning in its

Request #1 (and elsewhere) that the Project's Narrows 2 Development facilities do not allow anadromous salmon to reach the upper Yuba because the waterway it diverts around Englebright Dam (from the upper Yuba River intake, through the Powerhouse, and with release to the lower Yuba powerhouse tailrace) is the dominant, non-spill, continuous flow from the upper Yuba to the lower Yuba – and this flow path probably cannot be surmounted by upstream migrating fishes or safely and effectively passed by downstream migrants. Thus, the information regarding the Project's effects on marine-derived nutrients pertains directly to NMFS' exercise of its fishway prescriptive authorities. If, for example, the nutrient status of the upper Yuba River were found deficient to the point of affecting Chinook salmon EFH, and a time interval was necessary to treat the habitat sufficiently, this could affect the timing of any NMFS' fishway prescription. The ILP should, to the extent reasonably possible, serve to establish an evidentiary record upon which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. 68 FR 13988, 13995; March 21, 2003.

8. Anadromous Fish Ecosystem Effects Analysis: Synthesis of the Direct, Indirect, and Cumulative Effects of the Project and Related Facilities on Anadromous Fish.

In all cases above, NMFS has sought to explain the need for its Requests by linking the information requested to anadromous fishes and their habitats. This is because the often-cited “nexus criterion” (§5.9 (b) (5)) and its neglected companion (§5.11 (d) (4)) require explanation of any connection between Project operations and effects on the resource to be studied – and ultimately for NMFS, the resources to be studied are anadromous fishes

and their habitats. Request #8 was submitted by NMFS in part out of concern that Applicant-proposed study might evaluate Project effects to inanimate objects (e.g., water supply, gravel, large wood, etc.) or abiotic qualities (e.g. stream temperature) without adequately expressing the results in terms of the Project's effects to NMFS' resources – anadromous fishes and their habitats.

Thus, if evaluations of Project effects indicate that ESA-designated critical habitats are in proper condition, and ESA-listed and other anadromous fish populations in the lower Yuba River are viable and/or thriving, this information will obviously influence NMFS' responsible exercise of its fishway prescriptive authorities. That is, this information is relevant to decisions about whether or not upstream and downstream fishways are warranted to promote conservation and recovery of lower Yuba anadromous fishes. Similarly, NMFS' fishway prescription decisions would also consider information about the quality and quantity of upper Yuba River habitats, and their ability to support anadromous fishes, should they be reintroduced there. In all cases, to be most useful the information must be interpreted in terms of Project effects on anadromous fishes, critical habitats (and their primary constituent elements), and EFH (and their functions) – which are ecological resources more complex than the simple, physical aspects of water, rocks, and logs. Thus, Request #8 asks that information about water supply, flows, water temperatures, gravel supply, large wood, etc. be interpreted in terms of anadromous species life stage capacity and survival. Population-level information would then be used to design (and size) more effective fish passage alternatives. The effectiveness of fish ladders or other volitional, semi-volitional (e.g. tramway), or non-volitional (e.g. collection and transport) fishways may be affected by the population structure and

dynamics of the target species to be passed. For instance, fish collection facilities need to be sized according to the peak daily and seasonal run sizes (MWH 2010). Information on the theoretical population size at various life-stages is used to inform the design and construction of effective fish collection facilities. The ILP should, to the extent reasonably possible, serve to establish an evidentiary record upon which the Commission and agencies with mandatory conditioning authority can carry out their responsibilities. 68 FR 13988, 13995; March 21, 2003.



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**UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION**

**Yuba County Water Agency** )  
**Yuba River Hydroelectric Project** )  
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**P-2246-058**

**NOTICE OF STUDY DISPUTE**

**EXPLANATIONS OF HOW NMFS' REQUESTS FOR INFORMATION OR STUDY  
SATISFY THE CRITERIA SET FORTH IN 18 CFR §5.9 (b)**

The pages that follow are extracted from NMFS' filing of March 7, 2011, that responded to the Commission's Notice of Intent (January 4, 2011) that solicited requests for information or study. This information is provided to satisfy the ILP regulations (§ 5.14 (b)) requiring that a notice of study dispute explain how the disputing agency's requests satisfy the criteria set forth in § 5.9 (b). For each of NMFS' Request, these § 5.14 (b) explanations are provided following text stating:

This request is formatted in accordance with: Title 18 of the Federal regulations; Conservation of Power and Water Resources; Part 5 Integrated License Application Process; Section 5.9 Comments and information or study requests.

For additional information, such as how NMFS' Requests relate to satisfying the Commission's scoping, its ESA or MSA consultation requirements, or NMFS' Resource Goals and Objectives, the Commission should review the additional enclosures contained within the NMFS filing of March 7, 2011, its Comments on the Applicant's Proposed Study Plan (July 18, 2011) and its Comments on the Applicant's Revised Proposed Study Plan (September 1, 2011).

**NMFS Request #1**  
**Request for Information or Study**  
**Effects of the Project and Related Activities on Fish Passage for Anadromous Fish**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC Project No. 2246, Yuba River, California.

**Anadromous Fish Passage:**

NMFS requests that the applicant conduct studies related to fish passage for all life stages of anadromous fish inhabiting the Yuba River. This includes passage requirements for both juvenile and adult life stages. The fish species to be studied are: (1) fall-run Chinook salmon, (2) spring-run Chinook salmon, (3) steelhead (*O.mykiss*, ocean type), (4) green sturgeon. Fish passage must be analyzed throughout the river basin, including upstream and downstream of the river's major dams and reservoirs, to the extents of natural habitat accessibility.

Anadromous fish passage studies are requested to help inform decision making for NMFS' forthcoming FPA 10(j) recommendations and section 18 fishway prescriptions.

NMFS requests the Applicant apply its information collection and/or study to evaluate the safety, timeliness, and effectiveness (passage effects) of Project and related activities<sup>1</sup>, for the purpose of informing the decision making of NMFS under:

- I. The Endangered Species Act (ESA) section 7 (consultation between the Commission and NMFS);
- II. The Magnuson-Stevens Fisheries Conservation and Management Act (MSA) (consultation between the Commission and NMFS); and
- III. The Federal Power Act (FPA) section 10(a) and 10(j) (authority to recommend license terms and conditions) and section 18 (authority to prescribe fishway prescriptions).

Of course, the results of this request will also inform the Applicant, the Commission, and other interested parties.

NMFS requests the Applicant's evaluations of passage effects be directed at the following species (hereafter collectively referred to as "target species") found in the Yuba River (Table 1.)

- A. fall-run Chinook salmon;
- B. spring-run Chinook salmon;
- C. steelhead (*O.mykiss*, ocean type);
- D. green sturgeon;
- E. Pacific lamprey.

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<sup>1</sup> To understand NMFS' use of "related activities", see NMFS' response below to the regulations at 18 CFR § 5.9(a).

Table 1. Project facilities and related activities affecting anadromous Yuba River fish passage.

Reach	#	Facility Encountered (upstream direction)	RM	Target Species	Passage Issue	NMFS authority	Total Migration		
Lower Yuba									
	1	Daguerre Point Dam	11.4	A, B, C, D, E	a-d f g h j k l m	I, II	11.4		
	2	Hollywood-Cordua diversion	11.4	A, B, C, D, E	f h i j k l m	I, II	11.4		
	3	South Yuba-Brophy diversion	11.6	A, B, C, D, E	f h i j k l m	I, II	11.6		Species Key
	4	Brown's Valley diversion	12.2	A, B, C, D, E	f h i j k l m	I, II	12.2	A	fall-run Chinook
	5	Narrows I Powerhouse	23.6	A, B, C, D, E	a c d e f g i j l m	I, II, III	23.6	B	spring-run Chinook
	6	Narrows II Powerhouse	23.9	A, B, C, D, E	a c d e f g i j l m	I, II, III	23.9	C	CV steelhead
	7	Narrows II Flow Bypass	23.9	A, B, C, D, E	a c d e f g i j l m	I, II, III	23.9	D	green sturgeon
	8	Englebright Dam	24.0	A, B, C, D, E	a g k l m	I, II	24.0	E	Pacific lamprey
Upper Yuba									
	9	Englebright Reservoir	24.0	A, B, C, D	l m	I, II, III	24.0		
	10	Narrows I Intake	24.1	A, B, C, D	c i	I, II, III	24.1		Authority Key
	11	Narrows II Intake	24.1	A, B, C, D	c i	I, II, III	24.1	I	ESA
	12	Englebright Reservoir (end)	32.2	A, B, C, D	m	I, II, III	32.2	II	MSA
	13	New Colgate Powerhouse	33.9	A, B, C, D	b e f j k l m	I, II, III	33.9	III	FPAsec 18 and 10
Middle Yuba			0.0				40.1		
	14	Our House Measurement Weir	11.9	B, C	b g l	I, II, III	51.6		
	15	Our House Dam	12.0	B, C	a f g k l m	I, II, III	51.7		Passage Issue Key
	16	Our House Reservoir	12.0	B, C	l m	I, II, III	51.7	a	adult barrier
	17	Lohman Diversion Intake	12.1	B, C	c i	I, II, III	51.8	b	adult partial barrier
Oregon Creek			0.0				44.2	c	adult entrainment
	18	Log Cabin Diversion Dam	4.1	B, C	a f g k l m	I, II, III	48.3	d	adult stranding
	19	Log Cabin Reservoir	4.1	B, C	l m	I, II, III	48.3	e	adult tailrace attraction
	20	Camptonville Diversion Intake	4.1	B, C	c i	I, II, III	48.3	f	min.flow, flow continuation
	21	Lohman Ridge Diversion Outlet	4.3	B, C	e	I, II, III	48.5	g	juvenile barrier
North Yuba			0.0				42.0	h	juvenile partial barrier
	22	New Bullards Bar Dam Spillway	2.1	B, C	e f	I, II, III	44.1	i	juvenile entrainment
	23	Fish Release Measurement Weir	2.2	B, C	b g l	I, II, III	44.2	j	juvenile stranding
	24	New Bullards Fish Flow Powerhouse	2.3	B, C	a g f k l m	I, II, III	44.3	k	inadequate flow
	25	New Bullards Dam	2.3	B, C	a g k l m	I, II, III	44.3	l	increased predation
	26	New Bullards Reservoir	2.3	B, C	l m	I, II, III	44.3	m	water temperature modification
	27	New Colgate Power Intake	2.6	B, C	c i	I, II, III	44.6		
	28	Bullards Bar Dam (submerged)	2.7	B, C	h	I, II	44.7		
	29	Camptonville Diversion Tunnel Outlet	2.8	B, C	e	I, II, III	44.8		
	30	Recreation Facilities	3.0	B, C	?	I, II, III	45.0		
	31	New Bullards Reservoir (end)	18.1	B, C	m	I, II, III	60.1		

NMFS adds that evaluations at Project and related activities locations would also evaluate the habitats for these species, including ESA-designated critical habitats and MSA-identified essential fish habitat (EFH). Please see Enclosures B and C for additional information about these.

**Rationale for section 18 authority:**

1. Englebright Dam physically obstructs flow and fish passage via the natural river channel. As a result, all flow from the upper Yuba River is redirected through the hydroelectric complex- Narrows 1 and Narrows 2 facilities. These facilities were constructed without provisions for safe and effective fish passage.

NMFS does not contest that Englebright Dam, located further upstream from the Narrows hydroelectric plants, is a physical barrier to fish passage. We point out that the trio of *the dam and its two associated hydropower facilities* altogether are responsible for blocking fish passage.

For its part, the dam is a physical barrier to fish passage. However, the hydropower facilities are also hydraulic and mechanical barriers to fish passage. Regardless of the mode of blockage, the result is that all facilities are fish passage barriers in their own right.

Englebright Dam is located upstream of the Narrows hydroelectric facilities and water discharge points. The Narrows 2 facility is approximately 400 feet south of Englebright Dam on the west bank of the Yuba River (FERC 2005), and Narrows 1 is a quarter of a mile downstream of Englebright Reservoir on the eastern bank of the Yuba River (FERC 1992). Thus, upstream migrating fish encounter the passage effects of the Narrows hydroelectric facilities first, before potentially reaching Englebright Dam.

The penstocks to the Narrows 1 and Narrows 2 developments are the only outlets from Englebright dam, and are the only means of discharging water downstream, except for spills over the top of the dam (FERC 1992; 2005). The construction of the FERC-licensed Narrows hydroelectric complex resulted in the full flow of the Yuba River being routed through, and confined in project facilities - from the intakes in Englebright reservoir, through a gauntlet of tunnels, pressurized pipes, rotating turbines, high velocity draft tubes, and turbulent outfalls. In effect, the natural flow of the river was transformed into a highly unnatural environment for any fish and wildlife encountering it. With the exception of rare events when excess water spills over the crest of Englebright Dam, the flow through the Narrows 1 and Narrows 2 hydroelectric complex represents the only possible route to swim upstream – a route that fish cannot negotiate successfully.

The hydroelectric complex is operated in tandem. Narrows 1 and 2 constrain the entire Yuba River flow in some combination between them. At times, when Narrows 1 is shut down for maintenance or other reasons, then all flows need to pass through Narrows 2 if the downstream river is to be kept wetted. In this case, it is the only waterway that connects upstream with downstream.

Recognizing that the original Englebright Dam facility had no provisions for flow releases other than through the FERC-licensed hydropower complex, the Commission could have conditioned the Licenses to include fish passage as part of its FPA 10(a)(2) responsibility. Instead, hundreds of miles of historic anadromous fish habitat have been inaccessible to anadromous fish over the past 50 years, causing serious reductions in these fish populations over time. The current Integrated Licensing Process for the Yuba River Development represents an opportunity to repair the damage to Yuba River anadromous fish resources over the past 50 years – by restoring access to many miles of historic habitats upstream.

2. Narrows 2 is one of the three inter-related facilities that collectively constitute a total barrier to fish migration near River Mile 24 the Yuba River.

The Narrows 2, Narrows 1, and Englebright Dam complex represents an undeniable upstream passage barrier to fish. Each facility, in its own way, prevents or impairs the biologically necessary migration behavior of [anadromous] fish. At the same time, the facilities are highly related. Englebright Dam forms the forebay for the Narrows I and Narrows II facilities, which both have intakes that take water from Englebright Reservoir. The Applicant and the Pacific Gas and Electric Company (PG&E), licensee for the Narrows I project, currently coordinate the operation of Narrows 1 and Narrows 2 for hydropower efficiency and flow stability in the lower Yuba River. The penstocks to the two developments are the only outlets from Englebright Dam, and are the only means of discharging water downstream, except for spills over the top of the

dam. Both Narrows I and Narrows II are dependent on available storage in New Bullards Bar and Englebright reservoirs. Under an existing power purchase agreement between the Applicant and PG&E, PG&E can require the release of water from New Bullards Bar Reservoir for power generation based on monthly quotas and available storage in the reservoir above an established index or “critical line.” (FERC 2005).

The facilities each create independent, unique, and often extreme hazards for many different aquatic organisms encountering them, particularly for anadromous fish species native to the waters upstream of these locations. For example, fish that pass downstream by washing over the 260 foot dam crest during rare spill events (“dam route”), are subject to high injury and mortality rates. Likewise, downstream passage through the Narrows 2 and Narrows 1 complex (“hydro route”) is often injurious or fatal to fish. Similarly, the Narrows facilities do not allow for upstream migration, and they present conditions that are hazardous for fish trying to swim upstream. In seeking an upstream swimming route, fish may be able get inside the tailrace, draft tubes, or other parts of the power plant(s). Once there, they can be killed or injured. This could happen during startup and shutdown operations, as has been experienced at hydroelectric plants elsewhere.

The question arises:

*Why would fish try to swim into the draft tubes of these hydroelectric plants?*

Certain anadromous fishes evolved to seek spawning habitat at higher elevations in the watershed – where conditions are more conducive for their reproduction and early life cycle. For certain anadromous fish, this instinct can be a matter of survival, so these behaviors are strongly imprinted in each individual. In the case of the Yuba River, because there are no other predominant in-stream flow releases, the hydro plant discharges can function as an environmental cue for anadromous fish - by signaling to them the most likely route upstream. Instinct drives anadromous fish to explore for possible upstream migration routes – even in the high velocity, turbulent flow caused by Narrows 2. Many years ago, experts in the field of fish passage and hydraulic engineering named this phenomenon “false attraction.”

In the narrows reach (between Yuba River Mile 23 and 24), the only possible routes to upstream habitat are through the Narrows 2 and Narrows 1 hydroelectric facilities. This is because the hydroelectric plants capture and transport the full flow of the Yuba River from upstream of Englebright Dam to downstream of Englebright Dam. The dam itself, unlike other dams of this type, has no other provisions for passing water downstream – no low level outlet, no locks or sluice gates, and no fishways. Since fish cannot fly, they are faced with the insurmountable task of swimming through high energy power plant flows, as their only hope of getting further upstream:

*Since the hydraulic conditions of flows within Narrows 2 exceed the swimming ability of all anadromous fish, and because there are no other viable upstream swimming routes – Narrows 2 is a complete barrier to upstream fish passage.*

Because the trio of inter-related, man-made passage barriers cause anadromous fish to ultimately fail to find a viable route upstream, they are forced to fall back to spawn in competition with a host of other fishes utilizing the lower river. Expending energy reserves at hydropower outfalls during migration can decrease fecundity. Spatial competition for limited habitat can reduce fecundity, growth, and survivability. Crowding all species into limited habitat downstream of

the Narrows complex has significant ecosystems effects. The loss of upstream anadromous habitat is serious impact to the Yuba River anadromous fish population.

Basically, the conditions inside narrows 2 hydroelectric facility cannot provide safe, timely, and effective fish passage in either direction – upstream or downstream; and the Yuba River Development Project has no other means of mitigating this deficiency at this time. The Commission can rectify this situation by establishing effective fish passage facilities as a condition in the prospective, new license.

3. Narrows 2 facilities do not provide for safe and effective passage for [anadromous] fish in either direction– upstream or downstream. It is part of the Yuba River Development Project that is the subject of this Integrated Licensing Process.

The Narrows 2 complex is the subject of this P-2246 Integrated Licensing Process; therefore a focus on its failure to provide for effective [anadromous] fish passage is central to this discussion at this time. Similar impacts are created by the Narrows 1 power plant facilities. Both facilities are operated co-dependently, and in conjunction with one another to provide the requisite instream flow to the lower Yuba River.

However, the Narrows I license contains the following:

*Article 411. The Licensee shall, for the limited purpose of coordinating operations with FERC Project No. 2246 for the development of fish resources in the Yuba River downstream of Englebright dam, comply with such reasonable modifications of project operations, as may be ordered by the Commission upon the relicensing or amendment of the license for FERC Project No. 2246, after notice and opportunity for hearing.*

Therefore, NMFS understands the two project licensing processes are linked by the Commission.

Narrows 1 impact will be presumably be addressed in separate licensing proceedings unless the Commission chooses to merge the two project licensing processes for reasons of expediency. Englebright Dam is located further upstream of the Narrows water discharge points, so upstream migrating fish encounter the effects of the hydropower plants first. Impacts caused further upstream by Englebright Dam are not subject to FERC jurisdiction and therefore must be addressed in other venues. The original FERC licenses did not compel the licensees to construct appropriate fish passage systems, even though it was known that there were no other fish passage facilities at Englebright Dam (nor any plan to construct them), and that there was no satisfactory mitigation for the loss of hundreds of miles of upstream habitat caused when these facilities were licensed and constructed.

4. Upstream fish passage through the Narrows 2 is made impossible by hazardous and extreme conditions created within the facility as part of its normal operation.

Fish attempting to migrate upstream cannot swim through the Narrows 2 project facilities because the internal hydraulic conditions during operations are hazardous and extreme. Should fish attempt to swim through Narrows 2 facilities in the upstream direction – one of the two potential flow paths leading to upstream habitat (and sometimes the only one if Narrows 1 is taken off-line) -- they are unsuccessful. The Narrows 2 facility was licensed without any suitable, “auxiliary” waterway for fish to swim through. It is the intake tunnel and penstock that

“unnaturally compresses” the flow to transform potential energy into the kinetic energy that drives the hydropower turbines and it is this action that creates the unsuitable hydraulic conditions for anadromous fishes. Hydraulic engineers refer to this as closed conduit, pressurized pipe flow, as opposed to the “open channel” (depressurized) flow of a natural river, in which aquatic species have evolved.

5. Downstream fish passage through Narrows 2 is dangerous, resulting in injury and mortality to fish.

Fish attempting to migrate downstream would normally be entrained in the Narrows 2 or Narrows 1 intakes; thus they are then subjected to extreme forces within the project’s tunnels, penstocks, turbines, draft tubes, and outfall structures. The likelihood of successful downstream passage through Narrows 2 project facilities is low and the probability of injury and mortality is high – due to the hydraulic and mechanical conditions within these project facilities. Because Narrows 2 has no entrainment protection for fish, study of this impact is an important information requirement for this licensing process, in order to allow suitable preventive measures to be prescribed.

6. Study of the fish passage conditions in the segment where the Yuba river is captured for use by Narrows 2, along with detailed assessment of conditions in the adjacent river channel, is required to establish the full scope of fish passage concerns for the Yuba River Development Project during the Integrated Licensing Process.

The hazardous and extreme conditions imposed upon fish (by Narrows 2) will be documented in greater detail as the ILP process proceeds. Describing and illuminating the upstream and downstream swimming conditions resulting from bypassing all Yuba River flow through hydroelectric facilities - without any other provisions for safe, timely, and effective fish passage – is an important aspect of this licensing proceeding. By including this factual information on the Administrative Record, the Commission will fairly establish a basis for evaluating all impacts and characterizing potential protection, mitigation, and enhancement measures for anadromous fish resources. Furthermore, these investigations bear on NMFS’ future decision related to FPA§18 fishway prescriptions (whether or not to prescribe fishways) and form part of the basis for several of NMFS’ information and study requests.

7. The original 1963 FERC license contemplated the need, or necessity, of reasonable modifications to the project in the interest of fisheries resources.

Narrows 2 was authorized as part of the Yuba River Development Project by Commission Order on May 16, 1963 (29F.P.C. 1002). Article 31 of Commission Order states: “...The Licensee shall construct, maintain, and operate such protective devices and shall comply with such reasonable modifications of the project structures and operation in the interest of fish and wildlife resources, provided that such modifications shall be reasonably consistent with the primary purpose of the project...”

The Licensee has enjoyed a 50-year initial license term, utilizing the public resources for profit without providing reasonable measures for fish passage. The Commission’s original license endorsed this situation, but allowed for reasonable modifications to be instituted to protect fish and wildlife resources at a later time.

8. Re-establishment of safe and effective fish passage is a reasonable modification to the Narrows 2 project.



NMFS asserts that re-establishment of safe and effective anadromous fish passage is a reasonable modification to the Narrows 2 project, as contemplated in the original license. NMFS further asserts that anadromous fish passage and reintroduction upstream of Narrows 2 is a necessary conservation and recovery measure for ESA and MSA protected species. Once fish are successfully passed into the upper watershed, fish passage provisions at other project facilities will likely also be necessary. NMFS' study requests herein reflect a comprehensive inquiry about fish passage, fish habitat, and the other ecosystem-related effects of the Yuba River Development Project. The information derived from these inquiries will inform NMFS' future decisions regarding FPA§18 prescriptions.

9. NMFS respectfully requests the Commission order all studies enumerated in this official correspondence in support of developing a complete and accurate Administrative Record for these proceedings.

The requested scope of fish passage and habitat-based information and studies- upstream of the Narrows 2 facility development- is supported by the foregoing facts identifying the Narrows 2 facility as a "gateway" fish passage barrier. All requested studies in the upstream watershed are appropriate and relevant to this proceeding. Studies that are requested specifically to establish that the Narrows 2 facility is a fish migration barrier may be waived or modified if the applicant and the Commission will stipulate to the fact in this proceeding. Otherwise, the Commission should grant all studies requested by NMFS, other resource agencies, and other stakeholders that reasonably yield information to support decisions about future FPA§18 fishway prescriptions, FPA 4(e) conditions, as well as FPA§10(j) protection, mitigation, and enhancement measures for the entire Yuba River Development Project.

**a. Request Element #1: Information about Hydraulic Conditions near project facilities:**

Information to identify, quantify, and qualify hydraulic conditions within the hydroelectric power generation facilities including: all intakes, tunnels, pipes, flumes, penstocks, turbines and turbine housings, draft tubes, surge tanks or basins, and discharge outfalls. One primary focus of this investigation is the Narrows 2 power generation facility between the intake and outfall. Other project facilities should also be studied for actual or potential impacts on fish passage. The purpose of this information request is to evaluate whether or not anadromous fish of all life stages are affected by project facilities during operations. Specifically, the request seeks to answer the question of whether or not the hydropower facilities are conducive to maintaining safe, timely, and effective fish passage from the point just downstream of all project facilities to points upstream of those facilities. For example, the Narrows 2 outfall to the upper extents of natural, anadromous fish habitat in the upper Yuba watershed – inclusive of all intervening stream reaches and facilities comprising the Yuba River Development.

*If the applicant and the Commission wish to stipulate for the Record that Narrows 2, and certain other project facilities (e.g.- New Colgate powerhouse, New Bullards Bar Dam, Our House Dam, etc.), constitute upstream and downstream migration barriers that are hazardous to fish, then some elements of NMFS' information request may be retracted or modified accordingly.*

Lacking any stipulations as suggested above, one approach to the question of whether or not the water velocity through the project's power plants exceeds the swimming ability of anadromous fish is to install acoustic velocity flow meters in penstocks of Narrows 2 (and Narrows 1). In this

way, the water velocity data can be collected and compared against the known swimming abilities of fish.

**Request Element #2: Information about Fish Presence and Migration Behavior from downstream of project facilities to upstream of project facilities:**

Information about the presence, absence, timing and abundance, and migration behaviors of anadromous fish in the Narrows reach, and in the reaches in the vicinity of all other project facilities. For example, the study area for the Narrows 2 facility should include: (1) the immediate vicinity of the Narrows 2 draft tube and outfall structure, (2) area upstream of Narrows 2 inclusive of the full-flow bypass facility, up to the base of Englebright Dam, (3) downstream of the Narrows 2 outfall in the Narrows reach to a selected point downstream of Sinoro Bar, inclusive of the Narrows I project outfall. Other relevant project facilities should be included in this information/study request based on a similar, appropriate stream reaches to detect potential fish passage impacts in the immediate vicinity of project outfalls, plus a representative reach in the upstream and downstream directions. For facilities located upstream of the Narrows 2 intake, information should be developed to quantitatively determine the composition and behavior of existing fish species. This information should later be correlated with habitat-based information from other requests so that it is possible to perform an integrated ecological analysis, as called for in the NMFS ecosystems effects information/study request.

For the Narrows 2 reach, in particular, NMFS requests a detailed investigation of anadromous fish in the vicinity of the project facility. This information is needed because it is central to the understanding of the response of anadromous fish to conditions presented by project facilities and operations, a key aspect necessary for formulating conservation measures.

Fish survey in Narrows Reach

This is specifically requested by NMFS in order to understand [anadromous] fish presence and migration behavior. The survey should employ DIDSON technology to scan for, identify, and enumerate fish and fish behaviors in the identified river reach over periods of time that best coincide with expected presence of anadromous fish. Use of conventional underwater cameras and diving or snorkeling may also be employed in addition to DIDSON, or in lieu of DIDSON where conditions warrant, e.g.- below Bullards bar dam because of the extremely low flow releases at that point. Multiple assays should be conducted in the near vicinity of the Narrows 2 outfall, New Colgate outfall, “Fish Flow Powerhouse” outfall (base of Bullards Bar Dam), the confluence area of Middle Yuba with North Yuba River, Our House and Log Cabin Dams. Any known information about fish populations and assemblages in all reaches between Narrows 2 and the upstream extents of natural accessibility for anadromous fish (excluding so-called “partial barriers” or any project facilities) should be brought forward in response to this information request.

**Request Element #3: Specific fish passage information/study request at DaGuerre Point Dam**

The fish passage conditions and efficacy of fish ladders and screens at DaGuerre dam and its associated water diversions should be studied.

This information/study request recognizes that DaGuerre Point Dam is a key in stream facility affecting fish passage in the Yuba River. Although the facility is owned by the USACE, the reason for its existence and function is interdependent and interrelated with the FERC P-2246.

DaGuerre provides head for gravity diversions of water at the Brophy and Hallwood - Cordua Irrigation Districts. The reason why these diversions are able to function is because of the nearly 1M acre-feet storage capacity of Bullards Bar reservoir, established by the impoundment caused by Bullards Bar Dam (a project work). Without the large upstream impoundment capability of P-2246, the Hallwood-Cordua and Brophy water diversions would be severely restricted in their capacity and seasons of diversions. The existence of project storage water therefore creates an inter-related, indirect impact to the Yuba River fish habitat and ecosystem processes.

#### **Request Element #4: Fish Passage information/study request at Narrows I, Narrows 2, Englebright Dam, New Colgate Powerhouse, New Bullards Bar Dam, Our House and Log Cabin Dams**

##### **Hydraulic Studies**

The objective is to obtain hydraulic mapping of streams in the vicinity of each major project facility so that the project's environmental impacts on fish and the ecosystem can be assessed. This specifically includes detailed information and/or studies of velocity, turbulence, and temperature in the immediate vicinity of the Narrows 1, Narrows 2, and New Colgate tailraces as compared to surrounding channel characteristics. In particular, the hydraulic conditions adjacent to the Narrows 2 tailrace and the area leading up to the base of Englebright Dam shall be carefully mapped and described in terms of hydraulic characteristics that may affect fish passage or fish behavior, e.g.- velocity, turbulence, temperature gradients, seasonal flows and "flow splits" between project discharge and natural stream flows. Narrows 1 is included because it is important to understand fish migration and behavior relative to this important downstream discharge. The reason for hydraulic studies near project facilities (intakes, internal conduits, and discharges) is to establish physical and temporal profiles describing the hydraulic environment that may affect the migratory ability and/or behavior of anadromous fish. This includes both physical passage conditions and behavioral aquatic environment cues that affect fish passage, e.g.- temperature and water quality variations, flow cues, turbulence-related barriers, etc.

##### **Channel Bathymetry and Stage-Discharge Relationships**

This request involves a bathymetry survey and characterization in vicinity of all major project facilities, as compared with likely stage-discharge relationships under the range of operating scenarios, and a time-frequency analysis that compares conditions to fish passage windows for adult spring-run Chinook and steelhead. The required information will provide a comparison of channel dimensions and locations relative to fish passage and migration routes. For example, definition of channel characteristics (i.e.- widths, depths, velocities, temperatures) in key locations will enable an assessment as to whether or not the project inhibits or maintains the continuity of upstream and downstream fish passage. In addition to the other upstream project facilities, channel widths and depths should be taken at multiple transects at the following locations: (1) upstream and downstream of DaGuerre dam and water diversions (identified as indirect project effects), (2) Narrows I & 2, (3) Colgate, and (4) "Fish Flow" (Bullards) powerhouse facilities, as well as the area at the base of the Englebright, New Bullards Bar, and the other project dams. Channel widths, depths and temperatures need to be surveyed and recorded in the narrow channel and small pool immediately upstream of Narrows 2 during

summer and early fall seasons. These studies are needed to assess physical /hydraulic fish passage characteristics and habitat conditions in order to make an informed determination about physical and behavioral barriers to passage relative to the Project facilities.

### **Tailrace Barrier Protection Requirements**

This request involves an engineering study of the facility designs and review of prevailing operational conditions at the tailrace/outfall of the Narrows 2 and New Colgate powerhouses, and bypass outfalls. The objective is to understand the historical incidence, or potential future likelihood, of fish stranding, mortality or injury - resulting from “false attraction” into the power plant structures. All plant operating or maintenance records should be made available for inspection in this ILP proceeding, particularly any records that relate to the presence of fish inside project facilities, or documentation of capture or attraction within the project facilities. This study will inform the need for design and construction of tailrace barriers or other improvements that were not incorporated into original facility designs. Such measures have become standard upgrades at other hydroelectric facilities. The Commission should call for analysis of the need for tailrace barriers as a protective measure for all fish and wildlife species that may be susceptible to injury or mortality by power plant structures and operations.

### **Request Element #6: Specific information/study request about Fish Passage Upstream of the Narrows I & 2/Englebright Dam complex; and upstream of other Project facilities.**

This information request should be informed by the 2010 Montgomery-Watson- Harza, Inc. (MWH) report on Yuba River fish passage options. While the MWH study contains significant engineering and biological information, the scope of the study did not cover all fish passage aspects, so the FERC-sponsored studies should build on the MWH study and fill in the gaps. For example, the applicant should analyze the MWH fish passage options as compared to other potential modes for fish passage, including the notching or complete removal of Englebright Dam. A previous CH2M Hill effort produced information about a potential “dam notch and fishway” concept. This information should be brought forward for further analysis of this fish passage alternative. A study of the complete removal of Englebright and DaGuerre dams is warranted as a potential fisheries restoration action for the Yuba watershed, but these are not within the scope of FERC-licensing.

The MWH study looked at multiple options for fish passage into the upper watershed at a conceptual level. Some of these options involved volitional passage (ladders), others involved semi-volitional (trams) or non-volitional (“collection and transport”) methods. NMFS requests additional engineering feasibility studies to continue with the process of selecting and designing effective fish passage systems. Studies of all project facilities may be involved- to the extent they are relevant in the on-going process of developing and refining alternatives, and eventually selecting a preferred alternative for an effective anadromous fish passage program. This outcome is consistent with NMFS resource goals and objectives for this project. It is also consistent with NMFS Draft Central Valley Recovery Plan for ESA listed species, which has been filed with the Commission as a Comprehensive Watershed Plan.

**Request Element #7: Specific information/study request of reservoir fish passage conditions upstream of Englebright, Bullards Bar, Our House, and Log Cabin Dams:**

It is important to assess both upstream and downstream fish passage facility designs in order to develop a cost-effective fish passage program. For example, a volitional upstream passage system for adult salmonids needs to be informed by reservoir conditions at the release point(s); and downstream fishway designs (screens, surface collectors will require a study of physical relationships of dam, reservoir and shoreline topography/ bathymetry.

- Temperature profiles – detailed profiles in the vicinity of existing New Colgate, Narrows 1 and Narrows 2 Development hydropower intakes, and upstream to the estimated extent of fish guide nets for a possible floating surface collection system;
- Bathymetry profiles – detailed profiles in the vicinity of existing New Colgate, Narrows 1 and Narrows 2 Development hydropower intakes, and upstream to the estimated extent of fish guide nets for a possible floating surface collection system;
- Hydraulic profiles – detailed profiles in the vicinity of existing New Colgate, Narrows 1 and Narrows 2 Development hydropower intakes, and upstream to the estimated extent of fish guide nets for a possible floating surface collection system.

In addition to study upstream of dams, similar studies should be conducted at the head of the reservoirs to evaluate the potential for juvenile fish collection at these locations.

Specific studies for prevention of entrainment (e.g. fish screens and facilities for collection and transport downstream of fry/smolts/kelts) at all power plant intakes is part of this information/study request.

**Request Element #8: Specific information/study request of fish passage conditions over the length of DaGuerre Reservoir and its tail water pools, Englebright Reservoir, and New Bullards Bar reservoir and tail water pools.<sup>2</sup>**

- Temperature profiles - general profiles (width and depth) through the reservoir to identify thermal profiles and potential cool water refugia or other temperature stratification phenomena that potentially affects adult and juvenile salmonid migrations.
- Bathymetry profiles – general profiles (width and depth) through the reservoir to identify thermal profiles and potential cool water refugia or other temperature stratification phenomena that potentially affects adult and juvenile salmonid migrations.
- Hydraulic profiles – general profiles to describe velocity patterns in pools below the dam and upstream near the dam at diversion intakes. This should include study of the forebay, fish ladders, and the areas near points of diversion.

This information is useful to support evaluation of anadromous fish passage conditions in any scenario where fishways may be prescribed. The information will be considered in the overall analysis of whether or not to prescribe fish passage.

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<sup>2</sup> Specific , detailed study of conditions downstream of Englebright Dam is included in request element #4

### **Request Element #9: Fish Passage Conditions in the South Yuba River**

Study of anadromous fish passage conditions from the confluence of the South Yuba River at the reservoir and moving upstream to assess conditions up to RM 35.4. For natural in stream features currently classified as potential partial barriers, conduct a site survey and produce estimates of hydraulic conditions during higher flow events that would result from additional flow releases from upstream hydroelectric projects. Also, these studies should be conducted by qualified fish passage specialists to determine potential remediation methods should enhancement of fish passage become a restoration objective.

### **Request Element #10: Fish Passage conditions in the vicinity and upstream of New Colgate powerhouse to New Bullards Bar Dam**

Comprehensive study of physical and hydraulic conditions beginning at approximately one mile downstream of the Colgate powerhouse, and continuing to approximately one-half mile upstream of Colgate powerhouse . The study is to include a detailed analysis of temperature and hydraulic profiles, i.e.- velocity, turbulence, temperature gradients.

Tailrace barrier requirements - study of the conditions at the tailrace of the New Colgate powerhouse, and associated bypass outfalls or other discharges. All historical plant records documenting fish inside power plant facilities should be made available. Objective is to study and assess the historical incidence, or potential future incidence of fish mortality or injury - resulting from attraction and entrainment into the power plant structures. This study will inform future design and construction of tailrace barriers that were not incorporated into original facility designs.

### **Request Element #11: Fish Passage Conditions in the Middle Yuba River**

Study of anadromous fish passage conditions from the confluence of the Middle Yuba River with the North Yuba River, and moving upstream to assess conditions up to RM 34.5. For natural in stream features currently classified as potential, partial barriers, conduct a site survey and produce estimates of hydraulic conditions during higher flow events that would result from additional flow releases from upstream hydroelectric projects. Also, these studies should be conducted by qualified fish passage specialists to determine potential remediation methods should enhancement of fish passage become a restoration objective.

Upstream and Downstream fish passage conditions at Our House Dam (and the small downstream measurement weir) are part of this request.

### **Request Element #12: Fish Passage Conditions in the Upper North Yuba River**

Study of anadromous fish passage conditions in the New Bullards Bar reservoir and upstream to Love's Falls, including any major intervening tributaries. Habitat assessment and characterization is part of this information/study request.

### **Request Element #13: Pilot Field Experiments for Anadromous Fish Reintroduction**

NMFS has filed a preliminary ESA S10(a)1(a) permit application necessary to conduct field pilot experiment studies using adult and juvenile Chinook salmon and steelhead for research purposes. This permit can be applied for ESA “take” coverage for a consultant hired to conduct these experiments.

Types of reintroduction pilot studies:

- Adult Tracking and Migration – gaining access to holding and suitable spawning; will adults spawn and where?
- Juveniles – smolt outmigration and reservoir transit studies; use mark re-capture or hydroacoustics techniques to track juvenile out-migrant passage through reservoirs and at facility passage obstacles
- Eggs – experiments with fertilized hatchery eggs to establish founder populations in targeted upstream watershed reaches

The scope, extent, duration, design, and oversight of these studies must be done under the oversight of NMFS, with assistance from USFWS and CDFG.

#### **This request is formatted in accordance with:**

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
- (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
- (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
- (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;

(5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

(7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

(c) *Applicant seeking PURPA benefits; estimate of fees.* If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);



- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the “Project” facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

**50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
  - (b) the promulgation of regulations;
  - (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid;
- or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent

utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

**§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

Study goals and objectives:

- 1) To accurately identify, quantify, and qualify the effects of the Project on **fish passage** for all relevant anadromous and resident fish species at all project facilities. As well as in the vicinity of stream reaches which are affected directly or indirectly by the project facilities or operations. If this request is incorporated in the Applicant's Study Plan and implemented in a scientifically defensible manner, the results would inform NMFS' decisions with respect to this ILP (including NMFS' FPA§18 authority), consistent with NMFS' resource goals and objectives with respect to anadromous fish and their habitats.
- 2) Develop information that will be aggregated with other information requests to determine the Project's effects on anadromous fish and the ecosystems that support them.

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS' Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our requests for information or study are linked with NMFS' Resource Management Goals and Objectives. If NMFS' requests are included in the Applicant's Study Plan and approved in the Commission's Study Plan Determination, then successfully implemented, the results would inform:

- (A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;
- (B) NMFS' decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;
- (C) NMFS' decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;
- (D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River.

The fulfillment of NMFS' request is consistent with the following NMFS' Resource Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

5.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 6.1-6.4), migration (see 6.5), spawning (See 6.6), and adjoining

riparian and benthic macroinvertebrate (BMI) habitats (see 6.7).

5.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 6.1-6.4), migration (see 6.5), spawning (See 6.6), riparian and BMI habitats (see 6.7), protection from adverse Fish Hatchery operations (see 6.8) and predation (see 6.9), and ensure coordination within and outside of the Project (see 6.10) to minimize risk to anadromous fishes.

6.1-Flows; 6.2-Flow Ramping; 6.3-Water Quality; 6.4-Water Availability; 6.9-Predation; and 6.10-Coordination.

**§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a federal resource agency.

**§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

The data provided in the PAD needs to be supplemented with additional information to provide the temporal and spatial resolution in order to accurately quantify the Project's effects on anadromous fishes, their habitats, and the ecosystems which support them. Specific fish passage information is required to inform FPA§18 decisions and FPA§10(j) recommendations.

**§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

Fish passage studies play an important role in the design and construction of safe and effective fishways. Under Section 18 of the Federal Power Act, 16 U.S.C. § 811, the Secretary of Commerce has the mandatory conditioning authority to prescribe fishways. Successful operation of fishways may require adults and/or juveniles to successfully navigate Project works including reservoirs and stream reaches affected by powerhouse, dam, or other releases. Understanding the nature and characteristics of target stream reaches, project facilities, and reservoirs in the context of a comprehensive fish passage assessment will assist NMFS (on behalf of the Secretary) in its decisions regarding potential fishway alternatives and designs for the purpose of safe and effective fish passage. Clearly, the effectiveness of fish ladders, fish screens, or other volitional, semi-volitional (e.g. tramway), or non-volitional (e.g. collection and transport) methods of fish passage may be affected by the magnitude, duration, frequency and timing of the water flowing through them (MWH 2010).

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);
- 7) CV fall/late-fall run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 8) CV spring-run and CV fall/late fall-run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 9) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This request for information or study is consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game. Specific fish passage study requests are consistent West Coast practices with regard to pre-design information collection for engineered fishway systems.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant’s responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains

the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

**§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will be between \$470,000-\$850,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Licensees is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

## **8.0 References**

- DWR 2007. Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared for the California Department of Water Resources by the Upper Yuba River Studies Program Study Team.
- FERC 1992. (Federal Energy Regulatory Commission). Environmental Assessment for Hydropower License for the Narrows Project. FERC Project No. 1403-004. February 21, 1992. Washington, DC.
- FERC 2005. (Federal Energy Regulatory Commission). Environmental Assessment for Hydropower License for the Yuba River Development Project. FERC No. 2246-047. November 2005. Washington, DC.
- Moyle, P.B., J.G. Williams, J.D. Kiernan, G.M. Kondolf, and J.F. Mount. 2010. In Press. Improving environmental flow methodologies used in California FERC relicensing. California Energy Commission, PIER.
- MWH. 2010. Montgomery, Watson, Harza Americas, Inc. Yuba River Fish Passage Conceptual Engineering Options. Prepared for the National Marine Fisheries Service, Southwest Region, by MWH Americas, Inc., Sacramento California.
- NMFS 2009. "Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead." NMFS, Southwest Region, Sacramento, California. 7pp. October 2009.
- Pacific Fisheries Management Council (PFMC). 1999. Pacific Fishery Management Council. Description and identification of essential fish habitat, adverse impacts and recommended conservation measures for salmon. *Amendment 14 to the Pacific Coast Salmon Plan, Appendix A*. Pacific Fisheries Management Council, Portland, Oregon.
- Pasternack, G. B. 2008. SHIRA-Based River Analysis and Field-Based Manipulative Sediment Transport Experiments to Balance Habitat and Geomorphic Goals on the Lower Yuba River. Prepared for the Cooperative Ecosystems Study Unit (CESU) 813326J002, University of California at Davis. Department of Land, Air, and Water Resources (in association with the UC Davis Center for Watershed Sciences). Final Report. August (Revised January 29, 2009).
- PFMC. 2003. Pacific Fishery Management Council. Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon and California as Revised Through Amendment 14 (Adopted 1999).
- Powers, P.D. and J.F. Orsborn. 1985. Analysis of barriers to upstream fish migration. Final Project Report (Part 4 of 4). Bonneville Power Administration, Portland, OR. 61 p.
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## Federal Register Notices

Federal Register Notice, 63 Fed. Reg. 13347, March 19, 1998. Endangered and Threatened Species: Threatened Status for Two Evolutionarily Significant Units of Steelhead in Washington, Oregon, and California. Final Rule.

Federal Register Notice, 64 Fed. Reg. 50394, September 16, 1999. Endangered and Threatened Species: Threatened Status for Two Chinook Salmon Evolutionarily Significant Units in California. Final Rule.

Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.

Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

Federal Register Notice, 70 Fed. Reg. 52488, September 2, 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Final Rule.

Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

Federal Register Notice, 73 FR 60987, October 15, 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon. Final Rule.

Federal Register Notice, 74, FR 52300, October 9, 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 75 Fed. Reg. 30714, June 2, 2010. Endangered and Threatened Wildlife and Plants: Final Rulemaking To Establish Take Prohibitions for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. June 2, 2010.

**NMFS Request #2**  
**Request for Information or Study**  
**Effects of the Project and Related Activities on Hydrology for Anadromous Fish**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC Project No. 2246, Yuba River, California.

Hydrologic regimes, comprised of flow magnitude, duration, frequency, timing, and rate-of-change, substantially influence aquatic habitat and ecology (Poff and Zimmerman 2010). Threatened fishes native to the basin have evolved in and have adapted to the unique hydrologic regime of the Yuba Watershed. Stream characteristics and ecological processes affected by hydrologic regimes include stream channel width and depth, floodplain inundation, transport, storage, deposition, and recruitment of substrates and organic matter, and development, recruitment, and persistence of riparian vegetation. Changes in the timing of high flows affect anadromous species and habitats by altering timing of immigration and emigration, ability to ascend natural and artificial barriers, and ability to utilize overbank habitats that provide cover and nutrients in juvenile life-stages. Alteration of streamflow magnitudes has been shown to be the primary predictor of biological integrity for fish and macroinvertebrate communities (Carlisle et al. 2010).

**Request Element #1: Data Development**

NMFS requests the Applicant develop three hydrologic data sets to compare Project hydrology with unimpaired hydrology and the effects of other developments within the watershed. The three watershed hydrologic scenarios which data sets should be developed are: Unimpaired (e.g., natural flow conditions throughout the Yuba Basin), YRDP (accounting for the hydrological effects of just the Yuba River Development Project, and all other water development projects are represented in an unimpaired condition) and Current (e.g., current conditions with all water development in the Yuba Basin). These scenarios are similar to those developed in the hydrology report in Appendix F of the PAD, but the PAD's non-YRDP scenario is replaced with the YRDP scenario, allowing for easy comparisons of YRDP's hydrology effects with the unimpaired scenario without influence of other water development projects. Given the amount of FERC projects in the watershed it is important to separate out the contribution to hydrologic alteration of each project. Unimpaired hydrology should be developed in an open and transparent manner, with step-by-step, written accounting of the methods and processes used to develop the data set, as was done in Appendix F of the PAD. Unimpaired hydrology for contributing reaches upstream of the Project (e.g., Middle Yuba River above Our House Dam, South Yuba River, etc.) should be developed in the same manner as in Appendix F of the PAD, not imported from the Yuba-Bear/Drum Spaulding (FERC Nos. 2310, 2266) Project. This is to ensure continuity with the unimpaired hydrology developed for this Project and allow for adequate comparisons throughout the entire watershed. The data sets should be comprised of average daily flow for the water years 1970-2010 for each of the three scenarios.



The following parameters should be developed for all three sets of data; similar parameters for the Current scenario have already been developed in Appendix F of the PAD, and can easily be aggregated into the information requested below.

Average annual flow

Monthly averages for each month

1, 3, 7-day maximum – mean for all years

1, 3, 7-day minimum – mean for all years

Julian date and magnitude of annual maximum

Julian date and magnitude of annual minimum

The three datasets should be developed for the following locations of interest:

South Yuba River at Jones Bar (USGS Gage 11417500)

North Yuba at Goodyears Bar (USGS Gage 11413000)

North Yuba River below New Bullards Bar Dam (USGS Gage 11413520)

Middle Yuba River below Our House Dam (USGS Gage 11408880)

Middle Yuba River above North Yuba River confluence

Oregon Creek below Log Cabin Dam (USGS Gage 11409400)

Mainstem Upper Yuba below North/Middle Yuba confluence

Mainstem Upper Yuba below New Colgate Powerhouse

Mainstem Upper Yuba above Englebright reservoir

Mainstem Yuba River below Narrows II Powerhouse (USGS Gage 11418000)

Mainstem Yuba River below Daguerre Point Diversion Dam

Mainstem Yuba River at Marysville (USGS Gage 11421000)

Mainstem Yuba River above Feather River confluence

Feather River below Yuba Confluence

Feather River above Yuba Confluence

Sacramento River below Feather Confluence (USGS 11425500)

Sacramento River above Sacramento-San Joaquin Delta

## **Request Element #2: Peak Flows**

Alterations of peak flows by project operations can have a number of direct and indirect effects on threatened and endangered species in the Yuba basin. Peak flows are responsible for forming and maintaining aquatic habitats such as holding pools and spawning riffles. They can also affect migration cues and passage at partial barriers to migration. This information will illuminate how the magnitude and duration of peak flows have been altered by Project operations or operations related to the Project.

A log-Pearson type III flood frequency analysis should be performed on all three data sets, at all locations of interest. Magnitudes of the flood events with return intervals of 1.01, 1.5, 2, 5, 10, 25, 50, and 100 years should be calculated. In addition to the return intervals above, the Applicant should compute average monthly maximums for the years 1970-2010 for the all three scenarios. Any flow greater than 1.01 year return interval or greater than the unimpaired average monthly maximum flow will be considered a pulse flow. The date of the beginning and end of each occurrence of a pulse flow should be recorded, along with the magnitude and duration of

each pulse flow event. A table comparing the frequency, magnitude and duration of the pulse flows documented for each scenario should be prepared at all locations of interest listed above. Such a table would document the occurrence of pulse flows in each water year (1970-2010) as well as each water year type based on the North Yuba Index, as defined in the Yuba Accord Fisheries Agreement. Annual hydrographs should be developed for a representative year of each water year type under the North Yuba Index.

A comparison of hydrology at major confluences (Feather/Sacramento, Yuba/Feather, Yuba/South Yuba, Middle Yuba/North Yuba) under the three different watershed development scenarios should be performed for the purpose of characterizing the Projects' effects on magnitude and timing of attraction flows into each tributary. Pulse flow events along with average monthly flow should be compared and evaluated in terms of altered immigration attraction flows into one or more tributaries during times the months of January-June. In the Applicant's Anadromous Ecosystem Effects Analysis (NMFS information request #8), this information will be assessed for the capability of these attraction flows to influence the immigration of adult Chinook, steelhead, and green sturgeon in each reach to be assessed.

### **Request Element #3: Dam Spills**

The Applicant should compute the timing, magnitude, duration, and volume of historical spill events below the following dams:

North Yuba River – New Bullards Bar Dam

Middle Yuba River – Our House Diversion Dam

Oregon Creek – Log Cabin Diversion Dam

Yuba River – Englebright Dam

The Applicant should use historical flow records from operation of the Yuba-Bear/Drum Spaulding projects (FERC Nos. 2310, 2266) along with available Englebright reservoir stage information, New Bullards Bar Dam spills and releases from New Bullards Minimum Flow Powerhouse to analyze the contribution of each Project's effect on the spill frequency at Englebright and Our House Diversion Dams.

This information should be evaluated for its capacity to affect fish passage barriers and operation of fish passage facilities. It will also shed light on riparian recruitment processes, sediment and large woody debris transport capacity, attraction and outmigration flows for salmonids, as well as amount and quality of aquatic habitat.

### **Request Element #4: Ramping**

Applicant should analyze 15-minute data from water years 1970-2010 below the New Colgate and Narrows 2 powerhouses and 1-hour data for water years 1970-2010 below the Log Cabin and Our House diversion dams. An exceedance probability of change in flow and stage in 15 minute and 1 hour intervals for the New Colgate and Narrows 2 powerhouses and 1 hour interval for the Log Cabin and Our House diversion dams as measured at the nearest stream gage below the facility should be calculated for up-ramps and down-ramps as observed during the period of record. The greatest hourly rate of change in flow for the largest 10 rate-of-change events will

also be provided to characterize extreme change events. For the 10 largest events, 24-hour hydrographs with descriptions of event conditions should be provided.

Effects of the powerhouse discharge and ramping rate on the hydraulic characteristics of the reaches below Colgate Powerhouse should also be examined as a part of the Powerhouse element. Changes in the stage of the reach below the powerhouse due to project operations can have numerous effects on anadromous species and the physical habitats they may occupy (Hunter 1992). Down ramping events can rapidly change the water surface elevation and wetted perimeter of a reach, stranding juvenile fish or dewatering redds. Up ramping can scour redds and create increased velocities which can be barriers to upstream migration.

In order to assess these Project effects, a detailed two-dimensional hydraulic model of the reach below New Colgate powerhouse should be developed to determine depth, water surface elevations and velocities continuously along the entire reach below the powerhouse to the upstream extent of Englebright Reservoir. Two-dimensional models eliminate the problem of site selection of representative cross-sections that traditional one-dimensional models have been hampered by (Moyle et al. 2011, in press). A two-dimensional model has already been developed for the reach below Narrows II Powerhouse and is presented in Pasternack (2008) as well as ongoing mapping efforts by the Yuba River Management Team. Development of two-dimensional models such as SRH 2-D developed by the Bureau of Reclamation, enable modeling many kilometers of river at a fine resolution (<1 meter) accurately and quickly. Rapid advances in technology enable data gathering to be done in a comprehensive and cost-effective manner.

As input to the two-dimensional hydraulic model, Applicant should develop a digital elevation model (DEM) of the Colgate reach (from the outflow of New Colgate powerhouse downstream to the normal water surface elevation of Englebright Reservoir) spanning the maximum flow width. Mapping of this reach should take place when Englebright Reservoir is at or near its yearly minimum water surface level, to insure that exposed riverbed is surveyed for any migration barriers. The DEM should have a resolution of less than 1 meter both vertically and horizontally. DEM collection methods should mirror as closely as possible the Lower Yuba River Management Team's mapping efforts of the Lower River to insure data continuity. In that effort, an airborne light detection and ranging (LiDAR) topography survey was conducted and field checked with a ground based total station and GPS surveys. This data was combined with detailed stream bed bathymetry surveys by a boat mounted fathometer. A detailed data collection procedure is outlined by the Lower Yuba River Accord River Management Team Planning Group (RMT 2008).

The DEM should be used as input to the two-dimensional model to predict depths and velocities at various discharges. Applicant should model current average monthly discharges below Colgate and Narrows II powerhouses using hydraulic models. In addition, the Applicant should also model the 10 greatest rate-of-change events identified above. Because flows from the New Colgate Powerhouse combine with the discharge from the mainstem upper Yuba River, the range of flows discharged from New Colgate (maximum 3,430 cfs) can have a varying effect on depths and velocities downstream, depending on how much flow is coming down the mainstem Yuba. The 10 greatest rate-of-change events should be evaluated in terms of what time of year and how much flow was present in the mainstem Yuba. If it is determined that the 10 greatest rate-of-

change events do not accurately represent the full range of flows in the mainstem (winter storm runoff, spring snowmelt and summer low flows) then additional flow scenarios should be completed. The model should also be detailed enough to capture any hydraulic jets that occur immediately below New Colgate discharge.

The two-dimensional model should be validated using field measurements of depth, water surface elevations and velocity. An Acoustic Doppler Current Profiler (ACDP) can be used to accurately and quickly gather the necessary validation information at multiple discharges. At minimum, measurements should be taken at every significant geomorphic unit as classified by Montgomery and Buffington (1997) with more complex units such as braided channels requiring more intensive sampling.

This information should be evaluated for its capacity to affect fish passage barriers and operation of fish passage facilities. It will also shed light on riparian recruitment processes, sediment transport capacity, attraction and outmigration flows for salmonids, amount and quality of aquatic habitat, potential for stranding and dewatering of redds. The DEM and the two-dimensional model will also be used in the sediment budget analysis of project effects on physical habitat such as deposition or scour of spawning gravel.

#### **Request Element #5 Floodplains**

Floodplain functions and ecological processes depend on seasonal and periodic inundation of the floodplain. The floodplain is defined as “The floodplain is the flat area adjoining a river channel constructed by the river in the present climate and overflowed at high discharge.” (Dunne and Leopold 1978): The timing, or predictability, of flow events, is ecologically critical because the life cycles of many aquatic and riparian species depend on environmental cues provided by flow events and are timed to avoid or exploit flows of variable magnitude (Poff et al. 1997).

Using a two-dimensional hydraulic model, the Applicant shall compare the unimpaired and current frequency, magnitude and duration of floodplain inundation. Applicant shall use a two-dimensional model of the lower Yuba River from the Narrows II discharge to the confluence with the Feather River to determine how much floodplain area is currently accessible. The Applicant should then use current and unimpaired hydrology to determine the frequency, duration, and magnitude of floodplain inundation under both scenarios as well as the total area and depth of inundation during the ecologically important spring snowmelt season. The Applicant should work collaboratively with ILP participants to define additional, specific ecologically important time periods for floodplain inundation modeling.

#### **Request Element #6: Natural Gradient Impediment/Barriers**

Information from the peak flow, dam spill and powerhouse analyses should be used to analyze project effects on hydrology at partial and full natural impediments or barriers to adult salmonid migration. Applicant should analyze helicopter video, ground surveys and the results of previous studies to identify these natural gradient features within the study area. At minimum, field crews should conduct ground surveys along the North Yuba from New Bullards Bar Dam to the confluence with the Middle Yuba and the mainstem upper Yuba from the North/Middle Yuba confluence to the normal water surface elevation of Englebright Reservoir. It is assumed that

low-flow barriers occurring below New Colgate Powerhouse, including exposure of drowned riverbed when Englebright reservoir is at low water surface elevation should be identified in the powerhouse element. Ground surveys can easily be combined with ground surveys necessary to satisfy other information requests, such as Large Woody Debris (LWD) and Riparian Habitats.

The same definitions for partial and complete barriers to migration for salmonids that were used in Powers and Orsborn (1985) should be used in this analysis. Once a barrier is located, GPS coordinate points of its location should be recorded and a number of physical measurements should be taken which include: height of falls, depth of plunge pool, velocity, slope and depth of fish exit. While initial sampling should take place during annual low-flow conditions, once a barrier is located, the same physical measurements should be taken to the extent safely possible during flows greater than 200 cfs. At a minimum, the physical measurements described above should be developed for the potential barrier on the Middle Yuba approximately 0.4 miles upstream of the North Yuba confluence. The exact location of the barrier and some of its physical characteristics are identified in DWR (2007).

Alteration of the hydrograph at these barriers affects the hydraulic characteristics at the potential barrier, and therefore anadromous immigration potential. Average daily flow for all three watershed development scenarios should be developed at any potential barrier found. Analysis of the hydrology under the different watershed scenarios should be combined with the physical attributes of the barrier and species criteria, to develop a comprehensive assessment of fish passage “windows”, the dates and durations when adult Chinook salmon or CV steelhead would likely be able to ascend the barrier under different scenarios. This information should be supplied to partly fulfill NMFS’ information request #8 Anadromous Ecosystem Effects Analysis.

### **Request Element #7: Bay-Delta**

The Yuba Watershed has a drainage area of approximately 1,344 mi<sup>2</sup>, and is a significant contributor of streamflow to the larger Sacramento River watershed as well as the Sacramento-San Joaquin Delta and San Francisco Bay. Altered flow from the Project has the ability to affect water quantity and quality downstream to the Bay-Delta. The Bay-Delta is an important ecosystem from which consumptive water exports are made. The Yuba Accord EIS discusses some of the impacts that altered Project flow releases in the lower Yuba River would have on water quality and quantity in the Bay-Delta (DOI 2007). The Applicant should synthesize information and analysis already available in documents such as the Lower Yuba River Accord Final Environmental Impact Statement (DOI 2007) and any information developed in this request, to shed light on the Project’s effects on the Bay-Delta ecosystem and the various consumptive water demands in the Bay-Delta.

This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  - (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  - (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  - (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  - (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
  - (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
  - (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
- (c) *Applicant seeking PURPA benefits; estimate of fees*. If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the “Project” facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

**50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid;
- or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

**§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

Study goals:

- 1) To accurately quantify the effects of the Project on hydrologic regimes at a relevant temporal and geographic scale, that in turn affect anadromous fish and their habitats, resources over which NMFS has jurisdiction. If this request is incorporated in the Applicant’s Study Plan and implemented in a scientifically defensible manner, the results would inform NMFS’ decisions with respect to this ILP, consistent with NMFS’ resource goals and objectives with respect to anadromous fish and their habitats.
- 2) Develop information that will be aggregated with other information requests to determine the Project’s effects on anadromous fish and the ecosystems that support them.



Specific information and objectives to be obtained in this information request include:

- a. Daily average stream flow at all locations of interest (described below) within the watershed under current climate and water management, an unimpaired scenario, and a Yuba River Development Project scenario.
- b. Average annual flow for all three scenarios
- c. Monthly averages for each month for all three scenarios
- d. 1, 3, 7-day maximum – mean for all years for all three scenarios
- e. 1, 3, 7-day minimum – mean for all years for all three scenarios
- f. Julian date and magnitude of annual maximum for all three scenarios
- g. Julian date and magnitude of annual minimum for all three scenarios
- h. Log-Pearson type III flood analysis for all locations of interest for multiple return intervals (described below)
- i. Monthly average flow at major confluences (Yuba/Feather, Yuba/South Yuba, Middle Yuba/North Yuba)
- j. Timing, magnitude, duration, and volume of historical spill events below Project dams including Englebright Dam
- k. Relative contribution of Project vs. upstream projects to dam spill frequency
- l. Predicted velocities and water depths for various ramping and discharge scenarios in the New Colgate reach (described below)
- m. Documentation of natural barriers to migration and alteration of passage windows at these barriers under different scenarios
- n. Physical attributes and hydraulic measurements of any barriers to migration found during field surveys
- o. Detailed hydrologic alteration information for incorporation into Anadromous Effects Ecosystem Study (NMFS Information request #8)

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS' Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our requests for information or study are linked with NMFS' Resource Management Goals and Objectives. If NMFS' requests are included in the Applicant's Study Plan and approved in the Commission's Study Plan Determination, then successfully implemented, the results would inform:

(A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;

(B) NMFS' decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;

(C) NMFS' decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;

(D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River.

The fulfillment of NMFS' request is consistent with the following NMFS' Resource Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

Resource Goals:

3.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), and adjoining riparian and aquatic benthic macroinvertebrate (BMI) habitats (see 4.7).

3.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), riparian and BMI habitats (see 4.7), protection from adverse Fish Hatchery operations (see 4.8) and predation (see 4.9), and ensure coordination within and outside of the Project (see 4.10) to minimize risk to anadromous fishes.

Resource Objectives:

4.1-Flows; 4.2-Flow Ramping; 4.3-Water Quality; 4.4-Water Availability; 4.5-Fish Passage; 4.6-Channel Maintenance; 4.7-Riparian/LWD Habitat; 4.8-Hatchery Operations; 4.9-Predation; and 4.10-Coordination.

**§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

**§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

Section 7.2 and Appendix F of the PAD provides hydrology information which will be incorporated with the information generated by this request, to provide a more accurate representation of the Project's effects on anadromous fishes and their habitats. The existing information includes flow information from:

- Middle Yuba River below Our House Diversion Dam (USGS Gage 11408880 available from October 1, 1968 through October 1, 2008)

- Oregon Creek Below Log Cabin Diversion Dam (USGS Gage 11409400 available from September 1, 1968 through September 1, 2008)
- Middle Yuba River near North San Juan (USGS Gage 11410000 available from July 1, 1900 through March 17, 2005)
- North Yuba River below New Bullards Bar Dam (USGS Gage 11413520 available from August 13, 1966 through September 30, 2004)
- Yuba River at Smartville (USGS Gage 11418000 available from October 1, 1941 through September 30, 2008)
- Yuba River near Smartville (USGS Gage 11419600 available from October 3, 1960 through December 11, 2002)
- Yuba River near Marysville (USGS Gage 11421000 available from October 1, 1943 through September 30, 2008)

In addition, synthesized regulated streamflow data have been developed by YCWA at several other locations:

- Upper Yuba below confluence with Middle Yuba River (from October 1, 1969 through September 30, 2008)
- Upper Yuba below New Colgate Powerhouse (from October 1, 1969 through September 30, 2008)
- Yuba River below confluence with Deer Creek (from October 1, 1969 through September 30, 2008)
- Middle Yuba River below Our House Diversion Dam (USGS Gage 11408880 from water years (WY) 1969 through 2008)
- Oregon Creek Below Log Cabin Diversion Dam (USGS Gage 11409400 from WY 1969 through 2008)
- North Yuba River below Goodyears Bar (USGS Gage 11413000 from WY 1931 through 2008)
- North Yuba River below New Bullards Bar Dam (USGS Gage 11413520 from WY 1967 through 2004)
- Yuba River at Smartville (USGS Gage 11418000 from WY 1942 through 2008)
- Yuba River at Marysville (USGS Gage 11421000 from WY 1944 through 2008)

The data provided in the PAD needs to be supplemented with additional information to provide the temporal and spatial resolution in order to more accurately quantify the Project's effects on anadromous fishes, their habitats, and the ecosystems which support them.

**§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

YCWA's continued operation and maintenance (O&M) of the Project affects stream flows upstream of its facilities (through impoundment) and downstream of its facilities (through impoundment, release operations, and diversion). Hydrologic regimes, comprised of flow magnitude, duration, frequency, timing, and rate-of-change, substantially influence aquatic habitat and ecology (Poff and Zimmerman 2010). Threatened fishes native to the basin have evolved in and have adapted to the unique hydrologic regime of the Yuba Watershed. Stream characteristics and ecological processes affected by hydrologic regimes include stream channel width and depth; floodplain inundation; transport, storage, deposition, and recruitment of substrates and organic matter (such as woody materials); and development, recruitment, and persistence of riparian vegetation. Changes in the timing of high flows affect anadromous species and habitats by altering timing of immigration and ability to ascend natural and artificial barriers. Alteration of streamflow magnitudes has been shown to be the primary predictor of biological integrity for fish and macroinvertebrate communities (Carlisle et al. 2010). Altered hydrologic regimes also affect timing and success of reproduction as well as outmigration. Information developed in this request will be used in analyses of Project alterations on fish passage, stream temperatures, coarse sediment and large woody debris transport, the suitability and availability of mesohabitats (e.g. holding pools, spawning grounds, juvenile rearing habitats, etc.) and "ecosystem services" and then used to recommend protection, mitigation, enhancement, and other measures.

Hydrologic regimes also play an important role in the design and construction of safe and effective fishways. Under Section 18 of the Federal Power Act, 16 U.S.C. § 811, the Secretary of Commerce has the mandatory conditioning authority to prescribe fishways. Successful operation of fishways may require adults and/or juveniles to successfully navigate Project works including reservoirs and stream reaches affected by powerhouse, dam, or other releases. Understanding the hydrologic alteration of stream reaches and reservoirs will assist NMFS (on behalf of the Secretary) in its decisions regarding potential fishway alternatives and designs for the purpose of safe and effective fish passage. Clearly, the effectiveness of fish ladders or other volitional, semi-volitional (e.g. tramway), or non-volitional (e.g. collection and transport) methods of fish passage may be affected by the magnitude, duration, frequency and timing of the water flowing through them (MWH 2010).

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);

- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);
- 7) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 8) CV spring-run and CV fall/late-fall run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 9) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This request for information or study is consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant’s responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

### **§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will be between \$100,000-\$250,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Licensees is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

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- Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.
- Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

Federal Register Notice, 70 Fed. Reg. 52488, September 2, 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Final Rule.

Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

Federal Register Notice, 73 FR 60987, October 15, 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon. Final Rule.

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**NMFS Request #3**  
**Request for Information or Study**  
**Effects of the Project and Related Activities on Water Temperatures**  
**For Anadromous Fish Migration, Holding, Spawning, and Rearing Needs**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC Project No. 2246, Yuba River, California.

Aquatic species native to the Yuba Basin have evolved in and adapted to the unique thermal regime of the Yuba Basin. Altered thermal regimes can have a variety of adverse effects on the physiology and physical performance and life history expressions of anadromous fish (McCullough 1999). Temperature can affect growth, behavior, competitive interactions, habitat requirements, and susceptibility to disease. Most fish maintain body temperatures that closely match their environment and as a result, water temperature has a strong influence on every life history stage including: metabolism and growth, timing of life history events such as adult migration and spawning, emergence from the redd, and outmigration (Groot et al. 1995).

**Request Element #1: Temperature Monitoring**

Applicant has implemented a network of temperature monitoring stations listed in section 7.2.9.1 of the PAD. In addition to these locations, Applicant should install water temperature loggers that record water temperature at 15-minute intervals at the following locations: Oregon Creek above the confluence with the Middle Yuba and the mainstem Yuba River above Englebright Reservoir. It is NMFS understanding that in addition to these locations, the Applicants also have multiple temperature monitoring locations in the Upper North Yuba above New Bullards Bar reservoir, which should be included as a part of this study. All of the gage locations listed in table 7.2.9-1 of the PAD, in addition to the ones requested here should record stream temperature data at 15-minute intervals until at least the end of 2012, consulting yearly with ILP participants after that. Data should be downloaded at least twice per year and checked for quality assurance purposes. The raw gage data should then be made available in excel format to ILP participants through a public website.

Applicants are also collecting reservoir temperature data at Englebright and New Bullards Bar reservoirs twice per month at locations near the powerhouse intakes. In addition the Applicants should collect reservoir profile temperatures at two additional points in each reservoir. These points should be located in order to assess the spatial variability and cold water pools in each reservoir. Exact locations will be determined in a collaborative fashion but should be in the spaced in a manner to assess temperature profiles in the middle and upstream end of each reservoir. Temperatures should be measured at 10 foot intervals twice monthly. Data collection should continue bi-weekly at all locations until at least the end of 2012, consulting yearly with ILP participants after that. Data should be checked for quality assurance purposes and made available to ILP participants in excel format through a public website.

## **Request Element #2: Temperature Refugia**

The applicant should investigate for presence and persistence of temperature refugia. Tributary inputs, hyporheic flows, and stratified pools can create thermal refugia in streams with temperatures otherwise inhospitable for salmonids (Matthews and Berg 1997, Nielsen et al 1994). The Upper Yuba River Studies Report conducted an analysis of temperature refugia for the Middle and South Yuba Rivers above Project facilities (DWR 2007). The Applicant should conduct a similar analysis for riverine reaches of the mainstem Yuba from the Middle/North Yuba Confluence to the confluence with the Feather River, riverine reaches of the North Yuba from its headwaters to the confluence with the Middle Yuba, the Middle Yuba below Our House Dam to the confluence with the North Yuba.

Applicant should locate possible thermal refuge areas, and measure water temperatures wherever any clustering of trout are observed, in deep pools (> 10 feet) where stratification is possible, and above/below all flowing tributary mouths. Analysis should be conducted during annual minimum flow conditions. Thermal stratification of pools should be measured at maximum pool depth and compared to surface temperatures at the same location. In addition, a documentation of the physical characteristics of potential holding pools such as depth, width, length, presence of cover (riparian shade, overhanging rocks, bubble curtains) and presence of spawning gravel. If a significant temperature difference exists (>1 ° C) between bottom and surface pool temperatures, then additional temperature measurements will be made including: temperature profiles of the pool at 1 ft. intervals and at locations at the head and tail of the pool to quantify the spatial extent of the colder water.

The applicant should also investigate cold water inputs from tributaries or cold water seeps. Study area will include mainstem Yuba from the Middle/North Yuba Confluence to the confluence with the Feather River, riverine reaches of the North Yuba from its headwaters to the confluence with the Middle Yuba, the Middle Yuba below Our House Dam to the confluence with the North Yuba and Oregon Creek. Where ever a tributary enters the reaches listed above, temperature measurements should be made above and below tributary inputs as well as in the tributary itself. Wherever congregations of trout are observed temperatures both above and below this point will be measured in order to identify potential cold-water seeps. Field surveys should be conducted as closely as possible to annual flow minimums and tributary flows should be measured and recorded.

## **Request Element #3: Temperature Modeling**

The Applicant should develop a tool comprised of one or more models to predict water temperature in project affected streams, reservoirs, and related facilities. The tool should seamlessly incorporate upstream projects and inflows, project reservoirs and diversions with downstream flows and diversions in order to model the entire Yuba basin as well as the Feather River downstream to the Sacramento River confluence under different watershed development and climatic scenarios.

There are a number of water temperature modeling platforms that can accomplish the objectives of the study. It is expected that the Applicant will choose an appropriate platform in an open and

transparent manner in collaboration with ILP participants. It is expected that the model(s) will be calibrated and verified using accepted scientific methodology and the best available data.

All model runs should be for the water years 1970-2012 unless otherwise noted. Outputs for the tool should include water temperature predictions at 1hour intervals during water years 1970-2012 at the stream nodes specified in the Temperature Monitoring Element. These nodes include all temperature monitoring locations listed in table 7.2.9-1 of the PAD, along with the additional nodes requested, including North Yuba locations above New Bullards Bar. In addition, if any two nodes are greater than 2 river miles apart then an additional “reach” node should be located as close as possible to the geographic mean between the two nodes and the data made available to ILP participants upon request.

Water temperature models have been developed for the Middle Yuba River above Our House Dam and for the South Yuba River above Englebright Lake for the Yuba-Bear/Drum Spaulding Project. While temperature outputs are not requested for these locations, the Applicant will have to utilize these or comparable models to simulate water temperatures from these projects. Applicant should also provide daily minimums, means, maximums, as well as the 7 day average of daily means (MWAT) for all stream locations and make these results available to the public in excel format through a public website.

For water temperatures in New Bullards Bar and Englebright Reservoirs, accurate temperature predictions are desired in a both longitudinal and vertical direction, necessitating the need for a 2-dimensional representation of the reservoir. Vertical intervals and cross-section spacing should be as small as feasible to run the model in a timely fashion. At minimum the model should predict water temperatures on a daily time step for all cross-sections and depths for the water years 1970-2012 for all scenarios. Graphical representations of water temperatures and depths should be provided at areas where temperature profile data was collected (head, middle, tail of reservoir) for the entire period of record for each scenario listed below. The Applicant should use the tool to predict water temperatures for the following scenarios:

Historical Operations: water years 1970-2012. This scenario will mirror as closely as possible measured and observed values for streamflow, water temperature and climate during this period.

Alteration of Project diversions and releases: water years 1970-2012. The water temperature tool should be able to predict water temperatures resulting from any individual or collective alterations in project flows including:

- 1) Increased/decreased diversion at Log Cabin and Our House Diversion Dams
- 2) Increased/decreased flow release schedules for New Bullards minimum flow release, New Colgate, and Narrows I and II powerhouses.

Alteration of Project facilities: water years 1970-2012. The water temperature tool should be able to predict water temperature resulting from any combination of the following:

- 1) Alteration of either of the release pipes on Our House Diversion Dam to increase/decrease capacity or control flow
- 2) Alteration of either of the release pipes on Log Cabin Diversion Dam to increase/decrease capacity or control flow

- 3) Alteration of Camptonville and Lohman Ridge diversion tunnels to control flow at any desired level up to their maximum capacities
- 4) Alteration of the New Bullards Bar minimum flow powerhouse to increase maximum capacity
- 5) Alteration of New Bullards Bar Dam low-level outlet to increase maximum capacity
- 6) Alteration of intake structure for New Colgate tunnel and penstock to selectively draw from different depths or a combination of depths of New Bullard Bar reservoir
- 7) Alteration of the intake structures for Narrows I and II powerhouses to selectively draw from different depths or a combination of depths of Englebright reservoir.

The water temperature tool should be able to combine any of the scenarios above with any of the alteration of project diversions and releases scenarios.

Alterations of interrelated facilities: water years 1970-2012. The water temperature tool should be able to predict water temperatures resulting from any combination of the following:

- 1) Alteration of instream releases from the Yuba-Bear/Drum Spaulding project (FERC Nos. 2310, 2266)
- 2) Alteration of instream releases from the South Feather Power Project (FERC No. 2088) in Slate Creek
- 3) Alteration of diversion amounts/timing at Daguerre Point Diversion Dam

The water temperature tool should be able to combine any of the scenarios above with any of the alteration of project facilities, diversions and releases scenarios.

Unimpaired temperature regime scenario: water years 1970-2012. This scenario will examine water temperatures under various levels of watershed development. The Applicant should use unimpaired hydrology data developed in NMFS information request #2 combined with the historical climate data. The tool will predict water temperatures in an “unimpaired” state free of any human development including all of the Project facilities, upstream projects and land use changes. The Applicant should also model a “YRDP” scenario where the tool uses YRDP hydrology information, which represents the watershed in an otherwise unimpaired state except for YRDP (i.e. no upstream or downstream projects or land use change); this scenario will model Englebright reservoir as it is an interrelated and integral part of the YRDP. This scenario will also allow for comparison of effects of individual elements of the YRDP (i.e. what is the water temperature effect of the New Colgate development without the Narrows I and II developments and vice versa?) The water temperature tool should be able to combine any of the scenarios above with any of the alteration of project facilities, diversions and releases scenarios.

Climate change scenario: The water temperature tool should be able to assess the effects of a warmer future climate on water temperatures. Using hydrology and operations data from the water years 1970-2012 combined with average air temperature increases of 2, 5 and 8 degrees Celsius for adequate comparison to the analysis conducted in Lindley (2007). For each of the warming scenarios, reasonable assumptions will have to be made about other climatological inputs such as rain/snow proportion, snowmelt timing, rain/snow intensity and amounts. It is intended for the Applicant to develop reasonable estimates of these variables from scientific literature reviews and input from ILP participants.

.This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  - (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  - (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  - (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  - (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
  - (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
  - (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
- (c) *Applicant seeking PURPA benefits; estimate of fees*. If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more

than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the “Project” facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

**50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

**§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

Study Goals:

- 1) To accurately quantify the effects of the Project on water temperature at relevant temporal and geographic scales necessary to help inform license conditions and accomplish NMFS’ resource goals and objectives.

Specific information and objectives to be obtained in this information and study request include:

- a. 15-minute stream temperature collected at all relevant nodes (described above) within the watershed under current climate and water management regimes, from the installation of the data-loggers through at least water year 2012.
- b. Daily minimum, mean and maximum water temperature; along with 7-day average of the daily mean (MWAT) at all monitoring locations for the entire period of record.
- c. Water temperature measurements taken bi-weekly at 10-foot intervals at 3 sampling locations at Englebright and New Bullards Bar reservoirs.
- d. Detailed water temperature profiles of Englebright and New Bullards Bar reservoirs under current climate and water management regimes
- e. Simulated daily minimum, mean and maximum along with 7-day average of the daily mean (MWAT) temperature at all monitoring locations under multiple water management and climatic scenarios.
- f. Identification of any pool determined to be greater than 10 feet in depth that could provide holding habitat for salmonids.
- g. Identification of cold water seeps and tributary inputs that could provide cold-water refugia.
- h. Temperature profiles and physical characteristics of any such holding pools identified, measured during summer low-flow conditions at 1-foot intervals at the pools maximum depth.
- i. Simulated water temperature profiles of Englebright and New Bullards Bar reservoirs under multiple water management and climatic scenarios.
- j. Integration of stream and reservoir temperature models to predict multiple operational scenarios, including effects of different management of upstream and downstream projects (including but not limited to Daguerre Point Dam and the Yuba/Bear-Drum/Spalding Project, South Feather Power Project)
- k. Provide detailed stream and reservoir temperature information and analysis for incorporation into Anadromous Effects Ecosystem Study (NMFS #8).

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS' Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our requests for information or study are linked with NMFS' Resource Management Goals and Objectives. If NMFS' requests are included in the Applicant's Study Plan and approved in the Commission's Study Plan Determination, then successfully implemented, the results would inform:

(A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;



(B) NMFS' decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;

(C) NMFS' decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;

(D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River.

The fulfillment of NMFS' request is consistent with the following NMFS' Resources Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

Resource Goals:

3.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), and adjoining riparian and aquatic benthic macroinvertebrate (BMI) habitats (see 4.7).

3.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), riparian and BMI habitats (see 4.7), protection from adverse Fish Hatchery operations (see 4.8) and predation (see 4.9), and ensure coordination within and outside of the Project (see 4.10) to minimize risk to anadromous fishes.

Resource Objectives:

4.1-Flows; 4.2-Flow Ramping; 4.3-Water Quality; 4.4-Water Availability; 4.5-Fish Passage; 4.6-Channel Maintenance; 4.7-Riparian/LWD Habitat; 4.8-Hatchery Operations; 4.9-Predation; and 4.10-Coordination.

**§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

**§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

Available water temperature data are described in Section 7.2.9.1 of the PAD and summarized below:

Applicant is actively collecting stream water temperature data upstream, within and downstream of the Project, and is also collecting reservoir water temperature data in New Bullards Bar Reservoir and in the United States Army Corps of Engineers (USACE) Englebright Reservoir. Table 7.2.9-1 lists Applicant's stream temperature data collection network and the period of

record for each site as of July 2009. Data have been collected at several locations in the Yuba River below USACE's Englebright Dam since 2003; at other locations, data collection began in summer 2008. Reservoir temperature data have been recorded twice per month by Applicant since 1990 at a single point near the upstream face of New Bullards Bar Dam and at a single point near the upstream face of USACE's Englebright Dam. Normally, reservoir data have been collected at 10-foot intervals, along with *in situ* air temperature.

The data provided in the PAD needs to be supplemented with increased water temperature monitoring to provide the temporal and spatial resolution of measurements in order to accurately quantify its effects on anadromous fish and the ecosystems which support them.

The Upper Yuba River Studies Report (DWR 2007) collected temperature data along the Middle and South Yuba Rivers during parts of 2003-2007. A temperature model was also constructed for the report that simulated water temperatures for the summer of 2004. Model runs were made with increased flow releases from upstream reservoirs and the potential effects to salmonid suitability were discussed.

Temperature data was also collected as a part of the ILP process for the Yuba-Bear/Drum-Spaulding Project (FERC Nos. 2310, 2266). Multiple temperature models were constructed to simulate water temperatures in reservoirs and streams affected by the project. The stream models are able to predict water temperatures downstream to Our House Dam on the Middle Yuba and to Jones Bar on the South Yuba River. Multiple runs of the water model are being made for various water release scenarios for that project and the models are made available for public use.

The U.S. Fish and Wildlife Service also collected water temperature data in the lower Yuba, Middle and South Yuba Rivers during 1998 and 1999 (Deas 1999).

NMFS is currently collecting water temperature data in the upper North Yuba River at multiple locations above New Bullards Bar Reservoir upstream to the confluence with Haypress Creek, including tributaries such as the Downie River and Canyon Creek started during the summer of 2010.

Previous water temperature modeling efforts have resulted in several different modeling approaches, as described below:

- In 1991, a water temperature model, the Yuba River Temperature Model (YRTM) (YCWA 1992), was developed by YCWA in response to California Department of Fish and Game (DFG) proposed flow requirements on the lower Yuba River. This model consisted of the following:
  1. A CE-QUAL-R1 1-dimensional model of New Bullards Bar Reservoir.
  2. A series of linear regressions to simulate water temperatures in the Colgate Penstock as a function of water temperature from New Bullards Bar Reservoir, flow through the penstock, and Marysville air temperature.
  3. A series of linear regressions to simulate water temperatures in Englebright Reservoir as functions of Colgate Penstock temperatures, flows through the Colgate penstock, and Marysville air temperatures.

4. A HEC-5Q 1-dimensional model of the lower Yuba River.

This model operated on a daily basis, and was calibrated for water years 1974, 1976, and 1977, and a portion of June 1991. The model was verified by simulating water temperatures in 1975 and 1978.

While the regression coefficients for the Colgate Penstock and Englebright Reservoir components and the HEC-5Q model for the lower Yuba River are available, the CE-QUAL-R1 model of New Bullards Bar Reservoir is not available.

- In 2001, a water temperature model of the lower Yuba River was developed by YCWA to support testimony before the California State Water Resources Control Board (SWRCB) (YCWA 2001). This water temperature model consisted of three linear regressions for the following:
  1. Narrows 2 Powerhouse temperatures as a function of Colgate Powerhouse release temperature and Marysville air temperature.
  2. Yuba River flow temperature at the Marysville gage as a function of Narrows 2 Powerhouse release temperature, Yuba River flow at Marysville, and Marysville air temperature.
  3. Yuba River flow temperature at Daguerre Point Dam as a function of Marysville flow temperature, Yuba River flow at Marysville, and Marysville air temperature.

The model relied on historical average monthly release temperatures from Colgate Powerhouse rather than simulating New Bullards Bar Reservoir water temperatures. The model operated on a monthly basis, and the regressions were computed based on historical water temperatures from 1989 through 2001.

- In 2006, an expanded regression-based water temperature model was developed by YCWA to support the Yuba River Accord Environmental Impact Report/Environmental Impact Statement (EIR/EIS) (YCWA 2007). This water temperature model included regressions for the following:
  1. Colgate Powerhouse release temperature as a function of month and New Bullards Bar Reservoir storage.
  2. Narrows 2 Powerhouse release temperature as a function of Colgate Powerhouse release temperature, inflow to Englebright Reservoir, and Marysville air temperature.
  3. Daguerre Point Dam flow temperature as a function of Narrows 2 Powerhouse release temperature, Yuba River flow at Smartville, and Marysville air temperature.
  4. Marysville flow temperature as a function of Narrows 2 Powerhouse release temperature, Yuba River flow at Smartville, Yuba River flow at Marysville, and Marysville air temperature.

These regressions were developed using historical data from 2000 through 2006, and were validated against historical data from 1990 through 2000. The model operated on a monthly time step.

None of these previously developed models adequately addresses the range of operations and geography required to assess water management decisions throughout the entire basin over a range of climatic conditions, necessitating the development of a new tool.

**§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

YCWA's continued operation and maintenance (O&M) of the Yuba River Development Project (Project) affects water temperature. Temperature regimes in the Lower Yuba River are controlled by the complex interaction between releases from New Colgate powerhouse, flow from the North, Middle and South Yuba Rivers, and the thermal stratification of Englebright reservoir. Bypassed reaches of the North and Middle Yuba as well as Oregon Creek have altered thermal regimes as a result of flow alterations and diversions. The complex nature of water development in the Yuba Basin necessitates the need for a comprehensive, integrated understanding of water temperature effects on anadromous fish and their habitats.

Aquatic species native to the Yuba Basin have evolved in and adapted to the unique thermal regime of the Yuba Basin. Altered thermal regimes can have a variety of adverse effects on the physiology and physical performance and life history expressions of anadromous fish (McCullough 1999). Temperature can affect growth, behavior, competitive interactions, habitat requirements, and susceptibility to disease. Most fish maintain body temperatures that closely match their environment and as a result, water temperature has a strong influence on every life history stage including: metabolism and growth, timing of life history events such as adult migration and spawning, emergence from the redd, and outmigration (Groot et al. 1995).

Temperature also plays an important role in the design and construction of successful fishways. Under Section 18 of the Federal Power Act, 16 U.S.C. § 811, the Secretary of Commerce has the mandatory conditioning authority to prescribe fishways. Successful operation of fishways may require adults and/or juveniles to successfully navigate project reservoirs. The thermal profile of the reservoir combined with inflow temperatures and currents may provide cues to migration and help design more effective fish passage alternatives. The effectiveness of fish ladders or other volitional, semi-volitional (e.g. tramway), or non-volitional (e.g. collection and transport) of fish passage may be affected by the temperature of water that flows through them.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);

- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);
- 7) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 8) CV spring-run and CV fall/late-fall run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 9) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

Any proposed methodology is consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant’s responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

### **§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will be between \$100,000-\$250,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Licensees is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

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Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

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Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

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**NMFS Request #4**  
**Request for Information or Study**  
**Effects of the Project and Related Activities on Coarse Substrate**  
**for Anadromous Fish: Sediment Supply, Transport and Storage**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC Project No. 2246, Yuba River watershed, California.

The purpose of this study is to evaluate the effects of the Yuba River Development Project on fluvial processes and channel morphology, which includes the amount and size of coarse substrate material that life stages of anadromous and resident fishes use and rely upon in freshwaters. A river's character and morphologic function are strongly influenced by the amount and timing of sediment and water provided to them, and any change to this continuum provokes a change in the river and its associated physical and biological processes it supports (Reid and Dunne 2003). Dams can affect channel morphology by trapping sediment, altering the frequency, timing and magnitude of peak flows, and by intercepting large woody debris (LWD) (Grant et al. 2003). New Bullards Bar, Log Cabin, and Our House Diversion dams all interrupt the downstream continuum of sediment supply and transport. Operation and maintenance of the Project therefore has the potential to effect fluvial processes and channel form and associated anadromous and resident fish habitat, and this study seeks to quantify the Project's impacts to the mass balance of sediment supply and transport.

### ***1.1 Study Area***

The study area includes: 1) the Middle Yuba River from Our House Diversion Dam to the confluence with the North Yuba River; 2) Oregon Creek from the Log Cabin Diversion Dam to the confluence with the Middle Yuba River; 3) the North Yuba River from New Bullards Bar Dam to the confluence with the Middle Yuba River; 4) the portion of the Yuba River from the confluence of the North and Middle Yuba rivers downstream to Englebright Dam; 5) the lower Yuba river from Englebright Dam to the Feather River confluence; and 6) the portion of the North Yuba, Middle Yuba, Oregon Creek affected by base-level control exerted by either the diversion dam (Our House, Log Cabin) or reservoir water level (New Bullards Bar).

### ***1.2 Study Methods***

#### **1.2.1 Request Element #1: Develop Sediment Supply Estimates to Project Affected Reaches**

##### **1.2.1.1 Reservoir Sedimentation Rates to Project and Nearby Reservoirs**

Sediment accumulation in New Bullards Bar, Our House, and Log Cabin reservoirs since Project construction reflects sediment yield from reservoir source areas under current conditions and

should be used to estimate current average annual sediment yield. Additional reservoir sedimentation rates are available for Englebright Reservoir and several reservoirs in the nearby South Feather drainage (Childs et al. 2003, Snyder et al. 2004a and 2006 and SFWPA 2007). Calculating reservoir sediment yield requires measuring or estimating (1) the volume of sediment accumulated in each impoundment; (2) bulk sediment properties (i.e., density, percent organic matter, and coarse sediment : total sediment ratio); (3) reservoir trap efficiency; and (4) source area to the impoundment.

Information pertaining to sediment accumulation rates (volumetric) and subsequent dredging for Our House Diversion Dam is provided in the Project's PAD. Also within the PAD, there is mention of developing a sediment pass-through program at Log Cabin Diversion Dam, which presumes some information pertaining to the accumulation and/or dredging at the dam exists. For the purposes of this study request, it is assumed that sufficient data exists at the Log Cabin Reservoir to calculate an accumulation rate for Oregon Creek. Sediment accumulation rates for Englebright Dam are available for pre- and post-1970 (Childs et al. 2003, Snyder et al. 2004a and 2006).

The volume of sediment accumulated in New Bullards Bar Reservoir since construction should be determined by differencing two digital grids of reservoir floor elevations, one based on topography prior to sediment filling and the other based on modern bathymetry. Grids of reservoir topography prior to sediment filling should be derived from as-built construction drawings of Bullards Bar (built in 1924 and inundated by New Bullards Bar) and New Bullards Bar, as well as any bathymetric data pertaining to Bullards Bar sedimentation prior to construction of New Bullards Bar. Modern bathymetry should be surveyed using a combination of boat and ground-based techniques. The majority of the surveying should be conducted from a boat using a survey-grade echosounder and a real-time kinematic (RTK) global positioning system (GPS). Ground-based RTK GPS and total station surveys should supplement bathymetric data where shallow water depths and dense vegetation limit boat access, and where satellite coverage is inadequate. The combined bathymetric data should be used to construct a triangulated irregular network surface that should then be rasterized into a grid. The coincident grids of post-construction and modern reservoir floor elevations should be subtracted to determine sediment thickness and calculate accumulated sediment volume (Morris and Fan 1998, Childs et al. 2003, Snyder et al. 2004). Isopach maps will be used to evaluate the distribution of sediment accumulated in the reservoir.

Estimates of unit area sediment yields area derived from reservoir sedimentation are available for Bullards Bar Reservoir are available from 1919 to 1939 prior to the construction of New Bullards Bar Dam (Miner and Kondolf 2009, Dendy and Champion 1978). It is unknown precisely what data sources were used to derive these estimates, but presumable an as-built drawing of Bullards Bar Dam was used in conjunction with a bathymetric surveyed collected in 1939. These data sources will be pivotal in calculating the present day reservoir sedimentation in New Bullards Bar Reservoir. However, the reservoir sedimentation rate from 1919 to 1939 will not serve to replace a reservoir sedimentation survey for the modern day New Bullards Bar Reservoir for the following reason: 1) it covers a short time window (20 years) that does not likely cover sufficient hydrologic conditions to capture the long-term average rate; 2) the survey period is know more than 70 years old and likely does not reflect the modern day sediment yield;

3) uncertainty involving the 1939 bathymetric survey; and 4) potential differences in reservoir trap efficiency between Bullards Bar Dam and New Bullards Bar Dam.

Average annual, unit-area sediment yields to New Bullards Bar, Our House, and Log Cabin reservoirs should be calculated using the following procedure:

- 1 Accumulated sediment volume should be converted to accumulated mass using published values (e.g., Snyder 2004a,b) for reservoir sediment density.
- 2 Total mass yield should be calculated from accumulated mass using trap efficiency estimates derived from accepted empirical equations (e.g., Brown 1943, Churchill 1948, Brune 1953; Heinemann 1981).
- 3 Average annual, unit-area total sediment yield should be calculated by dividing the total mass sediment yield by the bedload (regulated) source area and the duration of accumulation.
- 4 Average annual coarse sediment yield should be estimated by multiplying the accumulated sediment mass by a coarse:total sediment ratio, and then dividing the total coarse mass by the bedload (regulated) source area and the duration of accumulation.

Note that due to the significant research surrounding the reservoir sediment deposited in Englebright Lake (Childs et al. 2003, Snyder et al. 2004a,b and 2006), several of the key uncertainties regarding extrapolation of reservoir sedimentation volumes into unit-area sediment yields, such as sediment density and coarse to total load ratios, are well constrained for Englebright Lake and are likely applicable for extrapolation to sediments deposited in Project reservoirs. Thus additional, detailed studies of the sediment properties deposited in Project reservoirs is likely not necessary.

#### 1.2.1.2 Extrapolation of Sediment Yields to Project Affected Reaches

Unit-area sediment yields from the reservoir sedimentation calculations should be applied to key locations affected by Project operations and other significant locations in the Yuba watershed to determine average annual coarse and total sediment yields for current and unimpaired conditions. Several of the key locations are listed in Table 1 and Figure 1, these locations focus on quantifying sediment supply upstream and downstream of Project Dams and Englebright Dam, at tributary and river confluences, and at Colgate Powerhouse. Average annual coarse and total sediment yield under reference and current conditions should be calculated by multiplying the apportioned average annual unit-area yield for each drainage basin by the upstream regulated drainage area (for regulated sediment supply) or upstream unimpaired drainage area (for unimpaired sediment supply) to each site. For example an unimpaired sediment supply node located downstream of the North and Middle Yuba confluence would use the New Bullards Bar unit area yield for the North Yuba drainage area, the Our House unit-area yield for the Middle Yuba drainage except for the Oregon Creek drainage area that would use the Log Cabin unit-area yield. Extrapolating this scenario to a current conditions value would use the same unit-area yields for each stream but would eliminate supply upstream of the dams by subtracting all of the source areas upstream of the New Bullards Bar, Our House, and Log Cabin Diversion Dams. Sedimentation rates in Englebright Reservoir (Childs et al. 2003 and Snyder et al. 2004a) can be

used for representing South and Middle Yuba supply rates downstream of the South Yuba confluence with the Yuba River.

**Table 1: Sediment supply nodes for sediment budget for Yuba River Development Project.**

Sediment Supply Node ID	Description
1	North Yuba input to New Bullards Bar Dam
2	North Yuba downstream of New Bullards Bar Dam
3	Oregon Cr upstream of Log Cabin Diversion Dam
4	Oregon Cr downstream Log Cabin Diversion Dam
5	Middle Yuba upstream of Our House Diversion Dam
6	Middle Yuba downstream of Our House Diversion Dam
7	Middle Yuba downstream of Oregon Cr confluence
8	Middle Yuba at confluence with North Yuba
9	Yuba River at confluence of North and Middle
10	Yuba River downstream of Colgate Powerhouse
11	Yuba River input to Englebright
12	Yuba River downstream of Englebright Dam
13	Yuba River downstream of Deer Creek
14	Yuba River downstream of Dry Creek
15	Yuba River at Daguerre Point Dam
16	Yuba River at confluence with Feather River

In all likelihood stratification of sediment supply rates by contributing drainage basin (e.g. New Bullards Bar unit-area yield represents all North Yuba drainage areas) will be sufficient to characterize sediment supply to the nodes downstream of Project dams listed in Table 1. However, in the event that substantial differences exist between unit-area yields at the different reservoirs, additional analysis may be necessary to decide which rate to use for contributing drainage areas potentially of mixed drainage area types. For example, if the unit-area yield is substantially different at Log Cabin Reservoir as compared to Our House Reservoir, the question will arise as to which rate to use (or potentially a weighted average of the two) for areas on the Middle Yuba downstream of the Oregon Creek confluence. In this case, additional stratification calculated in GIS by geologic type, hillslope gradient, soil erodibility, percent coverage by roads, and/or the TNF GIS geomorphic data layer differentiating colluvial hillslopes and eroding hillslopes (USFS 2010) may be necessary to determine which sediment yield is most appropriate to use.

**1.2.2 Request Element #2: Coarse Level Stratification and Study Site Selection**

The objectives of the coarse-level characterization of channel morphology in Project affected reaches are to classify and organize stream reaches in the Study Area based on valley and channel morphology and stratify the relative responsiveness (i.e. “sensitivity”) of river reaches to alterations in the flow and sediment regimes. This element will involve assessing information

gathered from previous studies, data from topographic maps and USGS 10-m DEM as well as aerial photographs, and a helicopter overflight. Based on a coarse-level analysis of the study area, detailed study sites will be selected to examine channel morphology and bed composition more closely and calculate sediment transport capacity. A detailed study site should be selected for in the nearby vicinity of sediment supply study nodes #1 through 10 identified listed in Table 1 and in Figure 1. Detailed study sites downstream of Englebright Dam are likely not necessary due to pre-existing information and studies already underway from the RMT (Pasternack 2010). An additional study site is not needed at node #11 because a site near node #10 should apply to both nodes. Study sites at nodes #1, 3, and 5 (upstream of New Bullards Bar, Log Cabin, and Our House reservoirs, respectively) are in part needed to characterize channel morphology, substrate conditions, and in-channel sediment storage in quasi-reference reaches (i.e., conditions upstream of Project facilities).

Coarse level channel stratification and selection of responsive study sites will involve the following steps:

1. **Review existing information and assemble aerial photographic sets.** Relevant existing data, reports, maps, and aerial photography will be collected and reviewed. These data are expected to include source documentation on geology, topography, soils, land-use (i.e., timber management history, fires, mining, grazing, road development, and water diversions), and the TNF GIS geomorphic data layer (USFS 2010) as well as the mass wasting map “Geology and Slope Instability map of a Portion of the Tahoe National Forest, California” by Don Lewis, TNF Geologist.
2. **Historical aerial photograph analysis.** Historical aerial photographs will be analyzed (where possible) for channel planform position and sinuosity, channel and valley width, coarse sediment deposits, bed morphology (pool-riffle, plane-bed, cascade, bedrock, etc), evidence of hillslope mass-wasting and relative presence of riparian vegetation. Aerial photography will also be used to assist with classifying channel morphology as described below. These photographs should also be used to assess any land use (e.g., mining or timber harvesting activities).
3. **Derive channel slope and create longitudinal profile.** Channel slope and longitudinal profile should be derived from 10-m USGS digital elevation data, or higher resolution data if available. A DEM and GIS coverage of channel slope will be generated for the Study Area. Planform maps of channel slope will be plotted as well as longitudinal profiles of the North , Middle , and mainstem Yuba Rivers as well as Oregon Creek.
4. **Helicopter overflight.** A low altitude aerial video of all Project-affected reaches and facilities was collected by the Licensee (PAD, Appendix E - Project Helicopter Video. This video should be further used to identify potential response reaches based on alluvial sediment storage and identification of pool-riffle reaches.
5. **Identify response reaches and select study sites.** Stream reaches within the Study Area will be grouped according to the channel classification scheme of Montgomery and Buffington (1997 and 1998), which utilizes a process-based framework of sediment supply, sediment transport, links to hillslope processes, and external forcing by valley

confinement, riparian vegetation, and LWD. Channel morphology classifications will be based on aerial photographs, channel slope generated from the DEM, and observations from the helicopter overflight.

Subsequent to designating a Montgomery-Buffington classification, response reaches within the Study Area will be delineated. Response reaches are those most likely to show an impact from altered hydrology or sediment loading, and typically have the following attributes: (1) are unconfined, (2) have a plane-bed or pool-riffle morphology, (3) are predominantly alluvial, and (4) have slopes of less than 4% (Montgomery and Buffington 1998). Channel confinement, alluvial sediment, and morphology will be assessed using aerial photographs and observations made during the helicopter overflight.

Detailed study sites will be selected from the response reaches where possible as identified during the coarse level analyses, which will promote investigation of sites most likely to show a response to any Project alterations in hydrology and sediment supply, are suitable for the sediment transport analysis described below, and will illuminate changes in the downstream trajectory of the balance between coarse sediment supply and transport. Where response reaches do not exist in the vicinity of the sediment supply nodes #1-10, sites with the lowest gradient, least confinement, and greatest alluvial sediment storage should be selected. Other criteria used to evaluate the suitability of the potential detailed study sites will include: minimal direct sediment input from streamside mass wasting (i.e., from bank collapse or shallow landsliding) that may cause localized changes in the channel morphology or bed texture, and minimal localized land use impacts such as riparian timber harvest, channel constrictions due to road construction or crossings, and artificial channel hardening from rip-rapping bank material.

### **1.2.3 Request Element #3: Assessment of Channel Morphology and Fluvial Processes**

Each detailed study site should be classified according to the scheme of Montgomery and Buffington (1997). All detailed study sites should be 20 bankfull channel width long. Data collected at each site should include:

- sediment facies mapped onto hard copy aerial photographs following the conventions of Buffington and Montgomery (1999);
- pebble counts (Wolman 1954) to verify facies mapping and provide roughness parameters at cross-sections used in the sediment transport analysis;
- 3 bulk samples at each site in alluvial sediment deposits using a McNeil or similar sampler in order to characterize the size distribution of the surface and subsurface material;
- 3 representative cross sections extended onto the floodplain (or to the hillslope toe if floodplains are not present), noting bankfull width and floodprone width at each cross-section using standard field indicators (Harrelson et al. 1994);
- Stage-discharge relationships observed at three discharges, with observations at 2 cross-sections within each site
- a long profile of the bed and water surface elevation, with elevations points surveyed at

- the habitat unit scale (i.e., at the top of each pool, riffle, run);
- mapping of all alluvial coarse sediment storage (see section 1.2.5 below); and
- notation of other characteristics of the channel bank and bed, including indicators of channel stability (e.g., bank erosion, aggradation, or degradation).
- LWD counts of all pieces within the floodprone width (also requested as part of study NMFS #5).

#### 1.2.4 Request Element #4: Calculation of Bed Mobility and Sediment Transport Capacity

The rate that bed material is transported downstream of the Project can be used to assess how quickly bed material is leaving the reach and compare how the mass balance of sediment supply and transport capacity has been affected by Project operations. The faster bed material leaves the reach, the greater the effect of reduced sediment supply on channel form and aquatic habitat. This study will assess how often sediment is transported under current and unimpaired conditions and how the Project has affected the frequency, magnitude, and volume of sediment transport. The objectives are to evaluate sediment transport thresholds and their recurrence interval in Project-affected reaches to predict how often bed material is transported and to derive the average annual sediment transport capacity. It is vital to note that the study of bed mobility thresholds (or incipient motion) does not substitute or quantify the average annual sediment transport capacity, which is necessary to calculate the annual sediment load, determine sediment budgets, estimate quantities of gravel augmentation, and to assess stream response to changes in water and sediment supply (Wilcock *et al.* 2009).

##### 1.2.4.1 Deploy Tracer Rocks and Monitor Following High Flow Events

Tracer gravel studies involve marking rocks or placing rocks of a foreign lithology (e.g., quartz rocks) on the river channel bed at low flows and monitoring whether they move after high flow events. Tracer rocks with grain size approximately equal to the local surface  $D_{50}$  and  $D_{84}$ , or if low flows permit rocks painted in-situ (e.g., paint the tops of rocks without removing them from the bed, which creates less disturbance to the natural particle arrangement), should be deployed at as many detailed study sites as logistically feasible. NMFS recognizes that due to access constraints and/or high flow velocities and depths that deployment of tracer rocks may not be feasible at all detailed study sites. Tracer rocks should be placed along the two cross-sections that represent the most uniform flow conditions conducive to sediment transport modeling at each study site. Tracer rock deployment is not necessary downstream of Englebright Dam due to previously collected data (Pasternack 2010).

Tracer gravel experiments are performed so that observations of particle movement and distances traveled are recorded after various high flow events. Tracer rocks should be resurveyed opportunistically following peak flow events, the lowest being flows that generally occur several times per year. If no movement is observed during these flows, the threshold for observations should increase. If the marked rocks do move, they should be replaced. The percent tracers mobilized at each flow are then used to produce a chart of discharge vs. percent moved for each size class. This gives the observer a better understanding of the flows at which bed material is under incipient and total mobility, which is then used to calibrate  $\tau_r^*$  for the sediment transport

model. Having some level of calibration for incipient motion in a sediment transport model is necessary in order to account for variations that may occur due to particle embeddedness, development of pavement layers, and/or effects of large, immobile roughness that can absorb a significant portion of the boundary shear stress. This information also can be used to refine future volumes and size distribution of gravel augmentation (where warranted) as well as instream flow regimes in order to maximize the benefits and residence times of any augmentation measures.

#### 1.2.4.2 Calculation of Bed Mobility and Coarse Sediment Transport Capacity

A hydraulic model should be used to estimate boundary shear stresses for the most uniform, representative cross-section at each detailed study site. Input data for the hydraulic model should include cross-section geometry, water surface slopes, and substrate grain size distributions. The total boundary shear stress from the hydraulic model must then be partitioned into the part that only acts on the grains and produces sediment transport (commonly referred to as the grain stress or skin friction). This is a necessary step because in steeper mountain streams a significant portion of the total shear stress is absorbed by relatively immobile roughness elements such as LWD, boulders, channel banks and bends. An example of how to calculate the grain shear stress can be found in Wilcock et al. (2009). The drag partitioned results from the hydraulic model should be used to develop a rating curve of grain shear stress compared to discharge at each detailed study site.

Incipient motion thresholds of the substrate distributions (both surface and sub-surface material) should then be calculated using a transport function designed for mixed-sized sediments. For a system such as the Yuba River where a large range of sediment sizes are present in the bed (small boulders to sand), it is important to not use a transport function designed for uni-sized sediment distributions such as the Shields curve coupled, because in a mixed-bed smaller grains will be harder to move (hiding effects) and larger grains are easier to move (exposure of larger grains with sediment mixing) (Wilcock et al. 2009). Examples of sediment transport relationships that are for mixed sized sediments that incorporate functions that incorporate these hiding effects include: the substrate –based equation of Parker-Klingeman-McLean (1982), the surface-based equation of Parker (1990a,b), and the surface-based equation of Wilcock and Crowe (2003). Equations such as these should be used to predict the discharge that different size classes of the grain size distributions are mobilized and the discharge which the entire bed is mobilized at. Initial results of sediment mobilization can then be calibrated based on observations of tracer gravels (see section 1.2.4.1). Following any calibration of incipient motion calculations, an analysis should be performed that calculates the frequency of bedload mobilization events (e.g., # of events per year) and determine the annual peak flow return interval (calculated according to USGS Bulletin 17B guidelines[(USGS 1982)]) of bedload transporting events for current and unimpaired conditions, using the unimpaired and current hydrology data sets developed in NMFS information request #4 at each study site.

Sediment transport equations as described above, should then be used to calculate transport capacity (e.g. tons/day) as a function of discharge. Flow duration curves of the mean daily flow series for current and unimpaired conditions should then be integrated under the transport capacity vs. discharge functions to produce an average annual sediment transport capacity There



are several “off-the-shelf” models available that can perform this calculation, such as the Bedload Assessment in Gravel-bedded Streams (BAGS) model (Wilcock et al. 2009).

For reaches downstream of Englebright, existing data (or data scheduled to be collected as part of other studies) pertaining to bed mobility thresholds, their associated frequency and return-intervals for current and unimpaired conditions, and average annual sediment transport capacity should be summarized. If bed mobility calculations and/or sediment transport capacities are not available for nodes 12 through 16 in Table 1, these values should be calculated with the methods described above using existing morphologic data as input parameters.

### **1.2.5 Request Element #5: Evaluate Coarse Sediment Storage in Project Affected Reaches**

The quantity and time that coarse alluvial sediment (e.g., gravel and cobble) is stored in a channel reflects the mass balance between coarse sediment supply and bedload transport. A reduction in coarse sediment supply with little change in the frequency and duration of effective discharges that transport bedload can force a coarse sediment deficit in responsive reaches, potentially resulting in reduced sediment storage, coarsening of the bed surface, and/or incision. Reduced in-channel sediment storage can lead to a loss in the frequency and size of smaller mobile sediment deposits often used for spawning that are typically formed by large roughness elements, local backwater effects, and local flow expansion.

In order to evaluate alluvial sediment storage in a quantitative manner, channel sediment storage should be quantified in the Project affected reaches and in response reaches upstream of the Project reservoirs in order to provide reference reaches. Reference reaches will compare in-channel sediment storage upstream and downstream of Project dams and provide a metric for assessing potential Project induced changes. Reference reaches are necessary for comparing in-channel sediment storage because an unimpaired calculation or extrapolation is not feasible – unlike sediment supply and transport capacity. Potential reference reaches should exhibit similar morphologic characteristics (such as channel slope, width to depth ratios, and morphologic classification as defined by Montgomery and Buffington (1997) [see section 1.2.2]) as Project affected reaches.

Channel sediment storage should be sampled along the entire length of the 10 detailed study sites outline in section 1.2.2, which includes three reference reaches upstream of Project Dams. An additional sediment storage sample site should be added to the following reaches: North Yuba upstream of New Bullards Bar Reservoir, North Yuba between New Bullards Bar Dam and Middle Yuba confluence, Middle Yuba upstream of Our House Diversion Dam, Middle Yuba between Our House Diversion Dam and Oregon Creek confluence, Middle Yuba downstream of Oregon Creek, and Oregon Creek downstream of Log Cabin Diversion Dam, which will bring the total population of channel sediment storage sample reaches to 16. Channel sediment storage downstream of Englebright Dam is not necessary due to existing information, ongoing gravel augmentation projects, and the large quantities of hydraulic mining related sediment stored throughout the lower Yuba (Pasternack 2010).

Channel sediment storage should be mapped in the field using methods similar to Kelsey et al. (1987) and Curtis et al. (2005). Stored sediment should be defined as the fraction of the bed material that is mobile during frequent flood events (e.g., 1.5–5-year recurrence interval floods). This will require defining a size distribution for what constitutes “mobile sediment”, which is often characterized by small or medium cobbles and finer (e.g., < 128 mm). However, results from the sediment transport modeling as well grain size data collected in Element 2 (see section 1.2.4.2) can be used to further refine what is “active, mobile sediment” for the Study Area.

Boundaries of each sediment storage patch should be mapped in the field on color aerial photo tiles printed at a relatively high resolution (e.g., less than or equal to 1:2,000). Each sediment storage patch should be described in geomorphic terms, assigned an activity class (e.g., active or semi active) based on relative position and indicators of residence time, and characterized with a textural facies and an estimated  $D_{50}$  and  $D_{84}$  grain size. Depth of each patch should be measured with a probing rod (see Hilton and Lisle 1993 for an example) or estimated relative to the depth to bedrock controls or the thalweg elevation if the patch is inaccessible by wading. For reaches where the following parameters have not been quantified as part of the detailed study sites the following need to be collected: bankfull width, wetted channel width, water surface slope, and length were measured in each sample reach.

Sediment storage areas mapped in the field on air photo tiles should be digitized in GIS, and the area of each patch calculated. Unit storage area (*i.e.*, area of sediment storage per unit area of bankfull channel in  $m^2/m^2$ ) and unit storage volume (*i.e.*, volume of sediment storage per unit area of bankfull channel in  $m^3/m^2$ ) should be calculated for each sample reach from field measurements of channel width, reach length, and depth of storage. Normalizing sediment storage values by channel area will likely be necessary to account for differences in the length and width of sample reaches.

Results from the channel sediment storage inventory should identify the following:

1. Compare sediment storage in Project effected reaches with reference reaches.
2. Will identify how far downstream the Project’s effects from sediment entrapment extend. For example, at some unknown distance, in-channel sediment storage below Our House Diversion Dam may approach values similar to unimpaired reaches.
3. Results will identify reaches that may warrant gravel augmentation, and quantify what volume of material would be needed to maintain a properly functioning channel morphology (this would be determined in concert with the sediment transport modeling results).

### **1.2.6 Request Element #6: Synthesize Study Results to Evaluate Ecological and Geomorphic Impacts**

In order to assess channel sediment dynamics and associated ecological effects on the Yuba River in the Study Area, data collected during this study and relevant hydrogeomorphic data from the proposed *Effects of the Project and Related Facilities on Hydrology for Anadromous Fish* and *Effects of the Project and Related Facilities on Large Wood and Riparian Habitat for Anadromous Fish* studies will be synthesized. The objectives of the synthesis are to (1) describe

the downstream trajectory of the mass balance between coarse sediment supply and transport capacity, (2) determine the extent and magnitude of the coarse sediment deficit on the Yuba downstream of Project Dams based on channel bed storage and morphology, (3) provide information required for future efforts aimed at quantifying the ecological significance of any geomorphic effects of the Project, and (4) provide information necessary to determine if and what management measures may be necessary to mitigate any sediment imbalance.

The synthesis should include a sediment budget (Reid and Dunne 1996 and 2003) comparing sediment supply and transport capacity from Project Dams downstream to the Feather River confluence, for both regulated and unimpaired conditions. The sediment budget should have nodes (stations on a longitudinal plot) for sediment supply as listed in Table 1 and sediment transport capacity calculated at detailed study sites. The sediment budget should also include a comparison with in-channel sediment storage results upstream of Englebright Dam in order to assess how the sediment supply and transport balance is affecting volumes of sediment stored within the channel.

The synthesis should summarize and tabulate the results from the sediment transport modeling at detailed study sites, including discharges necessary to mobilize individual grain size fractions as well as complete bed mobilization, the frequency of which bed mobilization discharges occur under the regulated and unimpaired flow regimes, and develop bedload and total sediment load rating curves (e.g., transport capacity as a function of discharge). In addition, simple conceptual models of channel sediment dynamics under current and reference conditions will be developed. These conceptual models should include analyzing Project effects with the framework proposed by Grant et al. (2003), often referred to as a  $T^*$  and  $S^*$  analysis, as well as calculating the metrics for assessing the downstream effects of dams proposed by Schmidt and Wilcock (2008).

The synthesis will enable an assessment of the Project's effects on channel morphology and substrate as well as the direct impacts on gravels used for spawning by anadromous fish and resident salmonids. This information can further be used to develop PM&E measures related to augment gravel, adjust instream flow regimes, and thereby improve salmonid spawning habitat affected by the Project. The need for this assessment results from the entrapment of likely 100% of the North Yuba sediment load at New Bullards Bar Reservoir and a substantial, but unknown percentage of the coarse sediment load for the Middle Yuba and Oregon Creek at Our House and Log Cabin diversion dams. In addition sediment transport capacity is affected due to changes to the hydrologic regime caused by the large storage created at New Bullards Bar Dam and flow diversions at Our House and Log Cabin diversion dams. These Project facilities and their operations have unknown effects on the volume and size distribution of alluvial sediment stored in the channel in Project affected reaches; these effects in turn are factors that strongly influence biologically-relevant conditions and ecological functions, including salmonid spawning habitat, BMI production and associated food supplies, and riparian conditions that provide shading and cover for salmonids, and food for BMI prey. This study will quantify the geomorphic processes influencing channel morphology and associated alluvial sediment available to maintain a properly functioning aquatic and riparian ecosystem, and these results will further be integrated into their effects on anadromous salmon in NMFS Proposed Study #8, *Anadromous Fish Ecosystem Effects Analysis: Synthesis of the Direct, Indirect, and Cumulative Effects of the Project and Related Activities on Anadromous Fish Resources*.

This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  - (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  - (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  - (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  - (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
  - (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
  - (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
- (c) *Applicant seeking PURPA benefits; estimate of fees*. If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more

than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the “Project” facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

**50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid;
- or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

**§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

The purpose of this study is to evaluate the effects of the Yuba River Development on fluvial processes and channel morphology, which includes the amount and size of coarse substrate material that life stages of anadromous and resident fishes use and rely upon in freshwaters. A river’s character and morphologic function are strongly influenced by the amount and timing of sediment and water provided to them, and any change to this continuum provokes a change in

the river and its associated physical and biological processes it supports (Reid and Dunne 2003). Dams can affect channel morphology by trapping sediment, altering the frequency, timing and magnitude of peak flows, and by intercepting large woody debris (LWD) (Grant et al. 2003). New Bullards Bar, Log Cabin, and Our House Diversion dams all interrupt the downstream continuum of sediment supply and transport.

This study has two primary goals: (1) to assess the potential geomorphic effect of reducing coarse sediment supply to, and altering coarse sediment transport capacity within, Oregon Creek, the Middle Yuba, the North Yuba, and the Yuba rivers downstream of Log Cabin, Our House, and New Bullards Bar dams (hereafter referred to as the Project affected reaches); and (2) to provide information required to assess the potential ecological impacts of any geomorphic changes in the Yuba River resulting from Project facilities or operations.

These goals will primarily be achieved by compiling a sediment budget beginning at the upstream end of the Project reservoirs and continuing through the Project affected reaches (e.g., downstream of the dams) to the Yuba River's confluence with the Feather River. A sediment budget describes the input, transport, storage, and export of sediment from a geomorphic system (Reid and Dunne 1996 and 2003). A sediment budget for both current conditions and unimpaired conditions will be developed in order to compare and quantify Project effects. The specific objectives of the sediment budget and this study include:

1. Characterize coarse sediment supply rates upstream and downstream of New Bullards Bar, Our House, Log Cabin, and Englebright dams, at tributary and river confluences (e.g., Oregon Creek with the Middle Yuba, Middle Yuba and North Yuba, South Yuba and mainstem Yuba River), and at Colgate Powerhouse.
2. Classify transport and response reaches within the Project affected reaches.
3. Characterize channel morphology, fluvial processes, substrate particle size, and coarse sediment transport at selected study sites (where possible in response reaches) in the Project affected reaches.
4. Evaluate the mass balance between coarse sediment supply and transport at study sites and other significant locations within the Project affected reaches to assess current and unimpaired conditions.
5. Determine coarse sediment storage within the Project affected reaches, including anadromous and resident fish spawning gravel.
6. Complete a current conditions and unimpaired sediment budget using data from objectives 1 through 6 above that will include evaluations of coarse sediment deficits and how they relate to in-channel sediment storage.
7. Synthesize results developed in this study with results from the following submitted study requests: *Effects of the Project on Hydrology for Anadromous Fish: Magnitude, Timing, Duration, and Rate of Change* and *Effects of the Project on LWD and Riparian Habitat for Anadromous Fish: Cover, Rearing, and Migration Habitats* in order to evaluate the geomorphic and associated ecological effects of trapping sediment and LWD and altering the hydrologic and associated sediment and LWD transport regimes due to Project operations and maintenance.

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS' Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our requests for information or study are linked with NMFS' Resource Management Goals and Objectives. If NMFS' requests are included in the Applicant's Study Plan and approved in the Commission's Study Plan Determination, then successfully implemented, the results would inform:

- (A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;
- (B) NMFS' decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;
- (C) NMFS' decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;
- (D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River, as well as areas downstream to the Bay/Delta;

The fulfillment of NMFS' request is consistent with the following NMFS' Resource Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

Resource Goals:

3.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), and adjoining riparian and aquatic benthic macroinvertebrate (BMI) habitats (see 4.7).

3.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), riparian and BMI habitats (see 4.7), protection from adverse Fish Hatchery operations (see 4.8) and predation (see 4.9), and ensure coordination within and outside of the Project (see 4.10) to minimize risk to anadromous fishes.

Resource Objectives:

4.1-Flows; 4.2-Flow Ramping; 4.3-Water Quality; 4.4-Water Availability; 4.5-Fish Passage; 4.6-Channel Maintenance; 4.7-Riparian/LWD Habitat; 4.8-Hatchery Operations; 4.9-Predation; and 4.10-Coordination.



**§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

**§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

- Upper Yuba River Studies Program (UYRSP). NMFS found existing information relevant to the geomorphology of the upper Yuba river in the *Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment (Report)* (CDWR 2007), prepared for the California Department of Water Resources. Approximately 415 potential Chinook salmon and steelhead spawning sites were identified in the upper Yuba, most located in the South Yuba and Middle Yuba rivers. On the Middle Yuba River, most of the potential spawning sites are located upstream of Our House Dam and downstream of Oregon Creek; few sites exist upstream of Tehama Ravine. No potential spawning sites were identified in the North Yuba River below New Bullards Bar Dam, to its confluence with the Middle Yuba. Only 13 potential spawning sites were identified in the upper Yuba River, all of which are located downstream of the confluence with the Middle Yuba. Most of the sites in the Yuba River below the mouth of the Middle Yuba contained relatively large gravel (d50 = 45 to 60 mm [1.8 to 2.4 inches]) and would potentially be used by only a few Chinook salmon and steelhead.
- Tahoe National Forest (TNF) has compiled a geomorphic data layer primarily differentiating colluvial hillslopes and eroding hillslopes (USFS 2010), which includes a significant portion of the Project Area, particularly in the Middle Yuba and Oregon Creek.
- Sediment management and volumes removed from Our House Diversion Dam (PAD, Section 7.1.8.2.2. Geology and Soils)
- Reservoir sedimentation rates at Englebright Reservoir (Childs et al. 2003 and Snyder et al. 2004a), Bullards Bar Reservoir (pre-New Bullards Bar Reservoir, Minear and Kondolf 2009, Dendy and Champion 1978), and nearby reservoirs for the South Feather River (SFWPA 2007)
- Hydrologic information, modeling and statistics for Project-affected reaches (PAD, Section 7.2 Water Resources and Appendix F - Hydrology)
- Low altitude aerial video of all Project-affected reaches and facilities (PAD, Appendix E - Project Helicopter Video)
- Habitat Mapping Report of the Yuba River Development Project completed by the Licensee in 2009 (Attachment 3.10A to Licensee's Instream Flow Study Proposal, Study 3.10)

Downstream of Englebright Dam substantial existing information exists pertaining to geomorphic processes and additional information is scheduled to be collected by the River Management Team (RMT) by mid-2012 (Pasternack 2010). The existing information downstream of Englebright Dam is summarized by Pasternack (2010). No additional field data

is requested in this study proposal downstream of Englebright Dam; however, further analysis, including continuation of the sediment budget from Englebright Dam to the Feather River confluence, of the data below Englebright Dam is requested.

To achieve the study goals, additional information is needed, which includes:

- Reservoir bathymetry of New Bullards Bar Reservoir in order to calculate sedimentation rates
- Calculation of average annual sediment yields for New Bullards Bar, Our House, and Log Cabin reservoirs
- Field measurement of cross-sections profiles and longitudinal profiles of water surface and bed elevations, at detailed study sites upstream of Englebright Reservoir
- Stage-discharge relationships, based on field measurement of calibration flows, to use in a sediment transport model for sediment transport capacity estimates and, in conjunction with flow frequency analysis, frequency of floodplain inundation
- Field measurement of grain size distribution of surface and subsurface material, at detailed study sites upstream of Englebright Reservoir
- Quantification of in-channel sediment storage through field measurement of Project affected reaches upstream of Englebright Reservoir as well as reaches upstream of Project reservoirs (as reference reaches)
- Modeling of annual sediment transport **capacity** for current and unimpaired conditions
- Development of a sediment budget for current and unimpaired conditions for Project affected reaches that compares the mass balance of sediment supply and transport capacity on an average annual basis

**§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

A river's character and morphologic function are strongly influenced by the amount and timing of sediment and water provided to it, and any change to this continuum provokes a change in the river and its associated physical and biological processes it supports (Reid and Dunne 2003). New Bullards Bar Dam/Reservoir traps all coarse sediment supplied by the upstream watershed and reduces peak flows due to its large storage capacity and creates a "bypass reach" between the dam and Colgate Powerhouse. Our House Diversion Dam on the Middle Yuba and Log Cabin Diversion Dam on Oregon Creek divert flow and trap a significant portion of the upstream coarse sediment. Operation and maintenance of the Project therefore alters the frequency, magnitude, and duration of flow events that mobilize coarse sediment deposits, and impose a coarse sediment deficit in several reaches of the Yuba watershed upstream of Englebright Dam. Downstream of Englebright Dam, the Project has the potential to affect channel morphology due to changes in the hydrologic regime caused by operation of the Project's large storage reservoir.

These Project effects may have initiated and/or lead to future downstream changes in channel morphology (e.g., channel incision, reduced coarse sediment storage, and bed surface coarsening) with associated ecological effects on aquatic and riparian habitat. In particular for anadromous and resident fisheries, the potential loss of coarse sediment storage and bed surface coarsening can lead to reduced spawning habitat availability and suitability, and decreased food availability due to impaired benthic macroinvertebrate (BMI) production or loss of prey diversity. Thus, this study seeks to evaluate the Project's effects to channel morphology by quantifying the coarse sediment supply and transport regimes.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);
- 7) CV fall/late-fall run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 8) CV spring-run and CV fall/late fall-run Chinook salmon identified "essential fish habitat" (EFH), (October 15, 2008 73 FR 60987);
- 9) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This study is consistent with the goals, objectives, and methods outlined for recent FERC hydroelectric relicensing studies in California (e.g. McCloud-Pit Project FERC No. 2106 and

South Feather Power Project FERC No. 2088 where a sediment budget framework was used to assess Project effects to geomorphic processes by analyzing the mass balance between sediment supply and transport), and uses well recognized scientific methodologies (e.g., Wilcock et al. 2009, Reid and Dunne 2003, Kondolf et al. 2003, Grant et al. 2003, Harrelson et al. 1994) and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant's responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

#### **§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

In this request, NMFS is not aware that the Applicant is seeking PURPA benefits. NMFS considers that the cost of these studies will total approximately \$125,000 to \$225,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Licensees is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

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Federal Register Notice, 64 Fed. Reg. 50394, September 16, 1999. Endangered and Threatened Species: Threatened Status for Two Chinook Salmon Evolutionarily Significant Units in California. Final Rule.

Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.

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Federal Register Notice, 70 Fed. Reg. 52488, September 2, 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Final Rule.

Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

Federal Register Notice, 73 FR 60987, October 15, 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon. Final Rule.

Federal Register Notice, 74, FR 52300, October 9, 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 75 Fed. Reg. 30714, June 2, 2010. Endangered and Threatened Wildlife and Plants: Final Rulemaking To Establish Take Prohibitions for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. June 2, 2010.



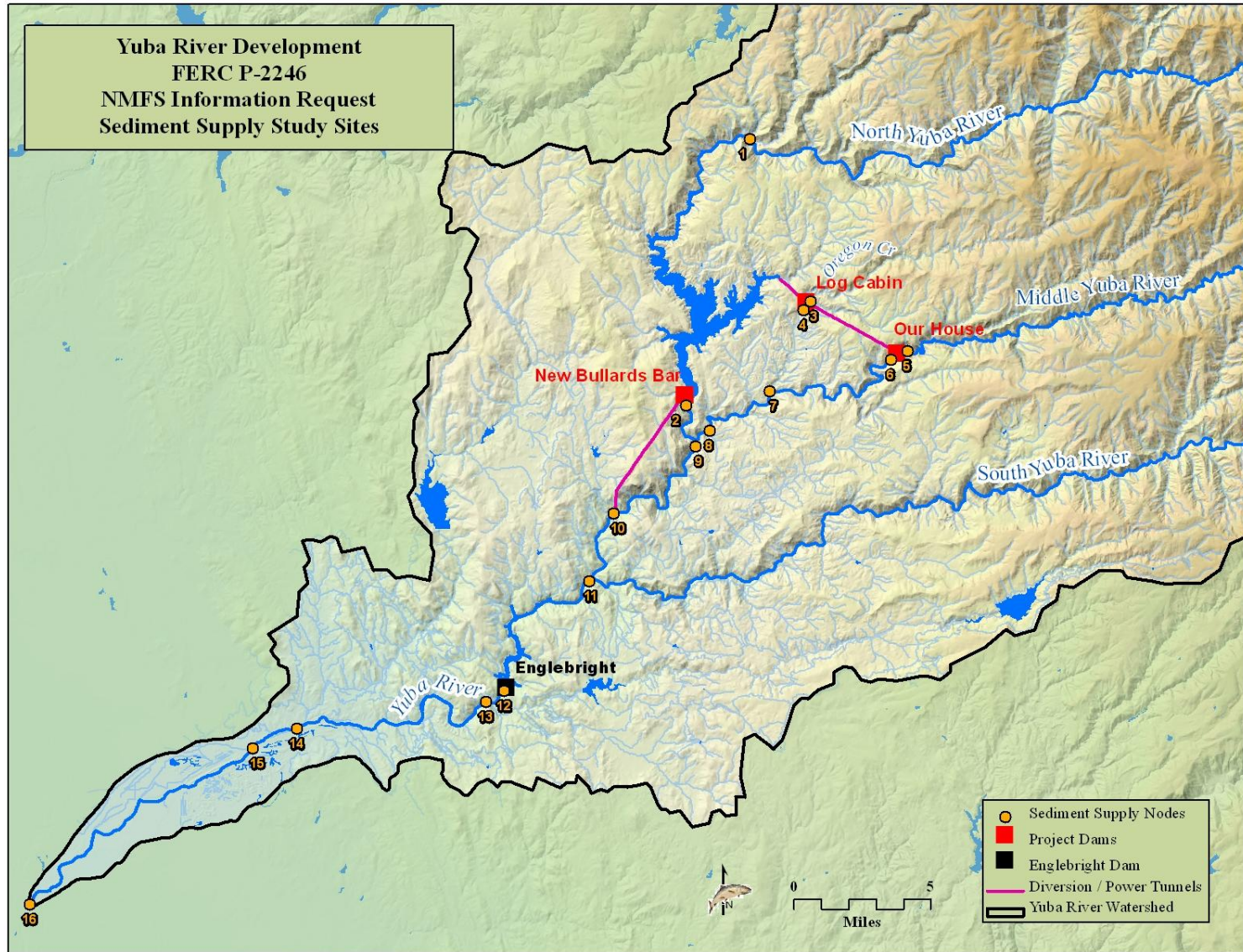


Figure 1: Location of sediment supply nodes for the proposed sediment budget for the Yuba River Development Project.



**NMFS Request #5**  
**Request for Information or Study**  
**Effects of the Project and Related Activities on Large Wood**  
**and Riparian Habitat for Anadromous Fish**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC Project No. 2246, Yuba River, California.

Large woody debris (LWD) plays an important role in streams by shaping channel morphology, storing sediment and organic matter, and providing habitat for all life-stages of anadromous fish. The three Project dams (New Bullards Bar, Our House Diversion, and Log Cabin Diversion) along with Englebright Dam trap LWD, which is periodically removed from the reservoirs by the Applicant and not returned to the river ecosystem. These actions have reduced LWD supplied to reaches downstream of Project dams, which could have negative effects on downstream habitat for anadromous fish. The magnitude of Project effects on LWD is a function of the amount of LWD trapped in project reservoirs, the potential mobility of that wood, and the distribution of potential depositional zones downstream. Information regarding the historical LWD budget along with the LWD volumes removed by the Applicant will help inform potential protection, mitigation and enhancement measures.

**Request Element #1: LWD Removal from Project Works**

Quantitative and anecdotal information on LWD removal from Project reservoirs and diversions including New Bullards Bar and Englebright reservoirs, and Our House and Log Cabin Dams, will be assembled. Information developed for the licensing of the South Feather Power Project (FERC No. 2088) which affects LWD supply on Slate Creek and the Yuba-Bear/Drum Spaulding project (FERC No. 2310, 2266) which affects LWD supply on the Middle Yuba shall be analyzed to determine their effect on LWD delivery to Project diversions and reservoirs. Potential impacts of other land use activities, such as timber harvest, salvage logging, road construction, and channel modification that can alter LWD loading should also be assessed. From this information, estimates of annual volumetric flux of wood volume entering project reservoirs and diversions will be calculated.

**Request Element #2: LWD Survey**

During the geomorphic field surveys conducted for NMFS information request #4 "Effects of Project on Coarse Substrates for Anadromous Fish", LWD greater than 1 meter long within the active channel will be recorded within four diameter classes: small (10-30 cm [4-12 inches]), medium (31-60 cm [12-24 inches]), large (61-90 cm [24-36 inches]), and very large (>90 cm [>36 inches]); and four length classes (1.0-7.3 m [3-25 ft.], 7.3-14.6 m [25-50 ft.], 14.6-21.9 m [50-75 ft.], and >21.9 m [75 ft.]). These size classes will enable like comparisons with other LWD studies in the Sierra Nevada such as Ruediger and Ward (1996) and Berg et al. (1998). Additional LWD field surveys should be conducted in areas identified as response reaches in the coarse level analysis outlined in NMFS Study #4, Effects of the Project and Related Facilities on

Coarse Substrate for Anadromous Fish: Sediment Supply, Transport and Storage, including reaches in the lower Yuba River below Narrows II Powerhouse. The length of additional sample reaches in response reaches should be at least 30 times the bankfull width.

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

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

Control reaches without significant watershed development upstream of project facilities should be surveyed for LWD using the protocols above. The length of control reaches should be at least 30 times the bankfull width. Since wood input mechanisms can be strongly influenced by hill slope processes and LWD dynamics can be strongly influenced by channel morphology, the geology and geomorphology of the control reaches and Project reaches should be as similar as possible. As many control reaches must be selected in order to compare similar channel geometry and geology. Selection of control reaches will ultimately need to be made in collaborative fashion with ILP participants after coarse level stratification of potential reaches is made based on geology, geomorphology, drainage area, and channel slope derived from USGS 10-m DEM. Preliminary potential control reaches include Canyon Creek (tributary to the North Yuba upstream of New Bullards Bar reservoir, drainage area of 158 km<sup>2</sup>), Oregon Creek upstream of Log Cabin Dam, and the Middle Yuba upstream of Our House Dam. Although the Middle Yuba upstream of Our House Dam is impacted by dams further upstream in the watershed (e.g., Milton Dam), because these dams are more than 22 miles upstream their impact on LWD loading in potential control reaches just upstream of Our House Dam is likely minimal. Significant watershed development and infrastructure influences LWD recruitment in the North Yuba above New Bullards Bar reservoir. For example, Highway 49 parallels the majority of the North Yuba in close proximity to the channel and likely interrupts the hillslope delivery of LWD on one side of the channel for a significant portion of its length. Therefore these reaches do not represent “natural” LWD abundance and would not be viable control reaches. Control reaches outside of the Yuba basin can be chosen but must be representative of the climate, hydrology and geomorphology and geology of the study reaches and adequate justification provided.

### **Request Element #3: Evaluation of Project effects on LWD and LWD Budget**

The objective of this task is to evaluate and summarize Project and other land-use effects on LWD dynamics in the Project area which extends from the upstream extent of project reservoirs to the Yuba River's confluence with the Feather River. This task will evaluate the effects of the Project and other land uses on LWD storage, recruitment, and transport in the lower and upper Yuba, North Yuba, Middle Yuba Rivers and Oregon Creek using information collected as part of the elements outlined above. In particular, the amount of wood trapped in Project reservoirs will be compared with current and historical loading levels in the study area. The size of wood, which affects its stability and influence on channel morphology and creation of aquatic habitat for salmonids, should be compared through time. The role of other land uses will also be assessed in terms of their effect on LWD loading and size.

Part of the evaluation of Project effects on LWD should include the development of a LWD budget that extends from the upstream extent of Project Reservoirs past Englebright Dam to the confluence with the Feather River. Conceptually, a wood budget uses a mass balance approach to analyze the input, output, depletion, and changes in storage of LWD in a channel network. A simplified mass balance relationship for LWD for a given channel segment is presented in Equation 1 (Martin and Benda 2001):

$$dS = (I_H dx - Ldx + (Q_I - Q_O) - D)dt \quad \text{(Equation 1)}$$

Where:

$dS$  = the change in wood storage within a given reach length ( $dx$ ) over time ( $dt$ )

$I_H$  = the volume ( $V$ ) of wood recruited from the hillslopes and channel margins per unit channel ( $x$ ) length over time ( $V/x$ )

$L$  = the loss of wood due to overbank deposition during high flow events, abandonment of jams, or burial per unit channel length over time ( $V/x$ )

$Q_I$  and  $Q_O$  = the volumes of wood fluvially transported into and out of a reach, respectively, over time ( $V/t$ )

$(Q_I - Q_O)$  = the fluvial LWD flux

$D$  = the volume lost from decay over time ( $V/t$ )

In order to quantify many of these parameters, values derived from peer reviewed publications will need to be used. Published values should be used in concert with field surveys and estimates of LWD trapped and removed at Project reservoirs should be used to complete the LWD budget. An additional element that will need to be quantified is the volume of LWD delivered to Project reservoirs from the hillslopes surrounding the impoundment. The LWD budget should be quantified for both current and unimpaired conditions. This will allow for a quantification of the Project impacts to LWD loading in Project affected reaches downstream of Project Dams.

### **Request Element #4: Riparian Habitat and Vegetation**

Riparian zones are a critical component of the landscape that connect and sustain river and terrestrial ecosystems. Riparian trees stabilize stream banks, filter nutrients and pollutants, provide shade that cools nearby air and waters, contribute nutritious organic matter and large

woody debris to the aquatic ecosystem, and their root masses can provide velocity and predator refugia for anadromous fishes. The Project's alteration of the hydrologic regime has the potential to affect riparian vegetation composition and distribution by decreasing seedling dispersal and recruitment flows and processes. The loss of in-channel sediment storage downstream of Project Dams due to sediment entrapment at Project Reservoirs may also reduce the surfaces available for riparian vegetation establishment. In addition, the frequency of riparian vegetation resetting processes (e.g., when a surface becomes scoured and then recolonized) may also be affected by Project operations that may reduce the frequency of vegetation and sediment scouring events. Due to the Project's potential to impact riparian processes and the vital contribution the riparian ecosystem provides several anadromous fishes' life stages, NMFS requests information pertaining to the following components of the riparian ecosystem:

1. Assess the current composition and distribution of riparian vegetation within all Project affected reaches.
2. Assess the composition and distribution of riparian vegetation within control upstream of Project influences (see LWD Survey Element above for potential control reaches). Compare results of control reaches with Project affected reaches.
3. Quantify the amount and type of riparian habitat lost under Project Reservoirs, including: New Bullards Bar, Our House, and Log Cabin reservoirs. The most appropriate method will likely be extrapolating riparian composition, distributions, and frequency from control reaches with similar geomorphic characteristics as the channels now under the reservoirs along the length of the now submerged channels.
4. Using cross-sections, stage-discharge, and hydraulic models developed as part NMFS Study Request #2 or #4, quantify the frequency of overbank flows that can facilitate riparian seedling establishment under current and unimpaired conditions. This should be calculated for all Project affected and control study sites where the necessary hydraulic input parameters are collected as part of other studies (see NMFS Study Request #2 or #4 for additional detail on study sites where such parameters should be collected).
5. Assess whether riparian vegetation encroachment has occurred in any of the reaches that have altered hydrology due to Project operations. In particular the following reaches need to be assessed: Oregon Creek from Log Cabin Diversion Dam downstream to the Middle Yuba confluence; and the North Yuba from New Bullards Bar Dam to the Middle Yuba confluence.
6. Using the in-channel sediment storage results from NMFS Study Request #4, assess whether the quantity (both frequency and areal extent) of surfaces available for riparian vegetation establishment has been affected by Project operations that impact the coarse sediment supply and transport capacity balance downstream of Project Dams. For example, the loss of coarse sediment supply may decrease the frequency and extent of point-bar surfaces that allow for various successional stages of riparian vegetation to establish.

This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  - (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  - (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  - (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  - (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
  - (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
  - (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
- (c) *Applicant seeking PURPA benefits; estimate of fees*. If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more

than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the “Project” facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

**50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

**§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

The goals of this information request are: (1) Describe historical and current LWD characteristics and loading in the Study Area (2) Identify the ongoing effects of the Yuba River Development Project (Project) and other land uses (forest management, roads, etc.) on LWD characteristics, recruitment, storage, and transport.

The objectives of the Information request are:

- a. Calculate annual volumetric flux of wood into project reservoirs (New Bullards and Englebright)
- b. Calculate annual volumetric flux of wood into project diversions (Our House and Log Cabin Dams)
- c. Calculate effects of upstream projects and land-use to LWD delivery into Project works
- d. Conduct ground surveys of LWD below Project works
- e. Description and measurements of all wood > 1m in length in the active stream channel in study reaches
- f. Conduct ground surveys of LWD in control reaches
- g. Description and measurements of all wood > 1m in length in the active stream channel in control reaches
- h. Evaluation of historical and current LWD recruitment, transport and storage through development of LWD budget.
- i. Evaluation of Project's effects on LWD budget

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS' Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our requests for information or study are linked with NMFS' Resource Management Goals and Objectives. If NMFS' requests are included in the Applicant's Study Plan and approved in the Commission's Study Plan Determination, then successfully implemented, the results would inform:

- (A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;
- (B) NMFS' decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;
- (C) NMFS' decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;
- (D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River.

The fulfillment of NMFS' request is consistent with the following NMFS' Resource Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

5.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for



related rearing and feeding (see 6.1-6.4), migration (see 6.5), spawning (See 6.6), and adjoining riparian and benthic macroinvertebrate (BMI) habitats (see 6.7).

5.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 6.1-6.4), migration (see 6.5), spawning (See 6.6), riparian and BMI habitats (see 6.7), protection from adverse Fish Hatchery operations (see 6.8) and predation (see 6.9), and ensure coordination within and outside of the Project (see 6.10) to minimize risk to anadromous fishes.

6.1-Flows; 6.2-Flow Ramping; 6.3-Water Quality; 6.4-Water Availability; 6.9-Predation; and 6.10-Coordination.

**§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

**§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

The Applicant has conducted a habitat mapping exercise included in the PAD as “Study 3-10a Attachment –Habitat Mapping Report”. This report includes documentation of large woody debris occurrence during habitat mapping surveys. Habitat was mapped using low-altitude helicopter aerial video combined with ground-based surveys of selected reaches.

Habitat mapping occurred in the following reaches:

Middle Yuba River – Oregon Creek and Our House Diversion Dam Reaches: 12.0 miles from the confluence with the North Yuba River to Our House Diversion Dam

Oregon Creek Reach – Log Cabin Diversion Dam Reach: 4.1 miles from the confluence with the Middle Yuba River to the Log Cabin Diversion Dam

North Yuba River – New Bullards Bar Dam Reach: 2.3 miles from the confluence with the Middle Yuba River to the New Bullards Bar Dam

Yuba River – New Colgate Powerhouse and Middle/North Yuba River Reaches: 7.5 miles. Normal maximum water surface elevation of USACE’s Englebright Reservoir (RM 32.2) to Middle Yuba/North Yuba river confluence at RM 39.7

During the Applicant’s habitat mapping effort, LWD was defined as: “All pieces of wood lying within the bankfull width of the channel that measure 1/2 bankfull width or longer. Wood must

be both downed, and with a portion lying within the bankfull channel, and dead or dying to be considered LWD. Divide into average size classes, and tally the total number of LWD pieces in each size class. Size classes we will use are maximum diameters of 6-12 inches, 12-24, 24-36, or >36 inches. Lengths are <3 feet, 3-10, 10-25, 25-75, >75 feet. These are total lengths, not just length in the channel. Note: LWD has to measure in length at least 1/2 bankfull width or longer to be counted, so which length classes you might use are dependent on stream width (e.g., a 30ft wide stream would only use classes from 10-25ft on up, because the log would have to be at least 15ft to be counted).”

Section 7.1.8.1.6 of the PAD entitled “Large Woody Debris in Slate Creek and Slate Creek Reservoir” summarizes LWD occurrence in Slate Creek above and below South Feather Power Project’s diversion dam on Slate Creek.

The Applicant’s proposed “Study 01-01 Channel Morphology Above Englebright” states:

“Applicant records regarding quantity and fate of large woody debris removed from New Bullards Bar Reservoir, from Our House Dam, and from Log Cabin Dam will be summarized in Applicant’s Pre-Application Document Section 7.1.”

This information is not provided in Section 7.1 of the PAD, but it is assumed that the information would be available to complete this information request.

The Applicant’s classification of LWD does not use similar methodology to comparable studies. Ruediger and Ward (1996) use 1 meter as the minimum length to count LWD, whereas the Applicant used a higher standard for minimum piece length (1/2 bank full width) in order to qualify for inclusion in its survey, which underestimates the amount of LWD relative to Ruediger and Ward (1996) and cannot be compared to results found in that study. In addition, the Applicant did not provide any removal history of LWD from project reservoirs or historical estimates of volumetric flux of LWD in project affected reaches, necessitating this information request.

**§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

Large woody debris (LWD) plays an important role in streams by shaping channel morphology, storing sediment and organic matter, and providing habitat for all life-stages of anadromous fish. The three Project dams (New Bullards Bar, Our House, and Log Cabin) along with Englebright Dam trap LWD, which is periodically removed by the Applicant. In addition, the inundation of 4,790 acres by New Bullards Bar reservoir has eliminated the ability for these areas to contribute LWD to the active stream channel. These actions have reduced LWD supplied to downstream reaches, which could have negative effects on downstream habitat for anadromous fish. Information regarding the historical LWD budget along with the LWD volumes removed by the Applicant will help inform potential protection, mitigation and enhancement measures.

The recruitment, transportation and deposition of LWD may also play an important role in the design and construction of successful fishways. Under Section 18 of the Federal Power Act, 16 U.S.C. § 811, the secretary of Commerce has the mandatory conditioning authority to prescribe fishways. Successful operation of fishways may require adults and/or juveniles to successfully navigate project works including reservoirs and stream reaches affected by powerhouse releases. The safety and effectiveness of fish ladders and other methods of fish passage may be affected by the amount of LWD contributed to project reservoirs and stream reaches.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);
- 7) CV fall/late-fall run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 8) CV spring-run and CV fall/late fall-run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 9) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

### **§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This study is consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant's responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

### **§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will to be between \$50,000-\$100,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Licensees is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

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Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.

Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

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Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

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Federal Register Notice, 74, FR 52300, October 9, 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

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**NMFS Request #6**  
**Request for Information or Study**  
**Effects of the Project and Related Activities on the Loss**  
**of Marine-Derived Nutrients in the Yuba River**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for information or study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC No. 2246, Yuba River, California.

**Background:**

Streams in temperate and northern latitudes are generally unproductive, limited by phosphorous (P) or nitrogen (N) as a result of the geology and the inevitable downstream flow of nutrients to the ocean. Therefore, the upstream migration of anadromous salmonids followed by their death is important to replenish or "fertilize" streams and rivers (Quinn 2005). This fertilization has been studied in several streams, where the uptake of nutrients has been found to enhance the abundances of benthic "biofilm and benthic macro invertebrates (Wiplfi et al. 1998), the condition of juvenile salmon (Bilby et al. 1998), riparian shrub and tree growth (Helfield and Naiman 2001), birds, mammals, and other "receptors". Direct and indirect "feedbacks" occur whereby this salmon-borne "fertilizer" improves the quality of spawning and rearing habitat, and thus the reproductive success of subsequent generations of salmon (Quinn 2005). For example, Wiplfi et al. (1998) found reaches of a creek accessible to salmon had 25 times higher densities of benthic macro invertebrates than reaches of the creek not accessible to salmon. This would benefit juvenile salmon, which eat primarily insects during much of their lives in streams (Quinn 2005). Bilby et al. (1998) demonstrated additional benefits when they examined gut contents of young salmon and learned they eat not only insects but salmon eggs and the flesh from salmon carcasses. The "ecosystem services" provided by dead salmon remain important and economically significant, and have been demonstrated even in the impaired watersheds of the California Central Valley (Merz and Moyle 2006).

Due primarily to the construction of dams, other barriers, and the dewatering of stream reaches, an estimated 1,057 miles (or 48%) of the stream lengths historically available to Chinook salmon have been lost from the original total of 2,183 miles in the Central Valley; if only spawning and holding habitat (excluding migration corridors in the lower elevations) are considered, the reduction in historical range probably exceeds 72% (this is because most of the former spawning and holding habitat is in upstream reaches now inaccessible to Chinook salmon) (Yoshiyama et al. 2001). Other estimates of habitat loss are as high as 95% (

Gresh et al. (2000) used estimates of the historic (high and low ranges) and current escapement sizes and average fish weights to compute biomass, then used information about the nutrient content of salmon carcasses to quantify the historic and current N and P loads transported to the Pacific Northwest (including to California rivers). The authors' estimates for California are collected in Table 1 below. The California (statewide) estimated loss of salmon biomass is 23 to 27 metric tons annually (52 to 60 million pounds). The estimated annual loss of marine-derived N (fertilizer) from historic levels is 713 to 826 metric tons (1.6 million to 1.8 million pounds). Proportionate losses of N, P, and salmon biomass are similar at 94-95% deficits from historic levels.

The estimates of Gresh et al. (2000) were based on statewide losses for all Pacific salmon, and applied an average N content for all salmon species. Merz and Moyle (2006) restricted their estimates to Central Valley Chinook salmon, using a peak escapement (in 2001) of 600,000 fish and a higher average carcass N content, based on analysis of Chinook tissue samples (collected from the Mokelumne River). Using these refinements, the authors calculated that Chinook salmon runs may contribute 337 metric tons of N to the Central Valley annually, much greater than the 43 metric tons estimated by Gresh et al. (2000). They also estimated annual losses of 13 to 22 metric tons of marine-derived N due to California’s state hatchery system, which disposes their salmon carcasses outside the watersheds (Merz and Moyle 2006).

Table 1. Estimates and comparisons of marine-derived nitrogen (N) and phosphorus (P) transported by Pacific salmon to California rivers in historic and current times. Data are extracted and compiled from Gresh et al. (2000) (Table 7, p. 19).

Biomass		Historic	Historic	Current	Loss	Loss	Percent loss	Percent loss
		high range	low range		low range	high range		
Salmon	Metric tons	28,623	24,882	1,404	23,478	27,219		
	U.S. tons	31,551	27,428	1,548	25,880	30,004	94.4%	95.1%
	Pounds	63,102,913	54,855,420	3,095,290	51,760,130	60,007,623		
N	Metric tons	869	756	43	713	826		
	U.S. tons	958	833	47	786	911	94.3%	95.1%
	Pounds	1,915,817	1,666,695	94,799	1,571,896	1,821,018		
P	Metric tons	103	89	5	84	98		
	U.S. tons	114	98	6	93	108	94.4%	95.1%
	Pounds	227,076	196,211	11,023	185,188	216,053		

**Request Element #1:** Estimate a range of the historic mass of marine-derived N transported annually by Chinook salmon (all runs) to the Yuba River.

NMFS’ understanding is information may be limited regarding the historical escapement ranges for the Yuba River. In the estimates of Merz and Moyle (2006), they used a 2001 peak escapement of 600,000 Chinook (presumably all ESUs) to the Central Valley. It may be possible to find estimates of the historical Sacramento Valley run size, or estimate its proportional contribution from total Central Valley escapement numbers. The California Department of Fish and Game (CDFG 1993, in Yoshiyama et al. 2006, p.25) estimates the Yuba River “historically supported up to 15% of the annual run of fall-run Chinook salmon in the Sacramento River system”, thereby providing an approximate proportion of the Yuba River contribution to the Sacramento Valley. An estimate calculated in this fashion would be “rough”, and would likely be a low estimate (because it would not include the spring-run escapement to the Yuba).

Yoshiyama et al. (2006) describe and summarize historical accounts indicating salmon originally migrated into the Yuba River in large numbers to spawn. They include discussion of reports of the California Fish Commission that in 1850 “the salmon resorted in vast numbers to the Feather, Yuba, American, Mokelumne, and Tuolumne Rivers”. Many of these were very likely spring-run Chinook because the California Fish Commission further stated that in 1850 and 1851, “large quantities [of salmon] were taken by the miners and by Indians ... as far up as Downieville on the Yuba”. In later years, the salmon ascended in “considerable numbers” up to Bullards Bar Dam during its period of construction (1921-1924)— “so many salmon congregated and died below it that they had to be burned” (Sumner and Smith 1940, in Yoshiyama et al. 2006). Therefore,



while the estimates requested here would be approximate, NMFS requests this information to provide a “baseline” regarding the historic levels of marine-derived N transported annually to the Yuba River.

Using the escapement estimates discussed above, NMFS requests the Applicant use a 10-kilogram (kg) average mass for adult Chinook, and a 5.62% average N content. The annual mass of marine-derived N would follow the calculation method of Merz and Moyle (2006),

transport = nut% x SW x SP, where  
nut% is the average percentage of N  
SW is the average mass of an adult Chinook, and  
SP is Chinook salmon escapement. (p. 1002).

**Request Element #2:** Estimate the historic mass of marine-derived N transported annually by spring-run Chinook salmon to the Yuba River.

If the proportion of the spring-run Chinook to the total historic run to the Yuba can be estimated, NMFS requests the Applicant follow the method above to estimate the historic mass of marine-derived N transported annually by spring-run Chinook salmon to the Yuba River.

**Request Element #3:** Estimate the current annual mass of marine-derived N transported by Chinook salmon to the Yuba River.

NMFS requests the Applicant use the use the recent peak and 10-year (2001-2010) average Yuba River Chinook escapements, a 10 kilogram (kg) average mass for adult Chinook, and a 5.62% average N content to compute an estimated range of the current mass of marine-derived N transported annually to the Yuba River. These estimates would follow the calculation method of Merz and Moyle (2006), given above.

**Request Element #4:** Estimate the current annual mass of marine-derived N transported by phenotypic “spring-run” Chinook salmon to the Yuba River.

NMFS’ understanding is the escapement estimates for the Yuba River (from carcass surveys) do not distinguish between spring-run and fall-run Chinook. However, since 2003, Vaki Riverwatchers have been used to count adult salmon migrating upstream in the fish ladders at Daguerre Point Dam (Greathouse 2010). This information could inform an estimate of the proportion of phenotypic spring-run Chinook escapement to the total escapement. Future improvements in VAKI operations could close some of the gaps in the count record that have occurred due to system outages (Greathouse 2010). It may also be that information from the (outer edges of) otoliths extracted from sampled Yuba River Chinook carcasses could further inform the estimate of the proportion of spring-run Chinook to the total run; tagging of at least a portion of the early-returning salmon passing the Daguerre Dam fish ladders might be necessary to validate the analysis. Using the results of Element #3 above, and the ratio of phenotypic spring-run to the total run, NMFS’ requests the Applicant estimate the annual N contribution of Chinook that return early (prior to September) to the Yuba River.

NMFS notes these results would also provide an estimate the current annual loss of marine-derived N to the upper Yuba River, if anadromous fish passage were possible at Englebright Dam and the associated hydroelectric facilities. This is because it can be assumed that nearly all early-returning Chinook would pass beyond the elevations of the lower Yuba. Spring-run Chinook historically used the higher spring flows to migrate to elevations of at least 1,500 feet to hold and mature during the summer, before spawning in the early fall at elevations of at least

1,000 feet. If they spawned in early fall, they needed to ascend even higher, at least to ~ 2,500-3,000 ft. in the Sacramento drainage (Yoshiyama et al. 2006). Fall-run historically immigrated in the fall (September or later) under lower flow conditions and spawned shortly after arrival at valley floor (up to 500 feet) and lower foothill (up to 1000 feet) elevations (Yoshiyama et al. 2006). Since lower Yuba elevations are well below the lower (1000-foot) limit historically used by spring-run Chinook (the base of Englebright Dam is ~ 247 feet), NMFS suggests the Applicant assume that all early-returning (spring-run) Chinook entering the Yuba would, if upstream passage were possible, migrate to the upper Yuba to hold, spawn, and die.

From the time Englebright Dam was closed and all upper Yuba flows have been passed to the lower Yuba either over its (247-foot) spillway and/or through Englebright's associated hydroelectric facilities (via the intakes, tunnels, penstocks, powerhouses, and outfalls of PG&E's Narrows I and the Project's Narrows II Development), the upper Yuba has been inaccessible to anadromous fishes. This is because neither Englebright Dam, nor the associated hydroelectric facilities or operations themselves, provide waterways that allow anadromous salmon to reach the upper Yuba. The only current waterways connecting the upper Yuba to the lower Yuba are paths that cannot be surmounted by upstream migrating fishes.

**Request Element #5:** Estimate the annual loss, from historic to current levels, of marine-derived N to the Yuba River.

This estimate can be obtained by subtraction from estimates computed above (Element#1 – Element #3).

**Request Element #6:** Estimate the annual loss, from historic to current levels, of marine-derived N to the upper Yuba

This estimate can be obtained by subtraction from estimates computed above (Element#2 – Element #4).

**Request Element #7:** Compare the differences of marine-derived N incorporated into periphyton and aquatic benthic macroinvertebrates collected in the upper and lower Yuba.

Nitrogen normally has a molecular weight of 14 but some atoms contain an extra neutron, increasing the molecular weight to 15; the proportion of the heavier isotope is greater in marine ecosystems than in freshwater ecosystems (Quinn 2005). NMFS requests the Applicant examine the ratio of (heavy) marine-derived N isotopes to the (lighter) atmospheric isotopes in periphyton and benthic macroinvertebrates collected in upper and lower Yuba locations. NMFS suggests the Applicant apply the methods in Kohler et al. (2008) and others cited therein.

Passage of anadromous salmonids into the upper Yuba would begin to replenish the nutrient levels in habitats which have likely experienced a deficit since Englebright Dam and associated facilities blocked anadromous immigrations. If implemented in the Applicant's Study Plan, the results would indicate whether uptake of marine-derived N is occurring in aquatic biota in the lower Yuba, upper Yuba, and the degree of uptake in these locations. The data would allow relative comparisons with upper Yuba locations.

In the future, resource agencies may determine the upper Yuba requires "fertilization" due to nutrient deficits caused by blocked anadromous access. Use of a manufactured salmon carcass analogue (Kohler et al. 2008) is one treatment option, and the data requested here could be used, and the techniques repeated, to monitor the success of nutrient restorations.

This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*; Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  - (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  - (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  - (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  - (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
  - (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
  - (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
- (c) *Applicant seeking PURPA benefits; estimate of fees*. If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the "Project" facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

## **50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

### **§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

The goal or purpose of this study is to evaluate the effects of the Project and Project-related activities on the degree of reduction or loss in nutrient replenishment to the upper and lower Yuba River. The nutrients in question are those that are marine-derived, and then transported and deposited in freshwaters by migrating anadromous fishes. The mass of nitrogen (N) will be measured here for simplicity, although carbon and phosphorus are also transported and deposited by returning anadromous salmon. In the final element, NMFS requests information about current uptake of marine-derived N, which can be “traced” in terrestrial systems because the proportion of the heavier isotope is greater in marine than freshwater ecosystems. NMFS requests the Applicant examine the ratio of (heavy) marine-derived N isotopes to the (lighter) atmospheric isotopes in periphyton and benthic macroinvertebrates collected in upper and lower Yuba locations, to compare and determine if differences in uptake in nutrients has occurred since salmon have lost access to the upper Yuba.

The information to be obtained is:

- 1) An estimate a range of the historic mass of marine-derived N that was transported annually by Chinook salmon (all runs) to the Yuba River. This is baseline information.
- 2) An estimate of the historic mass of marine-derived N that was transported annually by spring-run Chinook salmon to the upper Yuba River. This is baseline information.

- 3) An estimate of the current annual mass of marine-derived N transported by Chinook salmon to the lower Yuba River. This is current information, for comparison with baseline.
- 4) An estimate of the current annual mass of marine-derived N transported by phenotypic “spring-run” Chinook salmon to the Yuba River. This is current information, for comparison with baseline.
- 5) An estimate of the annual loss, from historic to current levels, of marine-derived N to the Yuba. This compares historic (baseline) conditions with current conditions.
- 6) An estimate of the annual loss, from historic to current levels, of marine-derived N to the upper Yuba. This compares historic (baseline) conditions with current conditions.
- 7) Compare the differences of marine-derived N incorporated into periphyton and aquatic benthic macroinvertebrates collected in the upper and lower Yuba. This will determine if uptake is occurring, and to what degree in the upper and lower Yuba.

The resulting information will be interpreted in the context of information or results yielded in other submitted requests, including *Effects of the Project and Related Facilities on Fish Passage for Anadromous Fish*, *Effects of the Project on Hydrology for Anadromous Fish: Magnitude, Timing, Duration, and Rate of Change*, and others.

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS’ Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our requests for information or study are linked with NMFS’ Resource Management Goals and Objectives. If NMFS’ requests are included in the Applicant’s Study Plan and approved in the Commission’s Study Plan Determination, then successfully implemented, the results would inform:

- (A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;
- (B) NMFS’ decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;
- (C) NMFS’ decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;
- (D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River, as well as areas downstream to the Bay/Delta;

The fulfillment of NMFS’ request is consistent with the following NMFS’ Resource Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

### Resource Goals:

3.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), and adjoining riparian and aquatic benthic macroinvertebrate (BMI) habitats (see 4.7).

3.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), riparian and BMI habitats (see 4.7), protection from adverse Fish Hatchery operations (see 4.8) and predation (see 4.9), and ensure coordination within and outside of the Project (see 4.10) to minimize risk to anadromous fishes.

### Resource Objectives:

4.1-Flows; 4.2-Flow Ramping; 4.3-Water Quality; 4.4-Water Availability; 4.5-Fish Passage; 4.6-Channel Maintenance; 4.7-Riparian/LWD Habitat; 4.8-Hatchery Operations; 4.9-Predation; and 4.10-Coordination.

### **§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

### **§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

NMFS could find no existing information regarding the nutrient status of the Yuba River, with respect to the loss of marine-derived nutrients due to reduced escapement of anadromous Chinook or their blocked access to historic habitats. NMFS understanding is a nutrient study may have been planned by the Upper Yuba River Studies Program, but not carried out.

### **§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

In NMFS' *Request for Information or Study: Effects of the Project and Related Facilities on Fish Passage for Anadromous Fish*, the Applicant is asked to conduct studies related to fish passage for all life stages of anadromous fish inhabiting the Yuba River; this includes passage requirements for Chinook salmon adults. In the "Background" section above, NMFS explains that the upstream migration of anadromous salmonids followed by their death is important to replenish or "fertilize" streams and rivers. This fertilization has been studied in several streams, where the uptake of nutrients has been found to enhance the abundances of periphyton, benthic macro invertebrates, the condition of juvenile salmon, the riparian shrub and tree growth, birds, mammals, and other wildlife and plants. Studies in the Pacific Northwest are finding that the inland transport of nutrients by salmon, and the deposit in rivers when they die is an "ecosystem service" that functions at the very base of the aquatic and terrestrial food webs.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) CV fall/late-fall run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 6) CV spring-run and CV fall/late fall-run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 7) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

The major nexus to this Project is that its facilities and operations may act to both reduce the abundances of returning Chinook salmon and/or impede or block their passage to upstream habitats. Since direct and indirect “feedbacks” occur whereby this salmon-borne “fertilizer” improves the quality of spawning and rearing habitat, and thus the reproductive success of subsequent generations of salmon, losses could beget more losses if this trend is not reversed. The consequences are vastly reduced stream and riparian productivity. The Project’s facilities and operations, and related activities, could impede or block anadromous fish passage at multiple locations in the watershed. NMFS constructed Table 2 (below) to note all these facilities locations where passage of adult Chinook could be impaired or blocked, and note it contains some 20 Project facilities. Due to relationship of Project operations with other facilities listed in

Table 2. Project and Project-related facilities encountered by anadromous fishes migrating in the Yuba River.



Reach	#	Facility Encountered (upstream direction)	RM	Total Migration Distance (mi.)
Lower Yuba				
	1	Daguerre Point Dam	11.4	11.4
	2	Hallwood-Cordua diversion	11.4	11.4
	3	South Yuba-Brophy diversion	11.6	11.6
	4	Brown's Valley diversion	12.2	12.2
	5	Narrows I Powerhouse	23.6	23.6
	6	Narrows II Powerhouse	23.9	23.9
	7	Narrows II Flow Bypass	23.9	23.9
	8	Englebright Dam	24.0	24.0
Upper Yuba				
	9	Englebright Reservoir	24.0	24.0
	10	Narrows I Intake	24.1	24.1
	11	Narrows II Intake	24.1	24.1
	12	Englebright Reservoir (end)	32.2	32.2
	13	New Colgate Powerhouse	33.9	33.9
Middle Yuba			0.0	40.1
	14	Our House Measurement Weir	11.9	51.6
	15	Our House Dam	12.0	51.7
	16	Our House Reservoir	12.0	51.7
	17	Lohman Diversion Intake	12.1	51.8
Oregon Creek			0.0	44.2
	18	Log Cabin Diversion Dam	4.1	48.3
	19	Log Cabin Reservoir	4.1	48.3
	20	Camptonville Diversion Intake	4.1	48.3
	21	Lohman Ridge Diversion Outlet	4.3	48.5
North Yuba			0.0	42.0
	22	New Bullards Bar Dam Spillway	2.1	44.1
	23	Fish Release Measurement Weir	2.2	44.2
	24	New Bullards Fish Flow Powerhouse	2.3	44.3
	25	New Bullards Dam	2.3	44.3
	26	New Bullards Reservoir	2.3	44.3
	27	New Colgate Power Intake	2.6	44.6
	28	Bullards Bar Dam (submerged)	2.7	44.7
	29	Camptonville Diversion Tunnel Outlet	2.8	44.8
	30	Recreation Facilities	3.0	45.0
	31	New Bullards Reservoir (end)	18.1	60.1

Table 2, there is a nexus to additional facilities that could block or impair upstream salmon migrations. Lastly, due to the effects of Project diversions, potential anadromous passage at additional areas of steep natural gradient within natural stream channels could be impaired or blocked.

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This request is consistent with evaluations of marine-derived nutrient status performed in California and the Pacific Northwest by Gresh et al. (2000). The request is also consistent with the methods applied by Merz and Moyle (2006) for the Central Valley Chinook salmon of the Central Valley of California. Ecological studies that rely on isotopes are widely performed and the results are available in the publicly available scientific journals.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant's responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

**§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will to be between \$10,000-\$20,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Applicant is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

## 8.0 References

- Bilby, R. E., B. R. Fransen, P. A. Bisson, and J. K. Walter. 1998. Response of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*) to the addition of salmon carcasses to two streams in southwestern Washington, USA. *Canadian Journal of Fisheries and Aquatic Sciences* 55:1909-1918.
- Greathouse, R. 2010. Vaki Riverwatcher monitoring at Daguerre Point Dam. Presentation at the June 29, 2010 Lower Yuba River Accord River Management Team, Sacramento, CA.
- Gresh, T., Lichatowich, J., and P. Schoonmaker. 2000. An estimation of historic and current levels of salmon production in the Northeast Pacific ecosystem: evidence of a nutrient deficit in the freshwater systems of the Pacific Northwest. *Fisheries*: 25(1):15-21.
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- Merz, J.E. and P.B. Moyle. 2006. Salmon, wildlife, and wine: marine-derived nutrients in human-dominated ecosystems of central California. *Ecological Applications* 16(3):999-1009.
- Quinn, T.P. 2005. The Ecology of Dead Salmon, Chapter 7 in *The Behavior and Ecology of Pacific Salmon and Trout*. University of Washington Press. Seattle.
- Wipfli, M. S., Hudson, J. P., and J. P. Caouette. 1998. Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, USA. *Canadian Journal of Fisheries and Aquatic Sciences* 55:1503-1511.
- Yoshiyama, R.M., E.R. Gerstung, F.W. Fisher, and P.B. Moyle. 2001. Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California in *Contributions to the Biology of Central Valley Salmonids*. Vol. 1. California Department of Fish and Game, Fish Bulletin 179, R.L. Brown, ed.

## Federal Register Notices

- Federal Register Notice, 63 Fed. Reg. 13347, March 19, 1998. Endangered and Threatened Species: Threatened Status for Two Evolutionarily Significant Units of Steelhead in Washington, Oregon, and California. Final Rule.
- Federal Register Notice, 64 Fed. Reg. 50394, September 16, 1999. Endangered and Threatened Species: Threatened Status for Two Chinook Salmon Evolutionarily Significant Units in California. Final Rule.
- Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.

Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

Federal Register Notice, 70 Fed. Reg. 52488, September 2, 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Final Rule.

Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

Federal Register Notice, 73 FR 60987, October 15, 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon. Final Rule.

Federal Register Notice, 74, FR 52300, October 9, 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 75 Fed. Reg. 30714, June 2, 2010. Endangered and Threatened Wildlife and Plants: Final Rulemaking To Establish Take Prohibitions for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. June 2, 2010.

**NMFS Request #6**  
**Request for Information or Study**  
**Effects of the Project and Related Activities on the Loss**  
**of Marine-Derived Nutrients in the Yuba River**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for information or study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC No. 2246, Yuba River, California.

**Background:**

Streams in temperate and northern latitudes are generally unproductive, limited by phosphorous (P) or nitrogen (N) as a result of the geology and the inevitable downstream flow of nutrients to the ocean. Therefore, the upstream migration of anadromous salmonids followed by their death is important to replenish or "fertilize" streams and rivers (Quinn 2005). This fertilization has been studied in several streams, where the uptake of nutrients has been found to enhance the abundances of benthic "biofilm and benthic macro invertebrates (Wiplfi et al. 1998), the condition of juvenile salmon (Bilby et al. 1998), riparian shrub and tree growth (Helfield and Naiman 2001), birds, mammals, and other "receptors". Direct and indirect "feedbacks" occur whereby this salmon-borne "fertilizer" improves the quality of spawning and rearing habitat, and thus the reproductive success of subsequent generations of salmon (Quinn 2005). For example, Wiplfi et al. (1998) found reaches of a creek accessible to salmon had 25 times higher densities of benthic macro invertebrates than reaches of the creek not accessible to salmon. This would benefit juvenile salmon, which eat primarily insects during much of their lives in streams (Quinn 2005). Bilby et al. (1998) demonstrated additional benefits when they examined gut contents of young salmon and learned they eat not only insects but salmon eggs and the flesh from salmon carcasses. The "ecosystem services" provided by dead salmon remain important and economically significant, and have been demonstrated even in the impaired watersheds of the California Central Valley (Merz and Moyle 2006).

Due primarily to the construction of dams, other barriers, and the dewatering of stream reaches, an estimated 1,057 miles (or 48%) of the stream lengths historically available to Chinook salmon have been lost from the original total of 2,183 miles in the Central Valley; if only spawning and holding habitat (excluding migration corridors in the lower elevations) are considered, the reduction in historical range probably exceeds 72% (this is because most of the former spawning and holding habitat is in upstream reaches now inaccessible to Chinook salmon) (Yoshiyama et al. 2001). Other estimates of habitat loss are as high as 95% (

Gresh et al. (2000) used estimates of the historic (high and low ranges) and current escapement sizes and average fish weights to compute biomass, then used information about the nutrient content of salmon carcasses to quantify the historic and current N and P loads transported to the Pacific Northwest (including to California rivers). The authors' estimates for California are collected in Table 1 below. The California (statewide) estimated loss of salmon biomass is 23 to 27 metric tons annually (52 to 60 million pounds). The estimated annual loss of marine-derived N (fertilizer) from historic levels is 713 to 826 metric tons (1.6 million to 1.8 million pounds). Proportionate losses of N, P, and salmon biomass are similar at 94-95% deficits from historic levels.

The estimates of Gresh et al. (2000) were based on statewide losses for all Pacific salmon, and applied an average N content for all salmon species. Merz and Moyle (2006) restricted their estimates to Central Valley Chinook salmon, using a peak escapement (in 2001) of 600,000 fish and a higher average carcass N content, based on analysis of Chinook tissue samples (collected from the Mokelumne River). Using these refinements, the authors calculated that Chinook salmon runs may contribute 337 metric tons of N to the Central Valley annually, much greater than the 43 metric tons estimated by Gresh et al. (2000). They also estimated annual losses of 13 to 22 metric tons of marine-derived N due to California’s state hatchery system, which disposes their salmon carcasses outside the watersheds (Merz and Moyle 2006).

Table 1. Estimates and comparisons of marine-derived nitrogen (N) and phosphorus (P) transported by Pacific salmon to California rivers in historic and current times. Data are extracted and compiled from Gresh et al. (2000) (Table 7, p. 19).

Biomass		Historic	Historic	Current	Loss	Loss	Percent loss	Percent loss
		high range	low range		low range	high range		
Salmon	Metric tons	28,623	24,882	1,404	23,478	27,219		
	U.S. tons	31,551	27,428	1,548	25,880	30,004	94.4%	95.1%
	Pounds	63,102,913	54,855,420	3,095,290	51,760,130	60,007,623		
N	Metric tons	869	756	43	713	826		
	U.S. tons	958	833	47	786	911	94.3%	95.1%
	Pounds	1,915,817	1,666,695	94,799	1,571,896	1,821,018		
P	Metric tons	103	89	5	84	98		
	U.S. tons	114	98	6	93	108	94.4%	95.1%
	Pounds	227,076	196,211	11,023	185,188	216,053		

**Request Element #1:** Estimate a range of the historic mass of marine-derived N transported annually by Chinook salmon (all runs) to the Yuba River.

NMFS’ understanding is information may be limited regarding the historical escapement ranges for the Yuba River. In the estimates of Merz and Moyle (2006), they used a 2001 peak escapement of 600,000 Chinook (presumably all ESUs) to the Central Valley. It may be possible to find estimates of the historical Sacramento Valley run size, or estimate its proportional contribution from total Central Valley escapement numbers. The California Department of Fish and Game (CDFG 1993, in Yoshiyama et al. 2006, p.25) estimates the Yuba River “historically supported up to 15% of the annual run of fall-run Chinook salmon in the Sacramento River system”, thereby providing an approximate proportion of the Yuba River contribution to the Sacramento Valley. An estimate calculated in this fashion would be “rough”, and would likely be a low estimate (because it would not include the spring-run escapement to the Yuba).

Yoshiyama et al. (2006) describe and summarize historical accounts indicating salmon originally migrated into the Yuba River in large numbers to spawn. They include discussion of reports of the California Fish Commission that in 1850 “the salmon resorted in vast numbers to the Feather, Yuba, American, Mokelumne, and Tuolumne Rivers”. Many of these were very likely spring-run Chinook because the California Fish Commission further stated that in 1850 and 1851, “large quantities [of salmon] were taken by the miners and by Indians ... as far up as Downieville on the Yuba”. In later years, the salmon ascended in “considerable numbers” up to Bullards Bar Dam during its period of construction (1921-1924)— “so many salmon congregated and died below it that they had to be burned” (Sumner and Smith 1940, in Yoshiyama et al. 2006). Therefore,

while the estimates requested here would be approximate, NMFS requests this information to provide a “baseline” regarding the historic levels of marine-derived N transported annually to the Yuba River.

Using the escapement estimates discussed above, NMFS requests the Applicant use a 10-kilogram (kg) average mass for adult Chinook, and a 5.62% average N content. The annual mass of marine-derived N would follow the calculation method of Merz and Moyle (2006),

transport = nut% x SW x SP, where  
nut% is the average percentage of N  
SW is the average mass of an adult Chinook, and  
SP is Chinook salmon escapement. (p. 1002).

**Request Element #2:** Estimate the historic mass of marine-derived N transported annually by spring-run Chinook salmon to the Yuba River.

If the proportion of the spring-run Chinook to the total historic run to the Yuba can be estimated, NMFS requests the Applicant follow the method above to estimate the historic mass of marine-derived N transported annually by spring-run Chinook salmon to the Yuba River.

**Request Element #3:** Estimate the current annual mass of marine-derived N transported by Chinook salmon to the Yuba River.

NMFS requests the Applicant use the use the recent peak and 10-year (2001-2010) average Yuba River Chinook escapements, a 10 kilogram (kg) average mass for adult Chinook, and a 5.62% average N content to compute an estimated range of the current mass of marine-derived N transported annually to the Yuba River. These estimates would follow the calculation method of Merz and Moyle (2006), given above.

**Request Element #4:** Estimate the current annual mass of marine-derived N transported by phenotypic “spring-run” Chinook salmon to the Yuba River.

NMFS’ understanding is the escapement estimates for the Yuba River (from carcass surveys) do not distinguish between spring-run and fall-run Chinook. However, since 2003, Vaki Riverwatchers have been used to count adult salmon migrating upstream in the fish ladders at Daguerre Point Dam (Greathouse 2010). This information could inform an estimate of the proportion of phenotypic spring-run Chinook escapement to the total escapement. Future improvements in VAKI operations could close some of the gaps in the count record that have occurred due to system outages (Greathouse 2010). It may also be that information from the (outer edges of) otoliths extracted from sampled Yuba River Chinook carcasses could further inform the estimate of the proportion of spring-run Chinook to the total run; tagging of at least a portion of the early-returning salmon passing the Daguerre Dam fish ladders might be necessary to validate the analysis. Using the results of Element #3 above, and the ratio of phenotypic spring-run to the total run, NMFS’ requests the Applicant estimate the annual N contribution of Chinook that return early (prior to September) to the Yuba River.

NMFS notes these results would also provide an estimate the current annual loss of marine-derived N to the upper Yuba River, if anadromous fish passage were possible at Englebright Dam and the associated hydroelectric facilities. This is because it can be assumed that nearly all early-returning Chinook would pass beyond the elevations of the lower Yuba. Spring-run Chinook historically used the higher spring flows to migrate to elevations of at least 1,500 feet to hold and mature during the summer, before spawning in the early fall at elevations of at least

1,000 feet. If they spawned in early fall, they needed to ascend even higher, at least to ~ 2,500-3,000 ft. in the Sacramento drainage (Yoshiyama et al. 2006). Fall-run historically immigrated in the fall (September or later) under lower flow conditions and spawned shortly after arrival at valley floor (up to 500 feet) and lower foothill (up to 1000 feet) elevations (Yoshiyama et al. 2006). Since lower Yuba elevations are well below the lower (1000-foot) limit historically used by spring-run Chinook (the base of Englebright Dam is ~ 247 feet), NMFS suggests the Applicant assume that all early-returning (spring-run) Chinook entering the Yuba would, if upstream passage were possible, migrate to the upper Yuba to hold, spawn, and die.

From the time Englebright Dam was closed and all upper Yuba flows have been passed to the lower Yuba either over its (247-foot) spillway and/or through Englebright's associated hydroelectric facilities (via the intakes, tunnels, penstocks, powerhouses, and outfalls of PG&E's Narrows I and the Project's Narrows II Development), the upper Yuba has been inaccessible to anadromous fishes. This is because neither Englebright Dam, nor the associated hydroelectric facilities or operations themselves, provide waterways that allow anadromous salmon to reach the upper Yuba. The only current waterways connecting the upper Yuba to the lower Yuba are paths that cannot be surmounted by upstream migrating fishes.

**Request Element #5:** Estimate the annual loss, from historic to current levels, of marine-derived N to the Yuba River.

This estimate can be obtained by subtraction from estimates computed above (Element#1 – Element #3).

**Request Element #6:** Estimate the annual loss, from historic to current levels, of marine-derived N to the upper Yuba

This estimate can be obtained by subtraction from estimates computed above (Element#2 – Element #4).

**Request Element #7:** Compare the differences of marine-derived N incorporated into periphyton and aquatic benthic macroinvertebrates collected in the upper and lower Yuba.

Nitrogen normally has a molecular weight of 14 but some atoms contain an extra neutron, increasing the molecular weight to 15; the proportion of the heavier isotope is greater in marine ecosystems than in freshwater ecosystems (Quinn 2005). NMFS requests the Applicant examine the ratio of (heavy) marine-derived N isotopes to the (lighter) atmospheric isotopes in periphyton and benthic macroinvertebrates collected in upper and lower Yuba locations. NMFS suggests the Applicant apply the methods in Kohler et al. (2008) and others cited therein.

Passage of anadromous salmonids into the upper Yuba would begin to replenish the nutrient levels in habitats which have likely experienced a deficit since Englebright Dam and associated facilities blocked anadromous immigrations. If implemented in the Applicant's Study Plan, the results would indicate whether uptake of marine-derived N is occurring in aquatic biota in the lower Yuba, upper Yuba, and the degree of uptake in these locations. The data would allow relative comparisons with upper Yuba locations.

In the future, resource agencies may determine the upper Yuba requires "fertilization" due to nutrient deficits caused by blocked anadromous access. Use of a manufactured salmon carcass analogue (Kohler et al. 2008) is one treatment option, and the data requested here could be used, and the techniques repeated, to monitor the success of nutrient restorations.



This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  - (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  - (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  - (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  - (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
  - (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
  - (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
- (c) *Applicant seeking PURPA benefits; estimate of fees*. If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the "Project" facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

## **50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

### **§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

The goal or purpose of this study is to evaluate the effects of the Project and Project-related activities on the degree of reduction or loss in nutrient replenishment to the upper and lower Yuba River. The nutrients in question are those that are marine-derived, and then transported and deposited in freshwaters by migrating anadromous fishes. The mass of nitrogen (N) will be measured here for simplicity, although carbon and phosphorus are also transported and deposited by returning anadromous salmon. In the final element, NMFS requests information about current uptake of marine-derived N, which can be “traced” in terrestrial systems because the proportion of the heavier isotope is greater in marine than freshwater ecosystems. NMFS requests the Applicant examine the ratio of (heavy) marine-derived N isotopes to the (lighter) atmospheric isotopes in periphyton and benthic macroinvertebrates collected in upper and lower Yuba locations, to compare and determine if differences in uptake in nutrients has occurred since salmon have lost access to the upper Yuba.

The information to be obtained is:

- 1) An estimate a range of the historic mass of marine-derived N that was transported annually by Chinook salmon (all runs) to the Yuba River. This is baseline information.
- 2) An estimate of the historic mass of marine-derived N that was transported annually by spring-run Chinook salmon to the upper Yuba River. This is baseline information.

- 3) An estimate of the current annual mass of marine-derived N transported by Chinook salmon to the lower Yuba River. This is current information, for comparison with baseline.
- 4) An estimate of the current annual mass of marine-derived N transported by phenotypic “spring-run” Chinook salmon to the Yuba River. This is current information, for comparison with baseline.
- 5) An estimate of the annual loss, from historic to current levels, of marine-derived N to the Yuba. This compares historic (baseline) conditions with current conditions.
- 6) An estimate of the annual loss, from historic to current levels, of marine-derived N to the upper Yuba. This compares historic (baseline) conditions with current conditions.
- 7) Compare the differences of marine-derived N incorporated into periphyton and aquatic benthic macroinvertebrates collected in the upper and lower Yuba. This will determine if uptake is occurring, and to what degree in the upper and lower Yuba.

The resulting information will be interpreted in the context of information or results yielded in other submitted requests, including *Effects of the Project and Related Facilities on Fish Passage for Anadromous Fish*, *Effects of the Project on Hydrology for Anadromous Fish: Magnitude, Timing, Duration, and Rate of Change*, and others.

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS’ Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our requests for information or study are linked with NMFS’ Resource Management Goals and Objectives. If NMFS’ requests are included in the Applicant’s Study Plan and approved in the Commission’s Study Plan Determination, then successfully implemented, the results would inform:

- (A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;
- (B) NMFS’ decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;
- (C) NMFS’ decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;
- (D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River, as well as areas downstream to the Bay/Delta;

The fulfillment of NMFS’ request is consistent with the following NMFS’ Resource Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

### Resource Goals:

3.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), and adjoining riparian and aquatic benthic macroinvertebrate (BMI) habitats (see 4.7).

3.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), riparian and BMI habitats (see 4.7), protection from adverse Fish Hatchery operations (see 4.8) and predation (see 4.9), and ensure coordination within and outside of the Project (see 4.10) to minimize risk to anadromous fishes.

### Resource Objectives:

4.1-Flows; 4.2-Flow Ramping; 4.3-Water Quality; 4.4-Water Availability; 4.5-Fish Passage; 4.6-Channel Maintenance; 4.7-Riparian/LWD Habitat; 4.8-Hatchery Operations; 4.9-Predation; and 4.10-Coordination.

### **§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

### **§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

NMFS could find no existing information regarding the nutrient status of the Yuba River, with respect to the loss of marine-derived nutrients due to reduced escapement of anadromous Chinook or their blocked access to historic habitats. NMFS understanding is a nutrient study may have been planned by the Upper Yuba River Studies Program, but not carried out.

### **§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

In NMFS' *Request for Information or Study: Effects of the Project and Related Facilities on Fish Passage for Anadromous Fish*, the Applicant is asked to conduct studies related to fish passage for all life stages of anadromous fish inhabiting the Yuba River; this includes passage requirements for Chinook salmon adults. In the "Background" section above, NMFS explains that the upstream migration of anadromous salmonids followed by their death is important to replenish or "fertilize" streams and rivers. This fertilization has been studied in several streams, where the uptake of nutrients has been found to enhance the abundances of periphyton, benthic macro invertebrates, the condition of juvenile salmon, the riparian shrub and tree growth, birds, mammals, and other wildlife and plants. Studies in the Pacific Northwest are finding that the inland transport of nutrients by salmon, and the deposit in rivers when they die is an "ecosystem service" that functions at the very base of the aquatic and terrestrial food webs.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) CV fall/late-fall run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 6) CV spring-run and CV fall/late fall-run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 7) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

The major nexus to this Project is that its facilities and operations may act to both reduce the abundances of returning Chinook salmon and/or impede or block their passage to upstream habitats. Since direct and indirect “feedbacks” occur whereby this salmon-borne “fertilizer” improves the quality of spawning and rearing habitat, and thus the reproductive success of subsequent generations of salmon, losses could beget more losses if this trend is not reversed. The consequences are vastly reduced stream and riparian productivity. The Project’s facilities and operations, and related activities, could impede or block anadromous fish passage at multiple locations in the watershed. NMFS constructed Table 2 (below) to note all these facilities locations where passage of adult Chinook could be impaired or blocked, and note it contains some 20 Project facilities. Due to relationship of Project operations with other facilities listed in

Table 2. Project and Project-related facilities encountered by anadromous fishes migrating in the Yuba River.

Reach	#	Facility Encountered (upstream direction)	RM	Total Migration Distance (mi.)
Lower Yuba				
	1	Daguerre Point Dam	11.4	11.4
	2	Hallwood-Cordua diversion	11.4	11.4
	3	South Yuba-Brophy diversion	11.6	11.6
	4	Brown's Valley diversion	12.2	12.2
	5	Narrows I Powerhouse	23.6	23.6
	6	Narrows II Powerhouse	23.9	23.9
	7	Narrows II Flow Bypass	23.9	23.9
	8	Englebright Dam	24.0	24.0
Upper Yuba				
	9	Englebright Reservoir	24.0	24.0
	10	Narrows I Intake	24.1	24.1
	11	Narrows II Intake	24.1	24.1
	12	Englebright Reservoir (end)	32.2	32.2
	13	New Colgate Powerhouse	33.9	33.9
Middle Yuba			0.0	40.1
	14	Our House Measurement Weir	11.9	51.6
	15	Our House Dam	12.0	51.7
	16	Our House Reservoir	12.0	51.7
	17	Lohman Diversion Intake	12.1	51.8
Oregon Creek			0.0	44.2
	18	Log Cabin Diversion Dam	4.1	48.3
	19	Log Cabin Reservoir	4.1	48.3
	20	Camptonville Diversion Intake	4.1	48.3
	21	Lohman Ridge Diversion Outlet	4.3	48.5
North Yuba			0.0	42.0
	22	New Bullards Bar Dam Spillway	2.1	44.1
	23	Fish Release Measurement Weir	2.2	44.2
	24	New Bullards Fish Flow Powerhouse	2.3	44.3
	25	New Bullards Dam	2.3	44.3
	26	New Bullards Reservoir	2.3	44.3
	27	New Colgate Power Intake	2.6	44.6
	28	Bullards Bar Dam (submerged)	2.7	44.7
	29	Camptonville Diversion Tunnel Outlet	2.8	44.8
	30	Recreation Facilities	3.0	45.0
	31	New Bullards Reservoir (end)	18.1	60.1

Table 2, there is a nexus to additional facilities that could block or impair upstream salmon migrations. Lastly, due to the effects of Project diversions, potential anadromous passage at additional areas of steep natural gradient within natural stream channels could be impaired or blocked.

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This request is consistent with evaluations of marine-derived nutrient status performed in California and the Pacific Northwest by Gresh et al. (2000). The request is also consistent with the methods applied by Merz and Moyle (2006) for the Central Valley Chinook salmon of the Central Valley of California. Ecological studies that rely on isotopes are widely performed and the results are available in the publicly available scientific journals.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant's responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

**§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will to be between \$10,000-\$20,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Applicant is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.



## 8.0 References

- Bilby, R. E., B. R. Fransen, P. A. Bisson, and J. K. Walter. 1998. Response of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*) to the addition of salmon carcasses to two streams in southwestern Washington, USA. *Canadian Journal of Fisheries and Aquatic Sciences* 55:1909-1918.
- Greathouse, R. 2010. Vaki Riverwatcher monitoring at Daguerre Point Dam. Presentation at the June 29, 2010 Lower Yuba River Accord River Management Team, Sacramento, CA.
- Gresh, T., Lichatowich, J., and P. Schoonmaker. 2000. An estimation of historic and current levels of salmon production in the Northeast Pacific ecosystem: evidence of a nutrient deficit in the freshwater systems of the Pacific Northwest. *Fisheries*: 25(1):15-21.
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- Kohler, A. E., Rugenski, A., and D. Taki. 2008. Stream food web response to a salmon carcass analogue addition in two central Idaho, U.S.A. streams. *Freshwater Biology* 53: 446-460.
- Merz, J.E. and P.B. Moyle. 2006. Salmon, wildlife, and wine: marine-derived nutrients in human-dominated ecosystems of central California. *Ecological Applications* 16(3):999-1009.
- Quinn, T.P. 2005. The Ecology of Dead Salmon, Chapter 7 in *The Behavior and Ecology of Pacific Salmon and Trout*. University of Washington Press. Seattle.
- Wipfli, M. S., Hudson, J. P., and J. P. Caouette. 1998. Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, USA. *Canadian Journal of Fisheries and Aquatic Sciences* 55:1503-1511.
- Yoshiyama, R.M., E.R. Gerstung, F.W. Fisher, and P.B. Moyle. 2001. Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California in *Contributions to the Biology of Central Valley Salmonids*. Vol. 1. California Department of Fish and Game, Fish Bulletin 179, R.L. Brown, ed.

## Federal Register Notices

- Federal Register Notice, 63 Fed. Reg. 13347, March 19, 1998. Endangered and Threatened Species: Threatened Status for Two Evolutionarily Significant Units of Steelhead in Washington, Oregon, and California. Final Rule.
- Federal Register Notice, 64 Fed. Reg. 50394, September 16, 1999. Endangered and Threatened Species: Threatened Status for Two Chinook Salmon Evolutionarily Significant Units in California. Final Rule.
- Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.

Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

Federal Register Notice, 70 Fed. Reg. 52488, September 2, 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Final Rule.

Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

Federal Register Notice, 73 FR 60987, October 15, 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon. Final Rule.

Federal Register Notice, 74, FR 52300, October 9, 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 75 Fed. Reg. 30714, June 2, 2010. Endangered and Threatened Wildlife and Plants: Final Rulemaking To Establish Take Prohibitions for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. June 2, 2010.

**NMFS Request #7**  
**Effects of the Project and Related Activities on**  
**Aquatic Benthic Macroinvertebrates for Anadromous Fish**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC Project No. 2246, Yuba River, California.

NMFS is presenting an Information Request and not proposing a study or related study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant's responsibility under the FPA is to either provide the requested information or to develop a more detailed study plan so as to obtain such information. It is anticipated that through the reiterative Study Development process within the ILP, that the Applicant and the Commission will work with all ILP participants to develop a study that obtains our requested information or that adequate information, approved by the Commission, is provided by the Applicant. However, preliminary guidance is provided below.

**Request Element #1: Literature and Data Review**

Describe the aquatic BMI communities found within the Project's action area including information on community structure and their habitat conditions.

**Request Element #2: Qualitatively evaluate effects on the aquatic BMI communities**

Applicant should develop qualitative relationships between Project operation and operational changes and existing aquatic BMI communities through field studies. Aquatic BMI form the basis of the aquatic food web and are excellent indicators of long-term water quality conditions since specific communities develop in response to specific stream conditions and perturbations. The Department of Fish and Game's California Stream Bioassessment Procedure (CSBP) will be used to assess aquatic macroinvertebrates communities (Harrington 1999). The CSBP is a regional adaptation of the national Rapid Bioassessment Protocols outlined by the U.S. Environmental Protection Agency in "*Rapid Bioassessment Protocols for use in Streams and Rivers*" (Barbour et al. 1999, EPA 841-D-97-002).

Habitat conditions downstream from major dams generally result in significant changes to macroinvertebrate community structure and function due to altered temperature, flow, food, and substrate regimes. Aquatic BMI will be assessed above and below Project's dams, within Project stream reaches and by-passed reaches, and will require at least one reference point that is upstream of any Project influences. Although more details may be worked out with the Applicant, based on how the Applicant proposes to address this information request, we request that BMI sampling be done in the following areas listed below.

NMFS Requested BMI Sampling Areas:

- 1) Reference Spot: Upper main stem NF Yuba, above New Bullards Bar Reservoir (somewhere within the 36 miles below Loves Falls);
- 2) NF Yuba, between New Bullards Bar Dam and Confluence of MF Yuba (somewhere within the 2.3 mi.);
- 3) NF Yuba, between confluence of MF Yuba and Colgate Powerhouse discharge (somewhere within the 5.8 mi.);
- 4) NF Yuba, between Colgate Powerhouse discharge and Englebright Reservoir (somewhere within the 1.7 mi.);
- 5) MF Yuba above Our House Reservoir;
- 6) MF Yuba, between Our House Dam and confluence of Oregon Creek (somewhere within the 7.5 mi.);
- 7) MF Yuba, between confluence of Oregon Creek and NF/MF Yuba confluence (somewhere within the 4.5 mi.);
- 8) Oregon Creek above Log Cabin Reservoir;
- 9) Oregon Creek, between Log Cabin Dam and Confluence of MF Yuba (somewhere within the 4.1 mi. );
- 10) SF Yuba, above Englbright Reservoir;
- 11) Main Stem Yuba, between Englbright Dam and Daguerre Point Dam (somewhere within the 12.6 mi.); and
- 12) Main Stem Yuba, between Daguerre Point Dam and confluence with Feather River (somewhere within the 11.4 mi.).

This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request.* Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  - (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  - (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  - (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  - (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
  - (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
  - (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
- (c) *Applicant seeking PURPA benefits; estimate of fees.* If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

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- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
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- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the “Project” facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

## **50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid;
- or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

### **§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

**Goals and Purpose:** The overall goal is, first, to describe the aquatic BMI resources located within the Project's action area and, second, to evaluate the potential impacts to these resources that are a result of ongoing Project operations. This will focus specifically on aquatic BMI as they are indicators of overall water quality and the prey base for fish. The purpose is to document the existing condition and evaluate the operational effects of the Project on aquatic BMI residing in the Project's reservoirs and river habitats within the action area. The Project has the potential to affect aquatic BMI communities directly by operations or related actions that affect water quantity or quality parameters such as river flows, reservoir surface elevation, turbidity, dissolved oxygen, and temperature. In addition, Project actions that result in changes in fish abundance or the introduction/removal of fish species would have indirect, trophic level effects on the aquatic communities of interest.

**Objectives:** Information collected from this and other requests will facilitate our understanding of the potential changes in the physical, chemical, and/or biological resources associated with future changes in Project operations. Potential effects on BMI associated with the existing condition and any proposed operational changes, will be assessed through an evaluation of

published scientific data from other similar facilities and data collected as part of the field investigations associated with this and other information requests. All potential Project-related effects will be described in terms of changes to water quality or quantity parameters and subsequent likely effects on the existing aquatic BMI communities. NMFS suggests some specific objectives below.

Objective 1. Describe the aquatic BMI communities found within Project waters and action area including information on community structure and their habitat conditions.

Objective 2. Qualitatively evaluate effects on the aquatic BMI communities that may result from current operations or operational changes at the Project.

### **§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS' Resource Management Goal and Objectives (Sections in NMFS 2011) apply with respect to species listed under the and Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project or may require listing in the future. Thus, our Resource Goals and Objectives serve to link our information requests with information needed to inform our various decisions that we will make during these proceedings:

- Information to inform how we may exercise our FPA Section 18 authority, to either reserve our fish passage prescriptive authority or to stipulate fish passage prescriptions;
- Information to inform the contents of our proposed FPA Section 10(j) and 10(a) protection, mitigation, and enhancement measures;
- Information to inform what we recommend as Essential Fish Habitat designations, pursuant to the MSA; and
- Information to inform our needs so that we may recommend Critical Habitat and conduct an adequate Section 7 consultation on listed species, pursuant to the ESA.

The fulfillment of our Information Request would serve, in part, towards satisfying the following NMFS' Resources Goals and Objectives (Sections in NMFS 2011) for anadromous fishes in the Yuba River:

#### **Resource Goals: Sections in NMFS 2011**

3.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), and adjoining riparian and aquatic benthic macroinvertebrate (BMI) habitats (see 4.7).

3.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), riparian and BMI



habitats (see 4.7), protection from adverse Fish Hatchery operations (see 4.8) and predation (see 4.9), and ensure coordination within and outside of the Project (see 4.10) to minimize risk to anadromous fishes.

Resource Objectives: Sections in NMFS 2011

4.1-Flows; 4.2-Flow Ramping; 4.3-Water Quality; 4.6-Channel Maintenance; and 4.7-Riparian/LWD Habitat.

**§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

**§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

NMFS is requesting information, not a specific study at this time. However, we expect that the Applicant may need to design and conduct a study, through the ILP study development process, in order to satisfy our information request. Section 4.51(f)(3) of 18 CFR requires reporting of certain types of information in the Application for License of major hydropower projects, including a discussion of fish, wildlife, and botanical resources in the vicinity of the project. The discussion needs to identify the potential effects of the project on these resources, including a description of any anticipated continuing effect for on-going and future operations. This information request fulfills these requirements, by asking for information that evaluates the potential effects on aquatic BMI within the Project's action area. As part of the relicensing action, and to be consistent with the National Environmental Policy Act (NEPA 1969), the Commission requires an analysis of the potential impacts associated with continuing operation of the power generation facility.

**§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

Aquatic benthic macroinvertebrate (BMI) communities are important components of the food web for fish species in the various stream reaches of the Yuba River watershed within the Project action area as well as for anadromous salmonids and green sturgeon in the lower Yuba River downstream from the Project. Aquatic BMI harvest aquatic bacteria and other organic materials, thereby assimilating carbon, nitrogen, phosphorus, sulfur, and other trace elements. In turn, aquatic BMI are the food organisms utilized by fish at various life-stages. Thus, aquatic BMI are important food organisms for fish species and provide the critical inorganic and organic nutrients needed for fish species to survive and propagate.

Changes in aquatic BMI can be associated with variations in water quality, water quantity, and/or harvesting intensities (feeding rates). For example, changes in water temperature can result in changes in species composition that are as dramatic as the permanent elimination of some species from the community. A shift in predatory species or a change in abundance of predators/foragers within the system may similarly alter the BMI community structures. Such community level changes may, or may not, be reflected in total biomass or production estimates, but should be indicated in an evaluation of taxonomic and/or functional groups represented within the aquatic BMI communities. The composition of BMI communities, including representation by a diversity of functional groups and size structures, is an indicator of system health and long-term water quality conditions that may not be evident from traditional water quality sampling.

Chemical, biological, and physical parameters correlated with aquatic BMI communities could be changed by alternative Project operations, and therefore must be evaluated to determine existing baseline conditions. For example, changes in basic water chemistry, important nutrients, water temperature regimes, downstream flow regimes, stream substrate composition, and rate and extent of reservoir water surface elevation changes could result in changes to the BMI communities within the Project's action area. Even if changes were predicted or suspected as a result of some future study, those changes might not result in a negative impact to aquatic BMI resources. An important aspect of this information request is the determination whether any predicted or suspected changes would result in negative impacts. To successfully evaluate the effects of continued Project operation or of operational changes there must first be a clear identification and understanding of what potential operational changes may be implemented, how those changes could affect important chemical, physical, and biological parameters, and whether those changes would result in adverse changes to aquatic BMI communities or the habitats upon which they depend. NMFS assumes that the Applicant may need to develop a specific study to address our request.

The first task in our request is designed to review available literature and collate Project specific data. Subsequently, this information will be used to assess the effects of changes in reservoir and downstream operations on the aquatic BMI resources. Because of the complications associated with trophic dynamics, it would be difficult to predict specific changes in aquatic BMI communities that might potentially result from a future proposed action or operational change. Based on the review of existing information and future field study results, we anticipate being able to identify a general level of impact or qualitative change to the aquatic communities of concern. For example, a proposed action that would result in significantly increased turbidity would be expected to have a strong impact on primary production as well as associated cascading trophic effects. This information request, as well as an Applicant's appropriately designed field study, will collect information to assess whether on-going Project operations or changes in Project operations may affect the aquatic BMI resources present within or transitory to the Project's action area.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);
- 7) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 8) CV spring-run and CV fall/late-fall run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 9) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This request for information or study is consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant’s responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains

the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

**§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will be between \$50,000-\$150,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Licensees is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

**8.0 References**

- Barbour, M.T., J. Gerritsen, B.D. Snyder and J.B. Stribling. 1999. Revision to rapid bioassessment protocols for use in stream and rivers: periphyton, BMIs and fish. EPA 841-D-97-002. U.S. Environmental Protection Agency. Washington DC.
- Harrington, J.M. 1999. California stream bioassessment procedures. California Department of Fish and Game, Water Pollution Control Laboratory. May 1999. Rancho Cordova, CA.
- Merz, J.E. and P.B. Moyle. 2006. Salmon, wildlife, and wine: marine-derived nutrients in human-dominated ecosystems of central California. *Ecological Applications* 16(3):999-1009.
- National Marine Fisheries Service (NMFS). 2009. "Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead." NMFS, Southwest Region, Sacramento, California. 7pp. October 2009.
- NMFS. 2011. Resource Management Goals and Objectives for the Yuba River and the Yuba River Hydroelectric Project, Federal Energy Regulatory Commission Project No. 2246, Yuba River, California. NMFS, Southwest Region, Santa Rosa, California. March 5, 2011.
- Pacific Fisheries Management Council (PFMC). 1999. Pacific Fishery Management Council. Description and identification of essential fish habitat, adverse impacts and recommended conservation measures for salmon. *Amendment 14 to the Pacific Coast Salmon Plan, Appendix A*. Pacific Fisheries Management Council, Portland, Oregon.
- PFMC. 2003. Pacific Fishery Management Council. Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon and California as Revised Through Amendment 14 (Adopted 1999).
- NEPA 1969. The National Environmental Policy Act of 1969, as amended (Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, § 4(b), Sept. 13, 1982)

## Federal Register Notices

Federal Register Notice, 63 Fed. Reg. 13347, March 19, 1998. Endangered and Threatened Species: Threatened Status for Two Evolutionarily Significant Units of Steelhead in Washington, Oregon, and California. Final Rule.

Federal Register Notice, 64 Fed. Reg. 50394, September 16, 1999. Endangered and Threatened Species: Threatened Status for Two Chinook Salmon Evolutionarily Significant Units in California. Final Rule.

Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.

Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

Federal Register Notice, 70 Fed. Reg. 52488, September 2, 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Final Rule.

Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

Federal Register Notice, 73 FR 60987, October 15, 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon. Final Rule.

Federal Register Notice, 74, FR 52300, October 9, 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 75 Fed. Reg. 30714, June 2, 2010. Endangered and Threatened Wildlife and Plants: Final Rulemaking To Establish Take Prohibitions for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. June 2, 2010.

**NMFS Request #8**  
**Request for Information or Study**  
**Anadromous Fish Ecosystem Effects Analysis: Synthesis of the Direct, Indirect, and**  
**Cumulative Effects of the Project and Related Facilities on Anadromous Fish**  
**March 7, 2011**

The National Oceanic and Atmospheric Administration's, National Marine Fisheries Service (NMFS) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for Yuba County Water Agency's (Applicant) Yuba River Hydroelectric Project (Project), FERC Project No. 2246, Yuba River, California.

This request compiles and synthesizes information generated from the following NMFS requests:

NMFS #1. Effects of the Project and Related Activities on Fish Passage for Anadromous Fish

NMFS #2. Effects of the Project and Related Activities on Hydrology for Anadromous Fish

NMFS #3. Effects of the Project and Related Activities on Water Temperatures for Anadromous Fish Migration, Holding, Spawning and Rearing Needs

NMFS #4. Effects of the Project and Related Activities on Coarse Substrate for Anadromous Fish: Sediment Supply, Transport and Storage

NMFS #5. Effects of the Project and Related Activities on Large Wood and Riparian Habitat for Anadromous Fish

NMFS #6. Effects of the Project and Related Activities on the Loss of Marine-Derived Nutrients in the Yuba River

NMFS #7. Effects of the Project and Related Activities on Aquatic Benthic Macroinvertebrates for Anadromous Fish

This request aims to synthesize the various abiotic and biotic categories studied in the ILP process (i.e. water resources, geology and soils, etc.) into a holistic and comprehensive assessment of the direct, indirect and cumulative effects of the Project, along with the effects of other activities that are interrelated or interdependent with the Project action, on anadromous fishes and their habitats. The assessment should be a synthesis that applies the results not only from the above requested elements (NMFS #1-7), but also considers the combined effects on each life stage of a species as well as on population structure and composition. Therefore this information request is arranged into sub-elements that correspond to the life history stages of the species, as well as a population dynamics element.

Although the above information requests (NMFS #1-7) were specifically crafted for inclusion into this information request (NMFS #8), this request may still be satisfied with information developed outside NMFS' requests, such as by the results of studies done by the Lower Yuba Accord River Management Team, or other studies to be completed by the Applicant. However, it is expected that other such studies will be combined with the NMFS information requests above, and synthesized, to fulfill this request. Table 1 lists Project and related facilities that could directly affect anadromous fish. These facilities also produce indirect and cumulative

Table 1. Project and Project-related facilities encountered by anadromous fishes migrating in the Yuba River.

Reach	#	Facility Encountered (upstream direction)	RM	Total Migration Distance (mi.)
Lower Yuba				
	1	Daguerre Point Dam	11.4	11.4
	2	Hallwood-Cordua diversion	11.4	11.4
	3	South Yuba-Brophy diversion	11.6	11.6
	4	Brown's Valley diversion	12.2	12.2
	5	Narrows I Powerhouse	23.6	23.6
	6	Narrows II Powerhouse	23.9	23.9
	7	Narrows II Flow Bypass	23.9	23.9
	8	Englebright Dam	24.0	24.0
Upper Yuba				
	9	Englebright Reservoir	24.0	24.0
	10	Narrows I Intake	24.1	24.1
	11	Narrows II Intake	24.1	24.1
	12	Englebright Reservoir (end)	32.2	32.2
	13	New Colgate Powerhouse	33.9	33.9
Middle Yuba			0.0	40.1
	14	Our House Measurement Weir	11.9	51.6
	15	Our House Dam	12.0	51.7
	16	Our House Reservoir	12.0	51.7
	17	Lohman Diversion Intake	12.1	51.8
Oregon Creek			0.0	44.2
	18	Log Cabin Diversion Dam	4.1	48.3
	19	Log Cabin Reservoir	4.1	48.3
	20	Camptonville Diversion Intake	4.1	48.3
	21	Lohman Ridge Diversion Outlet	4.3	48.5
North Yuba			0.0	42.0
	22	New Bullards Bar Dam Spillway	2.1	44.1
	23	Fish Release Measurement Weir	2.2	44.2
	24	New Bullards Fish Flow Powerhouse	2.3	44.3
	25	New Bullards Dam	2.3	44.3
	26	New Bullards Reservoir	2.3	44.3
	27	New Colgate Power Intake	2.6	44.6
	28	Bullards Bar Dam (submerged)	2.7	44.7
	29	Camptonville Diversion Tunnel Outlet	2.8	44.8
	30	Recreation Facilities	3.0	45.0
	31	New Bullards Reservoir (end)	18.1	60.1

effects that have the potential to produce even greater affects to anadromous fish and the ecosystems that support them. These indirect and cumulative effects are not adequately considered in the ILP process where Project effects are in “silos” where the holistic effects of the Project to the ecosystems which support anadromous fish are not adequately addressed. Facilities 4-8 in Table 1 not only affect streamflow but they affect, sediment, LWD, benthic macroinvertebrates, and temperature simultaneously, producing cumulative effects not addressed in investigations of any particular silo. For instance, reduced sediment supply may cause channel incision which leaves LWD “stranded” above normal flows which might reduce pool frequency and benthic macroinvertebrate frequency downstream, both vital components of anadromous fish ecosystems.

### **Request Element #1: Adult Migration**

Although this element focuses on the life history of spring-run Chinook salmon, information generated will be applicable to fall/late fall run Chinook salmon and steelhead. The main sources of information for assessment of adult migration will come from NMFS information requests #1-7. The Project facilities have direct, indirect and cumulative effects on the adult migration life stage of anadromous fish. These information requests should be synthesized with other existing and developed information to assess timing and magnitude of flows during migration seasons, natural and artificial barriers to upstream adult migration, as well as the effects to the ecosystems which support salmonids during this life stage. Some of the main questions to be answered in this synthesis are:

- 1) What effects do Project altered hydrology/water temperature at the Feather/Sacramento and Yuba/Feather confluences have on adult salmonid migration into the Yuba River?
- 2) What is the effect of Project altered hydrology/geomorphology at Daguerre Point Dam on successful use and operation of the fish ladders?
- 3) How does the Project affect migration timing or delay at Daguerre Point Dam?
- 4) What are the alternatives for Project-related improvements regarding the safe, timely, and effective fish passage at Daguerre Point Dam?
- 5) What are the alternatives for Project-related improvements regarding the safe, timely, and effective fish passage at the Narrows 1/Narrows 2/Englebright Dam complex?
- 6) What are the constraints and opportunities for successful adult migration through Englebright reservoir?
- 7) What effect does Project altered hydrology/water temperature at the Yuba/South Yuba River confluence have on potential adult salmonid migration into both rivers?
- 8) How does the operation of New Colgate powerhouse effect velocities, water depths, and other factors that could cause potential fish passage barriers to migration through the downstream, flow (peaking) affected reach?
- 9) How does the operation of New Colgate powerhouse effect water temperature, attraction flows and potential fish passage timing through this reach?
- 10) What effect does Project altered hydrology/water temperature at the Middle/North Yuba River confluence have on potential adult salmonid migration into each River?
- 11) Considering altered hydrology and temperature regimes and sedimentation processes, what are safe and effective alternatives for fish passage at New Bullards Bar, Our House, and Log Cabin Dams?
- 12) Considering altered hydrology and temperature regimes and sedimentation processes,



what are the constraints and opportunities for successful adult migration through New Bullards Bar Reservoir?

- 13) What are the effects of Project altered hydrology on adult salmonid migration “windows” at natural gradient impediments or low-flow barriers?
- 14) What are the locations of the complete (high and low-flow) natural (gradient) barriers to migration in the upper mainstem Yuba, and the North, Middle, and South Yuba rivers? and major tributaries?

### **Request Element #2: Holding**

The main sources of information for assessment of holding habitat will come from NMFS information requests #1-7. These information requests will be synthesized with other existing and developed information to assess current and potential utilization of holding habitat and the ecosystems which support salmonids during this lifestage. This synthesis will take into account adult migration opportunities developed above. Some of the main questions to be answered in this synthesis are:

- 1) What are the locations and physical characteristics (e.g. pools depths, overhanging cover, bubble curtains, etc.) of current spring-run Chinook and steelhead holding habitat in the lower Yuba River?
- 2) What is the current thermal regime of holding habitat and how have Project operations affected the thermal regime of current or potential holding habitat?
- 3) What is the effect of the Project on creation and maintenance of holding habitat through alterations of peak flows, LWD and sediment transport in the lower Yuba River and in Project affected reaches in the upper Yuba, upstream of Englebright Dam?
- 4) What are the locations and physical characteristics of potential holding habitat upstream of Project facilities?
- 5) How has operation of the Project affected the physical characteristics and thermal regimes of potential holding habitat?
- 6) How has Project alteration of recruitment, transport and deposition of LWD influenced creation of holding habitat?
- 7) What is the carrying capacity of current and potential holding habitat?
- 8) What is the proximity of spawning habitat to holding habitat?
- 9) How has the carrying capacity of current and potential holding habitat been affected by Project operations?

### **Request Element #3: Spawning**

The main sources of information for assessment of spawning should come from NMFS information requests NMFS #1-7. These information requests should be synthesized with other existing and developed information to assess current and potential utilization of spawning habitat. This synthesis should take into account adult migration and holding opportunities developed above. Some of the main questions to be answered in this synthesis are:

- 1) What are the locations and physical characteristics of spawning habitat in the Lower Yuba River?
- 2) How do spring-run and fall/late fall-run preferentially select spawning locations in the Lower Yuba?

- 3) What is the extent of spatial overlap between spring and fall run in the spawning habitats of the Lower Yuba River?
- 4) How much coarse sediment of suitable size for salmonid spawning is trapped by Project diversions and associated facilities?
- 5) Where would the spawning-sized sediment trapped behind Project facilities have been deposited if it were allowed to flow downstream?
- 6) How does alteration of peak flow components of the hydrograph affect the transportation and distribution of spawning gravels below Project facilities?
- 7) How do Project-caused hydrograph alterations and changes to LWD supply, transport, and depositional processes affect potential deposition of spawning gravels?
- 8) What are the locations and physical characteristics of potential spawning habitat in the upper Yuba River above Englebright Dam?
- 9) Where are the current and historic river reaches that provide adequate water temperatures for spawning of Chinook salmon and steelhead?
- 10) What is the current deficit of spawning gravels below Project reservoirs relative to unimpaired conditions?
- 11) What is the carrying capacity of current and potential spawning habitat upstream and downstream of Englebright Dam, respectively?
- 12) What is the proximity of spawning habitat to holding and rearing habitat?
- 13) How has the carrying capacity of current and potential spawning habitat been affected by Project operations?

#### **Request Element #4: Incubation/Emergence**

The main sources of information for assessment of incubation/emergence should come from NMFS information requests #1-7. These information requests should be synthesized with other existing and developed information to assess project effect on incubation and emergence life stages. This synthesis should take into account adult migration, holding and spawning information developed above. Some of the main questions to be answered in this synthesis are:

- 1) What are the Project's effects on the grain size, embeddedness, and permeability of current and potential spawning gravel?
- 2) How often and at what time of the year are spawning gravels mobilized, in current and potential spawning habitat upstream and downstream of Englebright Dam, respectively?
- 3) How do the Project's effects on water temperature affect the timing and success of incubation and emergence?
- 4) How do the Project's effects on peak flow alteration and sediment transport affect the scour or entombment of redds and embryos?
- 5) How do the Project's effects on the hydrologic regime influence dewatering of redds in current and potential spawning areas?

#### **Request Element #5: Fry/Juvenile Rearing**

The main sources of information for assessment of fry/juvenile rearing should come from NMFS information requests #1-7. These information requests should be synthesized with other existing and developed information to assess project effect on fry/juvenile rearing life stages. This

synthesis should take into account adult migration, holding, spawning, and incubation/emergence information developed above. Some of the main questions to be answered in this synthesis are:

- 1) What are the Project's effects on benthic macroinvertebrate (BMI) standing crop and diversity, that affect feeding and growth opportunities for fry/juveniles?
- 2) How does the Project's effects on LWD recruitment, transport and deposition impact rearing habitat for fry/juvenile salmonids?
- 3) What effects do alterations to the sediment and LWD mass balance have on BMI diversity and production downstream, given the importance of this prey for fry and juveniles?
- 4) What are the Project's effects on floodplain inundation and floodplain BMI production in terms of rearing opportunities for juveniles?
- 5) How do Project flow and temperature alterations affect juvenile rearing opportunities?
- 6) How do flow, temperature, and floodplain inundation affect predator abundance?
- 7) How do changes to the LWD supply, transport, and storage continuum affect juvenile cover habitat and predator avoidance?
- 8) How does peak flow and sediment alteration affect pool depth and other habitats used as cover by juvenile salmonids?
- 9) How do Project alterations to flow, temperature, BMI and rearing opportunities affect the physiological condition of juvenile salmonids?
- 10) What is the current and historical area, depth and inundation frequency of floodplain habitat?
- 11) What is current and historical rearing carrying capacity in the upper and lower Yuba?

#### **Request Element #6: Fry/Juvenile Outmigration**

The main sources of information for assessment of fry/juvenile outmigration should come from NMFS information requests #1-7. These information requests should be synthesized with other existing and developed information to assess project effect on fry/juvenile rearing life stages. This synthesis should take into account adult migration, holding, spawning, and incubation / emergence information developed above. Some of the main questions to be answered in this synthesis are:

- 1) How have the Project's effects on pulse flows and temperature altered outmigration timing?
- 2) Considering the Project's alterations of flows and temperatures, what is the likelihood of successful juvenile outmigration?
- 3) Considering the Project's impoundments, what is the likelihood of successful juvenile outmigration through Project reservoirs?
- 4) Considering the Project's dams, what is the likelihood of successful juvenile outmigration around Project dams?
- 5) Considering the Project's powerhouses and their alterations of flows and temperatures, what is the likelihood of successful juvenile outmigration around Project powerhouses?
- 6) How do project alterations of flow, temperature, BMI and rearing opportunities affect the physiological condition of salmonids, smoltification, and their outmigration timing, and life-history expressions?
- 7) Considering the Project's alterations, do anadromous salmonids out migrate predominantly as fry or smolts?

- 8) Considering flow, temperature, sediment and LWD dynamics what are the best suitable locations for juvenile collection facilities for transport around Project dams and Englebright Dam?

## **Request Element #7: Population Structure and Dynamics**

Information should be synthesized from the life-stage analysis above to analyze the population structure and dynamics of spring-run Chinook salmon and steelhead in the Yuba watershed. Quantitative measurement of habitat quality, quantity, and carrying capacity for each life stage should be used in a population dynamics model. Available population dynamics models which could be used to fulfill this request include models such as RIPPLE developed by Stillwater Sciences or SHIRAZ developed at the University of Washington. The specific quantitative information needed for each models' development should guide information gathering for each life-stage. At a minimum the carrying capacities for each life stage at the appropriate geomorphic unit should be developed. This population model should initially be developed for the existing population of spring-run Chinook salmon and steelhead below Englebright dam. Next, the best and most effective estimates of fish passage alternatives and improvements to Project facilities should be incorporated into a larger population dynamics model that takes into account access to potential habitat above currently impassable barriers. Survival estimates of each fish passage scenario should be incorporated into the carrying capacity estimates for each life-stage. The quantitative assessment of habitat quality, quantity and carrying capacity for each life stage for habitats above Englebright reservoir should be incorporated into the larger population dynamics model. An assessment of the genetic makeup of any population above or below Englebright should also be incorporated into this analysis including hatchery influence and spring/fall run interbreeding. This information should inform a final analysis on the Project effects on population viability.

This request is formatted in accordance with:

Title 18 of the Federal regulations *Conservation of Power and Water Resources*;  
Part 5 *Integrated License Application Process*; Section 5.9 *Comments and information or study requests*.

18 CFR § 5.9 (a): *Comments and study requests*. Comments on the pre-application document and the Commission staff's Scoping Document 1 must be filed with the Commission within 60 days following the Commission's notice of consultation procedures issued pursuant to §5.8. Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act and water quality certification under Section 401 of the Clean Water Act. (Emphasis added for relevance to highlight NMFS' ESA concerns)

18 CFR § 5.9 (b): *Content of study request*. Any information or study request must:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
- (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
- (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

(4) Describe existing information concerning the subject of the study proposal, and the need for additional information;

(5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

(7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs. (c) *Applicant seeking PURPA benefits; estimate of fees.* If a potential applicant has stated that it intends to seek PURPA benefits, comments on the pre-application document by a fish and wildlife agency must provide the potential applicant with a reasonable estimate of the total costs the agency anticipates it will incur in order to set mandatory terms and conditions for the proposed project. An agency may provide a potential applicant with an updated estimate as it deems necessary. If any agency believes that its most recent estimate will be exceeded by more than 25 percent, it must supply the potential applicant with a new estimate and submit a copy to the Commission.

**§ 5.9 (a): The Information Gathering or Study Should Inform Consultation Under Section 7 of the Endangered Species Act**

*Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act*

The information or study resulting from this Request would inform future ESA consultation between NMFS and the Commission because the Project's effects on the resource(s) to be studied in this request affect ESA-listed salmonids or sturgeon, and/or their ESA-designated critical habitats, both in the Yuba River and in locations downstream.

NMFS has identified the following ESA-protected anadromous fishes and habitats (ESA resources) in the Yuba River that could be affected by the Project:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);

- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

ESA resources that occur downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay may also be affected by the Project.

NMFS also identified the presence of an anadromous resource in the lower Yuba that is not listed under the ESA, but is a Federal Species of Concern (those species about which NMFS has concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA):

- CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975; October 17, 2006, 71 FR 61022).

This Federal Species of Concern also occurs downstream in the Feather River, Sacramento River, Sacramento-San Joaquin Delta, and San Francisco Bay, and may also be affected by the Project. While the fall/late-fall run Chinook ESU has no formal protection under the ESA, discussions with NMFS regarding effects to this species usually occurs during ESA consultation.

NMFS notes the facilities requested for review are not all considered part of the “Project” facilities by the Commission. However, for consultation under section 7 of the Endangered Species Act, the action, action area, and the effects of an action are defined more broadly. NMFS refers the Commission and Applicant to the following definitions from the Code of Federal Regulations (CFR), and to Enclosure B of this filing:

#### **50 CFR § 402.02 Definitions.**

*Action* means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to:

- (a) actions intended to conserve listed species or their habitat;
- (b) the promulgation of regulations;
- (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid;  
or
- (d) actions directly or indirectly causing modifications to the land, water, or air.

*Action area* means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

*Effects of the action* refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action

area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. (Emphasis added to highlight that evaluation of the effects of an action in the ESA sense is broader than evaluation of the action alone).

### **§ 5.9 (b): 1.0 Goals and Objectives of Request**

*Describe the goals and objectives of each study proposal and the information to be obtained;*

The goal of this information request is: (1) Synthesize the Project's effects on the various biotic and abiotic factors that affect each life stage of anadromous fish and the ecosystems that support them; (2) Combine and synthesize Project's effects into a holistic and comprehensive analysis on the Project's effects on anadromous fish population structure and dynamics.

The objectives of this information request are:

Assess the direct, indirect and cumulative effects of the Project on:

Central Valley Spring-run Chinook salmon (*O. tshawytscha*) and habitats

- a) Adult Migration (including fish passage)
- b) Adult Holding
- c) Spawning
- d) Incubation/Emergence
- e) Fry/Juvenile Rearing
- f) Fry/Juvenile Outmigration (including fish passage)
- g) Population structure (including genetic makeup/hatchery influence)
- h) Population Dynamics

Central Valley Steelhead (*O. mykiss*) and habitats

- a) Adult Migration (including fish passage)
- b) Adult growth
- c) Spawning
- d) Incubation/Emergence
- e) Fry/Juvenile Rearing
- f) Fry/Juvenile Outmigration (including fish passage)
- g) Population structure (including anadromous/resident proportions)
- h) Population dynamics

North American Green Sturgeon (*Acipenser medirostris*) and habitats

- a) Adult Migration (including fish passage)
- b) Adult growth/holding
- c) Spawning
- d) Incubation/Emergence
- e) Fry/Juvenile Rearing



- f) Fry/Juvenile Outmigration (including fish passage)
- g) Population structure
- h) Population dynamics

**§ 5.9 (b): 2.0 Resource Management Goals of NMFS**

*If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;*

NMFS' Resource Management Goal and Objectives, provided in full as Enclosure G, apply with respect to species listed under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §1801 *et seq.*) and the Endangered Species Act (ESA) (16 U.S.C. §1531 *et seq.*), as well as anadromous species that are not currently listed but are affected by continuing operations of the Project and may require listing in the future. Thus, our requests for information or study are linked with NMFS' Resource Management Goals and Objectives. If NMFS' requests are included in the Applicant's Study Plan and approved in the Commission's Study Plan Determination, then successfully implemented, the results would inform:

- (A) Whether and how NMFS may exercise its FPA Section 18 authority, to either prescribe fishways at the Project or to reserve its prescriptive authority;
- (B) NMFS' decisions regarding its future FPA Section 10(j) and 10(a) proposals for protection, mitigation, and enhancement measures;
- (C) NMFS' decisions regarding its future recommended measures to improve EFH for Chinook salmon in the upper and lower Yuba, as well as areas downstream to the Bay/Delta;
- (D) The ESA Section 7 consultations (informal and formal) regarding effects on threatened species and designated critical habitats in the Yuba River.

The fulfillment of NMFS' request is consistent with the following NMFS' Resource Goals and Objectives for anadromous fishes and habitats in the Yuba River (Enclosure G):

**Resource Goals:**

3.1 - Protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions for related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), and adjoining riparian and aquatic benthic macroinvertebrate (BMI) habitats (see 4.7).

3.2 - Identify and implement measures to protect, mitigate or minimize direct, indirect, and cumulative impacts to, and enhance native anadromous fish resources, including related rearing and feeding (see 4.1-4.4), migration (see 4.5), spawning (See 4.6), riparian and BMI habitats (see 4.7), protection from adverse Fish Hatchery operations (see 4.8) and predation (see 4.9), and ensure coordination within and outside of the Project (see 4.10) to minimize risk to anadromous fishes.

**Resource Objectives:**

4.1-Flows; 4.2-Flow Ramping; 4.3-Water Quality; 4.4-Water Availability; 4.5-Fish Passage; 4.6-Channel Maintenance; 4.7-Riparian/LWD Habitat; 4.8-Hatchery Operations; 4.9-Predation; and 4.10-Coordination.

**§ 5.9 (b): 3.0 Relevant Public Interest Considerations**

*If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;*

This content requirement is not applicable, as NMFS is a resource agency.

**§ 5.9 (b): 4.0 Existing Information and Need for Additional Information**

*Describe existing information concerning the subject of the study proposal, and the need for additional information;*

The Applicant discusses anadromous fishes in the PAD sections 7.3 Aquatic Resources, and section 7.7, Threatened, Endangered and Fully Protected species. The PAD does not in any great detail discuss the direct, indirect, or cumulative effects of the Project on anadromous fishes or their habitats. The PAD identifies some Project effects on individual, abiotic resources (such as water, geology and soils, etc.). This information is not adequate for a comprehensive biological evaluation of the Project's effects, on anadromous fishes and the ecosystems which support them.

The Project and related facilities currently impact anadromous fish passage, hydrology and geomorphology, coarse substrate and LWD supply and transport, riparian habitats, BMI communities, and the import of marine-derived nutrients. The combined impacts of the Project on these individual factors that support anadromous fish ecosystems within the Yuba River Basin represents a continuing impact of the Project on the biological resources of the area.

Section 4.51(f)(3) of 18 CFR requires reporting of certain types of information in the Application for License for major hydropower projects, including a discussion of the fish, wildlife and botanical resources in the vicinity of the Project. The discussion needs to identify the potential impacts of the Project on these resources, including a description of any anticipated continuing impact for on-going and future operation of the Project. This information request fulfills these requirements, by asking for information that evaluates the potential effects of the Project and its facilities on the suite of environmental factors that could contribute to the anadromous fish ecosystem within the Project's action area. As part of the relicensing action, and to be consistent with the National Environmental Policy Act (NEPA 1969), the Commission requires an analysis of the potential impacts associated with continuing operation of the power generation facility. In addition to fulfilling these requirements, the specific investigations developed by the Applicant's eventual study plan will also be used in determining protection, mitigation, and enhancement measures.

**§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results Would Inform Development of License Conditions**

*Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;*

This request aims to synthesize the various abiotic and biotic categories studied in NMFS requests #1-7 listed above into a holistic and comprehensive assessment of the direct, indirect and cumulative effects of the Project on anadromous fish. Project effects not only include those categories of requested information (NMFS #1-7) but the combination of those effects on each life stage, as well as the population structure and dynamics of each species over time.

The Project facilities exert direct, indirect and cumulative effects on the adult migration life stage of anadromous fish. In this request, NMFS seeks a synthesized analysis that makes use of other existing and developed information to assess timing and magnitude of flows during the seasons of migration, holding, spawning, incubation, hatching, fry/juvenile rearing, smoltification, and out migration. These complex and interdependent life stage functions may be adversely affected by natural and artificial barriers to upstream adult migration, water flows, sediment flows, large wood flows, temperature modifications, and other factors directly attributable to dams, diversions, and hydroelectric facilities such as those of the Project.

Information about the combinations of the Project's effects can help design and construct safe and effective fishways. Under Section 18 of the Federal Power Act, 16 U.S.C. § 811, the secretary of Commerce has the mandatory conditioning authority to prescribe fishways. Successful operation of fishways may require adults and/or juveniles to successfully navigate Project reservoirs and Project affected riverine reaches, detailed information of life stage carrying capacity and population dynamics may help design more effective fish passage alternatives. The effectiveness of fish ladders or other volitional, semi-volitional (e.g. tramway), or non-volitional (e.g. collection and transport) of fish passage may be affected by the population structure and dynamics of the fish species that are being passed.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, are listed in sections above. The results of NMFS' request would inform the development of license requirements to protect, enhance, and contribute to the recovery of these species, which (as indicated by their status) are in peril. The Project's dams, diversions, powerhouses, and other facilities cause direct, indirect, and cumulative effects on these species. NMFS provides more detail on the potential geographic "reach" of the Project's potential effects in Enclosure E, but the intent of this request is to more fully understand these effects.

The Yuba River anadromous resources to be studied in this Request, all under the jurisdiction of NMFS, include:

- 1) Central Valley (CV) spring-run Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), threatened (June 28, 2005, 70 FR 37160);
- 2) CV spring-run Chinook salmon designated critical habitat (September 2, 2005, 70 FR 52488);
- 3) CV steelhead Distinct Population Segment (DPS) (*O. mykiss*), threatened (January 5, 2006, 71 FR 834);
- 4) CV steelhead designated critical habitat (September 2, 2005, 70 FR 52488);
- 5) Southern DPS of North American green sturgeon (*Acipenser medirostris*), threatened (April 7, 2006, 71 FR 17757);
- 6) Southern DPS of North American green sturgeon designated critical habitat (October 9, 2009, 74 FR 52300);

- 7) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975);
- 8) CV spring-run and CV fall/late-fall run Chinook salmon identified “essential fish habitat” (EFH), (October 15, 2008 73 FR 60987);
- 9) CV fall/late fall-run Chinook salmon ESU, Species of Concern (April 15, 2004, 69 FR 19975).

**§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice**

*Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;*

This request for information or study is consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game.

NMFS is presenting an Information Request and not necessarily specific study methodology (preferred data collection and analysis techniques, or objectively quantified information). This is because the Applicant’s responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the reiterative study development process within the ILP that the Applicant and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Applicant.

**§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost**

*Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

The Licensees do not request PURPA benefits in their PAD. NMFS considers that the cost of these studies will to be between \$50,000-\$250,000. The Project is considered vast and complex. Considering the number of dams, the amount of water diverted, the potential for environmental disturbance, the status of several species listed under the ESA, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Licensees is commensurate with the magnitude and impacts of the Project, and the revenues derived from sales of generated energy.

**8.0 References**

Merz, J.E. and P.B. Moyle. 2006. Salmon, wildlife, and wine: marine-derived nutrients in human-dominated ecosystems of central California. *Ecological Applications* 16(3):999-1009.

NMFS 2009. "Public Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead." NMFS, Southwest Region, Sacramento, California. 7pp. October 2009.



Pacific Fisheries Management Council (PFMC). 1999. Pacific Fishery Management Council. Description and identification of essential fish habitat, adverse impacts and recommended conservation measures for salmon. *Amendment 14 to the Pacific Coast Salmon Plan, Appendix A*. Pacific Fisheries Management Council, Portland, Oregon.

PFMC. 2003. Pacific Fishery Management Council. Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon and California as Revised Through Amendment 14 (Adopted 1999).

#### Federal Register Notices

Federal Register Notice, 63 Fed. Reg. 13347, March 19, 1998. Endangered and Threatened Species: Threatened Status for Two Evolutionarily Significant Units of Steelhead in Washington, Oregon, and California. Final Rule.

Federal Register Notice, 64 Fed. Reg. 50394, September 16, 1999. Endangered and Threatened Species: Threatened Status for Two Chinook Salmon Evolutionarily Significant Units in California. Final Rule.

Federal Register Notice, 69 Fed. Reg. 19975, April 15, 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act. Final Rule.

Federal Register Notice, 70 Fed. Reg. 37160, June 28, 2005. Endangered and Threatened Species: Final Listing Determinations for 16 Evolutionarily Significant Units (ESUs) of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule.

Federal Register Notice, 70 Fed. Reg. 52488, September 2, 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Final Rule.

Federal Register Notice, 71 Fed. Reg. 834, January 5, 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Final Rule.

Federal Register Notice, 71 Fed. Reg. 17757, April 7, 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 71 Fed. Reg. 61022, October 17, 2006. Endangered and Threatened Species: Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List.

Federal Register Notice, 73 FR 60987, October 15, 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon. Final Rule.

Federal Register Notice, 74, FR 52300, October 9, 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule.

Federal Register Notice, 75 Fed. Reg. 30714, June 2, 2010. Endangered and Threatened Wildlife and Plants: Final Rulemaking To Establish Take Prohibitions for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. June 2, 2010.

**UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION**

**Yuba County Water Agency            )**  
**Yuba River Hydroelectric Project    )**  
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**P-2246-058**

**NOTICE OF STUDY DISPUTE**

**PHOTOGRAPHS TAKEN IN THE VICINITY OF THE NARROWS 2 POWERHOUSE,  
FLOW BYPASS, AND ENGLEBRIGHT DAM, SEPTEMBER 13, 2011**

The photos that follow (all taken by John Wooster, a NMFS hydrologist) support information in Enclosure A, pages 12-13, illustrate:

- 1) The Narrows 2 Powerhouse shut down for maintenance and the Narrows 2 Flow Bypass in operation (Photo 1);
- 2) Chinook salmon holding in a school (congregated) downstream of the Narrows 2 Powerhouse (Photos 2 and 3);
- 3) No upstream waterway existed (dry rock was exposed) beyond the release pool formed from the Flow Bypass (Photo 4); and
- 4) Chinook salmon were absent from the pool at the base of Englebright Dam (Photo 5).













PHOTO #3









Intake to Narrows 2 Penstock

PHOTO #5



UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

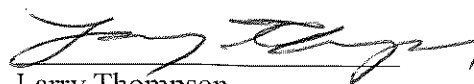
Yuba County Water Agency )  
Yuba River Hydroelectric Project )  
\_\_\_\_\_ )

Project No. P-2246

CERTIFICATE OF SERVICE

I hereby certify that I have this day served, by first class mail or electronic mail, a letter to Secretary Bose, Federal Energy Regulatory Commission, containing the National Marine Fisheries Service's Notice of Study Dispute pertaining to the Yuba River Hydroelectric Project. This Certificate of Service is served upon each person designated on the official P-2246 Service List compiled by the Commission in the above-captioned proceedings.

Dated this 20<sup>th</sup> day of October, 2011



Larry Thompson  
National Marine Fisheries Service